PROCEEDINGS

ONE HUNDRED AND FOURTH ANNUAL MEETING

of the

UNITED STATES ANIMAL HEALTH ASSOCIATION

SHERATON CIVIC CENTER HOTEL

BIRMINGHAM, ALABAMA

October 20-27, 2000
PROCEEDINGS

ONE HUNDRED AND FOURTH ANNUAL MEETING

of the

UNITED STATES ANIMAL HEALTH ASSOCIATION

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October 20-27, 2000
Synopsis of Table of Contents - 2000

I. 2001 Officers and Committees
   A. Officers
   B. Committee assignments

II. 2000 Annual Meeting Proceedings
   A. USAHA/AAVLD Joint Session
   B. Business Meeting Minutes
   C. Special Symposia
   D. Committee Reports and Related Scientific Papers
   E. Scientific Papers Presented During Annual Meeting General Session papers
      1. General Session Papers
      2. Committee Meeting Papers

III. Organizational Matters
   A. Constitution and Bylaws
   B. Proposed Bylaws
   C. Administrative policies
   D. Previous meetings

TABLE OF CONTENTS

I. 2001 Officers and Committees
   A. Officers ................................................................. 13
   B. Committees ............................................................ 14

II. 2000 Annual Meeting Proceedings
   A. USAHA/AAVLD Joint Session
      Invocation and Memorial Service – M. T. Szatalowicz .......... 34
      Welcome to Birmingham – T. Williamson, President
      of Alabama Veterinary Medical Association, and
      Billy Powell, Executive Vice President of Alabama
      Cattlemen’s Association .................................................. 36
      Invitation of AAVLD/USAHA to Hershey Pennsylvania –
      J. I. Enck .................................................................. 38
      Remarks of the President of AAVLD – B. L. Akey .............. 39
      Remarks of the President of USAHA – E. W. Zirkle ............ 41
     APHIS Administrator’s Award – C. Reed, Administrator,
      APHIS, USDA................................................................. 46
      National Assembly Award – T. J. Hagerty .......................... 48
B. Business Meeting Minutes

Session I
State of the Association – E. W. Zirkle .............................................. 49
Secretary/Treasurer's Report – H. W. Towers ................................. 51
Report of the Committee on Nominations – R. H. McCapes ......... 52
Consideration of Proposed Constitutional Amendment Relative to Dues - E. W. Zirkle ................................................................. 52

Session II
Discussion of the Executive Committees Action Regarding the Implementation of the Long-Range Plan – E. W. Zirkle ........ 53
Report on the Action of the Nominating Committee –
R. H. McCapes ........................................................................... 55
President Elect's Address – B. R. Hillman ..................................... 58
Passing the Presidential Gavel – E. W. Zirkle ............................... 61
President's Presentation – R. H. McCapes ...................................... 61

Session III
Report of the Committee on Resolutions – R. H. McCapes .......... 62

C. Special Symposia

Office International Des Epizooties (OIE) Follow-Up Session
Highlights of The 68th General Session Meeting of the OIE in Paris – M. David ................................................................. 85
OIE Regional Commission for the Americas and Tripartite Animal Health – A. Torres ................................................................. 95
Report of II Symposium for the Integration of the Public and Private Sectors to Develop Disease Control Programs for the Americas – E. W. Zirkle ................................................................. 99
Regions of the Americas Integration of Private and Public Sectors in Animal Production - E. Gimeno ......................................................... 101

Wildlife-Livestock Disease Interactions:
Challenges and Opportunities
Identification of Diseases and Agents of Concern –
V. F. Nettles and J. R. Fischer ......................................................... 109
Real and Potential Impacts of Wildlife Disease Reservoirs on State and National Disease Eradication Programs –
B. R. Hillman ............................................................................ 117
Conflicts of Authority and Strategies to Address Wildlife Diseases – T. Thorne, et al ................................................................. 123
D. Committee Reports and Related Scientific Papers

JOINT USAHA/AAVLD
ANIMAL HEALTH INFORMATION SYSTEMS


ANIMAL WELFARE


JOINT USAHA/AAVLD AQUACULTURE

Report of the Joint USAHA/AAVLD Committee on Aquaculture –
E. D. Park, et al .............................................................................. 149

BIOLOGICS AND BIOTECHNOLOGY

Report of the Committee on Biologics and Biotechnology –
D. A. Espeseth, et al ....................................................................... 151

BLUETONGUE AND BOVINE RETROVIRUSES

Report of the Committee on Bluetongue and Bovine Retroviruses –
J. O. Meacham, et al ....................................................................... 159
Bluetongue Virus (BTV) and Epizootic Hemorrhagic Disease
Virus (EHVD) – E. Ostlund .............................................................. 160
Molecular Evolution of Orbiviruses – W. C. Wilson and
J. O. Meacham ............................................................................... 169
Status of the Bluetongue Surveillance Pilot Project –
N. E. Wineland, et al ..................................................................... 181

BRUCELLOSIS

Wyoming Wildlife Brucellosis Update – T. Thorne .......................... 199
Safety of Brucella Vaccines in Pronghorn Antelope –
P. H. Elzer ..................................................................................... 203
Brucellosis in Elk in Idaho – M. Drew .............................................. 207
Brucellosis Melitensis in South Texas – T. H. Conger ....................... 214
Status Report – Fiscal Year 2000-Cooperative State-Federal
Brucellosis Eradication Program – V. E. Ragan and
M. J. Gilsdorf ............................................................................... 219
Greater Yellowstone Interagency Brucellosis Committee –
B. Hillman ................................................................. 230
Fluorescence Polarization Assay for Field Diagnosis of
Brucellosis – K. Nielson, et al ........................................... 231
Safety of Brucella Abortus and RB51 and Strain 19 Vaccines in
Coyotes (Canis Latrans) – D. S. Davis .................................. 239

CAPTIVE WILDLIFE AND ALTERNATIVE LIVESTOCK
Report of the Committee on Captive Wildlife and Alternative

ENVIRONMENTAL RESIDUES
Report of the Committee on Environmental Residues –
J. C. Reagor, et al ............................................................. 249

FEED SAFETY

FOOD SAFETY
Animal Production Food Safety Model Program Guidelines –
An Outline to Assist Development of a State Program –
R. E. Breitmeyer .............................................................. 267
Emerging International Standards Impacting Animal Production
Systems – B. Buntain ........................................................ 269
National Trichinae Herd Certification Program – Update for
2000-01 – D. Pyburn ...................................................... 270
The National Food Safety System – D. Saunders ......................... 274
Public Health Partnerships in Animal Production and
Food Safety – J. P. Huntley .................................................. 275

JOINT MEETING OF FOREIGN ANIMAL DISEASES
AND EPIZOOTIC ATTACK PLANS
Report of the Committees on Foreign Animal Diseases and Epizootic
Emergence and Re-emergence of Foot-and-Mouth Disease
in Asia: Identification and Characterization of New Strains
of an Old Enemy – P. Mason and N. J. Knowles .................... 291
GOVERNMENT RELATIONS

Report of the Committee on Government Relations –
E. W. Zirkle, et al ................................................................. 301

IMPORT-EXPORT

Annual Report to the United States Animal Health Association
Fiscal Year 2000-National Center for Import/Export –
L. Ferguson and R. Perkins ..................................................... 316
Physical and Chemical Restraint of Horses Held in U. S.
Department of Agriculture Animal Import Centers –
R. C. Knowles ........................................................................... 323

INFECTIONOUS DISEASES OF CATTLE, BISON, AND LAMA

Report of the Committee on Infectious Diseases of Cattle, Bison
and Lama – J. A. Schmitz, et al ..................................................... 324
Experimental Transmission of Chronic Wasting Disease to Cattle –
A. Hamir and J. Miller ............................................................... 330
Analysis of Virus Infections in Shipping Fever Pneumonia of Cattle:
Emergence of Respiratory Coronavirus – J. Storz ..................... 333

INFECTIONOUS DISEASES OF HORSES

Report of the Committee of Infectious Diseases of Horses –
L. M. Myers, et al ............................................................................ 338
Efficacy of Competitive ELISAs for Serological Detection of
Infection with Babesia equi and Babesia caballi –
D. Knowles ............................................................................... 339
West Nile Virus in Horses in the United States, 1999-2000 –
R. L. Crom ................................................................................ 341
Risk of Foreign Equine Diseases in the United States –
A. Green ................................................................................... 346
Eastern Equine Encephalomyelitis in Virginia, North Carolina,
South Carolina and New Jersey – 2000 – E. N. Ostlund ............... 352
Report of Contagious Equine Metritis Focus Group – D. Lein ....... 354
NAHMS Equine 98 Study – Report Summary –
J. Traub-Dargatz ....................................................................... 355
Equine Infectious Anemia and EIA Brochure 200 – T. Cordes ....... 357
Investigations on Equine Infectious Anemia in Equids from the
National Equine Viral Arteritis Video Conference Follow-Up – T. Cordes ........................... 382
Physical and Chemical Restraint of Horses Held in USDA Animal Import Centers – R. C. Knowles ......................... 384

JOHNE’S DISEASE
Report of the Committee on Johne’s Disease – W. L. Hartmann, et al .. 386
National Johne’s Working Group: Five Year Review with Path Forward - R. H. Whitlock .................................................. 400

LIVESTOCK IDENTIFICATION

NOMINATIONS AND RESOLUTIONS

PARASITIC AND HEMOPARASITIC DISEASES, AND PARASITICIDES

PHARMACEUTICALS
Future Developments and Trends with Respect to Food Animal Veterinary Drugs - D. J. S. Miller ........................................... 471
Characterization of Antimicrobial Resistance – D. E. Reeves .......... 479
Review of Developments with Veterinary Medicines in the EU - D. J. S. Miller .................................................................. 488
Risk Factors Associated with Antimicrobial Resistance Phenotype Character as Seen within Swine Farms - D. E. Reeves, et al ... 492

PROGRAM COMMITTEE

PSEUDORABIES

PUBLIC HEALTH AND ENVIRONMENTAL QUALITY

PUBLIC RELATIONS AND COMMUNICATIONS TECHNOLOGY

RABIES

SALMONELLA
Salmonella Serotypes From Animals and Related Sources
Detection of Salmonella enteritidis Infections in Chickens and Egg Yolks Using Fluorencence Polarization – M. E. Jolley, et al .... 527
Epidemiology of Salmonella Contamination of Milk on a Commercial Dry-Lot Dairy – J. K. House ................................. 536

SALMONELLA ENTERITIDIS IN EGGS
SHEEP AND GOATS

Scrapie Program Update – September - D. Sutton, NAHPS ............ 555

TRANSMISSIBLE DISEASES OF POULTRY

Report of the Committee on Transmissible Diseases of Poultry and Other Avian Species - R. J. Eckroade, et al ................................. 559
Update on FSIS on Baseline studies on Campylobacter –
A. Thaler ................................................................................... 559
Update on APHIS on the Live Bird Market Working Group –
T. J. Myers ................................................................................ 561
National Animal Health Report System(NAHRS) – S. Kleven .... 564
Status Reports – Newcastle Diseases, Velogenic Viscerotropic,
in the Laguna Region of Mexico – E. Rivera ............................. 575
Update on USAHA Committees of Interest – K. V. Nagaraja .... 599
The U. S. West Nile Virus Outbreak in 2000: An Update –
L. C. Glaser .............................................................................. 630

TRANSMISSIBLE DISEASES OF SWINE

Report of the Committee on Transmissible Diseases of Swine –
E. A. Lautner, et al .................................................................... 633

TUBERCULOSIS


WILDLIFE DISEASES

E. Scientific Papers Presented During Annual Meeting

1. General Session Papers
   Detection of *Salmonella enteriditis* Infections in Chickens and Egg Yolk Using Fluorescence Polarization – M. E. Jolley .......... 527
   Emergence and Re-emergence of Foot-and-Mouth Disease in Asia: Identification and Characterization of New Strains of an Old Enemy – P. Mason and N. J. Knowles ....................... 291
   Molecular Evolution of Orbiviruses – W. C. Wilson and J. O. Mecham ................................................................. 169
   Characterization of Antimicrobial Resistance - D. E. Reeves .......... 479
   Analysis of Virus Infections in Shipping Fever Pneumonia of Cattle: Emergence of Respiratory Coronavirus – J. Storz .................. 333
   Safety of Brucella Vaccines in Pronghorn Antelope – P. H. Elzer .... 203

2. Scheduled Committee Scientific Papers
   Safety of Brucella Abortus and RB51 and Strain 19 Vaccines in Coyotes (Canis latrans) – D. S. Davis ................................. 239
   The National Food Safety System Project – D. Saunders ............... 274
   Experimental Transmission of Chronic Wasting Disease to Cattle – A. Hamir and J. Miller ............................................. 330
   National Johne’s Working Group: Five Year Review with Path Forward - R. H. Whitlock ................................................ 400
   Future Developments and Trends with Respect to Food Animal Veterinary Drugs – D. J. S. Miller ................................... 471
   Epidemiology of Salmonella Contamination of Milk on a Commercial Dry-Lot Dairy – J. K. House ................................. 536

III. Organizational Matters

A. Constitution and Bylaws of USAHA ............................................. 673
B. Proposed Bylaws of USAHA ....................................................... 683
C. USAHA Administrative Policies .............................................. 695
D. Previous Meetings ................................................................... 697
I. 2001 Officers and Committees
   A. Officers
   B. Committee Assignments
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14
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16
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**Vice Chairman:** Dr. David M. Castellan, Sacramento, CA

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**Vice Chairman:** Dr. Katherine N. Bretzlaff, College Station, TX

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Mr. Dave Whittlesey, CO
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Dr. Richard W. Winters, TX
Mr. Steve Wolcott, CO
Ms. Jill Bryan Wood, TX
Dr. Leslie W. Woods, CA
II. 2000 Annual Meeting Proceedings
   A. USAHA/AAVLD Joint Session
   B. Business Meeting Minutes
   C. Special Symposia
   D. Committee Reports and Related Scientific Papers
   E. Scientific Papers Presented During Annual Meeting
      1. General Session Papers
      2. Committee Meeting Papers
INVOCATION

Dr. Marion T. Szatalowicz

Let us bow our heads in prayer. Almighty Lord, we first thank Thee for the privilege you grant us to be of service on behalf of the entire animal industry of our nation and this world. We thank Thee for the innovative processes that you have instilled in us to continuously improve and progress in controlling devastating disease in your animal kingdom, ensuring not only improved health of animals, but humankind as well. We thank You for providing all of us with the safest food on the face of this planet. Almighty Lord, we seek you forgiveness for our shortcomings and transgressions in our personal and professional responsibilities. We ask Thy blessings on the leadership of this United States Animal Health Association, and all those that labor on our behalf, that they may have your divine guidance to responsibly lead us into the new millennium. We ask Thy blessings on those that are entrusted to diagnose the maladies that bring suffering and despair to animals and man. We ask Thy blessings on those that have the responsibility to protect consumers, enforce our laws, and provide for the humane care and treatment of all thy creatures. We ask Thy blessings on those in the military service of our country. We likewise see Your blessings on those that continue to seek answers and solutions to problems through research and study, that they may persevere and possess the energy and enthusiasm to press on. We ask Thy blessings on all those here assembled, that they may share in knowledge, fellowship, and good will. Lord, we ask Thy blessings on our colleagues and friends that are experiencing illness, pain, and suffering. Lord, alleviate their pain and anxiety. And Lord, we ask that You grant eternal peace and rest, and Your most heavenly rewards to our departed colleagues and friends. Those who have gone to their heavenly reward this past year are the following:

Dr. E. C. Sharman - USAHA Life Member - Alexandria, VA - Died October 22, 1999.  
Dr. John M. Dick - USAHA Member - Hummelstown, PA - Died October 22, 1999.  
Ms. Patricia Lee - Member (National Buffalo Association) - Attica, IN - Died May 3, 2000.  
Dr. James W. Glosser - Former Administrator of APHIS, USDA, VS - Massillon, OH - Died May 24, 2000.
Dr. Delmar R. Cassidy - USAHA Life Member - Omaha, NE - Died July 7, 2000.
Dr. Patton L. Smith - Past President of USAHA 1991 - Sacramento, CA - Died August 9, 2000.

Finally, Almighty Lord, please grant us a lasting peace in this troubled world. Lord, make each of us an instrument of your peace. Almighty Lord, we humbly beseech Thee, grant us all these things in Thy most holy name, for your greater glory. Amen.
WELCOME
JOINT USAHA/AAVLD GENERAL SESSION

Tom Williamson
President of Alabama Veterinary Medical Association

I bring greetings to all of you with the United States Animal Health Association and the American Association of Veterinary Diagnosticians from the Alabama Veterinary Medical Association.

When Dr. Alley extended the invitation to attend your opening session and to say a few words representing the Alabama Veterinary Medical Association, I was most pleased. Our association knows your work. Many of you are our esteemed colleagues. Our association members know and value what a tremendous positive impact your professional endeavors provide for the well-being of the public's health.

I know that it is not necessary to illustrate and give specific examples of your contributions to animal health, research, food safety and public health policy. You are the folks in the trenches, working day-in and day-out to perform the services.

The Alabama Veterinary Medical Association members, whether in government employ, private practice, education, wildlife management, or the like, are aware each day of your contributions.

Likewise, if I might take off my Veterinary hat for a moment, I would like to speak to you simply as a resident of the Great State of Alabama, a state proud of a strong agricultural heritage. A state with high production in poultry, crops, and beef cattle. Your professional expertise touches the lives of every citizen in our State. We thank you. For the young and the old, from the producer to the consumer, your vigilance and knowledge are appreciated for their enhancement of our quality of life.
WELCOME
JOINT USAHA/AAVLD GENERAL SESSION

William E. Powell, Ph D
Executive Vice President
Alabama Cattlemen’s Association

On behalf of Alabama’s 25,000 cattle producers I would like to welcome you to our great state. We are pleased that you chose Birmingham for the 104th Annual Meeting of the United States Animal Health Association and the 43rd Annual Conference of the American Association of Veterinarian Laboratory Diagnosticians.

Alabama has 700,000 brood cows and each year our producers sell over $350 million in cattle and calves. Alabama’s cattle industry is a $2 billion business ranking 3rd only behind forestry and poultry among all agricultural commodities. These 3 commodities make up approximately 80 percent of Alabama’s annual agricultural cash receipts, which exceeds $4.3 billion.

Alabama’s cattle business, like our neighboring states in the southeast, is the first step in the beef production chain. We ship approximately 95% of all of our calves out of state at weaning to stockers and feedlots.

As CEO of the Alabama Cattlemen’s Association, which has over 12,500 active members and also handles the state’s beef checkoff program, we rely heavily on our state veterinarian, state and federal animal health personnel and the state animal disease diagnostic laboratory. We are fortunate to have a great working relationship with Dr. J. Lee Alley, Dr. Fred Hoerr and others in the Department of Agriculture.

I am pleased to report that tomorrow at 10:00 I will be with our Governor, the Commissioner of Agriculture and Dr. Hoerr at a news conference requesting support of a constitutional amendment that is on the November 7th ballot which will provide $13 million for a new state diagnostic laboratory. I am not saying progress has been slow, but Dr. Alley and I have been working on this project for at least 15 years.

We appreciate the commitment and dedication that each one of you makes daily to the animal health profession. Your presence at this conference is indicative of your role in this profession that is so important to our industries.

I hope the balance of this conference goes well and that you have an opportunity to return to Alabama for another visit soon. Again, welcome to Alabama.
INVITATION OF AAVLD/USAHA TO HERSHEY, PENNSYLVANIA

John Enck
Harrisburg, PA

How "sweet it is" Hershey, PA that is. I want to take this moment to invite all of you to Hershey for next year’s meeting. The Hershey Lodge and Convention Center is a wonderful facility to have our meeting. The temperatures in Hershey this time of year range from the 40s to the 60s and most of all, by this time of year, all of the West Nile Virus mosquitoes are dead.

Hershey is centrally located in south central Pennsylvania. It is easy to get to from the Harrisburg International Airport. Hershey Lodge and Convention Center has a shuttle from the airport. One could fly into Philadelphia and rent a car for the two-hour ride West to Hershey or take Amtrack into Harrisburg.

There are many attractions in and around Hershey that makes this a fine meeting to bring the whole family. There are attractions like Hershey Chocolate World, historic Lancaster County with the famous Amish life style, Gettysburg National Park and Museum, Pennsylvania Veterinary Laboratory, Hershey Medical Center, Strasburg Railroad, Longwood Gardens, antique shops galore and many many outlet stores. There is something that can interest everyone.

The Hershey Lodge and Convention Center is very comfortable, there is easy access to the center and there are plenty of extracurricular activities for everyone. So, Please put this meeting on you calendar now, and I will see all of you in Hershey.
REMARKS OF PRESIDENT OF AAVLD

Dr. Bruce L. Akey
Richmond, VA

Good evening ladies and gentlemen. As I look back at the past year as President of the American Association of Veterinary Laboratory Diagnosticians, I am struck by how much the organization has grown. With over 1100 members representing every state in the US as well as Canada, Mexico and many other countries, the AAVLD has become a vital center for the exchange of ideas and information and a driving force in improving the quality of diagnostic veterinary medicine world-wide. Just as with the emergence of a global marketplace, a major transition is underway in veterinary diagnostic laboratories towards internationally-recognized standards of quality assurance and accreditation. The AAVLD has been invited by the USDA for the first time to send an observer to accompany the delegation of the Chief Veterinary Officer to the annual Organization International des Epizooties (OIE) meeting in Paris, France. The OIE is the internationally recognized body that sets standards for testing and trade of animals and animal products. Observation of the workings of the OIE will provide the AAVLD valuable insight into the processes of international trade and improve our ability to contribute to the review of proposed testing standards.

Within the US, we are strengthening our collaboration between state and federal laboratories to provide US agriculture with an exemplary system for detecting and diagnosing both domestic and foreign animal diseases and facilitate trade. We will be working closely with the National Veterinary Services Laboratories in defining the scope of veterinary diagnostic testing for purposes of national and international accreditation, the latter to ISO standards. The expertise of AAVLD members will likely be relied upon to fill the roles of assessors in the ISO accreditation process. A major initiative has begun to establish "AAVLD-Approved" standardized test protocols to be used as part of the accreditation process.

I would like to thank the membership of the AAVLD for giving me this wonderful opportunity and experience and extend special thanks to the other officers, regional representatives, committee chairs and support staff that provide the horsepower to keep the AAVLD moving forward. I look forward to many more years of rewarding association with the AAVLD.
REMARKS OF PRESIDENT OF AAVLD

Dr. Bruce L. Akey, President of AAVLD
First of all I want to sincerely thank you for giving me the opportunity to serve as your president. It has truly been the highlight of my career in veterinary medicine. I really thought when I sold my practice and went with the state of NJ that I was through with 16 – 18 hour days, however there were periods when I found it necessary to spend more time on USAHA than my “day” job. Of course this couldn’t have happened without the support of the Secretary of Agriculture, Art Brown, and my excellent staff. Altogether, I attended 31 meeting outside of New Jersey this year. This included attending all the regional meetings, The Canadian Animal Health Consultative Committee meeting in Quebec, the NIAA meeting, the Association of Food and Drug officials, AVMA and the OIE meeting of the Americas in Panama. For those of you considering the Presidency of USAHA, my total travel costs exceeded $15,000.

One of the comments that really impressed me soon after becoming Third VP, was from Joan Arnoldi, then Deputy Administrator of Veterinary Services. She felt that if USAHA was to become truly effective in addressing VS needs, we had to be available more than just once a year at the annual meeting. VS and other governmental agencies need access to our expertise and we must have the ability to develop positions quickly. Much of the extra time that I spent on USAHA included trips to Riverdale and Downtown Washington. I live close enough to drive and I made it my goal to see that USAHA had a presence in both places as often as I felt was necessary.

The AHPA is a good case in point. Members of the AAC had worked several years on writing the proposed legislation. They had informed us that they were working on it and requested our support. USAHA is a member of the AAC and the main architects of the language are all members of USAHA but they did not solicit input from the perspective of USAHA organizationally or from the National Assembly. It is my understanding that AVIC’s were no more aware of the proposal than state veterinarians. I applaud the work AAC did on the AHPA and agree that it is sorely needed, but we all needed to have input during the drafting phase so that consensus could be established to make implementation possible.

Your Board of Directors remains committed to the Long Range Plan as outlined by Larry Williams and initially implemented by Dick McCapes. Towards that end, we will be asking membership at large to vote for the hiring of
a part-time Executive Director. The AHPA is only one example of how imperative it is that we have a presence in Washington. We must be available for scientific input and advice on issues concerning the delivery of service from Federal agencies to our livestock industries.

The Constitution and Bylaws committee has completed their work and the Executive Committee will be asked to vote on the draft Bylaws Tuesday. Over the past year we have been extremely fortunate to have a lawyer working probono with the committee. Sam Serata is not only a close personal friend, but also a true friend of agriculture. He graduated with a BS in Agriculture from Cornell before serving in Korea, and then deciding on a career in law. He has served in a number of capacities in the judicial system in NJ, taught administrative law and continues to do municipal and school board work in addition to his private practice. Sam also gave a presentation to committee chairs present at the Government Relations Committee on parliamentary procedures. Sam will you please stand to be recognized, and members of the audience if you would join me in a round of applause. Sam will also be acting, along with Dick McCapes, as Parliamentarians for the remainder of this meeting.

The Committee Chaired by Francois Elvinger to develop a set of guidelines for committee chairs has completed their work and the report will go to the Executive Committee for approval at this meeting. The strength of USAHA is in its committee system and they will now have a uniform set of guidelines to follow.

The state of disrepair of NVSL is a concern to all of us. Dick McCapes and Bob Frost have researched the facilities at Ames, Iowa and are putting together a special edition of the newsletter to point out the problems in a more understandable and descriptive way. We hope the newsletter can be used as another tool to help convince legislators not only of the need, but also to get a commitment to fund the entire proposed project and to start construction as soon as possible. Another tool that can be used is the outstanding article that appeared in the Sept. 11 issue of Business Week Magazine entitled Bioinvasion, by Janet Ginsberg. The Board of Directors will be recommending that USAHA declare getting this building project funded our #1 goal for the coming year. I wish to congratulate the AAC on the outstanding lobbying they did to get the $9 million to initiate planning for the new combined facility. I'm convinced that without their strong last minute effort we'd be waiting another year to get started.

We are moving forward in expanding our aura of influence internationally. Bob Hillman attended OIE in Paris and returned with similar impressions to those I expressed last year. We must continue to help generate information and comments on issues from scientists and industry representatives on items up for discussion, not only in Paris, but other places where they are discussed around the world. I attended the Canadian Animal Health Consul-
tative Committee meeting in Quebec this past December and was honored to be included in their discussions. We must strive to have such an exchange with Mexico and other countries in the Americas.

I attended an OIE meeting of the Americas for the integration of the public and private sector to develop disease control programs for production of livestock. This meeting exposed very clearly the need for a core group to help devise programs on two levels:

A. Individual countries need to develop producer organizations to help educate producers to the benefit of disease control programs. Once this infrastructure is developed, it can serve as a stabilizing force when government structure is disrupted through the election process.

B. There needs to be an organized framework of the Countries of the Americas to bring together consensus and understanding of each country's strengths, weaknesses and needs to provide a unity that will help dilute the strength of the EU on issues of concern to this hemisphere.

I volunteered USAHA to assist with both of these suggestions.

Dr. Emilio Gimeno, the OIE Regional Representative to the Americas, agrees with this concept and thinks it should be OIE supported. I see advantages and disadvantages to that concept. Anyway, Dr. Gimeno has stated he will be in continuous contact with USAHA regarding working towards these goals. He will be here to address the OIE scientific session Tuesday.

The International Issues Committee that I established last year is being expanded. I ask that all issues dealing with OIE and other international issues or presentations, touch base with Michael David and his staff and the chair of the International Issues Committee who will be appointed annually and will be the immediate Past President of USAHA.

This morning the National Assembly heard Dr. Torres announce that NASDA is being contracted to conduct a Safeguarding Animal Health Review of Veterinary Services. I am already familiar with this process since I have been privy to the review of PPQ by the National Plant Board. I can tell you that this type of review is long overdue and that USAHA is ready to have a major role in the process.

The resulting document will allow all of us to better serve our livestock industry.

While I am proud of the accomplishments of the past year I must point out some areas of need and ask your help to enable USAHA to reach its full potential.

1. We must "sell" USAHA to increase membership – There are many people out there in almost every category of membership that should or could be members of USAHA. We have something to offer all animal agriculture related people and I challenge each of you to help bring them aboard. The organization needs them and our trea-
sury needs them.

2. We must find supplemental sources of income – We cannot continue to operate this organization on fees and dues of its members only. I have appointed a Finance and Budget Committee chaired by Bob Eckroade to, as part of their charge, find innovative ways to increase revenues. If any of you have any ideas please see Bob or our Treasurer, Wes Towers.

3. USAHA, AAVLD, the National Assembly, NIAA, and AAC are all organizations that service and support animal agriculture. Some of you are members of several of these groups. Each group has a somewhat different approach toward accomplishing their mission and goals. That is as it should be and is good. I see times when we all are in unison on an issue and then times when we are not working together or at least do not consider the other groups position on an issue. I have outlined today how progress on a critical issue, the AHPA, was stopped because one group was ignored.

I am suggesting that these groups get together at the top organizational level to sort out their differences and find a way to decide who should take the lead on issues and who will be supportive and thus save a lot of time spent spinning wheels needlessly. We all have too much to do to have that happen as much as it does. More importantly, we need to show the public, Congress, Federal Agencies or whomever is interested that we are unified in our support of animal agriculture. Bob and I are ready to take the 1st step towards this kind of compact

I would now like to mention a few people who should be recognized for their contributions to this organization this year.

Dr. Richard McCapes for his services as Editor of the newsletter the past 4 years.

Dr. Jones Bryan for getting the Salmonella enteriditis committee going under very difficult circumstances.

Mr. Larry Mark for his continued progress with the web site.

Dr. Alley and the office staff, Linda Ragland and Beverley Bahen, for year round devotion to the organization and all the many tasks of getting this meeting running smoothly

My wife Cindy’s support and assistance with the many obligations associated with the Presidency.

It has been a pleasure to work with President-Elect Hillman this year. He, and as I mentioned earlier, the Board of Directors are committed to continuing the direction we are going. Bob has some innovative ideas that we will learn about Thursday. I look forward to my year as past President and will support the Board in any way I can. Since I live close to Washington, I will continue the presence there until an Executive Director is named.

USAHA is unique in the world. We are the only association that can bring all groups, from regulated industry to federal policy makers to the same
REMARKS OF THE PRESIDENT OF USAHA

table and cooperatively develop solutions to animal agricultural problems. We must work together to ensure that our association remains strong and vibrant.

Dr. Richard H. McCapes, Immediate Past President of USAHA, presents plaque, tie tack and life member badge to the outgoing USAHA President, Dr. Ernest W. Zirkle.
APHIS ADMINISTRATOR'S AWARD

Craig Reed, Administrator, APHIS, USDA

Dr. M. D. (Mo) Salman received his veterinary degree from the University of Baghdad (Iraq) in 1973. He spent the first five years of his career in various positions (private practice, military service, and government service) in Iraq, Oman, and the United Arab Emirates. In 1978, he moved to the United States and earned an MPVM at the University of California-Davis in 1980. He received his Ph.D. in Comparative Pathology/Quantitative Epidemiology from UC-Davis in 1983 with a dissertation entitled "Quantitative Study by Path Analysis of the Epidemiology of Bovine Brucellosis in the Mexicali Valley, Mexico." Dr. Salman came to Colorado State University in 1984 as an Assistant Professor in Veterinary Medicine and Biomedical Science. He became a full professor in 1994 and in 1995 began serving as the Section Chief of Epidemiology in the Department of Environmental Health, Colorado State University. He is a diplomat of the American College of Veterinary Preventive Medicine and a Fellow of the American College of Epidemiology.

Dr. Salman can best be characterized as a true friend of APHIS. He has a long history of involvement with key APHIS programs such as tuberculosis, brucellosis, and NAHMS as well as hot topics for APHIS such as vesicular stomatitis, risk analysis of infectious animal diseases and trade. He has been an advisor and mentor to many current and former APHIS employees.

During his tenure as chair of the National Animal Health Information Systems Committee of USAHA, Dr. Salman worked hard to help APHIS develop a more cohesive national monitoring approach. It started by assessing what was already being done at the state and national level. State veterinarians were asked how they knew about the disease status of their state and what type of reporting systems was in place. At the national level, he was very familiar with the Veterinary Diagnostic Laboratory Reporting System and strongly encouraged APHIS:VS personnel at CEAH to review the approach to that system and consider modifying it to be more inclusive of important animal diseases. Based on the review of the system, CEAH proposed making changes to the system and the AAVLD subcommittee for animal disease reporting concurred with those recommendations. As a result, more diseases and sources of information were included for coverage in the DxMonitor Animal Health Report. This caused concern among the state veterinarians and reporting only lasted a couple of months. Dr. Salman worked with USAHA and APHIS to have this topic of OIE listed disease reporting come before USAHA in 1996. He was instrumental in helping to plan for the meeting which brought all of the state veterinarians and many industry leaders together. This was the initial beginning for the National Animal Health Reporting System (NAHRS) which continues to undergo development today. He
was not content to let this effort end and spent the next two years tirelessly talking to regulatory officials and industry officials about the importance of the system and garnering both internal and external support for the effort. He also worked very closely with personnel at CEAH to convey feedback and encourage the development of NAHRS.

Dr. Salman has been instrumental in acquiring funding for and initiating vesicular stomatitis virus research both within the United States and in Central and South America since 1995. His leadership in epidemiologic research in Colorado, New Mexico, El Salvador, Costa Rica and Colombia has been instrumental in gaining insights into the epidemiology of this disease. He has served as a scientific adviser and member of evaluation team for the surveillance systems of vesicular diseases in Columbia, Panama, Costa Rica, El Salvador, and Mexico.

Nominee's Title and Business Affiliation: Section Chief, Department of Environmental Health, Colorado State University, Fort Collins, CO 80523

Dr. Craig Reed, Administrator, APHIS, USDA presents the APHIS Administrator's Award to Dr. Mo Salman, DVM, Ph.D.
2000 NATIONAL ASSEMBLY AWARD

Dr. Thomas J. Hagerty
St. Paul, MN

The National Assembly Award is given annually to an individual who has demonstrated leadership and ability in his or her endeavors toward the betterment of the health of livestock and the safety of the U. S. food supply.

This year's recipient is an individual who has a long and illustrious career as a State Veterinarian. He has served for 31 years in this capacity. He has been very active in State and National professional organizations. He has held offices in both state and local veterinary groups and has served on many livestock industry task forces and committees.

He is a member of the AVMA, the Delaware VMA of which he is a Past President, the Northeastern USAHA, the National Association of Public Health Veterinarians, the National Assembly of Chief Livestock Health Officials where he twice served as President, he is Past President of the USAHA and presently Treasurer of USAHA and Chairman of the Public Relations Committee of USAHA. He also serves on the Executive Committee of the AAVLD. He and his wife, Sara, have two children, David, 29, and Laura, 26.

This year's award goes to Dr. Wesley Towers, Jr. of Harrington, Delaware, Delaware State Veterinarian for the past 31 years.

Dr. Thomas J. Hagerty, President of the National Assembly of Chief Livestock Health Officials, presented the eleventh National Assembly Award to Dr. H. Wesley Towers. The award is given to an active regulatory official or an industry representative for outstanding services in the animal health regulatory programs.
BUSINESS MEETING MINUTES

Business Session I, Tuesday, October 24, 2000 – Chaired by Ernest W. Zirkle, President.

State of the Association -

Your Board of Directors remains firmly committed to the Long Range Plan. I had hoped to be able to give a positive update on the status of moving to Stage II, however, we are not ready since we have not cut the number of committee meetings down to around 30.

This year we will be asking the membership of the association to vote on hiring a part-time Executive Director. I visited Washington 16 times during this year and can tell you it is imperative that we have a presence in Washington to have input on issues concerning the delivery of services from the federal agencies to our livestock entities. We must be available for scientific input and advice when needed. We cannot do this without being available when it can be most beneficial. I have agreed to continue that presence under President Hillman until the part time Executive Director is appointed. We are exploring several options that could provide office space for an Executive Director in Washington.

The Constitution and Bylaws Committee has completed their work and the Executive Committee will be asked to consider the revision Tuesday. We utilized the services of attorney, Mr. Sam Serata to help draft the document. His service for this work was pro bon, so I hope each of you make it a point to thank him for this invaluable service.

The Yellowstone National Park issue continues to be a serious concern. USDA's withdrawal from the cooperative agreement with Montana was perceived to be a harsh blow to the long-term effort to eradicate brucellosis from the bison and elk in the park. We were equally harsh in our response to the withdrawal, as it is our duty to point out inappropriate actions that can have long-term consequences on the eradication of a disease. I have been informed that the record of the decision for the Montana/ Yellowstone National Park Bison Management Plan will not be completed until next month. It will not be available for discussion at this meeting.

I appointed a Tuberculosis/Wildlife working group to report on a number of questions surrounding the outbreak of tuberculosis in whitetail deer and cattle in Michigan. The group is co-chaired by members of the Tuberculosis and Diseases of Wildlife Committees. They will be presenting their preliminary report to the respective committees at this meeting.

It has been five years since the establishment of the Johne's Working Group. The group under the tripartite chairmanship has accomplished a lot since it was founded. There appeared to be some sentiment that the group had completed its mission. President Elect Hillman and I met with the co-chairs and the Johne's Committee Chair, Dr. Hartman, and all agreed that the goals of the committee were not met and that a review of accomplishments and changing needs needed to be made and a report given to the parent
Johne's Committee. The working group presented a review of accomplishments and recommended direction for the future to the Johne's committee for review and comment yesterday afternoon. I'm sure comments will be included in the committee report. The focus of attention to the disease has resulted in the development of a draft voluntary control program with indemnity.

The Committee Chaired by Francois Elvinger to develop a set of guidelines for committee chairs has completed their work and the report will come to the Executive Committee for approval at this meeting. The strength of USAHA is in its committee system and they will now have a uniform set of guidelines to follow.

Web Page usage has been increasing exponentially each year since Larry Mark put it up. We are fast becoming the premier animal health web site on the Internet.

Permission has been granted to have the Foreign Animal Disease Book translated into Spanish and distributed in Central American countries.

The AHPA was very close to obtaining approval by USAHA and time simply ran out. I have spoken to Dr. Torres and he is anxious to pick up where we were when action was dropped and see if we cannot get a consensus from USAHA and the few members of AAC who still had problems with it, so that when the new session convenes we can get an early start.

The state of disrepair of NVSL is a concern to all of us. The Board of Directors has decided that USAHA will declare getting legislative attention and full funding for the proposed project at Ames, Iowa, our # 1 goal for the coming year.

President-elect Hillman represented USAHA at OIE in Paris and returned with similar impressions to those I had last year. We must continue to help generate information and comments on issues from scientists and industry representatives on issues up for discussion, not only in Paris, but wherever they are discussed. I attended the Canadian Food Inspection Agency meeting in Quebec this past December and was honored to be included in their discussions. We must strive to encourage such exchanges with Mexico and other countries in the Americas.

I attended an OIE meeting of the Americas for integration of public and private sectors to develop disease control programs for production of livestock at the invitation of Dr. Emillio Gimeno in Panama City. This meeting exposed very clearly the need for a core group to help devise programs on two levels:

A. Individual countries need to develop producer organizations to help educate producers to the benefit of disease control programs

B. There needs to be an organized framework at the OIE Americas level to bring together consensus and understanding of each country's strengths, weaknesses, and needs to provide a unity that will help dilute the strength of the EU on issues of concern to this hemisphere.
I volunteered USAHA to assist with both of these suggestions. 
The OIE Committee that we established is being expanded and will be 
named the International Issues Committee. All those with issues dealing 
with OIE or other international issues should touch base with Michael David 
and his staff and the chair of the International Issues Committee. The imme-
diate Past President of USAHA will serve as chair.

While I am proud of the accomplishments over the past year I would be 
remiss if I did not point out our financial needs and ask you to help in making 
USAHA the leader that is needed in the 21st century. There are a number of 
things we must do for future growth.

1. During this year we have been able to convert our accounting sys-
tem to a new chart of accounts and have begun accumulating reli-
able data on which to develop a budget. USAHA has never had a 
formal budget, which has contributed to the financial uncertainties 
we face today.

2. We must find supplemental sources of income. We cannot con-
tinue to operate this organization on fees and dues of its members 
only. The Finance and Budget Committee chaired by Bob Eckroade 
has been asked to, as part of their charge, find innovative ways to 
increase revenues. If any of you have any ideas please see Bob or 
our Treasurer, Wes Towers.

3. We must “sell” USAHA to increase membership. There are many 
people out there in almost every category of membership that should 
or could be members of USAHA. We have something to offer all 
animal agriculture related people and I challenge each of you to 
help bring them aboard. The organization needs them and our trea-
sury needs them. Bob Hillman will be naming a membership com-
mittee and giving them their charge this week.

The unique and complex makeup of USAHA could not be duplicated to-
day with the myriad regulations on Federal/industry relationships. We must 
work together to ensure that our Association remains strong and vibrant. 
While we all come to the table from different perspectives, we need to keep 
the best interests of the organization in mind if we are to remain as strong 
and vibrant in the 21st century as we have been in the past.

Secretary/Treasurer's Report - H. W. Towers

I am pleased to tell you that our organization remains on a fairly fiscally 
sound basis. As you all know, the cost of doing our kind of business keeps 
edging upward each year. The Board of Directors has worked hard to arrive 
at the organization’s budget and have kept projected expenses for the year 
2000 to a sparse 2% increase. Every effort is being made to keep expenses 
in line with the budget.

The Board of Directors voted to have an independent audit performed 
this year. The firm of Farrell and Zarnegar was hired. They certified that as of
BUSINESS MEETING MINUTES

12/31/99 the organization’s schedule of cash accounts was a total of $246,333.18. This differs from the amount in your “blue book” by approximately $25,000. The figure in the blue book counts the net worth of the as yet unsold Foreign Animal Disease books and some office equipment.

In 1999, our expenses out paced our revenues by $1,910.01. This year, even with our budget and holding expense increases to a mere 2%, the Board of Directors projects a shortfall of between five and six thousand dollars. These shortfalls of $1,900 last year and $5 or $6,000 this year have to be made up out of our cash reserves. Dipping into your cash reserves each year is not a sound practice.

The Board of Directors approved the purchase of a new computer program that is able to help us keep accurate, up-to-the-minute records of our receipts and expenditures. This new equipment has been in place for only three months but for future meetings should generate a complete set of data for the entire year.

Report of the Committee on Nominations and Resolutions –


Dr. McCapes announced the slate of nominees would be posted on the bulletin board overnight and will be brought forth for discussion during Business Session II, the following day at 4:00pm. At that time, members have an opportunity to amend the report by replacing an individual’s name on the slate with another’s. The report as is or as amended then goes to the Executive Committee for consideration. Acceptance by the Executive Committee constitutes election.

Dr. Alley: Constitutional Amendment relative to Dues:

Dr. Zirkle: The Executive Committee approved an amendment to the Constitution Bylaws during the San Diego meeting. That amendment now needs to be approved by the general membership. Dr. Alley would you please discuss this item of business.

Dr. Alley: The proposed by-law change reads:

The Executive Committee shall establish the amount of dues.

Are there questions?

Dr. Lea: Move for approval.

Dr. Leafstedt: Second.

Dr. Zirkle: Moved and seconded. Any discussion? All in favor signify by saying Aye. Opposed like sign. Motion approved. There being no other business, meeting is adjourned.
BUSINESS MEETING MINUTES

Business Session II - October 25, 2000 - Chaired by Ernest W. Zirkle, President

DR. ZIRKLE: Our first item on the agenda is a discussion of the Executive Committee’s action regarding the implementation of the long range plan. We had thought that for this meeting we would be reporting on action of the Executive Committee yesterday and indeed the Executive Committee did take some action. The ratified the amendment that was offered last year to be able to collect fees. And they discussed at length the recommendations of the Board of Directors to the Executive Committee with regards to this long range plan. The Executive Committee decided that there was enough to think about that they would think about it overnight and they would come back today to discuss those issues. Since we seem to have enough time before our 4:30 time specific election of officers, I’ve asked Dr. Hillman and Dr. Alley and Dr. Alley will be here shortly, since they pretty much put that plan together, if they would like to just discuss it a little bit to enlighten those who are not on the Executive Committee. So Bob if you would like...Here comes J. Lee. (laughter) J. Lee to bring you up to date...sorry about that. I just briefly outlined what occurred yesterday and said since we do have some time and you have your overheads, since we do have a little time here if you would like to discuss briefly what we discussed yesterday and why the deliberations are carried over. I think it might be helpful to the group.

DR. ALLEY: The Executive Committee in 1997 approved the USAHA Long Range Plan. The objective of the Long Range Plan was to make USAHA a year-round association. The 2000 Board of Directors concurred with the 1997 Long Range Plan.

The Long Range Plan states that USAHA should be a forum for communicating and coordinating animal health activities, be a clearinghouse for policies and programs, to develop solutions in animal health issues and to develop rules and regulations.

To expand USAHA into a work active year round association with an Executive Director requires increased financial resources with an accounting system to control operating costs. The Chart of Accounts is being established. We received our first report for July 2000. There are still problems to be worked out with the system.

The Board of Directors has developed two plans for increasing income. (Option 1 and Option 2).

Option 1:
- increase individual dues from $75 to $100
- increase official agency and allied organization dues from $300 to $600
- increase registration from $180 to $200 for members and $200 to $250 for non-members (this registration fee increase approved by Board of 2000)
Option 2:
- increase individual member dues from $75 to $125
- increase official agency and allied organization dues from $300 to $500
- increase annual meeting registration fees for members from $200 to $300 and non-members from $250 to $350

Option 1 should provide an estimated excess increase of $14,000 and Option 2 should provide an estimated excess income of $85,000.

The Executive Committee will be reviewing the association's financial structure during the Second Executive Committee meeting this afternoon at 5:00 P.M. The real question is what are we willing to pay to proceed with implementing the association's Long Range Plan. Each of you should have a copy of the Blue Book, which in detail explains the Long Range Plan and the association’s finances.

DR. HAGERTY: J. Lee I've got the blue book. I've got it all marked up and got tabs now that's been working hard today trying to get out. I understand … it's very straight forward. It takes some reading to get through it, but to increase dues from $300.00 to $600.00. Option 1 recommendation would raises us $15,000.00. And then raises the individual to $20,000. That's $35,000. And what your saying is the cost of living will eat up a good chunk of this.

DR. ALLEY: Again hopefully we can identify some areas in our expenses that can be reduced. The big expense items are the salaries and office rent, those are the things we cannot do without.

DR. ZIRKLE: At the risk of confusing, also factor into that difference Tom is the fact that we counted probably if we raise those two we might have 90 less people coming to accommodate for that as well. And I guess the other thing I should say at this point is we have appointed the finance committee and they have been charged to find innovative ways to increase our funding and will be giving their report to the Board of Directors at this week and we'll be looking at those areas as well.

DR. ZIRKLE: Is there anything else or anybody, Conner we've got about five minutes until time specifics reports, so Tom?

DR. HAGERTY: Ernie on the bylaws, I just wanted to point out. I think if I'm reading this right, today the Executive Committee is the group that meets after this meeting and the Board of Directors is the elected group. Once the new bylaws are adopted that changes, am I correct.

DR. ZIRKLE: That's correct.

DR. HAGERTY: Well this is the document that changes, am I right?

DR. ZIRKLE: That is correct? The Board of Directors then becomes the Executive Committee.

DR. ZIRKLE: I know it's confusing believe me in our committee when we were working on this. We finally ended up just saying the big group and the little group. Or the group of 9 or the group of 90, you know so we knew what
we were all talking about. And it's going to be confusing for the organization getting accustomed to that initially but it is a more proper way to deal with it. Thanks to our solicitor, he helped work us through that. I'm not going to excuse anybody. We won't get them back in time so, Bob did you have any comments you wanted to make? We talked about thanking our solicitor but we should really thank the entire task force who worked on this. It took two years to get it to where it is and it certainly was worth it. It was high time like a lot of things we've done in USAHA. We haven't done them before it was indicated.

DR. ZIRKLE: A couple of you mentioned about the availability of the resolutions for review. It has been set up, they are available down in the reading room. Each one is come along now but everyone that is completed is in the reading room for review, so anybody who wants to read them can go down there, Larry will be very happy to introduce you to them. It's shame we don't have Jones Bryant here, he could tell a story. (laughter) John, please bail me out.

DR. ENCK: Hershey next year. (laughter) Well, I just wanted to tell everybody, there's been a lot of people asking me questions about flying into wherever Harrisburg International is where you would fly into there are about five or six airlines that do fly in there. So it's not a very big airport and there will be a shuttle to the hotel. Make sure you fly into Harrisburg International, that's the way we get there and it is not very difficult.

DR. ZIRKLE: Lee just gave me a commentary here by Baxter Black and unfortunately its long enough that I'm not going to have time to read it but I'd sure like to after those comments. It's entitled "Women Who Love Cowboys". If Dick McCapes can take a minute to get here (laughter). He will report on the action of the Nominating Committee.

DR. McCAPES: Thank you Ernie. This will be the second reading of the action of the, or this will be the action of the Nominating Committee. Yesterday was the report and our action is the same as yesterday. Our nomination slate is for President, B. R. Hillman from Idaho, President Elect, H. M. Chaddock from Michigan, First Vice President, Mack Lea from Louisiana, Second Vice President, Robert Frost from California, Third Vice President, Don H. Lien from New York and Treasurer, H. W. Towers from Delaware. For regional elected delegates from the Northeast District, R. J. Ekroade from Pennsylvania, V. P. LaBranche from Massachusetts, from the North Central District, C. W. Geary from Wisconsin, J. W. Leafsteadt from South Dakota, from the Southern District, R. E. Good from Arkansas, M. S. Silberman from Georgia and from the Western District, Pono Von Holt in Hawaii, and C. W. Lum, Hawaii. That's our report of the Nominees, slate of officers.

DR. ZIRKLE: You've heard the report of the Nominating Committee, is there any discussion? Or any amendments? There is a motion on the floor for acceptance, is there a second? All those in favor of the motion declare
themselves by saying Aye.

VOICES: Aye.

DR. ZIRKLE: All those opposed the same. And all those who have abstained. Is that an abstention? (laughter) I hereby declare they are the officers for the new year. (applause) Is there any unfinished business to come before us tonight? Hearing none I'll call for any new business. Hearing none, I'd like to call on the new President of USAHA to give his acceptance address. Dr. Hillman.

Dr. Hillman presented his speech which is included in its entirety after the Business Meeting Minutes.

DR. ZIRKLE: Thank you Bob for those kind words. You know there are some who might say turning this over might be something to improve the dignity of this organization. Nevertheless, it's a great pleasure to hand the gavel over to you and I wish you luck in the next year. I might hope that I hope you have as much fun as I did and hope you accomplish a lot more than I did.

(applause)

DR. HILLMAN: Thank you.

DR. ZIRKLE: I guess it's appropriate to call Dr. McCapes.

DR. McCAPES: Thank you Ernie. This part of the program is the recognition of the immediate past president, who this year will be Dr. Zirkle.

It gives me great pleasure to be involved in this, Ernie.

Mr. C. P. Johnston of Springfield, Illinois, was the first immediate past president of our association. He served as president for four years during the formative period of the United States Animal Health Association from 1897 to 1900. Ernie it's a pleasure to welcome you to the ranks of a wonderful group of individuals who have served our association so well over the past 103 years. USAHA is particularly grateful for your leadership and tremendous drive and initiative that you mounted this year to maintain and advance USAHA as our nation's first and most effective forum for animal health.

Your dedication of time to accomplish all that you have is well recognized and appreciated. As a friend and colleague, it has been a distinct pleasure to have served with you during these very exciting years.

As a sign of the membership's gratitude to you, it's the tradition of the association to recognize your service this year, providing you with three symbols of your past exalted position. The first of these is the president's plaque that presented and this plaque that is inscribed with the words "The United States Animal Health Association presents to Dr. Ernest W. Zirkle in recognition and appreciation of outstanding leadership as president 2000". Ernie it gives me a great deal of pleasure to give you this plaque on behalf of the membership of USAHA.

DR. ZIRKLE: Thank you. (applause)

DR. McCAPES: The second symbol is the president's gavel, which is inscribed to read, "USAHA, Ernest W. Zirkle, President 2000," and again
this is a token from the membership of the association in recognition of your service.

And finally I want to award the third and last symbol which is a very unusual and unique symbol. This is the president’s pin, a very small, but very significant symbol. The pin is a solid gold replica of our logo key and is inscribed on the back in very small letters, with the words “E. W. Zirkle, President 2000.” Just as a point of history, this pin was designed by past Secretary Hendershott at the request of the Executive Committee and has been presented to past presidents since 1950. I found that this key in particular will most likely, in fact, I am sure it will, serve over the years to refresh fond memories of your presidency and of all the years you have been associated with USAHA. Ernie this is the third symbol the membership presents to you.

I now officially proclaim you to be Past President, Ernie Zirkle!

(DR. ZIRKLE: Thank you, Dick. I must admit I got a little bit of an early start in that I did go to the past president’s breakfast and I found out they are a fine bunch of fellows, so I am going to be happy to be there. Thank you and that’s our last official duty. I declare this meeting adjourned.

(applause)
Thank you Ernie.
I want to thank each of you as members of USAHA for your vote of confidence in electing me to this position.

Over the past four years under the leadership of Presidents Williams, Bryan, McCapes and Zirkle, the actions and activities of USAHA have increased substantially. We have a long range plan as Dr. Alley and Dr. Zirkle talked about just the last few minutes. We are moving towards employment of at least a part time Executive Director.

Here at this meeting we are talking about revisions to the constitution and bylaws, that are currently being considered by the Executive Committee and if they are approved, they will be presented to the membership for action next year. These revisions will enable the association to encourage participation in USAHA by international members by providing a mechanism to address sensitive issues without international influence. Through the leadership of these presidents, the Board of Directors has become increasingly able to address issues between annual meetings. This is an essential function. It will not reach full potential until we are able to bring on board a part time Executive Director. However, we do have unfinished business that must be accomplished to complete transition to a full time, or to a year round organization and to bring the long range plan to complete fruition.

The first item on this list and it goes back to comments J. Lee brought up a while ago about our financial situation. The fact that the organization has never had a budget. First item on the list for the Board of Directors will be to develop a budget. We would have done that before now, but we’ve had first of all to develop a chart of accounts. Dr. McCapes saw that that was accomplished. It’s been a conversion process in getting our current system converted to the new system. As Dr. Alley mentioned we’ve got a little difficulty getting those things to jive. But it appears at this point we will be able to develop a budget. We will be more accurately able to predict revenues and expenses and that will be a major item for the new Board of Directors to accomplish.

However, having and living within a budget alone is not enough to insure the long term financial health of our association. We must find ways to bring additional revenue to the association. To this end as Dr. Zirkle mentioned earlier, we’ve asked the Finance and Budget Committee to explore ways to improve the financial situation of our association.

Additionally we must find ways to grow the organization, to bring new people into it. During his term as President, Dr. Zirkle recommended the formation of a membership committee. I will appoint this committee within
the next few weeks. The charge to this committee will be to determine why former members of the association have not continued their membership and recommend actions that would reengage them. Identify mechanisms to increase membership and then recruit new members to our association.

While we are in the process of moving toward hiring an Executive Director, there is still a need to have a presence in Washington. I don’t live near Washington; I live in Idaho. Travel can be a serious impediment to myself or others to have a presence there. I commit to attend those functions, those meetings, those events that are necessary for the furtherance of our cause. Dr. Zirkle has generously offered to continue to serve as a presence in Washington as the need may arise and there will be occasions that I will ask Dr. Zirkle to do that. There will also be occasions when other members of the Board may be asked to step in when there is an event that they can attend more easily than myself.

At this meeting there has been a number of discussions on ways we may improve our ability as industry animal health officials, as wildlife officials, to address Johne’s disease, chronic wasting disease. Both of these diseases are emerging as significant concerns. We must work diligently as an association to assure that the products of our collective efforts are implemented.

At the same time we are working on these challenges we must not forget and lose sight of our old time nemesis Brucellosis, TB, Pseudorabies. We must work to complete the eradication effort for those diseases.

Just prior to this business session, we had a special session dedicated to wildlife livestock disease interaction issues. The purpose of that session was to identify some of the issues that we face, relative to wildlife, livestock disease interactions, stimulate thought and discussion, that will lead hopefully to solutions. I challenge each USAHA, AAVLD committee whose charge includes some aspect of livestock, wildlife disease interaction to explore mechanisms through which these issues may be addressed.

It’s clear that if we are going to address these issues we must bring new members to our association, especially those who are involved in wildlife management, wildlife biologists, wildlife veterinarians, and bring them to the table if we are to develop and implement equitable solutions to this multifaceted challenge. I do believe that USAHA is up to the challenge.

In addition to these items are a number of issues that we will be continuing to work on throughout 2001. I’m not going to go into depth in them, but list them. Every one has been discussed to some level in this meeting, Animal Health Protection Act, the Safe Guarding Review, International trade issues, USDA compliance combined laboratory facilities at Ames, animal health emergency management, and there are a number of other things that we could list.

During the past year in a effort to address issues between annual meetings, Dr. Zirkle and the Board of Directors on a number of occasions asked
committee chairs to provide input on important issues so that we could provide some guidance or some needed input to our national leaders. Committee chairs rose to this challenge and provided invaluable service to the association.

I would first like to thank all those committee chairs who provided that service. And I would also say that during the coming year invariably there will be a number of other situations where we need similar help and will be asking more and more of our committee chairs to help us.

Our new Board of Directors is an excellent group of officers. I have every confidence that they will provide a solid base of support for my presidency. I look forward to working with them and service to our association.

Dr. Zirkle has provided exemplary service to our association during his term. He set a pace for the president of our association, that I and perhaps those that follow, will be hard pressed to duplicate. I commend him for this leadership and for his dedication to USAHA, its members and to our purpose. I would like you all to join me in a round of applause for Dr. Zirkle for a job well done.

(applause)

And thank you Ernie for the hard work. I will strive during my term to emulate his example of leadership to our association and hopefully do you all proud. Thank you.

(applause)
Dr. Ernest W. Zirkle, 2000 USAHA President, passing the gavel to Dr. Bob R. Hillman, 2001 USAHA President.
DR. HILLMAN: To begin this business session: I'd like to call the meeting to order. The order of business this morning would be reports of the Committee on Resolutions by Dr. McCapes, et al. The process that we would like to use is that Dr. McCapes and Dr. Towers will read the resolve portion of each resolution. If someone would like to have some discussion about some particular resolution, please signify by asking for that resolution to be held, then after we've gone through the entire total number of resolutions we will take action on those not held and then individually go back through those held for the action of the body. So with that Dr. McCapes will start reading the resolutions.

DR. MCCAPES: Thank you Bob. The Constitution and Bylaws of the Association states that the committee on Nominations and Resolutions consists of the President or Chair of the Five USAHA districts and the living immediate Past USAHA Presidents from each of the districts and the Secretary. This year individuals in those categories that assisted in the resolutions were Andrew Clark from the western states Animal Health Association, Burk Healy from the southern Animal Health Association, Amy Mann from the district at large, Mike Marshall from the western district, Wes Towers from northeastern district, Larry Williams from the central district, and J. Lee Alley and myself. I'll now proceed to read the resolutions, the resolve part of the resolutions.

Resolution No. 1: Subject matter is USDA/APHIS/ARS master plan for facility consolidation and modernization. This resolution was sponsored by or came out of seventeen committees, the committee on Tuberculosis, Import/Export, Foreign Animal Diseases, Food Safety, Pseudorabies, Infectious Diseases of Horses, Parasitic Diseases, Transmissible Diseases of Swine, Transmissible Diseases of Poultry, Johnes Disease, Animal Health Information Systems, Captive Wildlife and Alternative Livestock, Brucellosis, Pharmaceuticals, Transmissible Diseases of Swine, Infectious Diseases of Cattle, Bison and Llama, and Bluetongue and Bovine Retrovirus.

Resolution: The United States Animal Health Association strongly urges the USDA's APHIS ARS master plan for facility consolidation and modernization of the APHIS national veterinary services laboratories, the APHIS center for veterinary biologics, and the ARS national animal disease center and recommends the construction, equipping operation and maintenance of the Ames, Iowa national animal health facilities depicted in the United States Department of Agriculture master plan. These facilities are essential to protect and insure our nation's food supply and to supply its $120 billion animal industries. A copy of this resolution shall be delivered to the Secretary of Agriculture, Congress and the President of the United States of America.

Resolution No. 2: Committee on Salmonella, phage typing and finger-
printing isolates.

Resolution: USAHA requests that USDA APHIS phage type, as well as provide support for pulsed field gel fingerprinting of all isolates of S. typhimurium and S. enteritidis submitted to NVSL.

Resolution No. 3: Committee on Salmonella.
Resolution: USAHA recommends that USDA APHIS take steps to insure that high quality salmonella serogrouping sera are available to the animal health diagnostic laboratories in the United States.

Resolution No. 4: Committee on Salmonella.
Subject Matter: Development of Salmonella monitoring and response system.

Resolution: USAHA recommends that USDA APHIS provide at least a quarterly summary of sera type salmonella isolates to the respective submitting state agency which oversees animal health. This could allow states to monitor and detect clusters of salmonellosis cases and take appropriate actions to control disease spread if necessary. Currently the sources of such information are inadequate to provide quarterly reports of salmonella serotypes.

Resolution No. 5: Committee on Salmonella enteriditis in eggs.

Subject Matter: Recognition of existing egg quality assurance programs in the proposed egg safety action plan.

Resolution: USAHA urges FDA to recognize existing egg quality assurance programs that meet the minimum requirements of the egg safety action plan and establish an agreement with the cooperating state agency to administer the program. Under this agreement FDA would recognize producers enrolled in an approved state program as meeting the requirements of federal regulations.

Resolution No. 6: Infectious Diseases of Cattle, Bison and Llama
Subject Matter: Transmissible spongiform encephalopathy surveillance.

Resolution: USAHA requests that USDA allocate specific funds for surveillance for bovine spongiform encephalopathy and transmissible encephalopathies of animals.

Resolution No. 7: Infectious Diseases of Cattle, Bison and Llama
Sheep associated malignant catarrhal fever
Resolution: USAHA urges the USDA, ARS to initiate a research program directed toward isolation of the sheep associated MCF virus and eventual control of the disease.

Resolution No. 8: Committee on Tuberculosis
Subject Matter: Conditional approval of the Bovigam as a supplemental test for diagnosis of bovine tuberculosis.

Resolution: USAHA requests that USDA APHIS grant conditional approval for a period of two years of the bovigam for use as an ancillary/supplemental test for diagnosis of bovine tuberculosis. The assay should use for detection should be used for detection of interferon gamma in blood samples.
collected from cattle three to 30 days after injection of PPD for skin testing and should be used in conjunction with the CCT. Designated tuberculosis epidemiologists should be give the authority to use test results at their discretion to make decisions on the final classification and disposition of cattle. The method for interpretation of assay should be the same used as that used in New Zealand. Laboratories conducting the assay should include an antigen such as pokeweed mitogen as a positive sample control during the evaluation period. The approval period should be used to gather additional data on the performance of the test under field conditions in the United States.

Resolution No. 9: Committee on Food Safety
Subject Matter: Animal production food safety training for food animal veterinarians.

Resolution: USAHA urges USDA and the state animal health authorities in cooperation with livestock and poultry industries develop appropriate systems and guidelines for training food animal practitioners and animal production food safety audit and certification processes. And encourage their participation in animal production food safety in quality assurance programs.

Resolution No. 10: Committee on Brucellosis
Subject Matter: USDA support to the Wyoming Fish and Game Department

Resolution: USAHA urges USDAAPHIS veterinary services to support financially and with personnel the efforts of the Wyoming Game and Fish Department to improve the elk winter habitat so that the cycle of transmission of brucella among elk in Wyoming will be interrupted.

Resolution No. 11: Committee on Animal Health Information Systems
Subject Matter: Integration of USDAAPHIS veterinary services surveillance system.

Resolution: USAHA urges USDAAPHIS veterinary services to work with the animal health information systems committee and utilize the expertise of other appropriate USAHA committees to evaluate, streamline and integrate all existing national animal health information surveillance systems and provide support at the state level for the surveillance system infrastructure necessary to enhance national and international trade.

Resolution No. 12: Committee on Johne’s Disease
Subject Matter: Assessment of ground beef contamination with microbacterium avium, subspecies paratuberculosis both before and after cooking.

Resolution: USAHA requests that the USDA fund independent, extramural research to evaluate the rate of occurrence of Mycobacterium, avium subsp. Paratuberculosis (MAP) in ground beef and the rate of killing of MAP in ground beef when exposed to cooking temperatures or irradiation.

DR. MASSENGILL: Chuck Massengill from Missouri. Could you please hold that resolution?

DR. McCAPES: Yes we will, thank you.
Resolution No. 13: Committee on Johne’s Disease  
Subject Matter: Testing of retail milk for presence of live Mycobacterium avium, subspecies paratuberculosis (MAP).  
Resolution: USAHA urges USDA to fund multiple independent investigation by laboratories experienced in cultivation of MAP and using the most sensitive detection methods possible to test for the presence of live MAP in retail milk in the United States.  
DR. HEALEY: Save us a lot of time, can we just hold all of the Johne’s resolutions?  
DR. McCAPES: We are going to go through them one at a time, Burke, if you would like this one held, we can do so.  
DR. HEALEY: How about I tell you now I just want to hold this one through 26.  
DR. McCAPES: One at a time.  
Resolution No. 14: Committee on Johne’s Disease  
Subject Matter: Quantitative risk assessment of human exposure to microbacterium avium, subspecies paratuberculosis (MAP).  
Resolution: USAHA requests USDAAPHIS facilitate through appropriate federal agencies the quantitative assessment of the risk of human exposure to MAP through milk, meat, and environmental pathways.  
DR. HEALEY: Hold please.  
Resolution No. 15: Committee on Johne’s Disease  
Subject Matter: Check test performance for Johne’s Disease  
Resolution: USAHA requests that USDA APHIS include explicit instructions to check test participants that testing should be carried out using methods and materials routinely used for testing diagnostic samples to assure compliance, the report shall contain a statement attesting to this practice. This statement will be signed by the laboratory supervisor of each person who performs any aspect of the testing including recording and recording of results.  
DR. HEALEY: Hold.  
DR. McCAPES: Resolution No. 16: Committee on Johne’s Disease  
Subject Matter: Laboratory recertification following a Johne’s Disease check failure.  
Resolution: USAHA requests that NVSL develop a laboratory improvement program as a part of the current Johne’s Disease fecal and serum check test program. The program should be designed to prevent a laboratory that fails a check test to become recertified at the earliest opportunity provided that it submits evidence steps have been taken to improve test performance and a certification test is passed.  
DR. HEALEY: Hold  
DR. McCAPES: Resolution No. 17: Committee on Johne’s Disease  
Subject Matter: USDAAPHIS Johne’s Disease budget.  
Resolution: USAHA requests USDA APHIS implement a specific line
item in the budget for Johne’s Disease as prioritized by the Johne’s Disease committee and the national Johne’s working group.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 18: Committee on Johne’s Disease
Subject Matter: Check test panel of bovine sera for evaluation of serological test kits for Johne’s disease.
Resolution: USAHA requests that USDA and VSL in conjunction with CVB and the National Johne’s Working Group create a panel of sera from well-characterized mycobacterium avium subspecies paratuberculosis infected and non-infected cattle to use for evaluation of serial production lots of serology based diagnostic test kits for Johne’s Disease in cattle.

DR. HEALEY: Hold.

Resolution No. 19: Committee on Johne’s Disease
Subject Matter: Voluntary Johne’s Disease program standards for cattle.
Resolution: USAHA requests USDAAPHIS to develop program standards and the necessary infrastructure to implement a national voluntary Johne’s Disease indemnity program for dairy cattle.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 20: Committee on Johne’s Disease
Subject Matter: Johne’s Disease funding for laboratories.
Resolution: USAHA urges USDAAPHIS veterinary service to provide funding specifically to increase the quality and capacity for Johne’s Disease testing services for state veterinary diagnostic laboratories.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 21: Committee on Johne’s Disease
Subject Matter: National Johne’s Disease pilot project.
Resolution: USAHA requests USDAAPHIS convene a panel of Johne’s Disease experts to design and implement a multifaceted national Johne’s Disease pilot project to validate the current sampling scheme of the national voluntary Johne’s Disease herd status program for cattle and the use of pool fecal samples for an organism base test to detect mycobacterium avium subspecies paratuberculosis map. Funds for this project should come from funds allocated for Johne’s Disease in this year’s budget.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 22: Committee on Johne’s Disease
Subject Matter: Johne’s Disease elisa guide to interpretation.
Resolution: USAHA urges USDAAPHIS to convene a panel of Johne’s Disease experts that include individuals from approved Johne’s Disease testing labs to develop a national guide to interpretation of Johne’s elisa assay using ranges of test values and expected herd prevalence of Johne’s Disease.

DR. HEALEY: Hold.

Resolution No. 23: Committee on Johne’s Disease
Subject Matter: Johne’s Disease fecal culture quality control.
Resolution: USAHA requests that NVSL make available to certified Johne's Disease testing labs on a fee basis a panel of fecal samples of unknown mycobacterium avium subspecies paratuberculosis (MAP) status to be used for quality control and quality assurance purposes.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 24: Committee on Johne's Disease
Subject Matter: Johne's Disease fecal culture check test.
Resolution: USAHA requests that USDAAPHIS require each laboratory participating in the national fecal culture check test provide media from their laboratory for evaluation by NVSL using repository fecal samples.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 25: Committee on Johne's Disease
Subject Matter: Quality assurance for commercial license Johne's Disease antibody test.
Resolution: USAHA requests that USDAAPHIS, BS and NVSL support a pilot project to establish a quality assurance program for laboratories using licensed commercial Johne's Disease ELISA test kits.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 26: Committee on Johne’s Disease
Subject Matter: Johne’s Disease testing in ruminants other than cattle.
Resolution: USAHA requests that NVSL indicate on their list of approved laboratories that laboratories approved by serum proficiency testing for Johne’s Disease are only approved for the species represented in the proficiency panel.

DR. ALLEY: Hold.

Resolution No. 27: Committee on Johne’s Disease
Subject Matter: Johne’s Disease testing in ruminants other than cattle.
Resolution: USAHA requests that NVSL assemble well characterized serum and fecal panels for Johne’s Disease infected and infection free sheep, goat and elk for use in laboratory feasibility studies and methods evaluation but not intended for full validation.

DR. HEALEY: Hold.

DR. McCAPES: Resolution No. 28: Committee on Livestock Identification
Subject Matter: National mid-year meeting.
Resolution: USAHA should facilitate the participation of the food safety committee and the animal health information committee in organizing a national meeting on the applications of animal identification systems.

Resolution No. 29: Committee on Transmissible Diseases of Poultry
Subject Matter: Congressional feasibility study on avian viral disease research.
Resolution: USAHA encourages ARS to complete the congressionally mandated feasibility study to consolidate avian viral research in Athens, Georgia and the initiation of planning to construct physical facilities for this national institute or center for poultry health research.
Resolution No.30: Committee on Transmissible Diseases of Poultry
Subject Matter: Live bird markets
Resolution: USAHA urges USDA APHIS veterinary services to make emergency funds available to support a USDA state industry cooperative program to eliminate H5 and H7 low path avian influenza virus infections from the live bird market systems in the northeastern United States. This program should include temporary closure, depopulation with indemnification and cleaning/disinfection of the New York and New Jersey urban retail live bird markets.

Resolution No. 31: Committee on Brucellosis
Subject Matter: Pseudorabies and brucellosis cull sow and boar slaughter surveillance. USAHA urges USDA APHIS veterinary services and cooperatives to conduct a review of cull sow and boar slaughter surveillance for Brucellosis and Pseudorabies as suggested in the 1998 swine Brucellosis sub-committee report. This review could be patterned after a recent review of the cattle’s slaughter surveillance program.

Resolution No. 32: Committee on Pseudorabies
Subject Matter: National plans for Pseudorabies post eradication. USAHA urges USDA APHIS veterinary services to work with state industry and academic stakeholders to ensure the action items for the national plans for PRV post-eradication including emergency response surveillance regulations and thorough/wild swine are appropriately addressed in a timely manner and that progress be reported on each of the four topics of the 2001 USHA Pseudorabies committee meeting.

Resolution No.33: Committee on Brucellosis and committee on Pseudorabies thorough/wild swine.
Resolution: the USAHA urges the US secretary of agriculture to recognize the thorough/wild swine threat as a high priority for funding for research through ARS and CREES and field studies through USDA Aphis veterinary services and or wild life services. In particular funding is necessary to 1) conduct population studies needed to support the development of threat management strategies. 2) Design the role of Brucellosis strain rv51 for use as a duel vaccine and conduct field trials to determine its efficacy. 3) Conduct further study and field trials in relation to spine Brucellosis and Pseudorabies infection in feral swine and the transmission to domestic swine.

Resolution No.34: Committee on Pseudorabies subject matter electronic transfer of permits and certificates for swine. USAHA urges USDA aphis veterinary services to expedite the adoption of the use of electronic signature and electronic transfer of official documents for swine movements.

Resolution No. 35: Committee on foreign animal diseases. Subject matter: Education of foreign and emerging diseases.
Resolution: A) The USAHA recommends to the AVMA counsel on education that the essential curriculum requirements of a approved college of veterinary medicine AVMA directory 2000 page 190 be modified to include for-
eign and emerging animal diseases. The suggested change in bold would read page 191,9 curriculum: and in quotes the curriculum shall require students to attain an understanding of the central biological principles and mechanisms that underlie animal health and disease from the molecular and cellular level to organ or nominal and population manifestation. This shall include number 2 and understanding of the principles of maintenance of health, of diagnosis and prevention of diseases, including foreign and emerging animal diseases in bold. B) The USHA supports the timely development of a system assuring that a credent veterinarian demonstrates efficiency in recognizing signs and lesions of foreign and emerging animal diseases.

Resolution No. 36: Committee on foreign animal diseases. Subject Matter: Plan for plum island animal disease center PIADC. The United States Health Association urges the US Secretary of Agriculture to develop a comprehensive plan for modernization of the Plum Island Animal Disease Center, a vital component of the Foreign Animal Disease diagnosis and prevention.

MR. FROST: Mr. Chairman, Bob Frost request hold.

DR. McCAPES: Resolution No. 37: Committee on Transmissible Diseases of Poultry

Subject Matter: Avian health research funding.

Resolution: USAHA supports increased funding for research programs on poultry health at the National Animal Disease Center, avian disease and oncology laboratory and the southeast poultry disease research laboratory.

Resolution No. 38: Committee on Rabies

Subject Matter: A national plan for rabies control in wildlife.

Resolution: USAHA urges USDAAPHIS wildlife services seek new funding for terrestrial wildlife rabies vaccination programs and further encourages other state and local governments and regional alliances to support this activity through appropriate funding channels. USAHA also strongly encourages USDAAPHIS wildlife services, United States public health service, and Centers for Disease Control to assist states and local agencies in the development, maintenance and expansion of coordinated wildlife rabies control and vaccination programs.

Resolution No. 39: Committee on Sheep and Goats

Subject Matter: Support for Nom sheep study.


Resolution No. 40: Committee on Sheep and Goats

Subject Matter: Support for depopulation of PSE sheep.

Resolution: USAHA supports the United States Department of Agriculture efforts to expeditiously depopulate the two Vermont sheep flocks under quarantine for a transmissible spongiform encephalopathy of foreign origin.

Resolution No. 41: Committee on Wildlife Diseases

Subject Matter: Chronic wasting disease, (CWD).
Resolution: USAHA strongly urges the United States Department of Agriculture, Animal and Plant Health Inspection Service to continue to develop and implement a Federal program for the eradication of CWD in domestic elk with provision of indemnity.

Resolution No. 42: Committee on Tuberculosis
Subject Matter: Railing out cost in slaughter plants.
Resolution: USAHA urges USDAAPHIS to consult with slaughter plants for the purpose of gathering information to determine an equitable railout fee and that a system be established to pay such plants when a carcass is railed out, a granulomatous lesion is detected and sufficient identification is collected to enhance tracing.

Resolution No. 43: Committee on Sheep and Goats
Subject Matter: Johne’s disease and testing in ruminants other than cattle.
Resolution: USAHA urges the United States Department of Agriculture, Agriculture Research Service to develop and evaluate new and/or improved serologic and agent detection methods for the diagnosis of Mycobacterium Aviam, subspecies Paratuberculosis infection in sheep and goats.

DR. HAGERTY: There was an earlier resolution that was dealing with testing in ruminants other than cattle, I think, were they similar, did you look up those?

DR. McCAPES: This was to ARS, I think the other was to NVSL, as I recall. Andrew do you recall that? They must be two separate then. Mr. President, that's our report.

DR. HILLMAN: Thank you Dr. McCapes. Is there anyone who wishes to request any additional ones be held? Mike Chaddock.

DR. CHADDOCK: Number six?

DR. McCAPES: Number six, Committee on Infectious Diseases of Cattle, Bison and Llama. Subject Matter: Transmissible spongiform encephalopathy surveillance. USAHA requests that USDA allocate specific funds for surveillance of bovine spongiform encephalopathy and other transmissible encephalopathies of animals.

DR. LEA: Number 29.

DR. HILLMAN: Number 29?

DR. LEA: I’d like to have it read.

DR. HILLMAN: It's already being held. There was a request for Number 29 to be held.

DR. McCAPES: Resolution 29, Committee on Transmissible Diseases of Poultry, Subject Matter, Congressional feasibility studies on avian viral disease research. USAHA encourages ARS to complete the Congressionally mandated feasibility study to consolidate avian viral disease research in Athens, Georgia and the initiation of planning to construct physical facilities for this national institute or center for poultry health research.

DR. HILLMAN: Okay, Dr. Alley, I'm going to go through the held ones so
that we are all in agreement on the ones held. My list says number 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, and 36. The chair would entertain a motion to approve all those resolutions not held.

DR. ALLEY: Move.
DR. ZIRKLE: Second.
DR. HILLMAN: Moved by Dr. Alley, second by Dr. Zirkle, is there discussion? Hearing none, all in favor of the motion to approve those resolutions not held, signify by saying Aye.

VOICES: Aye.

DR. HILLMAN: Any opposed? Any abstentions? All resolutions not held have been approved. Now we need to go back individually through those that were held. The first one is number 12, and I think, Dr. Alley, we have those on the overhead so we can put them on overhead. We are recording this session so whoever speaks we need to ask you to speak with the microphone, please. Resolution number 12 is open for discussion.

DR. MASSENGILL: Chuck Massengill from Missouri. I believe this assessment is already underway and it is being sponsored by the National Cattlemen Beef Association. It seems redundant.

DR. HARTMANN: Bill Hartmann, I chairman of the Johne's Committee and just to give you background on this resolution and the discussion that went on in the committee; I suggested that the resolution be referred back to our national Johne's working group to be looked at to see if the question is being answered or adequately and whether if it hasn't been answered adequately, what might be the best way to answer it. A majority of people on the committee did not want to wait a year to pass this resolution. It passed unanimously. And one of the reasons I suggested passing it back to the working group is because it didn't make it through this session last year.

DR. HILLMAN: Did you have another comment? Any other discussion? Dr. Healey?

DR. HEALEY: Healey from Oklahoma. The Cattlemen just recently identified the variety of strains and are in the process of determining the amount of inoculants to put in ground beef in an effort to determine how to recover that or how much was in there in order to recover, so all this is moving forward. The only holdup have been trying to make sure that we had all the bases covered so there wouldn't be challenged too heavily when it was produced and finished out. Actually we hoped we would have the results by this meeting. We certainly will have them by the time we get to Hershey.

DR. HILLMAN: I guess we got the cart before the horse a little. We should have had a motion to either approve or reject this resolution, prior to discussion. Would either Chuck or Burke like to make a motion?

DR. MASSENGILL: Chuck Massengill, Missouri. I would move to reject this motion.

DR. HILLMAN: We have a motion, is there a second? Seconded by Burt Healy to hold this resolution. Is there any other discussion? Hearing none,
all those in favor of not approving this resolution signify by saying Aye.

VOICES: Aye.

DR. HILLMAN: Opposed No. The Ayes have it. This resolution is held. Next resolution is resolution 13. Committee on Johne’s Disease testing of retail milk for presence of live mycobacterium avium, subspecies paratuberculosis MAP. Is there a motion on this resolution?

DR. SIROKY: Mr. President, Clarence Siroky, Wisconsin, I move we not approve this resolution.

DR. HILLMAN: I have a motion, is there a second?

DR. MASSENGILL: Second.

DR. HILLMAN: Any discussion? John Adams.

MR. ADAMS: I feel compelled, ladies and gentlemen, to come down here so you can all see me because I not only want to address this resolution, but the entire group of resolutions from the Johne’s committee. As you know I have been privileged to serve as co chair of the Johne’s working group. You may recall that the Johne’s working group was organized in 1995 by the National Cattlemen Beef Association and National Milk under the auspices of USAHA with the approval of all you folks. If you are privy to the Johne’s committee meeting the other day, Dr. Whitlock gave a five year update and report of the progress which has been made and it is truly a significant degree of progress.

You are also aware of the fact that Johne’s is a major emerging disease in the United States and in throughout the world for that matter. And therefore a lot of effort has gone into working on this disease through this organization. Now I know it appears that there are a lot of resolutions on this issue, but I suspect that if you go back many years on some of the other major diseases that we have had to deal with, such as brucellosis, TB, pseudorabies, you would have probably seen just as many resolutions. And one of the reasons for that is that those dedicated people who have been coming to this meeting and coming to the working group who have been working on this issue are very dedicated to solving a lot of the laboratory and basics infrastructure problems.

Before we can deal with the disease we have to be able to test for the disease and we have to have reliability so I want you to keep in mind, Mr. Chairman, that I think that we need to deal with the laboratory resolutions as a group and then there is only three or four other ones when you single out the lab resolutions. I just want to make that notation.

With regard to this resolution on retail milk sampling, the dairy industry would suggest very strongly that this invalid way of determining whether or not pasteurization would kill this organism. Last year you passed a resolution that, in fact two years ago you passed a resolution to encourage Ames to continue to work to develop an experimental design that could determine for once and for all whether this organism survived pasteurization. That experimental effort has gone forward. It is called the Moffit Study, because it
will be conducted at the Moffit Center in Chicago starting in two weeks. It involves a number of agencies including FDA, USDA, and Dr. Mike Collins at the University of Wisconsin, as well as Judy Staples, who is chairman of your Johne’s research committee. So your research group has been represented and involved in the design of this study. I guess the point I’m making here this morning is that your efforts to address this issue before are now going to be addressed in a couple of weeks and we would argue that that is the valid way to determine if this organism will survive pasteurization and therefore we would support the motion for that reason.

DR. HILLMAN: Any other comments or discussion?

DR. THOMPSON: Well I’m just seeing this for the first time and I just noticed the language in the resolution it says “and using the most sensitive detection methods possible”.

DR. HILLMAN: Dennis, please identify yourself.

DR. THOMPSON: Dennis Thompson, California. And at the very least, the resolution needs modifying there, in my opinion. That kind of language, most sensitive detection methods possible, seems like it could really get into the very impractical, regardless of cost, regardless of various factors, seems pretty impractical, so if the group is disposed to have this passed, I would urge that at the very least they modify the language.

DR. HILLMAN: Thank you Dr. Thompson, any other discussion? Seeing none, we have a motion on the floor that would reject this resolution, would not approve the resolution. All in favor of the motion signify by saying Aye.

VOICES: Aye.

DR. HILLMAN: Opposed No. Any abstentions? The motion carries. This resolution is not approved. Next resolution is number 14, Committee on Johne’s Disease, quantitative risk assessment of human exposure to mycobacterium avaim subspecies paratuberculosis MAP. Copy is on the overhead. Is there any discussion? I need a motion.

DR. HEALEY: Healey, Oklahoma. I motion that we reject this resolution.

DR. HILLMAN: Is there a second.

DR. LOGAN: Linda Logan, I don’t think this is in the area of responsibility of USDA. I would think it would be in the area of responsibility of the Center for Disease Control.

DR. SIROKY: Clarence Siroky, Wisconsin. There is a similar study being conducted by Marshall Laboratories in Wisconsin right now along with the Iowa states conducting something too. So I would submit that this is currently being done.

DR. HILLMAN: Any other discussion? We have a motion to reject resolution 14. All those in favor of the motion, please signify by saying Aye.

VOICES: Aye.

a motion?

USAHA requests the USDA, APHIS, ARS to work with AAVLD, National Johne’s working group. USAHA Johne’s committee. Certified Labs, etc. You want me to read it one more time? Okay this motion, if approved then would substitute for those that we listed which are 15, 16, 18, 20, 22, 23, 24, 25, 26 and 27. Is there further discussion? All in favor of the substitute motion signify by saying Aye.

VOICES: Aye.

DR. HILLMAN: Opposed No. Abstentions? The motion is carried. Now we have resolution 17. Is there a motion? Resolution 17, committee on Johne’s Disease, resolution that USAHA request USDAAPHIS to implement a specific line item in the budget for Johne’s Disease as prioritized by the Johne’s Disease Committee and the National Johne’s working group.

MR. ADAMS: Move.

DR. HILLMAN: Adams moved, is there a second?

DR. OLSON: Olson, second.

DR. HILLMAN: Second, Olson, is there discussion?

DR. HARTMANN: Bill Hartmann. The reason for this resolution and the concern was, and I can’t substantiate that but there was concern that USDA funding apparently available was not specifically directed to Johne’s Disease and this was just to try and get …

DR. HILLMAN: Okay other discussion?

DR. TORRES: Mr. Chairman? Torres. Just a point of clarification. The earliest we can put a line item in the budget is for fiscal year 2003. That’s the earliest we can do that. Just so you know that. And no guarantee of that, but that’s the earliest we can attempt to do so.

DR. HILLMAN: Dr. Healey?

DR. HEALEY: Healey, Oklahoma. I suggest that we do this in a more timely manner than requesting a line item budget and I think the issue is that the money was supposedly allocated or set aside and was misdirected or not spent in areas we felt. The concern should be in order to meet our needs and …

VOICE: Personally from the comments we receive from the cattlemen around the industry, there’s two things that are concerns to us. One of them we addressed is laboratories and I think in that we need to adequately fund these tests, new technologies and recertification so that we have standardized good accurate tests. The other one we are going to address and that’s illegal liability issue.

DR. HILLMAN: Any discussion?

DR. TORRES: Torres. Just a point of clarification, Dr. Hillman. Money has not been used for other purposes. Monies that come for Johne’s or other diseases come into the funds Animal Health Monitoring System so there are many diseases that are there and for each one of those diseases have their own program. They are set aside from the budget but they are used as
BUSINESS MEETING MINUTES

separate pools of money to do different diseases, so we have a lot of dis-
eases lumped into one, but it not misdirected into other programs.

DR. HILLMAN: Other comments; other discussion? Rich Breitmeyer?

DR. BREITMEYER: I think we just need to be careful that by approving
this resolution we are basically saying as an association that there’s been
misdirected funds.

DR. HILLMAN: Other discussion?

DR. BREITMEYER: My comment would be that I think the purpose of
this is to facilitate engendering greater support for this disease. When we
first started out it was under NAHMS and as you know NAHMS covers a lot
of ground and I think that up until this point at least we have not had a plan
presented to us from USDA on how the 1.5 million that now exists in the
NAHMS budget has been spent. But my argument here for supporting this
motion would be that we need it as a line item if we are going to engender
more support from the Congress to support this national effort.

DR. HILLMAN: If I may as chairman, take the prerogative, I think Rich
Breitmeyer, your comment was aimed at the last sentence of the back-
ground information not at the resolution itself. Is that correct? Is there any
other discussion? The motion is to approve the resolution as it is printed.
Bill Hartmann?

DR. HARTMANN: Would it be helpful to eliminate that last sentence or
change that last sentence?

DR. HILLMAN: Would you like to make a motion to do that?

DR. HARTMANN: Yes.

DR. HILLMAN: Or amend the motion to do that? Amend the motion.

DR. HARTMANN: Yes, I would like to amend the motion and let’s see, I
have to read it.

DR. HILLMAN: Is there a second to the amendment that would strike the
last sentence of the background?

DR. OLSON: Olson second.

DR. HILLMAN: Bill is that what you were trying to do?

DR. HARTMANN: And just delete that last sentence of the background
information and might work.

DR. HILLMAN: Okay we have an amendment to delete the last sentence
of the background information. Any other discussion? Vote on the amend-
ment to delete the sentence that says "however, it appears that things are
not being used for new efforts to assist with information National Johne’s
Disease programs that have been used in a significant way to defray sala-
ries." All in favor of the amendment, say Aye.

VOICES: Aye.

DR. HILLMAN: Opposed No. Any abstentions? The vote on the amended
motion which would approve this resolution with the last sentence stricken,
all those in favor say Aye.

VOICES: Aye.
DR. HILLMAN: Opposed No. Any abstentions? The amended resolution is approved. Resolution 19, Committee on Johne’s Disease. Voluntary Johne’s disease indemnity program for cattle. Is there a motion?

MR. ADAMS: John Adams, move to approve it?

DR. ZIRKLE: Zirkle second.

DR. HILLMAN: Motion is made and seconded to approve the resolution, is there any discussion? John Adams?

MR. ADAMS: Ever since we were able to develop this status program, as you know there was an expert group put together to do that, it’s been important to try to do the on ground epidemiology in the field to validate it and we haven’t had the funds to do that. And so the question comes up, is 30 animals enough or is it too much? Or under what circumstances do you sample and how much? So we want to be able to validate our sampling schemes and recommendations for the status program.

DR. HILLMAN: Any other discussion? Rich Breitmeyer?

DR. BREITMEYER: I want to support the resolution but I think we need program standards regardless of whether there is money appropriated for this program. So I don’t know if I have the language in my head at the moment but we need to, my recommendation would be for somebody to think of a way to amend that resolution. We get program standards with or without indemnity.

DR. HILLMAN: John Adams?

MR. ADAMS: Rich, this was strictly to try to validate the herd status program, but standards that you are talking about that we need are already under development and were discussed at the working group and remember we have a long discussion about the changes that were needed. This was a specific pilot project that would be designed to go on farms, commercial farms and ranches and try to validate the sampling scheme that has been developed by the experts.

DR. HILLMAN: I think you’re on the wrong one John, we are on Number 19.

MR. ADAMS: Sorry.

MR. FROST: Mr. Chairman, shall we start over, make sure we’re on the same page?

DR. HILLMAN: Resolution number 19, voluntary Johne’s Disease Indemnity program for cattle. The one that’s on the screen.

MR. FROST: Is there an amendment for this?

DR. HILLMAN: No there is no amendment. Clarence

DR. SIROKY: Siroky, Wisconsin. Just food for thought. I’m not sure that we’ve got the testing and the money for testing, etc. there in place to put a whole eradication program together. So while I’m not against eradication as such and indemnity which indemnity is aiming at eradication, I’m not sure that we are in the eradication mode yet.

DR. HILLMAN: Bill Hartmann?
DR. HARTMANN: I think the program standards that are being developed currently is in draft form but what it is to be prepared if Federal funding occurs for this, so that’s an independent issue. This is just to be prepared for if it happens.

MR. HILLMAN: Max Coat?

DR. COATS: A viable point that seems to be inconsistent with our previous efforts to do indemnification for voluntary program. Indemnification usually goes along with something that is mandated.

DR. HILLMAN: Now Rich Breitmeyer?

DR. BREITMEYER: I recall from the discussion at the National Johne’s working group, that the intent was for APHIS to develop program standards in lieu of UMNRR and that those program standards needed to be develop with or without an indemnity program to include the educational component, the management factors, those things whether indemnity comes along or not. So that was my concern of just linking this to indemnity only. So if I could... I can’t think and read at the same time, that’s the problem. Yes, I think we can either just take the indemnity out or say USAHA requests APHIS to develop program standards and the necessary infrastructure to implement a national voluntary Johne’s program and if open for discussion, we could leave indemnity in or say which may include indemnity for dairy cattle.

DR. HILLMAN: Rich, would you offer that as an amendment?

DR. BREITMEYER: Yes, I think we have to have the ability to include the indemnity function if appropriation comes next year, so I would just amend it to say “voluntary Johne’s program which may include indemnity for dairy cattle”.

DR. HILLMAN: Second to the amendment? Okay we have a second to the amendment. Chuck?

DR. MASSENGILL: Massengill, second.

DR. HILLMAN: Don Lein, you had a comment?

DR. LEIN: Why are we only saying dairy cattle? Is there any reason we shouldn’t being doing beef, too? (laughter) I mean to me it should just be cattle, instead of...

DR. HILLMAN: Conely, do you have a comment?

DR. BYRD: Could not hear what he was saying.

DR. HILLMAN: Other comments? Strike dairy in your... Chuck, do you agree? Okay, so let me try to reread what we have as the amended motion. USAHA requests USDA/APHIS to develop program standards and the necessary infrastructure to implement a national Johne’s Disease, voluntary Johne’s Disease program which may include indemnity to cattle. Max Coat?

DR. COATS: Coats, Texas. I still would council that it would be a very wide departure to provide indemnity for something that is not in the eradication program. I think it opens up a Pandora’s box for everybody else that has a problem that wants to tap the treasury.

DR. HILLMAN: Adams?
BUSINESS MEETING MINUTES

MR. ADAMS: Max, this was, has been well discussed and well thought of in the discussion to date. My comment would be that there is a quid pro quo. If you are going to accept money from the government then there is a quid pro quo to have the appropriate bias security measures in place and other protection so that we’re just not throwing money out there; that we’re going to get something back for it and that’s control and eradication of the disease. So while it is a voluntary program, what we are trying to do is, we don’t want a federal program like we had for Brucellosis and TB, the producers don’t want that. They want a voluntary program. So what we’re trying to do is design it with the appropriate safeguards there to protect the public treasury.

DR. HILLMAN: Go ahead, Roger

DR. OLSON: Roger Olson. I agree with Dr. Breitmeyer’s amendment, but to make it consistent, I think two words must be removed from the background information, and I’d ask you to strike them. Those words are indemnity and dairy on the last line.

DR. HILLMAN: So Roger, you’re amending the amendment? Rich will agree to it, Chuck you’ll agree to it so now we have an amended motion. Is there any other discussion?

DR. ALLEY: That is to strike indemnity and dairy

DR. HILLMAN: Sir?

DR. HEALEY: Healey, Oklahoma. Again, I think I’m going to agree with Dr. Coats as far as indemnification program for cattle in general when we’re talking about voluntary program, but I certainly don’t object to developing the program standards and think we need to do so but I think our funding should be directed at trying to get tests developed and get laboratory certifications, and those issues up to speed. If this motion does pass as it is amended two or three times now, I would also suggest that we change our subject matter to reflect the developing of program standards and not indemnity program.

DR. HOLLAND: Holland, South Dakota. The background information starts talking about the western states dairymen and major commitment and now we’ve moved it into all cattle and I don’t think I’ve got the input from the beef industry to support a voluntary indemnity program at all so I’d be reluctant to support it.

DR. HILLMAN: Any other discussion? We have a motion on the floor that would strike in the last line of the background information the word indemnity and the word dairy. The resolution would read USAHA would request USDAAPHIS to develop program standards and the necessary infrastructure to implement a national Johne’s disease, national voluntary Johne’s disease program which may include indemnity for cattle. John Adams?

MR. ADAMS: Mr. Chairman, I’m sorry for so much confusion but sometimes that happens. I think what we are trying to do here to develop program standards, minimum program standards for the states and the indemnity part of it is still in the making. It’s still under development. So to eliminate a
lot of confusion and to support the progress that’s been made to date, I would suggest that we just say to implement a national voluntary Johne’s program. Let’s take the indemnity out of there at this point in time. And when the working group gets an indemnity program developed, you all have a chance to review it.

DR. HILLMAN: Mr. Adams, then would you like to make an amendment to the amendment? Rich will accept that and that needs also to include changing the title to Voluntary Johne’s Disease program standards for cattle. Any other discussion? We’ve got it all handled. The amended motion then would change the title to Voluntary Johne’s Disease program standards for cattle, would strike indemnity and dairy out of the last line of the background and the resolution would read, USAHA requests USDAAPHIS develop program standards and the necessary infrastructure to implement a national voluntary Johne’s Disease program for cattle. Second line of the background there is another word indemnity, strike to be consistent. Any other discussion? All those in favor of the amended motion to approve this resolution, say Aye.

VOICES: Aye.

DR. HILLMAN: Any opposed? Any abstentions? The amended motion is approved. We took dairy out. Okay everybody on the same page? Next one I believe J. Lee is 21. National Johne’s disease pilot project. Is there a motion? Get it up here on the screen in a second. Dr. Hartmann?

DR. HARTMANN: I would make a motion to approve this resolution and just as a little background...

DR. HILLMAN: Let’s get a second, first Bill. Is there a second? John Adams second. Okay Bill you have the floor.

DR. HARTMANN: Background we instituted this US voluntary Johne’s disease herd status program nationwide. Many states are starting to work with it. I have experience in Minnesota and we’ve looked at some demonstration herds and how effective this 30 sampling is and there is some information that maybe there are better ways of protecting infected herds verses herds that are free of the disease, so this looks at trying to answer those questions and also some techniques used in herds that are infected. So I think it is a pretty important resolution.

DR. HILLMAN: Burk Healey?

DR. HEALEY: The reason I pulled this resolution was for a possible consideration and that’s Omnibus resolution. But I apologize for holding the group for holding you here longer. I support this ...

DR. HILLMAN: Any other discussion? I have a motion to approve Resolution 21, do we need to read it? All those in favor of the motion to approve Resolution 21, say Aye.

VOICES: Aye.

DR. HILLMAN: Opposed No. Any abstentions? 21 is approved. Next on is 27. No, that’s 29. Resolution 29, Committee on Transmissible Diseases
BUSINESS MEETING MINUTES

of Poultry, Congressional Feasibility study on Aviam viral disease research.

DR. ECKROADE: Eckroade moves to approve.

DR. HILLMAN: Eckroade moved to approve, is there a second?

DR. SWAYNE: Swayne, second.

DR. HILLMAN: Any discussion? Max Coats.

DR. COATS: I'm just trying to improve my understanding here. It seemed to me that unless Congress has mandated that that all be in Athens, it occurred to me that having the turkey portion of the poultry research somewhere there are turkeys might be more effective to be cited in their industry. And unless that was mandated, it seems to me that might be considered...

DR. SWAYNE: These are two separate issues I think what Dr. Coats is talking about is discussion at NDC to move the turkey research in Athens, Georgia, and that is not part of the Congressional mandate feasibility study. This is just a feasibility study to look at, should ARS consolidate their viral disease research into one location for enhanced possibility for funding and continue the program.

DR. HILLMAN: Any other discussion? I have a motion to approve this resolution. All those in favor, say Aye.

VOICES: Aye.

DR. HILLMAN: Opposed, No. Any abstentions? Motion is approved. The one I have left is Resolution 36. Subject matter from Committee on Foreign Animal Diseases, Subject matter, plan for Plum Island Animal Disease Center, the PIADC.

MR. FROST: Bob Frost, California. I move to reject this resolution.

DR. HILLMAN: Is there a second?

DR. CHADDOCK: Chaddock second.

DR. HILLMAN: Is there discussion?

MR. FROST: Frost, California. Relinquish my statement for a moment. Dr. Torres?

DR. HILLMAN: Dr. Torres?

DR. TORRES: Thank you, point of clarification. There is a comprehensive plan for renovating Plum Island. We've been working on this for many years. So we have been receiving money every year for renovating Plum Island. So I don't think this is necessary. We have that and it's working for many years.

DR. HILLMAN: You already have it?

DR. TORRES: Yes, and we have been investing any thing from five to up to ten million dollars a year for renovating Plum Island.

DR. HILLMAN: Okay. Any other discussion? Dr. Logan-Henfrey?

DR. LOGAN-HENFREY: Reason that we put this motion forward is because the master plans for Plum Island have never been approved at departmental level like the master plan for moving forward for NADC. And this would speed up the renovations at Plum Island instead of the department putting in 10 million dollars a year, we would suggest that it would be prudent
for these facilities to move forward with large chunks because you cannot renovate as you know Alfonso the entire animal wing at 10 million dollars a year.

DR. HILLMAN: Dr. Torres?

DR. TORRES: What I suggest is that the resolution then be changed, the language to say something that what Dr. Logan has said, to complete or to expand or to... the way it reads now it sounds like there is no plan, and there is a plan, maybe not approve or being presented to the Secretary like all the plans but there is a plan, there is a comprehensive plan for the renovation of Plum Island, that's what I'm trying to say. If the solution is to accelerate this, then let's say so in the resolution.

DR. HILLMAN: Mr. Frost.

MR. FROST: I'd like to give just a moment of background if I could. I don't know anybody in my beating the pavement here in the last five, six months that has anything negative to say about going forward on Plum Island. We are looking at a thing of, a window of opportunity and timing, that's been the feeling of many people involved, that we should take this opportunity where we have a shot of getting full compliance and full funding for the three facilities at Ames, hopefully go forward with that and use the same kind of background force and ground grass roots work that we have been doing for Ames and move that over in an attempt to give a full blown program for Plum that has correct efforts from all parties and all people and that in my opinion is not been done to date, not that there is disagreement on Plum but it takes a tremendous amount of effort grassroots around the country, this organization, many other organizations and that work has not been done to date. I would hate to see confusion hit the hill, somehow, someway, by tying Plum in at this point in time to the master plan for Ames. On that basis it sounds like I'm against Plum; I'm not; I'm just against Plum at timing and don't want to confuse the issue at any other level.

DR. HILLMAN: Don Lein?

DR. LEIN: You're getting your exercise. (laughter) You know I understand what Bob is saying. We also could be looked at as at least not coming forward with something that could be very important if we have a national disaster. And that we have not recognized that Plum does have problems. Sometimes we also get criticized for not bring those things that are evident forward as a group and then letting them choose so that all of a sudden you are back again requesting monies, again for another USDAARS APHIS facility and legislatures will say also why didn't this come forward with the other, what's happening here, what are we doing? So I think that will get sorted out in legislation basically. I think it doesn't make sense not to take it forward, I think you ought to try taking both of them forward.

DR. HILLMAN: The motion we have is to reject this resolution.

DR. BYRD: Byrd, Arkansas. You know it concerns me as state veterinarian we've done some of our tabletop exercise and discussed the capabili-
ties of Plum Island. We've had a tremendous reduction in staff there, you know the facility, even though it's making some progress, it has not come along and it is as vital component, the protection of our domestic livestock from foreign animal disease as is the other projects at Ames. It's not to take away from that other project, it's to indicate that there is also a need that needs to be included. And for that I'm opposed to the motion that's on the floor.

DR. HILLMAN: Dr. Coffman?

DR. COFFMAN: I'm not sure what the present language is concerning Plum Island, but what if we take and reword the resolution to say at the bottom here just a suggestion instead of to develop a comprehensive plan, perhaps you might say to finalize the comprehensive plan?

DR. HILLMAN: I think they are all possibilities, but we've got a motion on the floor to kill the resolution. I think we've got to act on that motion... Question's been called for. All in favor of the motion to kill this resolution, say Aye. All opposed, No.

VOICES: No.

DR. HILLMAN: Abstentions? Okay the motion failed. Dr. Coffman?

DR. COFFMAN: I propose that we change agriculture to finalize, is it better to finalize the comprehensive or a comprehensive...

VOICE: Could not hear.

DR. COFFMAN: I still like finalizing. I like finality. (laughter)

DR. HILLMAN: Okay, Leroy, would you make that in the form of a motion?

DR. COFFMAN: Yes, I move that we change develop the finalized and since is there actually a plan in existence? Okay then, it would be finalize the plan for modernization at Plum Island, would that...

DR. TORRES: We are still debating the timing and the scope of the feel and capability of Plum Island. So by saying revised and expedite will allow us to put that into better package. That is not up to this point in time.

DR. HILLMAN: Alfonso, do you mean review and finalize, or revise and finalize?

DR. TORRES: Revise and finalize.

DR. COFFMAN: Okay, let's say to revise and finalize the comprehensive plan for modernization.

DR. HILLMAN: Is there a second?

DR. COATS: Coats, Texas. Where are we with the amendment? Have we got the wording down yet or are we still...?

DR. HILLMAN: No we don't have a second to it, Nancy suggested some additional language be added to the motion and we don't have a second to the motion yet.

DR. ECKROADE: Second, Eckroade.

DR. HILLMAN: Okay, Nancy you suggested...

MS. ROBINSON: My suggestion is that after plan you add and acceler-
ate completion of the modernization of the Plum Island Animal Disease Center.

DR. HILLMAN: Is that acceptable to you Leroy. Okay Dr. Coates you had a comment? That's it? Now let me see if I can decipher what we said. The resolution would read, United States Animal Health Association urges the US Secretary of Agriculture to revise and finalize the comprehensive plan and accelerate completion of ... I've got something wrong here. ... and accelerate the modernization of Plum Island Animal Disease Center, a vital component of Foreign Animal Diagnosis and Prevention. One more time: United States Animal Health Association urges the US Secretary of Agriculture to revise and finalize the comprehensive plan and accelerate the modernization of the Plum Island Animal Disease Center, a vital component of Foreign Animal Diagnosis and Prevention. Any discussion? Tom?

DR. LINFIELD: Linfield, Montana. The last sentence, shouldn't that read, foreign animal disease diagnosis and prevention?

DR. HILLMAN: Foreign Animal disease and prevention. Any other discussion?

DR. SWAYNE: Swayne for ARS. Just to complete the picture the discussion because we talked about the master plan in ADC and also Plum Island is to remind you that those two facilities in that planning are really for the live stock industry and it is not for the poultry industry so the state that have major poultry industry and this must remember that previous resolution is to try to resolve the issue where all the avian viral diseases are done. So it's really a three way planning segment with NADC as by far advanced in their master plan. Second is Plum Island using the existing master plan and hopefully the BL4 being added into that. And the third comprehensive program is the facility in ARS in Athens.

DR. TORRES: Just an additional point, that is a good point, David, but that applies only to ARS. The two possibilities of the APHIS Master Plan in Ames we provide diagnostic services for the poultry industry, including the foreign poultry diseases and also we do the Center for Veterinary Biological Licenses and all poultry vaccines there, so APHIS gets involved in poultry activities in Ames.

DR. HILLMAN: Any other discussions? I have a motion on the floor to approve the amended resolution. All those in favor, I guess we've got to act on the amendment first, all in favor of the amendment to the resolution, say Aye.

VOICES: Aye.

DR. HILLMAN: Opposed, No. Abstentions? The amendment is approved. We vote on the amended motion. The amended resolution then would say the US Animal Health Association urges US Secretary of Agriculture to revise and finalize the comprehensive plan and accelerate the modernization of the Plum Island Disease Center, a vital component of foreign animal disease diagnosis and prevention. All in favor, say Aye.
VOICES: Aye.

DR. HILLMAN: Opposed, No. Abstentions? It carries. That's it, is there any other business to come before this assembly? If not I'd like to thank everyone for your help and participation, I think we've had a great meeting. We look forward to a great year. We are adjourned. Thank you.
HIGHLIGHTS OF THE 68TH GENERAL SESSION
MEETING OF THE OIE IN PARIS

Michael David

OFFICE INTERNATIONAL DES
EPIZOOTIES

68th General Session of
the OIE

Highlights
Overview

- History of the OIE
- General structure
- Functions
- Elections
- 68th General Session

History of the OIE

- Established in 1924
- Rinderpest introduced into Europe from Pakistan
- Today -- recognized as the scientific reference body for animal health
- 155 member countries

Functions of the OIE

- Collect and disseminate information
- Coordinate research
- Establish standards for international trade
- Provide guidance for disease control and eradication
Structure of the OIE

- Office of the Director General
- Administrative Commission
- Specialist Commissions
- Regional Commissions

Standards Commission

- Function
  - updates the Manual of Standards for Diagnostic Tests and Vaccines q 4yrs
  - advises the Code Commission on approved diagnostic tests
Foot and Mouth Disease and Other Epizootics Commission

- Functions
  - develops strategies for disease control
  - evaluates the disease status of countries
    - FMD, Rinderpest, CBPP, BSE
  - provides scientific advice to the Code Commission

International Animal Health Code Commission

- Meets twice a year (in addition to GS)
  - September and January
- Ad hoc groups
- Functions
  - Updates the "Code" q 2yrs

Code Commission

- May -- General Session
  - Report on the year's activities
  - Adopt new or updated chapters (consensus)
  - Discuss Code Chapters for consideration
  - Seek input on new/updated chapters that need revision
Code Commission

September
- review chapters not adopted
- review any comments coming out of the GS
  - BSE input
- prepare the work plan for the year
- identify issues for "ad hoc" expert groups to address
- send report to delegates re: chapters for adoption

Code Commission

January
- review comments from member countries
- review the submissions and recommendations from the ad hoc groups
- decide on the language on chapters for adoption (brackets, double underline, etc)
- prepare chapters for consideration
- send out final draft for comment
Agenda for the 68th Session

- Technical items
  - Control and prevention of aquatic diseases
  - Advances — diagnosis and control of TB
- Worldwide animal disease status
- Regional Commission recommendations
- Reports of the Technical Commissions
  - Standards
  - FMD
  - Animal Health Code

Code Texts up for Adoption - 68th

- Definitions
- Evaluation of Veterinary Services
- Zoning
- Blue tongue
- Aujesky's
- BSE
- Paratuberculosis
- Anthrax
- Japanese encephalitis
- Issues concerning ova/embryos
- Processing of embryos
Animal Health Code
Blue tongue Chapter

- List A -- Chapter 2.1.9
- Ad hoc expert group
- Improved chapter
- Tabled chapter

Animal Health Code
BSE Chapter

- List B disease -- Chapter 3.2.13
- Improved Chapter
- Areas of concern
  - categorization of countries/zones
  - parameters used for categorization
    - risk factors and their mitigation
FMD Commission
Recognition of Status

- Free of FMD w/o Vx: Argentina
- Countries w/ zones free of FMD w/o Vx:
  - Botswana, Colombia, Namibia, South Africa
- Countries w/ zones free of FMD w/ Vx:
  - Brazil
- Rinderpest -- updated list of free countries

OIE- 68th Session - Elections

- Election of Director General (q5yrs)
- Election of the Presidents and other members of the Specialist Commissions (q3yrs)
- Election of Members to the Regional Commissions (q3yrs)
Elections -- OIE -- 68th GS

- Director General -- Dr. Bernard Vallat
- Code Commission
  - Alex Thiermann -- President (USA)
- FMD Commission
  - Eduardo Correa Melo -- Secretary General (Chile)
- Standards Commission
  - Bev Schmitt -- Secretary General (USA)
- Fish Diseases Commission
  - Don Lightner -- Member (USA)
- Administrative Commission
  - Carlos Correa Messuti -- Member (Uruguay)

OIE - Strategic Plan

- Future direction
  - international animal disease information
  - develop scientific standards
  - guidance on disease prevention, control and eradication
  - coordination of research
HIGHLIGHTS OF THE 68TH GENERAL SESSION
MEETING OF THE OIE IN PARIS

OIE- Strategic Plan

- Expanding its scope of activity
  - zoonotic diseases
  - public health component
  - wildlife and non-traditional livestock
  - animal welfare

Web Sites

- www.oie.int
- www.usaha.org
OIE REGIONAL COMMISSION FOR THE AMERICAS
&
TRIPARTITE ANIMAL HEALTH GROUP

Alfonso Torres
Deputy Administrator
USDA – APHIS – Veterinary Services

OIE Regional Commission for the Americas

One of five OIE Regional Commissions
– Africa
– Americas
– Asia, Far East and Oceania
– Europe
– Middle East

OIE Regional Commission for the Americas
Purpose & Meetings:
• Promote OIE activities in the Americas
• Study specific regional animal health issues
• Organize regional cooperative activities
• Regional Conferences every 2 years
• Meetings at OIE Headquarters every year

OIE Regional Commission for the Americas - 24 Member Countries:
Argentina         Guyana
Barbados          Haiti
Bolivia           Honduras
Brazil            Jamaica
Canada            Mexico
Chile             Panama
Colombia          Paraguay
Costa Rica        Peru
Cuba              Trinidad and Tobago
El Salvador       United States of America
Ecuador           Uruguay
Guatemala         Venezuela

OIE Regional Commission for the Americas
• President: Dr. Angel O. Flores – Mexico
• Vice-Presidents: Dr. Hamilton R. Farias – Brazil, and Dr. Luz A. Cruz – Colombia
OIE Regional Commission for the Americas
15th Conference at Cartagena, Colombia
March 7-10, 2000

PARTICIPANTS:
- Members from 20 countries
- Representatives from 4 international Organizations
  IICA
  OIRSA
  COSALFA
  PAHO / WHO

PROGRAM ACTIVITIES:
- Election of new officers
- Technical presentations
  - Bovine brucellosis
  - Screwworm myasis
- Review of Animal Health Code Chapters
- Preparation for 16th. Conference
  - Santiago, Chile, March 4-9, 2002

RECOMMENDATIONS:
1. Brucellosis in the Americas
   - Implementation of programs for control and eradication in all countries in the Americas
   - OIE and International Organizations to assist in diagnostic technologies and reagents
   - Research support and coordination
2. Vesicular Stomatitis
   - Establish a working group with PAHO – PANAFTOSA to establish a hemispheric epidemiological surveillance system
   - Conduct complete differential diagnosis of all vesicular disease suspect cases
3. New World Screwworm
   - Establish improved prevention and eradication programs for all NWS-free countries
   - Accelerate construction of new sterile fly production facility in Panama
4. Harmonization of Registration and Control of Veterinary Medicinal Products
   - Creation of the “Committee of the Americas for the Registration and Control of Veterinary Medicinal Products” (CAMEVET)

5. Risk Analysis
   - Creation of Regional risk analysis group of technical experts with support of CEAH
   - Prepare technical documents and training materials

6. Bovine Spongiform Encephalopathy
   - Clarifications on proposed BSE Chapter

7. Classical Swine Fever – Continental eradication plan
   - Review of proposed plan presented by FAO
   - Request to FAO completion of the plan taking into consideration comments from the Regional countries

8. OIE categorization of diseases
   - Request that OIE reviews the current categorization of diseases into Lists A and B
     - Immediate notification diseases (24 hours)
     - Yearly reportable diseases
   - Request that OIE undertake education of member countries on fundamental principles of disease listing: timely and quality information

**Tripartite Animal Health Group or North American Animal Health Committee**

**HISTORY:**
- Tripartite Animal Health Group has met yearly for the last 30 years
- With the creation of NAFTA, there was a need to create a North American Animal Health Committee
- A Memorandum of Understanding for the creation of the NAAH Committee has been signed

**Trilateral Memorandum of Understanding (selected articles)**

MOU to establish an effective mechanism to facilitate technical consultations on sanitary matters
- Article 1. A North American Animal Health Committee is established pursuant to NAFTA Article 722.3 (e)
- Article 2. The objective of the Committee shall be to serve as a forum for consultation and discussion for the Parties regarding animal health issues to facilitate:
  - a) The improvement in animal health
Article 3. Actions taken within the framework of the Committee will include but are not limited to the following areas:

- a) To issue opinions on specific animal health subjects for international organizations that request such opinions.
- b) To report and exchange information on changes in animal regulations and border controls.
- c) To review areas of potential cooperation such as in research and training.
- d) To discuss animal health issues that may have not been solved by the technical working groups.

Article 6. The Committee will be composed of the top ranking veterinary official with animal health responsibilities from each of the Parties, or their designated veterinarians.

Article 7. The Committee's Chair will be rotated and will be held by the animal health official who presides over the regular meeting in the country where it is held.

Article 9. The Committee will hold a regular meeting once a year, to be rotated among the three countries.

North American Animal Health Committee
Puebla, Mexico, April 10-14, 2000

Program Activities:
- Country sanitary updates
- Updates from Tripartite 1999 (Victoria, Can.)
- Report of technical working groups
  - Bilateral groups
  - Tripartite TSE working group
- FMD vaccine test exercise
- Field visit

North American Animal Health Committee
Next meeting
Lexington, KY, March 12-16, 2001
On September 7-9, 1 attended the second regional symposium for the Integration of the Public and Private Sector to develop disease control programs for production of livestock in Central America.

This meeting was sponsored by OIE with Dr. Emilio Gimeno, the coordinator OIE of the Americas.

There were papers on the following titles:

- Theoretical and practical aspects of the global economy and distribution of the role of State and private animal health services.
- International economy and foreign trade: consequences, paradigms and sanitary methodology.
- Significance of social participation (private sector) in strengthening Veterinary Service systems and the co-management of animal health activities.
- Quality certification of animal health services.
- Relevance of the animal production chain in the prevention, control and eradication of diseases in the various countries of the region.

My role was to present the experience of the USAHA and how the system worked in developing the premier disease control program in the world and to relay how in the US we accomplished integration of the public and private sectors.

There were a number of points, which I learned from attending this meeting.

- There is very little, if any, disease control coordination in most of the Central American countries.
- The veterinary infrastructure that is there is very fragile.
- Government infrastructure is often very fragile.
- There is great skepticism from even government veterinarians that OIE concepts of SPS, transparency, harmonization, equivalence and evaluation processes are attainable.
- Veterinary accreditation is considered a dream.

Yet, by the end of the second day, veterinarians expounded on how they were "charged up" by the meeting and ready to go back home and convince others that this has to happen.

I gave a 30-minute presentation and answered questions for one hour. These people can be convinced that the concepts are sound and need to be implemented in their countries.
I suggested that there should be two phases to bringing the concepts to fruition.

1. Each individual country needs to develop its own infrastructure and begin to implement. I offered the assistance of USAHA to any country that needed or wanted our help.

2. There also needs to be an organized framework at the Organization of the Americas' level to bring together consensus and understanding of each country's strengths, goals, and weaknesses to provide a unity that will help dilute the strength of the EU on issues of concern to us here.

Dr. Gimeno strongly agreed with the concept and felt this infrastructure should be under the guidance and principles of OIE. I argued that it is not necessary to be tutored by OIE and there might be some advantages to not be.

We did both agree to work towards the collective goal of such a group.

➢ If there is a private producer organization, then there is something in place when government structure collapses and then reorganizes.

➢ The countries of the Americas are in need of assistance and may be willing to pay for help in some instances.

I visited a couple of farmers in Costa Rica and found they all believed in the concept I espoused.

One stated, "I am in good shape." "I only had six brucellosis reactors out of 350 beef animals and no tuberculosis on the annual herd test this year." He killed the brucellosis reactors and will await the test next year to see how he is doing.

Another was a dairy farmer outside of San Jose who milked 11 cows and took the unpastuerized milk to a local Catholic Church each morning where the parishioners would pick it up for home use. He had heard of tuberculosis and brucellosis but had never had his cows tested. The government (according to him) knew of his herd but had never requested a test.

While both of these farmers espoused they believed in my concepts neither would or could take the first positive step towards initiation.

Obviously, the concepts discussed at the meeting were sound and agreed to by the participants.

The task of getting such concepts implemented through the Americas will be time consuming and costly. If OIE can help defray the costs and support implementation, then I recommend USAHA follow their lead and be available for future participation.

I also propose that the International Issues Committee be the place where participation efforts be evaluated, approved and coordinated. We have had members of USAHA participate in such discussions in other countries and while I applaud their effort, Alfonso and Michael David should be apprised of their participation and results.

USAHA looks forward to participating and helping to facilitate the needs of Veterinary Services in the Americas.
REGIONS OF THE AMERICAS INTEGRATION OF PRIVATE AND PUBLIC SECTORS IN ANIMAL PRODUCTION

Dr. Emilio Gimeno

Regional Representation for the Americas Working Plan 2000-2005

Dr. Emilio Gimeno
Coordinator
OIE Regional Representation for Americas

Line of action synthesis
Work plan 2000-2005

- To strengthen official veterinary services
  - Evaluation and quality certification
- Information activities
  - Risk analysis
  - Surveillance systems
- Development of standards
  - Laboratory diagnosis
  - Veterinary medicines harmonization
ASSESSMENT AND CERTIFICATION OF VETERINARY SERVICES QUALITY

- Practical Objectives:
  
  To promote:
  
  - Methodology to guarantee an international recognized certification of quality of veterinary services.
  - Participation of private sectors with upgrade responsibility
  - Quality certification and control systems (HCCP and GMP)

Information System

- Practical Objectives
  
  - To train in active and passive epidemiological surveillance.
  - To coordinate activities with country official and private sectors.
  - To assist countries in adapting and coordinating their information systems.
Risk Analysis
in cooperation with CEAH
(APHIS)

Practical Objectives

- To strengthen the veterinary services skill in this technology.
- To harmonize methodology among countries.
- To promote risk analysis for international trade purposes.

Laboratory Diagnosis

Practical Objective

- To develop an official and private network among countries as to standardize diagnoses and harmonize techniques.
Harmonization on Veterinary Medicines

- Annual Seminars (next: VII to be held in Lima-Peru)
- Committee on harmonization (CAMEVET) with participation of Private and Official Sectors
- DATA-BASE Web site (OIE-PAHO). Compilation of information

Integration of Veterinary Assistance System

- **Official Sector**
  - Nation level
  - Province level
  - Town level
  - Universities and Others

- **Private Sector**
  - Livestock producers
  - Food Industry
  - Pharmacologic Industry
  - Private Professionals
Integration of Veterinary Service Programs

- Programs identification
- Integration of official and private sectors
- Legal support
- Integration methodology
- Operative systems (Official and Private Sectors)
- Management quality systems
- Assessment indicators

Programs identification

- Animal health: Prevention-Control-Eradication
- Food protection: Production-Manufacture-Storage-Sell
- Veterinary industry: Biologic and Pharmacologic
Integration methods

- Economic motive (Cost-Benefit) (Return rate)
- Social motive (Public health)
- Moral motive (prestige)

Legal Support

- Ruling of:
  - Responsibilities
  - Rights
  - Actions
Operative Systems

Definition of Official and Private Sectors
Responsibility

Official Sector
Outline legal bases
Monitoring
Audit

Private Sector
Responsible carry out of programs

Quality Control Systems

Control Management and Quality Certification
International Norms
Facilitate Trade (SPS Agreement)
Assessment System Indicators

- Operative indicators
- Economic Indicators
- Private and Official Sectors Communication Indicators
IDENTIFICATION OF DISEASES AND AGENTS OF CONCERN

Victor F. Nettles and John R. Fischer
Southeastern Cooperative Wildlife Disease Study
College of Veterinary Medicine
The University of Georgia
Athens, Georgia 30602

Introduction
Animal health is an important issue with agricultural industries and wildlife conservationists. Both groups have concerns for various diseases as to how they impact their animals, and each group has apprehension about possibilities of disease introduction from the other’s animals. From the livestock/poultry producer’s perspective, there are multiple concerns about the perceived or actual presence of diseases in wild, free-ranging animals. We noted that the USAHA News Release gave the cost of disease to producers at $1 billion annually, so there is much to be feared. When a disease moves from wildlife to domestic animals, there is the direct threat to the health of livestock or poultry due to morbidity and mortality, and the accompanying economic losses. Additional financial losses occur through quarantines, special husbandry practices (fencing, closed housing) that can be required to segregate wildlife from domestic animals, extra testing and surveillance programs, vaccination, etc. Also, there is economic loss that is caused by the denial of export markets due to the presence of endemic infections in wildlife, even when the domestic animals are not infected. A reverse economic threat also can occur when access to public grazing is denied to cattle or sheep owners because of a real or perceived disease threat to wildlife from domestic stock.

Wildlife conservationists, including professional wildlife managers, hunters, most landowners, and the many private citizens who enjoy wildlife in a non-consumptive manner, also worry about diseases. As with livestock and poultry, there is the direct risk to wildlife that can occur due to the pathogenic action of the agent in question. Losses could be devastating, and there are a few examples where wildlife populations have been decimated by specific diseases. But an equal or perhaps greater threat is for wildlife to become involved in the epidemiology of a disease of significance for any of the animal agriculture industries. When a wild animal species is identified as the reservoir host, amplifying host, main or alternate host for the disease vector, or transport mechanism for spreading a disease from farm to farm, it means trouble and conflict for wildlife conservationists. Preserving our agriculture economy may call for harsh control measures such as the depopulation of thousands of animals, intolerance to wildlife on farms, and destruction of
NETTLES, FISCHER

habitat. Even perceived health threats from wildlife have led poultry industries to lobby forcefully against waterfowl refuges in poultry producing areas. Given these circumstances, it is not unusual for agriculture and wildlife interests to collide over health issues.

One special area of health concern for wildlife conservationists is the private ownership of wildlife species as "alternative livestock." Wildlife managers fear the introduction of diseases or undesirable genetic material into wildlife populations from animals that are being rapidly moved throughout the country. In addition to fence line contact, escapes are particularly worrisome because recovery of the privately owned animals can be difficult, particularly when indistinguishable wild animals are present.

Before progressing further, it is important to recognize that fish and wildlife-associated recreation is big business. Outdoor activities associated with wildlife have a huge public constituency and the economics of wildlife are generally under-recognized. The latest National Survey of Hunting, Fishing and Wildlife-Associated Recreation revealed that 77 million Americans participate in fishing, hunting, or non-consumptive wildlife enjoyment. And, they spend $104 billion annually in the process. Thirty five million people fish and spend $38.1 billion, and 14 million people hunt and spend $20.6 billion. Non-consumptive wildlife activities (observation, feeding) is enjoyed by 63 million people who spend $25.7 billion. Hunting, which is the smallest of the wildlife industries, is huge. Hunting activities provide for $16.1 billion in household income, $3.1 billion in state and federal tax revenue, 704,000 jobs, and an economic multiplier effect of $61 billion. It is important to note that many economic benefits from hunting and fishing impact rural areas.

One comparative example is the figures for the cattle industry provided by the National Cattlemen's Beef Association. The farm gate value of all cattle, calves, and dairy products was $44 billion in 1996. There were approximately 1 million cattle farmers and ranchers, which means for every vote the cattlemen had that year, fish and wildlife enthusiasts had 76. Cattlemen have the largest percentage of private land, some 525 million acres, but they also are dependent upon much of the 516 million acres of public land. Both the private and public land are teeming with wild animals that are held in public trust, and thus, there are multiple scenarios where disease interaction between wildlife and livestock can become contentious issues.

General Concepts

Concept 1: Collectively, the information on domestic animal diseases in free-ranging wildlife show that the prevalence of infection usually is lower than what is generally expected for confined domestic stock. This phenomenon can be explained by greater dispersion of the wild animals, or sporadic disease spillover from domestic animals. One also must consider that some pathogens could have a strong preference for a selected domestic animal as opposed to a wildlife species.
IDENTIFICATION OF DISEASES AND AGENTS OF CONCERN

Concept 2: Another generalization is that when wildlife harbor a domestic animal disease, un-natural circumstances such as overcrowding or artificial management (e.g. feeding) often are involved. However, there are exceptions, and it would be careless to state that livestock and poultry diseases are minimized in natural conditions for all pathogens.

Notable Diseases of Concern

**Brucellosis:** The most publicized issue is the residual bovine brucellosis infection in the bison and elk in the Greater Yellowstone Area of Wyoming, Montana, and Idaho. Of the two species, the bison receive the most media exposure because of controversial lethal control practices that have been implemented at times. The debate over how to deal with infection of the bison has been interesting. In the beginning, there was the denial phase, where wildlife managers wanted to maintain brucellosis infection in the bison to control the population in a "natural" manner. Strangely, they also contended that the organism in bison was not abortifacient. More recently, the position has been that brucellosis originated in cattle and is an exotic disease to native wildlife. The presence of brucellosis in elk is a problem of equal or perhaps greater magnitude. Unfortunately, infection in the elk appears to be linked strongly with artificial winter feeding that is required to maintain elk where people have displaced their winter range.

There is no immediate resolution to the brucellosis problem. Current strategies include separation of infected bison and elk from cattle, close surveillance and vaccination of the cattle at risk, research on potential vaccines for both bison and elk, and changes in habitat management, particularly for the elk.

**Bovine tuberculosis:** Wildlife are intricately involved with the residual bovine tuberculosis infection in the United States, notably in Michigan and probably in Hawaii. Historically, it has been well known that wild ruminant species, when held in captivity, were fully susceptible to Mycobacterium bovis. The literature contains numerous reports of infection in zoological animals, and in recent years, infection has been a problem to both captive bison and cervid industries. However, there were few examples in North America to suggest that bovine tuberculosis could be maintained in free-ranging wildlife. Most reports were of sporadic cases in individual animals, the exception being the established infection in Wood Bison in Wood Buffalo National Park in Canada. The "old epidemiology" was that free-ranging wildlife in North America generally were too dispersed to maintain bovine tuberculosis. The "new epidemiology" shows that wildlife can maintain the disease, at least under certain circumstances.

Presently, a nidus of bovine tuberculosis is being maintained in wild white-tailed deer in a large 11-county area of Michigan. Other wildlife species, viz., coyote, bobcat, red fox, opossum, raccoon, black bear, also have been positive, and it is presumed that their infection is secondary to scavenging or
eating from common food sources. The Michigan deer tuberculosis problem has been responsible for several infected cattle herds and the loss of the state's TB-free status. Artificial feeding, with accompanying artificially high population densities, are the epidemiologic features that are considered responsible for facilitating transmission of the disease.

Hawaii also has identified residual infection in wildlife on Molokai Island. Early on, axis deer and feral swine were shown to be infected, but only the swine were infected at a high prevalence. The problem was addressed by removal of the infected cattle and reduction of the feral swine, which was a strategy that worked earlier in California. However, about 10 years after repopulation of the cattle, infection reappeared and residual infection in feral swine appears to have been the cause.

Strategies for resolving bovine tuberculosis risks from free-ranging wildlife include education, surveillance, control programs for captive ruminants (including cervids), addressing the feeding issue, population reduction, and research. It is worth noting that the problem of rampant supplemental deer feeding is not unique to Michigan. Over 20 states allow feeding or baiting for deer, and close nose-to-nose contact of deer is not unique to Michigan. There is potential for this disease scenario to occur in numerous other states.

**Johne's disease:** There has been considerable discussion on possible control or eradication programs for *Mycobacterium paratuberculosis* in domestic livestock in recent years, and these programs are going to run headlong into the likelihood that wild ruminants can harbor residual infection. National surveys reveal that there are substantial numbers of cattle herds, particularly dairies, that are infected with Johne's disease. Additionally, some zoological ruminant collections and captive cervid herds have been infected. Reports of infection in wild ruminants have been sporadic, but the question has not been studied well. There is a well-documented infection of elk in California in an area where cattle had been present. More recently, three sporadic cases have been confirmed in Florida Key deer on an island with no cattle. The concern can be best stated as "Will removal of this highly resistant organism from livestock be possible if deer and other wild ruminants also can harbor infection?"

**Other bovine diseases:** There are numerous other bovine diseases which could possibly involve wildlife in their epidemiology. Serologic evidence of exposure has been reported for such diseases as parainfluenza virus 3, bovine virus diarrhea, infectious bovine rhinotracheitis, leptospirosis, bluetongue, vesicular stomatitis, et al., and occasionally these agents have been recovered from wild animals. Interpretation of these findings remains speculative, but concern for wildlife harboring these and many other maladies often surfaces whenever unexplained infection appears in domestic stock.

**Swine Brucellosis:** Wild/feral swine are not native wildlife in North America, but are free-ranging and totally self sufficient animals in at least 19 states. Swine brucellosis (*Brucella suis*) is present in wild swine popula-
IDENTIFICATION OF DISEASES AND AGENTS OF CONCERN

tions in at least 9 states, and wild swine will represent the last bastion of infection in our Nation for many years to come. The problem is being aggravated by the relocation of wild swine by hunt clubs and shooting preserve owners who have no knowledge of diseases. Modern swine producers generally are well aware of swine brucellosis and have totally isolated their animals from the risk posed by wild swine. However, backyard swine producers and marginal swine farmers who use antiquated husbandry methods will continue to provide a potential interface between feral swine and the legitimate pork industry. Strategies to combat the problem include education of pork producers, application of disease control regulations to people who move wild swine for hunting purposes, legitimization and regulation of the “wild swine industry”, wild swine control, and research on vaccines or population control techniques.

Pseudorabies: As with swine brucellosis, pseudorabies virus is endemic in many wild swine populations of 10 states. Of interest is the finding that the virus isolated from wild swine appears to be more venereal than respiratory, which lessens the risk of spread to bona fide domestic swine somewhat. Like the problem with swine brucellosis, careless transportation and release of infected wild swine by hunters and introduction of infected animals into commercial market channels by marginal producers are hazards. The strategies for resolution of the problem are the same as for brucellosis.

Chronic Wasting Disease (CWD): This disease is among the transmissible spongiform encephalopathies that include scrapie, bovine spongiform encephalopathy (BSE), Creuzfeldt Jacob disease of humans (CJD), and transmissible mink encephalopathy. CWD is endemic in northeastern Colorado and southcentral Wyoming in free-ranging mule deer, white-tailed deer, and elk. The disease also has been diagnosed in captive elk in South Dakota, Nebraska, Oklahoma, Colorado, Montana, and Saskatchewan. There was spillover infection into white-tailed deer in a South Dakota enclosure. The susceptibility of cervid species other than mule deer, white-tailed deer, and elk is undocumented but likely. Given the unknown epidemiology of the infectious agent and the inability to test for CWD in live animals, this disease will be difficult to control without strict program standards.

Of the known diseases of cervidae, CWD represents the greatest threat in regard to spread and establishment throughout North America. With time, there may be a natural extension of the disease across the landscape; however, the widespread movement of exposed and infected captive elk has provided an “instant recipe” for disease spread. To date, there has only been a single documented instance of spread of CWD from captive to wild cervids in the South Dakota elk enclosure, but the potential for CWD introduction is alarming. For example, a shipment of newly imported captive elk escaped and wandered in Georgia white-tailed deer habitat for several weeks during the summer of 1999. At present, any associations between CWD in cervids and either BSE in cattle or CJD in human beings are speculative. However,
should any links be identified, CWD will become a central issue of big game management.

**Poultry Diseases:** Two major viral diseases of poultry, Newcastle disease and avian influenza, have wild birds as part of their epidemiology. Both viruses behave similarly by having multiple strains that vary in host preference and pathogenicity. It is not uncommon to isolate these viruses from wild birds, but most of the viruses recovered are not serious threats to poultry. Wild birds have and always will harbor the building blocks of genetic material that could result in emergence of pathogenic strains of Newcastle disease and avian influenza; however, to blame wild birds for every new outbreak of these diseases is poor science. Many other avians, including backyard poultry and pet birds are involved in the epidemiology. Species of *Mycoplasma* and *Salmonella* have been isolated from wild birds, but generally wild birds are not harboring the major pathogenic species or strains that affect poultry.

Because of the universal presence of wild birds, the best way to reduce disease risk from wildlife is for poultry producers to partition their flocks from nature. Modern poultry producers recognize this fact, and intensive poultry confinement results in this effect. Vaccination, removal of menagerie birds, and wildlife habitat manipulation also may be advisable.

**A Mutual Concern: Foreign Disease Introduction**

Both agriculture and wildlife interests have a great risk from foreign animal diseases. For wildlife, there is the direct threat of morbidity and/or mortality at the population level. For example, rinderpest is a notorious killer of wild ruminants in Africa and the Middle East. Considering that our native North American wildlife species are totally naive to many foreign agents, the consequences are speculative but they could be devastating.

The indirect threats that foreign agents pose probably are an equal or greater threat. These are the negative consequences that occur when wildlife is identified as a key part of the epidemiology of the new disease. Wildlife could be carriers, hosts for the vector, amplifiers of the agent, or simply a means to spread the agent from premise to premise. Any of these scenarios will change the farm community's attitude toward wildlife, resulting in greater pressure to eliminate and less willingness to conserve the species in question.

There are only a few instances where wildlife were a factor in containment of a disease which currently is foreign to our boundaries. The most often mentioned is the problem with foot and mouth disease in deer in California in 1924, when over 22,000 deer were killed in the eradication program. Later, in the cattle fever tick eradication program in Florida, deer were killed by the thousands to stop tick maintenance in the wild. Considering the current situation in Europe with classical swine fever, it is a miracle that the United States was able to eradicate this disease without having to deal with wild
IDENTIFICATION OF DISEASES AND AGENTS OF CONCERN

swine. These success stories are offset by what in actuality are successful foreign animal disease introductions into our native wildlife. Here we are speaking of the aforementioned problems with bovine brucellosis and bovine tuberculosis. Also, the newly introduced West Nile virus is a notable example.

To the credit of APHIS, USDA, the protocols for importation of traditional farm animals have provided highly secure pathways for bringing these animals into the United States. The greatest headaches have been associated with the non-traditional, exotic animal imports that seem to continually catch us off guard. Unfamiliar diseases and parasites in exotic species must be dealt with, usually with a minimal knowledge base. For example, an obscure parasite, *Elaphostrongylus cervi*, suddenly became an import issue for red deer, and new importation policies were required.

One general problem has been exotic tick vectors. There have been multiple instances where exotic ticks have been found hitchhiking on imported rhinoceroses, ostriches, tortoises and snakes. Reptile importation for the pet and exotic animal trade involves a tremendous volume of animals, and the numbers of these animals bearing ticks is simply unacceptable. In the past, there was an unspoken attitude of “no problem, its only a snake tick!” This may be acceptable in regard to managing health problems of domestic animals, but to those who are responsible for wildlife health, the introduction of new pests for native snakes is objectionable. To an outside observer, the inability of APHIS, USDA, and the Fish and Wildlife Service, USDI, to mesh their oversight of exotic animal importation has been frustrating. Admittedly, it is a difficult task, but the new information on the capacity for some of these ticks to harbor heartwater disease is forcing the issue. The eradication of any multi-stage tick from our native wildlife population will be extremely difficult to impossible, and preventing introduction is the only viable option.

**West Nile Virus:** The introduction of this disease into North America has provided us with a good overview of what can happen with wildlife when a foreign agent enters. Without downplaying the importance of this disease to people or horses, it has been much less damaging compared to many of the other possible foreign animal diseases. Of interest is the fact that West Nile Virus is highly pathogenic to some of our birds, notably the crows and jays, which corresponds to concerns about native wildlife being naive. Because the virus involves multiple species of wild birds and mosquitoes, it can be predicted that it is here to stay, and probably will become widespread. The long-term impacts on wildlife are unknown. Perhaps the direct losses of crows will become an important factor. The indirect problems for wildlife due to pesticide use are unknown.

**Conclusion**

Although much of this presentation has dealt with the contrasting perspectives of animal agriculture and wildlife conservation groups on health
issues, it must be stressed that there is substantial common ground. To a great extent, many of the same people are involved in both activities and have understanding from both sides of controversial issues. In addition, both animal agriculturalists and wildlife managers understand the concept and value of population health management as opposed to treating individual animals. Both groups are competing against a “tide of humanity” as human populations increase demand for land and water resources, and there is the animal rights movement directed against consumptive use of either wild or domestic animals. As previously mentioned, the concern for foreign animal disease introduction is mutual. Lastly, because the land base for much of wildlife production is private land, and much of private land is used for animal agriculture, saving farming enterprises is beneficial to wildlife.

In closing, it is important for all to view the transmission of diseases between domestic animals and wildlife as a “two way street” where organisms have the potential to move either way. Thus, the goal should be to develop programs and policies that can protect and sustain all interests.
REAL AND POTENTIAL IMPACTS OF WILDLIFE DISEASE RESERVOIRS ON STATE AND NATIONAL DISEASE ERADICATION PROGRAMS

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Introduction

The presence of diseases of importance, to the livestock industries of the United States, in wildlife or feral animal populations is not a new phenomenon. A number of such diseases have been recognized for decades. For example, Brucella abortus was initially diagnosed in Yellowstone National Park bison in 1917. What is relatively new is the concern that disease will spill over from wildlife or feral animal disease reservoirs to our domestic animal populations. This can have a significant impact to the livestock industry and may affect classification of the state or the classification of the United States relative to particular diseases. Concerns continue to grow as we near completion of current national disease eradication programs and as international trade continues to expand.

It is important for us to recognize that most, if not all of the diseases of concern in wild and feral populations in the United States, were originally transmitted from domestic animals to wild or feral animals. In some cases, transmission occurred prior to development and implementation of disease control strategies for that disease. Here again, brucellosis in bison and elk in the GYA serves as an excellent example. Transmission of brucellosis to bison and elk occurred before there was a disease control program. This factor should be acknowledged, but must not detract from the issue at hand. The diseases are present in wild and feral populations and must be dealt with.

This paper will focus primarily on brucellosis and tuberculosis because of the current concerns about wildlife reservoirs of these diseases and because these diseases serve as excellent examples to illustrate issues and concerns. However, the author does not intend to discount the impacts of wild or feral reservoirs of diseases on other species of animals or birds.

CFR and UM&R Requirements

Brucellosis CFR and UM&R Requirements

Neither the CFR nor the UM&R specifically addresses brucellosis in non-domestic species. However, it is clear from the language of both documents that a state must address all sources of brucellosis in order to achieve and maintain state status. Consider the following:

- The CFR definition of "Herd" includes "all animals..." not just cattle, bison and swine.
- The CFR definition of "Epidemiological Investigation" in part requires
the state and federal officials to "...investigate that herd to identify possible sources of brucellosis."

- The UM&R definition of "Class Free State or Area" states in part "...included among the requirements for Class Free status are that the cattle and/or bison herds in the State or area within the State must have remained free from infection with field strains of Brucella abortus ..." It does not say "free from field strains of Brucella abortus from domestic animal sources."

- The UM&R definition of "Individual Herd Plan" identifies the herd plan as a "written herd management and testing plan..." and further states that "A similar plan for determining the true status of animals suspected to harbor Brucella abortus and for preventing exposure to brucellosis within the herd is also within the meaning of the term."

- In Chapter 1, Part III, Section 1 of the UM&R subpart B the "State and federal officials ... in each state are responsible for continuously evaluating the efficiency of local procedures for locating and eliminating infected cattle and bison."

- In Chapter 2, Part II, Section 3. B. 1. and 2. Herd Infection Rate, the UM&R requires that "States must remain free of brucellosis resulting from infections with field strains of Brucella abortus ..." This subpart also requires the "State or Federal representative to conduct an epidemiological investigation of each herd that has reactor cattle or bison... to identify the potential sources of infection." This subsection further states "If the source of infection for a reactor cannot be identified, a committee will be designated to review the circumstances and recommend actions to the Deputy Administrator."

It is amply clear from this language that a state cannot ignore the presence of brucellosis in wild or feral species. Even though neither the CRF nor the UM&R requires state or federal officials to conduct specific actions if brucellosis is present in non-domestic animals, both the CFR and The UM&R clearly imply that the state must address known or potential exposure of cattle or bison to brucellosis infected wildlife in order to achieve or maintain state status.

Practical experience in the Greater Yellowstone Area makes it very clear that a state that has brucellosis in wildlife must address the threat to domestic livestock.

Proposed Tuberculosis CFR Requirements for State or Zone Classification Relative to Disease Reservoirs

While both the Brucellosis CFR and UM&R are vague in reference to brucellosis in non-domestic species, the Proposed CFR relative to tuberculosis is very clear. Part 77.7.(e) Accredited-free States or zones, states: "If tuberculosis is diagnosed within an accredited-free State or zone
in an animal not specifically regulated by this part and a risk assessment conducted by APHIS determines that the outbreak poses a tuberculosis risk to livestock within the State or zone, the State or zone must implement a tuberculosis management plan, approved jointly by the State animal health official and the Administrator, within 6 months of the diagnosis. The management plan must include provisions for immediate investigation of tuberculosis in livestock, wildlife and animals held for exhibition, the prevention of the spread of the disease to other livestock, wildlife and animals held for exhibition, increased surveillance of tuberculosis in wildlife and animals held for exhibition, eradication of tuberculosis from individual herds, a timeline for tuberculosis eradication, and performance standards by which to measure yearly progress toward eradication. If a State or zone does not implement such a plan within the required 6 months, the State or zone will lose its accredited-free status and will be reclassified as modified accredited advanced”. A similar statement is included in the proposed CFR for each classification level.

Impact of Wild or Feral Animal Disease Reservoirs on States

While the National Program Standards may not require that disease foci in wildlife or feral populations be eliminated as a condition for declaring that a state or area is free of disease in livestock, the occurrence of disease in wildlife or feral animals will impact the state that has that disease. Examples include:

- Brucellosis in the GYA

  The Greater Yellowstone Area (GYA) wildlife brucellosis problem has been a topic of discussion at USAHA committee meetings every year for the past 12 years because of the impact on the three states of the GYA (Idaho, Montana and Wyoming) and the potential impact on the whole country.

  ➢ Both Wyoming and Idaho have been subjected to brucellosis program reviews (at the request of the states) to evaluate effectiveness of brucellosis surveillance, control, and prevention measures and to identify and correct deficiencies in the state programs.

  ➢ Montana, in an effort to protect the livestock industry of the state is embroiled in conflict over management of Yellowstone National Park Bison that migrate into the state of Montana. This effort has been ongoing for almost 10 years.

  ➢ State and federal agencies have been working for over 12 years to prevent transmission of brucellosis from wildlife to livestock and to develop and implement a brucellosis control and eradication plan for the Greater Yellowstone Area.

  The classification of the states of the GYA has not been affected, up to the current time, because there has not been a recent spillover of brucellosis...
from wildlife to cattle. However, the impact to the states and the industries within the states has been significant.

- **Tuberculosis in Michigan**

  The impact of tuberculosis on the livestock industries and on the state of Michigan have been more pronounced than the impact of wildlife brucellosis on the states of the GYA. Transmission of tuberculosis from whitetail deer to livestock has occurred at least 5 times and continues to be a threat. The state of Michigan has lost its Accredited Free Status.

  So what are some of the impacts to states and industries within those states? The following is a partial list:

  - **Conflicting mandates.** The presence of a disease in concern in wildlife opens an entire new area of real and potential conflicts for animal health officials. In most states, animal health officials have limited authority to address diseases in wildlife. Wildlife management authorities are responsible for management of wildlife species, but many of these agencies have neither the authority nor the interest in disease control. If federal refuges or parks harbor diseased wild or feral animals, the federal wildlife management agencies must become involved. These federal agencies also see their mandate as one of managing wildlife, not disease control. Attaining concurrence on mechanisms to manage, control or eradicate diseases in wildlife among such diverse interests and mandates becomes very difficult.

  - **Conflicting interests.** Sportsmen’s groups, wildlife interests, wildlife conservationists and animal rights groups have a very different concept and understanding of animal disease issues from that of our domestic livestock industries and our animal health officials. These diverse interests and concerns must be addressed if we are to successfully manage wildlife diseases issues.

  - **Disease surveillance.** States must conduct surveillance not only in livestock, but also in the wild or feral animal species. The traditional methods for surveillance in livestock are inadequate to identify wild or feral sources of potential transmission.

  - **Strategies to prevent transmission.** Here again, traditional methods utilized to prevent transmission among domestic species are inadequate to prevent transmission from free roaming species.

  - **Regionalization.** Michigan officials regionalized an area of that state in an attempt to preserve free status in a portion of the state and to more clearly delineate the area of disease concern. This effort was not successful in Michigan. The Montana/Yellowstone National Park Bison Management plan will result in regionalization of areas of Montana. It is likely that the other two states of the GYA will be
REAL AND POTENTIAL IMPACTS OF WILDLIFE DISEASE RESEVOIRS ON DISEASE ERADICATION PROGRAMS

- Continued vaccination (Brucellosis). Many states have dropped vaccination requirements. The states of the GYA will be required to continue vaccination into the foreseeable future.
- Imposition of more stringent requirements by other states. If a state loses its disease free classification the National Program Standards impose additional interstate movement requirements on that state. However, some states have imposed additional testing requirements on the states of the GYA even though those states are still classified as free states.
- Trade disadvantages. Livestock from areas that have a disease reservoir are considered potentially exposed. The risk, whether real or perceived, reduces the marketability of livestock that originate in areas that have a wildlife disease reservoir.

Impact on National Disease Eradication Programs and on International Trade

So long as a disease is present in wild or feral animals the United States cannot be considered free of that disease. Until recent years, disease reservoirs in wild and feral animals have largely been ignored. The focus has been on eradicating diseases from domestic species. We are rapidly approaching a time when the only remaining foci of these diseases will be in wild or feral species.

The ultimate impact of wildlife disease reservoirs on classification of a country and on international trade is not clear at this time. It is clear that countries will have to implement measures to prevent transmission from wildlife reservoir to livestock.

One example that we can look to is how Canada has dealt with brucellosis and tuberculosis in bison in Wood Buffalo National Park. Efforts to directly address the diseases in bison have not been successful, largely because of political constraints. Canada has “regionalized” the park and areas adjacent to the park. This approach has been accepted by the international community and has not impacted Canada’s ability to market livestock in international commerce.

It appears clear to the author that this is the approach that will be utilized in the United States. On the one hand it is a plausible mechanism to recognize most of the country as free of a particular disease in livestock. On the other hand, it is patently unfair to segments of the industry that happen to own livestock in the regionalized area. The impacted industry does not have the ability to address the disease in wildlife and thus becomes a pawn in the hands of federal and state agencies.

Impacts on International Trade

Many other countries, besides the United States, have very serious
wildlife or feral animal disease reservoirs in a number of species. The following are some examples:

- Foot and Mouth Disease, Rinderpest, Classical Swine Fever, Newcastle Disease, Rift Valley Fever, Avian Cholera, Bovine Tuberculosis and Brucellosis.

It is not clear at this time what the ultimate impact from diseases that are transmissible among wildlife, feral animals, domestic animals and humans will be on international trade in animals and animal products. It is clear that wildlife disease reservoirs are an issue of concern to Office of International Epizootics (OIE). The following excerpts from the OIE Ten Year Report (1990 – 1999) serve to illustrate this concern:

- Wild Animals are known to be susceptible to most of the 15 OIE List A Diseases or at least act as one of the major reservoirs for the pathogens responsible for the diseases.
- As more is known of wild animals and their diseases, there is increasing awareness not only of those transmissible diseases that threaten humans and their domestic animals but also of those that have a significant effect on wildlife populations themselves.

Several years ago OIE established a Working Group on Wildlife Diseases. This Working Group continues to deliberate and will make recommendations on wildlife/livestock interaction issues.

Conclusion

Diseases in wild and feral animals are having an impact on domestic animal production and on domestic animal disease control efforts in a number of areas of the United States. We must find mechanisms to address these diseases in wild and feral animals if we are to successfully eradicate the diseases from domestic species and keep the diseases from reoccurring in domestic species.

Additionally, reservoirs of disease in wild and feral animals must be addressed if a country is to be considered free of a disease in domestic species and achieve the ability to freely market animals and animal products in international commerce.
CONFLICTS OF AUTHORITY AND STRATEGIES TO ADDRESS WILDLIFE DISEASES

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Introduction

Although the same basic methods are used to study, diagnose, and manage diseases of domestic animals and wild animals, managers of wild animal diseases face significant difficulties that are relatively unimportant in management of diseases of domestic animals (Wobeser, 1994). Some of these difficulties are inherent in the wild nature of truly free-ranging animals, while others are related to a lack of knowledge and/or tools necessary to effectively manage diseases of concern. All these difficulties are compounded by varying perceptions of ownership and management jurisdiction. In addition, wild animals capture the interest of diverse constituencies, including some advocacy groups that have little concern for the health of domestic animals.

For the purposes of this discussion regarding management of diseases of wild animals, we will limit our comments to free-ranging North American wild ruminants, or big game. We use examples of diseases of wild ruminants because they are most likely to be important to domestic livestock health and, therefore, are of economic (and sometimes of human health) importance because they are often the subject of federal disease control programs, and because they are of direct concern to the United States Animal Health Association. Furthermore, we will restrict our discussion to issues of authority and responsibility for wildlife disease management, strategies for managing important wildlife disease problems, and examples of ongoing management programs for wildlife diseases.

Conflicts of Authority

There is considerable debate over which agency, or agencies, has jurisdictional authority to manage diseases in wildlife. This question has been addressed in great depth regarding brucellosis in bison and elk in the Greater Yellowstone Area (GYA) (Keiter and Froelicher 1993, Carlman 1994, Keiter 1997, Melcher 2000); brucellosis in the GYA has resulted in more litigation (Keiter and Froelicher 1993) and controversy than any other recent regional
environmental issue. Similar questions have been raised more recently with respect to managing bovine tuberculosis (TB) in white-tailed deer in Michigan (Salman et al. 2000).

Traditionally, states have been responsible for wildlife management on U.S. Forest Service and Bureau of Land Management multiple use federal lands, as well as state and private lands (Coggins and Ward 1981). Federal law governs wildlife management on national park and national wildlife refuge lands (Coggins and Ward 1981). But federal law does not address brucellosis, or other diseases, in wildlife (Keiter 1997). However, based on discussions with General Counsel attorneys who advise the U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS), Melcher (2000) maintained that APHIS has authority over wildlife that are infected with or are carriers of diseases contagious to domestic livestock. This, apparently, is based on quarantine laws from the 1880s modified by subsequent statutes. In the case of diseased wildlife on national park and wildlife refuge lands, APHIS would seek concurrence of the U.S. Department of Interior before exercising its authority. Elsewhere, APHIS regulations would be administered in cooperation with the appropriate state(s) (Melcher 2000).

According to Keiter and Froelicher (1993), Keiter (1997), and Salman, et al. (2000), jurisdictional authority for diseases of wildlife is fragmented among many state and federal agencies. We will use brucellosis in elk and bison as an example because management and control involve more federal (APHIS, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management) and state (Wyoming State Livestock Board and Game and Fish Department; Montana Board of Livestock and Department of Fish, Wildlife and Parks; and Idaho Department of Agriculture and Department of Fish and Game) agencies than possibly any other wildlife disease issue and because it was recently reviewed from a legal perspective (Keiter and Froelicher 1993, Carlman 1994, Keiter 1997).

In shaping federal law " "Congress passed the Animal Industry Act of 1884 authorizing the Secretary of Agriculture to regulate contagious animal diseases to prevent their interstate dissemination (21 U.S.C. §111). Congress has since amended the Act to authorize the Secretary "...to control and eradicate any communicable diseases of livestock or poultry including...brucellosis of domestic animals" (21 U.S.C. §114A). To protect livestock against communicable diseases, the Secretary is also empowered to seize, quarantine, and destroy infected animals moving in interstate commerce (21 U.S.C. §134a (a)). The term “animals” includes “...all members of the animal kingdom ...whether domestic or wild” (21 U.S.C. §134(b)) (Keiter 1997:182)." " However, enabling legislation for the National Brucellosis Eradication Program and the Uniform Methods and Rules for Brucellosis Eradication address domestic livestock and do not apply to free-ranging wildlife, which is regulated by states (Parker Land and Cattle Co., Inc. vs. United States 1992, Keiter 1997).
CONFLICTS OF AUTHORITY AND STRATEGIES TO ADDRESS WILDLIFE DISEASES

Within the GYA, the immediate location of brucellosis-exposed or infected bison and elk determines prevailing legal standards (Keiter and Froelicher 1993). The Yellowstone National Park organic act contains a wildlife preservation provision (16 U.S.C. §26) and clearly provides legal authority over wildlife within the park. However, special enabling legislation for Grand Teton National Park provides that the National Park Service and state of Wyoming share responsibility for protecting elk and allows for hunting of elk within the park under specific statutory limitations (16 U.S.C. §673c); this does not apply to bison. On the National Elk Refuge, which is managed by the U.S. Fish and Wildlife Service, responsibility for elk management is currently the subject of heated litigation (State of Wyoming v. Babbitt, 10th Circuit Court of Appeals, No. 99-8089). On national forests, the U.S. Forest Service is responsible for habitat management and states are responsible for wildlife management (16 U.S.C. §528; U.S.C. §1732(b)). In Parker Land and Cattle Co., Inc. vs. United States (1992) a Dubois, Wyoming, rancher sued the federal government under the Federal Tort Claims Act (28 U.S.C. §2671 et seq.) for monetary damages because he believed his cattle became infected with brucellosis from federally managed wildlife. Although the court denied the claim because it was not convinced federally managed wildlife were responsible, it did send a strong message that federal land managers should take positive steps to protect livestock from brucellosis-infected wildlife (Keiter 1997).

The Wyoming Game and Fish Department is responsible for managing wildlife of the state under Wyoming law (Wyo. Stat. §23-1101 et seq.). Although brucellosis is not directly addressed in either this statute or the wildlife-caused damages law (Wyo. Stat. §23-1-901(c)), the state supreme court has concluded the state could be liable if elk were proven responsible for transmission of brucellosis to livestock (Parker Land and Cattle Co., Inc. vs. United States (1992) a Dubois, Wyoming, rancher sued the federal government under the Federal Tort Claims Act (28 U.S.C. §2671 et seq.) for monetary damages because he believed his cattle became infected with brucellosis from federally managed wildlife. Although the court denied the claim because it was not convinced federally managed wildlife were responsible, it did send a strong message that federal land managers should take positive steps to protect livestock from brucellosis-infected wildlife (Keiter 1997).

In the GYA, absence of clear legal authority over brucellosis-exposed wild animals provides opportunities for flexibility to administratively develop a regional, multi-agency, cooperative brucellosis management policy (Keiter and Froelicher 1993, Keiter 1997). That is being accomplished, at least in part, through the Greater Yellowstone Interagency Brucellosis Committee.
Similarly, Salman et al. (2000) recognized that no single agency can control tuberculosis in white-tailed deer in Michigan and that state and federal wildlife management and animal health agencies must cooperate to resolve the problem. A cooperative approach is far preferable to a single agency attempting to assume sole legal authority over, or assuming it has the resources to manage, significant wildlife disease problems. We believe such an approach would be doomed to many years of litigation in the courts, adverse public reaction, or Congressional resolution, and would ultimately fail because none of these options or institutions is likely to arrive at a satisfactory resolution to wildlife disease problems.

**Strategies to Address Wildlife Diseases**

Wobeser (1994) extensively reviewed disease management in wild animals and provides a valuable reference for anyone contemplating such a program. Disease management for domestic and wild animals readily fits into three categories:

- **Prevention** encompasses measures taken to prevent individuals and/or populations from harboring or being affected by certain diseases. Wild animals benefit from efforts of state and federal animal health officials and livestock producers to prevent introduction of foreign animal diseases, such as foot and mouth disease.

- **Control** encompasses measures taken to restrict distribution and/or frequency of occurrence of diseases at tolerable levels. There may be disagreement about acceptable levels of occurrence within domestic and wild animal populations, and inherent with disease control is acceptance that it must last forever or until a different category is reached.

- **Eradication** encompasses the complete elimination of an existing disease. It usually follows some stage of control and may be a prerequisite for prevention.

It is important to recognize some of the problems that are more-or-less unique to managers of wildlife diseases and to appreciate the difficulties inherent in developing and implementing strategies to manage wildlife diseases. Detecting the presence of important diseases in wildlife can be surprisingly difficult. Surveillance by serologic tests (where available) is feasible, but may be expensive and time-consuming because of difficulties inherent in obtaining sera from hunter-killed and trapped animals; retesting of "suspect" animals is usually impossible. Sensitivity and specificity of serologic tests developed for domestic animals and used on wild animals frequently are not known, and often they are not the same. Few wild animals are individually marked for re-identification, and they are seldom controlled by fences, corrals, etc. Many wild animals are seasonally migratory and they never respect jurisdictional boundaries or property lines. Carcasses of
wild animals are frequently recycled back into the environment before they are located and submitted for necropsy; consequently, a disease outbreak might not be detected until quite advanced. Compared to domestic animals, live wild animals are intractable, and restraint and manipulation for veterinary procedures may induce a spectrum of perturbations, such as capture myopathy, not encountered with domestic animals; these physiologic processes may confound diagnostic and disease management procedures. Moreover, it is rarely possible to capture all, or even a majority, of all the individuals in a free-ranging population. A major obstacle to disease prevention is that vaccines and vaccine delivery systems developed for domestic animals may not be safe, effective, or suitable for wild animals. Finally, there is a unique human relations factor relative to disease management with wild animals. While there is strong personal or economic incentive to control diseases of domestic animals, wild animals are often viewed as belonging to everyone or belonging to no one and capable of overcoming diseases on their own if we simply restore the balance of nature or remove domestic animals. By domestic animal standards, these factors as well as others not listed make epidemiology and disease management considerably more difficult with wild animals. If such factors are taken into consideration, however, attempts to manage important wildlife diseases may be more effective.

Whether it is even desirable to manage diseases is more difficult to resolve with wild animals than with domestic animals. There are some people and groups that believe diseases of wild animals are natural and a part of the balance of nature. To them any disease management strategy is unnatural interference and, therefore, inappropriate. The common failure of disease management advocates to consider or plan for mitigation of resources impacted or lost in the course of such activities may help foster such sentiment. This philosophical obstacle to disease management is seldom, if ever, encountered for domestic animals (Wobeser 1994). Desirability of wildlife disease management is complicated further in western states with large public land holdings. There, some people believe that not only is disease management unnatural, but that the only necessary strategy is to eliminate public land grazing and remove all livestock from public lands, thus eliminating any threat to domestic animals. This short-sighted viewpoint ignores the fact that wild animals, along with domestic animals, also depend on private lands and that the philosophy of multiple use on federal land, including grazing, is well established in law.

Feasibility is often perceived to be an obstacle to attempting disease management in wild animals (Wobeser 1994). To some people, it is not practical to address diseases in wild animals because it is difficult or impossible to treat or immunize wild animals, or because such strategies are unnatural. However, many environmental, habitat, and population factors influence diseases of wild animals and can be manipulated as disease management strategies. Investments in research and development of practical tools
for aiding in detection and management of diseases in free-ranging wildlife could help diminish inaction based on the perceived futility of such attempts.

Desirability and feasibility aside, Wobeser (1994) provided three major reasons to control diseases in wild animals:

- Diseases have deleterious effects on species considered important to man; pasteurellosis in bighorn sheep and hemorrhagic disease in white-tailed deer are examples.
- Diseases can constitute threats to human health; brucellosis in elk and bison and bovine TB in white-tailed deer are examples.
- Diseases can threaten health of domestic animals; again brucellosis and bovine TB are examples.

Among wild animals there are three basic determinants of disease: the disease agent, the host, and the environment. Management strategies are based on manipulation of one or more of these determinants, as appropriate, and on influencing human activities. Wobeser (1994) extensively discussed strategies that have been or could be used for management of diseases of wild animals:

- **Controlling the causative agent** of a disease or its vector is the most direct strategy. A disease eradication program has an ultimate objective of time- and place-specific elimination of a causative agent. The screw worm (*Callitroga hominivorax*) program in Florida, the southwest U.S., and Mexico eliminated the fly through release of irradiated, sterile but sexually active males. Although this highly successful program was intended primarily to benefit domestic animals, it also greatly reduced screw worm-induced losses of deer, especially fawns, by controlling the agent (Strickland et al. 1981).

- **Manipulation of host populations** for disease management can occur through restrictions on distribution, selective removal (i.e., culling) of diseased animals, and reduction of population density. Disease- and host-specific factors may influence the potential efficacy of respective strategies (Barlow 1996). Population manipulation is generally intended to reduce or prevent disease transmission; but at its extreme, which is depopulation, it may eliminate a disease.

- Disease management through treatment or immunization may have application under certain circumstances. Treatment of wild animals is rarely attempted, but has occasionally been used with individuals or small populations of species at risk or of critical concern. Immunization of wild animals may have greater utility under appropriate conditions (Barlow 1996), but requires safe and effective vaccines and delivery systems that will reach a sufficiently large portion of the population to protect exposed individuals and/or reduce transmission. Vaccination of free-ranging elk to control brucellosis in Wyoming is an example.
• **Environmental and habitat modifications** are strategies that may be used to manage diseases of wild animals. Objectives generally are to reduce survival of specific disease agents or vectors, or lower population densities and reduce transmission rates. Habitat modifications usually should not be expected to produce rapid results, but the results should be relatively long lasting. Habitat enhancements to disperse bighorn sheep in winter serve to reduce disease transmission.

• Finally, diseases of wild animals may be managed by **influencing human activities**. The best example is taking measures to be sure diseases are not moved or introduced through translocation and reintroduction of wild or domestic animals. Specifically, some western states have restrictions on translocation of white-tailed deer from the east to prevent introduction of meningeal worm (Paraelaphostrongylus tenuis) to the west. Of greater long-term importance may be modifying public opinion through education and information programs to improve acceptance of disease management in wild animals.

### Ongoing Wildlife Disease Management Programs

Currently there are at least three examples of important diseases of free-ranging wild animals, which are being cooperatively managed by multiple agencies using a variety of strategies specific for wild animals. Two of these, brucellosis in elk and bison of the GYA and bovine TB in white-tailed deer of Michigan, have important domestic animal and human health ramifications, and the third, chronic wasting disease (CWD) of cervids in southeast Wyoming and northeast Colorado, has national significance because of its uniqueness as a transmissible spongiform encephalopathy (TSE) in wild animals.

### Chronic Wasting Disease of Cervids in Wyoming and Colorado

Chronic wasting disease is a TSE of native deer and elk that is endemic throughout northeastern Colorado and southeastern Wyoming. It was first recognized among captive cervids in the late 1960s and was diagnosed in free-ranging deer and elk during the 1980s (Williams and Young 1992). Estimated infection rates range from <1-15% in deer and ≤1% in elk residing in these endemic areas (Miller et al. 2000). Models suggest CWD has been present in free-ranging populations in areas of Colorado and Wyoming for more than 30 years (Miller et al. 2000). Although CWD occurs in three species of cervids, there is no evidence that humans (World Health Organization 2000) or domestic livestock are susceptible to CWD by natural routes of exposure.

Through the 1980s and early 1990s, the presence of CWD in Colorado and Wyoming led to considerable interagency cooperation at the state wildlife management level. Surveillance for CWD in free-ranging deer began in
Wyoming in 1983 and has been continually expanded in both states over-time. Following the onset of the bovine spongiform encephalopathy (BSE) epidemic in the United Kingdom and with the recognition of the relationship of variant Creutzfeldt-Jacob disease of humans and BSE, interest in the TSEs in general, and CWD in particular, greatly increased. This led to expansion of agencies and industries with legitimate concern about this disease and increased interagency communication and cooperation. An ad hoc committee (the Colorado-Wyoming Interstate Forum on CWD) was formed for exchanging information on CWD and included representatives from the Colorado Division of Wildlife, Wyoming Game and Fish Department, Colorado and Wyoming Departments of Agriculture, State Veterinarians of both states, USDA/APHIS, University of Wyoming, Colorado State University, Colorado and Wyoming Public Health Departments, and representatives of cattle, sheep, and alternative livestock industries. Meetings among the wildlife management agencies of Colorado, Wyoming, South Dakota, and Nebraska to discuss CWD have occurred periodically. Yearly meetings specifically to address advances in CWD research involve scientists from across the country representing a spectrum of state and federal institutions and agencies.

There is no precedent for attempting to manage a TSE in free-ranging wildlife. Programs for managing or eliminating scrapie of domestic sheep have proven only marginally successful to date, and the epidemiologic differences between CWD and other TSEs make such programs rather poor models for prospective CWD management. Limited understanding of the epidemiology of CWD makes development and implementation of strategies to prevent, control, and eradicate CWD extremely difficult. Therefore a primary goal of the wildlife management agencies in Colorado and Wyoming has been to invest resources in applied research to understand the epidemiology, distribution, and prevalence of CWD in affected areas (e.g., Miller and Kahn 1999). Common sense preventive measures have been instituted, including bans on relocation of cervids from the CWD endemic areas, halting artificial feeding of deer and elk by the public in areas where CWD occurs, and culling of deer and elk showing clinical signs of CWD. It may be possible to manage affected deer or elk populations to reduce CWD prevalence in endemic foci (Gross and Miller 2000), but prevalence reduction will require a long-term commitment and may not eliminate CWD from endemic areas. A cooperative experiment assessing the efficacy of alternative deer management strategies in changing CWD prevalence is underway in two game management units with high CWD prevalence in Colorado and Wyoming. Considering the difficulties inherent in addressing disease in free-ranging wildlife, an adaptive resource management approach (Holling 1978, Walters and Holling 1990) to test candidate strategies for reducing CWD prevalence and distribution is imperative.
Bovine Tuberculosis in Michigan Wildlife and Livestock

Since 1994, the state of Michigan has recognized a problem with bovine TB, caused by *Mycobacterium bovis*, in free-ranging white-tailed deer from an 11 county area in northeastern Lower Michigan. A total of 41,500 free-ranging deer have been tested and 285 were positive for *M. bovis*. The disease has been found in other wildlife species, including 8 coyotes, 2 raccoons, 2 opossums, 2 bobcats, 1 black bear, and 1 red fox, and beginning in 1998, in domestic cattle. To date 9 beef and 2 dairy cattle herds have been diagnosed with bovine tuberculosis.

Recognizing the potential economic and public health consequences of bovine tuberculosis to the state, the governor issued orders to eradicate *M. bovis* from the state's deer population. Unfortunately, the situation is unique in that there have never been reports of self-sustaining bovine TB in a wild, free-ranging cervid population in North America. There are no existing control programs for bovine TB in free-ranging deer, and there is much about bovine TB in deer that is currently unknown. Scientists, biologists, epidemiologists, and veterinarians that have studied this situation have concluded that the most logical explanation is that high deer densities, the focal concentration caused by baiting (the practice of hunting deer over feed), and feeding are the factors most likely responsible for the establishment of self-sustaining bovine TB in free-ranging Michigan deer (Schmitt et al. 1997). By repeatedly concentrating deer into close contact with each other, baiting and feeding provide ideal conditions for the transmission of bovine TB via both inhalation of infectious aerosols and ingestion of bovine TB contaminated feed (Whipple and Palmer 2000).

The extremely important goal of eliminating bovine TB from free-ranging deer is likely to be difficult to accomplish. It will require cooperation and collaboration of state and federal animal health and wildlife resource agencies. Animal health agencies do not have sufficient expertise in wildlife biology and management techniques to address the situation independently, while the same can be said for wildlife resource agencies faced with diseases in domestic animal populations. Therefore, multiple agencies must rely on each other and work collaboratively to deal with the control of disease in wildlife; unilateral efforts cannot be expected to succeed. It should be understood that wildlife resource agencies want their free-ranging wildlife populations to be free of disease just as much as animal health agencies want domestic animals to be free of disease.

A management strategy recommended by a multi-agency committee composed of individuals with disease expertise and jurisdiction included surveying wildlife populations, testing livestock, educating the public about bovine TB, eliminating feeding and baiting of deer, reducing the deer density through legal hunting in areas of Michigan where bovine TB has been found, and banning the transport of free-ranging deer from the infected area.

A comprehensive statewide program of surveillance of free-ranging deer
populations is necessary to identify areas that will need intensified management practices and to monitor success of management strategies. Continued evaluation of the prevalence of the disease allows the Michigan Department of Natural Resources to determine the reservoir of existing disease, define geographic areas of infection, and assess trends in disease occurrence. Such information will need to be collected for many years in order to interpret trends. The deer surveillance plan focuses on areas that are most likely to have bovine TB-positive free-ranging deer. The plan is science-based using past and present livestock infection rates, locations of livestock, areas of deer density, and appropriate sample sizes for statistical analysis. It is coordinated with surveillance in livestock conducted by the Michigan Department of Agriculture, and it is practical in terms of manpower, money, and laboratory capacities.

A strong education program is necessary to bring about public understanding of, develop support for, and encourage participation in the TB eradication project. Improved communications, both at the grass roots level and through statewide marketing, is vital to success of the education program. Continued and enhanced contact with key audiences (i.e. livestock producers, industry representatives, media, hunters, and recreational wildlife viewers) will lead to an understanding of the recommended strategies for M. bovis eradication in white tailed deer and livestock populations. Examples of ongoing education efforts include Michigan Department of Natural Resources/ Michigan Department of Agriculture/Michigan State University extension training sessions, bovine TB brochures and newsletters, the annual Bovine TB in Michigan Conference, bovine TB web site, infomercials, satellite training sessions, and press packets.

Methods employed for eradicating bovine TB from free-ranging Michigan deer should decrease the transmission of bovine TB among deer. Reduction of transmission can be enhanced in two ways: reduction in the number of infected animals and reduction in the amount of contact (direct or indirect) between infected and susceptible animals. Increasing the hunter harvest of deer will reduce the overall number of deer as well as reduce the average age of the deer population. Hunting regulations should be liberalized to remove greater numbers of antlerless deer in order to control deer populations and to remove greater numbers of adult males because a higher prevalence of bovine TB has been observed in adult male deer in Michigan. The goal of liberalized hunting regulations should be a smaller deer herd with a younger age structure.

Elimination of baiting and supplemental feeding of deer will reduce the deer population as the herd density approaches the carrying capacity of the land, as well as decrease contact among deer. Artificial feed supplies (baiting and supplemental feeding) increase the density of deer populations beyond the carrying capacity. Even if the deer herd density is not artificially inflated, the presence of feed and bait encourage unnatural congregation of
the animals, thereby increasing contact among deer and enhancing the transmission of infectious agents. Large numbers of animals in close proximity for extended periods of time are more likely to inhale infected aerosolized droplets or to consume food contaminated by coughing and exhalation (Schmitt et al., 1997).

In summary, the two main strategies for eradicating bovine TB from free-ranging Michigan deer are to minimize concentrations of deer by eliminating baiting and feeding and to reduce deer numbers through hunting to the biological carrying capacity. Baiting and feeding have been banned since 1998 in counties where the disease has been found. In addition, the deer herd has been reduced by 50% in the endemic area with the use of unlimited antlerless permits. The measures of apparent bovine TB prevalence have decreased by half since 1997, providing hopeful preliminary evidence that eradication strategies are succeeding.

Brucellosis in Bison and Elk of the Greater Yellowstone Area

The GYA is the largest and most nearly intact ecosystem and encompasses some of the most inaccessible and rugged country in the lower 48 states. It occupies approximately 7.3 million ha in Wyoming, Montana, and Idaho. Within the GYA there are approximately 120,000 elk, about 25,000 of which are artificially maintained during the winter by feeding hay on the National Elk Refuge and on 23 additional feedgrounds managed by the Wyoming Game and Fish Department. In addition, there are 3,000 to 4,000 free-ranging bison, most belonging to the Yellowstone population. Almost all the GYA's elk and bison are migratory to one degree or another. Over 1 million cattle occur in the GYA, and most are managed as cow-calf operations.

Brucellosis was first detected in bison of Yellowstone National Park in 1917 (Mohler, 1917) and in elk on the National Elk Refuge in 1930 (Murie, 1951), and brucellosis has probably been present in the GYA's elk and bison herds for around 100 years. Brucellosis is now recognized to be present in all 25 elk populations and the two bison populations of the GYA, and for many years it has been the source of controversy and conflict (Hillman, 1999, Toman et al., 1997, Thorne et al., 1997). The problem is extensively discussed in Thorne et al. (1997) and other publications.

Each of the 13 state and federal agencies with management authority over animals and lands in the GYA is developing or participating in implementation of strategies to address the brucellosis problem. It is not the purpose of this summary to describe all strategies in play in the GYA.

The federal agencies must comply with the National Environmental Policy Act (42 U.S.C. §§4321–61) (NEPA) for most federal actions, and much of their efforts to date have gone into Environmental Impact Statement (EIS) preparation and participating in implementation of interim plans until EISs are completed. In Montana, strategies to manage brucellosis-exposed bison that leave Yellowstone National Park have included agency destruction by shoot-
ing and slaughter of known test-positive bison, pregnant potentially latently infected female bison, and exposed bison of uncertain status; confining exposed bison until they can be returned to the park; hazing bison back into the park; allowing bison to stay outside the park for limited periods and in specific areas so that temporal and spatial separation from cattle can be assured. Research on feasibility of vaccinating bison is ongoing. With the minor exception of population manipulation through destruction of bison and removal of test-positive animals, both of which occur on a small scale relative to the population's size, these strategies are accomplishing little to control brucellosis within Yellowstone's bison. But they are managing the disease to nearly eliminate risk to cattle.

In Idaho, bison from Yellowstone are not tolerated and are removed as soon as they enter the state, but this is a very rare event. Idaho has a relatively small number of elk on the western edge of the GYA that use feedgrounds in winter and are infected or exposed to brucellosis. Idaho has prepared and implemented a management plan that employs disease management strategies of removal of test-positive elk, population density reduction by hunting, and habitat manipulation to provide alternatives to feedgrounds. These strategies are intended to eliminate brucellosis from Idaho elk as soon as possible.

The largest number of brucellosis infected and exposed elk occur in Wyoming. In addition, Wyoming has the relatively small Jackson Bison Herd, and a few bison exit the east gate of Yellowstone National Park into the state. In addition to an extensive research program initiated in 1971, a number of disease management strategies have been implemented. East of Yellowstone National Park, only a small number of male bison are tolerated in an area where there are no cattle, and female bison and excess males are removed by hunting regardless of brucellosis status. The Jackson Bison Herd summers in Grand Teton National Park and winters on feedlines on the National Park Refuge. Litigation by the Fund for Animals has precluded population reduction as disease management, except for a very few animals hunted on U.S. Forest Service and private lands under Wyoming Game and Fish regulations. The litigation also has prompted federal agencies to embark on an extensive, controversial NEPA process. Grand Teton National Park, where enabling legislation provides for cattle grazing during summer, manages cattle grazing times and locations and bison distribution to preclude brucellosis transmission to cattle. None of the strategies currently implemented in Wyoming serve to control brucellosis in bison.

The Wyoming Game and Fish Department has implemented numerous strategies to control brucellosis in elk with a goal of eventual elimination of the disease and reducing the threat of transmission to cattle. This is done under an integrated program called the Brucellosis-Feedground-Habitat program. Some strategies have been in place for decades, and draft Brucellosis Management Action Plans are being revised, updated, and formalized.
CONFLICTS OF AUTHORITY AND STRATEGIES TO ADDRESS WILDLIFE DISEASES

tategies to reduce the risk of transmission of brucellosis to cattle include feeding elk on feedgrounds so they do not commingle with cattle in winter; hazing elk away from private property with wintering cattle; fencing hay stored for cattle so it will not attract elk in winter; removal of elk from private property with wintering cattle by special depredation hunts and agency removal; and manipulation of winter habitat to attract elk away from cattle. These strategies greatly reduce risk to cattle, but with the exception of habitat manipulation, these strategies do not control the occurrence of brucellosis in elk, and feeding elk during winter encourages elk to elk transmission of brucellosis by artificially crowding them during mid-pregnancy.

Management strategies to control brucellosis in Wyoming elk include ballistic vaccination of feedground elk with strain 19 vaccine delivered via biobullet; moving elk feedlines to new, clean snow daily, if possible; habitat manipulation to encourage elk to leave feedgrounds earlier in the spring and to attract some elk away from feedgrounds; and monitoring for prevalence of brucellosis by testing hunter-killed non-feedground elk and testing trapped feedground elk to determine brucellosis management priorities and measure program success. These strategies, especially vaccination, have been demonstrated to be successfully reducing the occurrence of brucellosis. As an example, at Greys River Feedground, where elk have been vaccinated since 1985, seroprevalence has been reduced from a pre-vaccination (1971-1976) level of 46 percent to a post-vaccination (1993-2000) level of 11 percent.

Two notable strategies common to all agencies and states are to not translocate any elk or bison from the GYA and to participate in the GYIBC. With limited success, the GYIBC provides coordination and encourages implementation of brucellosis management strategies. It also encourages coordinated research necessary to develop additional strategies (Hillman 1999).

Summary

In summary, we believe many important wildlife disease problems may be successfully managed for the benefit of both wildlife and livestock interests. Success will depend on sharing both responsibility and support for such management among a broad range of agencies and constituencies, on setting realistic goals and timetables for disease management in free-ranging populations, and on recognizing and overcoming technical challenges unique to managing the health and viability of valuable wildlife resources.

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CONFLICTS OF AUTHORITY AND STRATEGIES TO ADDRESS WILDLIFE DISEASES


ROLE OF USAHA IN DEVELOPMENT AND IMPLEMENTATION OF DISEASE CONTROL STRATEGIES FOR WILDLIFE DISEASES

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October 25, 2000

The History of USAHA has been to address tough animal disease issues and, through collaborative effort, recommend sound solutions to those disease problems.

Eradication of several important diseases of livestock is in sight. Most of the country is free of Brucellosis in swine and cattle, tuberculosis in domestic livestock, Pseudorabies in swine. Neither WND nor AI currently is known to be present in domestic flocks. Yet all of these diseases are present in wildlife or feral animals. Besides the impact of these diseases on the wild or feral animal populations, these disease reservoirs will continually serve as a possible and probable source of reinfection to livestock.

We believe USAHA is up to the task of finding solutions to these problems. In order to do so we need to do the following:

- USAHA committees must address animal disease reservoirs that are within their purview
- We must bring additional wildlife managers, biologists and veterinarians to the USAHA table
- We must be willing to attend and participate in wildlife management meetings to discuss wildlife disease reservoirs
- We must seek new and innovative methods to identify, manage and eliminate disease from wildlife populations
  > It is clear that we will not be able to fully employ livestock disease control and eradication techniques on wild or free-ranging wildife populations
  > We must develop mechanisms to conduct surveillance in wild and free-ranging populations
  > We must develop vaccines and vaccine delivery systems that can be used to control disease in free-ranging animals (the oral rabies vaccination projects are an excellent example
  > We must identify strategies to prevent transmission of disease from wild and feral animals to livestock

I think we should step back and look more closely at the wildlife/livestock interface and try to develop ways to limit or totally restrict contacts at this interface while we are developing strategies to eradicate the disease in wildlife. We all know that it will be a long time before we eradicate the diseases mentioned above from wildlife and therefore the threat to our livestock populations will be there just as long.
ROLE OF USAHA IN DISEASE CONTROL STRATEGIES FOR WILDLIFE DISEASES

I call on the various disease and wildlife committees as well as Veterinary Services to think about how to develop a UM&R kind of process and to develop documentable strategies. This would ensure that there is minimal chance that an animal entering trade channels has been exposed to any disease in question. If this process is implemented then there would be confidence that animals entering into interstate commerce from states bordering on these interfaces are free from exposure to disease. This can be done, and would greatly help disease prevention efforts.

In order to achieve these objectives we need the assistance of our members that are involved with wildlife management agencies, universities and zoological industries to help identify the people who need to be at the USAHA table and then help to get them involved in working with us to find solutions. We also need these members to help us identify opportunities to address these issues at wildlife management meetings around the country.

The wildlife, feral animal disease issues that have been discussed today must be resolved. If we all commit to finding solutions then indeed we will.
The committee held its third annual meeting as a joint committee of USAHA and AAVLD on Sunday, October 22, 2000 from 1 to 5:00 p.m. Attendance fluctuated between 20 and 30 people during the course of the meeting, with 11 members present. Dr. Elvinger welcomed the attendees and gave a brief synopsis of the previous year’s meeting.

Dr. Bruce Akey, Virginia Department of Agriculture and Consumer Services, provided an update on the continuing development efforts for a National Animal Health Reporting System (NAHRS). After last year’s USAHA meeting at which concerns were raised about the potential negative effects on trade that participation in the NAHRS might have, a meeting was convened in Washington, D. C. in May of 2000 as part of an educational effort for the export negotiators of the poultry, egg and meat industries. In addition, the National Chicken Council was briefed on this issue in October. So far in 2000, some 30 states have submitted at least one monthly report, with an average of 24 states reporting monthly. With an export market in
livestock, poultry and animal products reaching $11.3 billion annually, it is in the best interests of American agriculture to fully meet the requirements for transparency under the World Trade Organization agreements. The lack of a NAHRS in the past has resulted in a trade embargo on poultry exports to Russia as well as additional testing requirements being placed on poultry products being exported to Mexico.

Dr. Charles Beard, U.S. Poultry and Egg Association, followed with a review of the NAHRS program from the perspective of the poultry industry. He stated that there were concerns that the reporting of diseases might not be done on an equal basis by competing exporters and that importers might use an exporting country's report of a common disease as justification to suspend imports from that country. These measures are best countered by diplomatic queries about how the importing country knows it is "free" of the disease at issue. Reporting credibility is particularly important to the U.S. because its prompt scientific publications of disease research and clinical reports are read throughout the world. This makes failure to report disease or fallacious claims of disease freedom particularly damaging when an attempt is made to deny what trading partners already know is true.

Dr. Nora Wineland, USDA:APHIS:CEAH, presented a preliminary, qualitative assessment of the benefits and costs of a NAHRS program. Potential benefits would include reduced disruptions to existing trade, expansion of trade and the enhancement of animal health infrastructures. An embargo on poultry products in 1996 by one international trading partner, due to the lack of an effective and transparent animal disease reporting system, resulted in a price drop from $0.44 in February to $0.33 per pound of poultry legs in March, and it took until September of that year for the prices to recover. As a percent of production, U.S. pork exports increased from 1.6% in 1990 to greater than 6% in 1998, U.S. beef and veal exports from 4.2% to close to 9%, and U.S. broiler exports from 6% to greater than 15%. With such increasing exports of U.S. animal products, the potential losses could be much greater. However, benefits of a reporting system are difficult to estimate given the difficulty in predicting future events.

The costs of implementing a national animal health reporting system are the costs incurred for data collection in excess of costs already incurred by diagnostic laboratories or other entities for presently ongoing disease surveillance activities. Some current reporting infrastructures allow reporting into a national system without significant additional costs. The greatest cost could be due to trade disruptions following reports of the discovery of a disease, agent, or condition through the national reporting system when there was no previous specific knowledge of occurrence of that condition in the U.S., or if information reported out of the system was used by importing countries in an effort to limit U.S. exports to those countries. Those benefits and costs must be carefully weighed and balanced when implementing a reporting system.

Ensuing discussion focused on the international acceptance of U.S.
claims of freedom from disease, with attending representatives from trading partners re-emphasizing their preparedness to accept regionalization if a country offers the same guarantees for its exports that it requires of its imports. Additional discussion concerning the continued development of the NAHRS addressed questions of possibly reducing the scope of the NAHRS, either in numbers of diseases reported or number of commodities covered. The consensus was to continue to work toward reporting the complete OIE List A and List B of diseases for all commodities with the goal of having all 50 states routinely reporting.

The draft Uniform Methods and Rules (UM&R) for the National Animal Health Reporting System was reviewed and unanimously endorsed by the Committee.

Dr. Mark Schoenbaum, USDA:APHIS:CEAH, reported on USDA's initiative to coordinate all surveillance efforts. As the prevalence of a disease changes, both the type and amount of surveillance for that disease change also. The Federal government will continue to play a role in coordinating surveillance among states and in setting standards for reporting data. Dr. Schoenbaum and Dr. Adam Grow have been tasked with conducting a review of APHIS:VS surveillance programs. Following the outcome of a review planning meeting in Estes Park, Colorado in August, 1998, and the publication of the Swine Futures Report in 1999, a working group was established (Adam Grow, Barry Meade, Vicki Bridges, Marty Smith, Tom Gidlewski, John Green, Mark Schoenbaum) which met in May, 2000 to develop a review plan. Surveillance/monitoring systems in the US that already exist are very complex and multifaceted. The working group has thus far established a conceptual framework of APHIS' surveillance efforts as an ongoing system of collecting and reporting animal health data, subject to continual evaluation and adjustment. Actions should be taken based on data collected, employing various reporting and sampling tools to achieve this. Currently APHIS has different surveillance systems with different purposes. These could integrated and streamlined resulting in cost savings and better communication. Surveillance implementation should be done at state and local levels with design advice from CEAH and policy development and administration by APHIS:VS. The working group will propose routine evaluation of surveillance systems, removal of ineffectve ones and addition/integration of new surveillance efforts when appropriate. Veterinary Services has a long-term commitment to improve and streamline surveillance for animal health. It should be based on rapid detection, appropriate response to introduced/emerging diseases, promoting trade, improving efficiency and increasing knowledge of endemic animal health conditions. A possible pilot effort would be the integration of Pseudorabies and Classical Swine Fever surveillance systems. No single position with oversight responsibility has been establish yet.

Several attending State Veterinarians provided their perspectives on the needs for surveillance and reporting systems. The development of a
Uniform Methods and Rules (UM&R) document for the NAHRS program was cited as pivotal to the effort to recruit all 50 states into the system. It was noted that like the NAHRS, the National Animal Health Monitoring System projects have undergone quite an evolution over the years too. There is a need to make sure surveillance mechanisms keep up with changes in industry production practices. The states need help with resources from the USDA to establish and maintain a surveillance infrastructure. This includes gathering requisite surveillance data to support requests for regionalization. The USDA must discontinue adding reporting requirements as needed without deleting unnecessary reporting. Some surveys are requesting data with no explanation for the request. Another problem is requesting data from states when that data is available from other sources within the USDA. Another key issue is animal identification because as disease detection moves to reliance on slaughter surveillance, there must be individual animal ID to allow tracebacks.

A resolution to request USDA:APHIS:VS to work with the USAHA/AAVLD Animal Health Information Systems Committee and utilize the expertise of other appropriate USAHA committees to evaluate, streamline and integrate all existing national animal health information surveillance systems as well as to provide support for surveillance systems necessary to enhance national and international trade was passed by the Committee.

Dr. Bill Buisch, USDA:APHIS:NVSL, provided information to the Committee on several issues. As part of a bioterrorism initiative, Dr. Gary Osweiler at Iowa State University is preparing a database of laboratory capabilities. The National Veterinary Services Laboratory (NVSL) is partnering with the American Association of Veterinary Laboratory Diagnosticians (AAVLD) to work together with state expertise more closely on Foreign Animal Disease (FAD) investigations and make sure that if an FAD is ruled out, a diagnosis is still made for the producer. The USDA is also considering adding state diagnostic lab personnel to Emergency Response Teams and is planning to increase FAD training opportunities for state diagnostic lab personnel. One example of this partnership could be allowing duplicate samples to be taken on FAD investigations with one set sent to NVSL/FADDL, the other held securely in the state lab for further diagnostics. Differential diagnostics could be started in the state lab if they have a BSL-3 suite or diagnostics on formalin-fixed tissues could be initiated while an FAD is being ruled out at the Federal labs. The NVSL needs to take on a bigger role in test validation and proficiency testing. The AAVLD has passed a resolution directing the development of a Memorandum of Understanding with NVSL to define a national animal disease diagnostic system. The NVSL is pursuing internationally recognized accreditation under ISO 17025. NVSL does not have the same capacity it had 10-15 years ago and therefore needs to work with state labs to develop the best system and approach for the livestock and poultry industries. The entire USDA:APHIS will be undergoing a “Safe-Guarding Review” under the auspices of NASDA to evaluate its ef-
forts to protect animal agriculture.

A resolution was proposed and passed by the Committee for the United States Animal Health Association to urge Congress to appropriate the funds requested in the President's 2002 budget necessary to develop, construct and operate the facilities in Ames, Iowa, as described in the USDA Master Plan for the APHIS National Veterinary Services Laboratories, the APHIS Center for Veterinary Biologics and the ARS National Animal Disease Center.

Dr. Martin Hugh-Jones, Louisiana State University, College of Veterinary Medicine, explained the origins and development of the Project to Monitor Emerging Diseases or ProMED. The ProMED-mail electronic outbreak reporting system was inaugurated on the Internet in August, 1994 to globally monitor emerging infectious diseases and acute toxic episodes. It covers humans, animals, and plants. It is the only outbreak rapid reporting system open to all sources and free of political restraints. It is not a government program. All reports are screened by expert Moderators before posting. In October, 1999 ProMED-mail became a program of the International Society for Infectious Diseases, a non-profit professional organization with headquarters in Boston and membership around the world. ProMED reports of outbreaks are available through the Internet, either from the web page (www.promedmail.org), or as e-mail messages. The e-mail component is user configurable to deliver messages individually or as compiled digests and on all topics or only on the areas of interest (plant, animal or human). Subscriptions are free. Future initiatives include: addition of a more graphics intensive web site, multi-language forms to send reports in to ProMED-mail, maps with locations of outbreaks and expansion to include reports in additional languages (English and Portuguese versions are currently available). Also under discussion are embedded links for relevant prior postings in the e-mail and filtering, so that users have a decision on what topics they receive. Dr. Hugh-Jones stated that if you get your report in first, you have control of the story, everyone follows and responds to you. Dr. Hugh-Jones would like to know of any animal disease outbreaks or situations that are not being reported.

Dr. Mo Salman, Colorado State University, discussed monitoring/surveillance for disease agents when the incidence/prevalence of a disease approaches zero. A number of factors need to be considered when designing a strategy aimed at determining the absence of disease. Supporting disease claims as prevalence approaches zero requires a multifaceted approach. An international panel of scientists working in this field met in Fort Collins, Colorado in September, 2000 to discuss different methods regarding the use of survey and surveillance data to determine the disease status of countries and zones as prevalence approaches zero. Participants tried to identify and discuss the issues involved in determining the disease status at a country or regional level, when prevalence approaches zero, discuss different methods and approaches used internationally for
disease status recognition and provide a set of tools applicable to different epidemiological conditions. Brief presentations were made by participants outlining their approaches to these issues. Presentations included both current application of the concept of disease freedom as well as methods being currently researched. Group discussions on three main topics followed the presentations. The topics were current needs in the international recognition of disease freedom, methods currently available to assess disease freedom both quantitatively and qualitatively and requirements for field application of existing methods and necessary modifications to existing surveillance and monitoring systems to assess disease freedom. Requirements that were identified included active surveillance (structured surveys), passive collection of data for a surveillance system, quality of veterinary services, geographical location and livestock movement history. Collaborative teams were formed to draft a series of papers that will be published as a special issue of Preventive Veterinary Medicine. Topics to be covered include user needs, surveillance methods, quality assurance of the system, data collection and analysis and maintenance of the system.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
Dr. Joan M. Arnoldi, WI; Dr. Bonnie Bargstedt, NY; Dr. W. Ron DeHaven, MD; Ms. Debra S. Duncan, KS; Ms. J. Amelita Facchiano-Donald, TX; Dr. Nancy A. Frank, MI; Mr. Del E. Hensel, CO; Dr. Richard D. Hull, IL; Dr. Pam J. Hullinger, CA; Mr. Tom J. Hunt, MI; Mr. Ralph D. Jones, SD; Ms. Cathy A. Liss, DC; Dr. Calvin W. S. Lum, HI; Ms. Amy W. Mann, VA; Dr. Charles E. Massengill, MO; Dr. Thomas J. McGinn, NC; Mr. Terry R. Menlove, UT; Dr. Raymond L. Morter, IN; Dr. Victor F. Nettles, GA; Dr. John R. Ragan, MD; Ms. Nancy J. Robinson, MO; Dr. David D. Schmitt, IA; Dr. Dale F. Schwindaman, MD; Dr. Morton S. Silberman, GA; Dr. Paul Sundberg, IA; Mr. George Teagarden, KS; Dr. Robert M. S. Temple, OH; Dr. Kenneth L. Thomazin, CA; Mrs. Michele C. Turner, CA; Dr. Charles D. Vail, CO; Dr. Gary M. Weber, DC; Dr. Karen M. Wernette, IL; Mr. Dave Whittlesey, CO; Dr. Elizabeth S. Williams, WY; Dr. Norman G. Willis, CAN; Dr. Richard W. Winters, TX; Ms. Ria de Grassi, CA.

The Committee on Animal Welfare met on Wednesday, October 25, 2000 in the Medical Forum B Room of the Sheraton Birmingham Hotel, Birmingham, Alabama. The meeting was called to order at 7:15 by Committee Chair Stull. Twenty-two Committee members and 23 guests were in attendance.

Dr. Tim Cordes, Senior Staff Veterinarian, USDA, APHIS, VS outlined the progress to date and the future possibilities of the proposed regulations (98-074-1) on the commercial transport of horses to slaughter. The educational materials including a video on proper handling and a guidebook for truckers is near completion. The Food Safety Inspection Service will assist with compliance of the proposed rule at each of the existing three processing plants in the U.S. He recounted the stakeholders meetings held in 1998 for the drafting of the proposed rules including equine groups, veterinarians, researchers, animal protection organizations, slaughter horse plants, trucking industry, and state and federal veterinarians. A draft of the owner/shipper certificates was reviewed especially the qualifying statements and the identification sections. The proposed rule will contain a "grandfather clause" to phase out the use of two-tiered trailers over five years. Target date for publication of the final rule is late Fall, 2000.

Dr. Brian Peart, Senior Staff Veterinarian, from the Canadian Food Inspection Agency (www.cfia-acia.agr.ca/acts and regulations/ health of animals act/health of animals regulations/Part XII) reported on the deliberations of the Animal Welfare Expert Committee. The transportation of spent
hens continues to be problematic with areas of interest focused at on-farm care, the development and recent publishing of *A Recommended Guidelines for Procurement, Handling and Transportation of Spent Laying Hens*, and the evaluation of Concept 2000 vehicles with forced ventilation and monitoring devices. The transport of slaughter horses is also a problem in Canada and currently there is a survey in progress to develop statistics on shipments to each processing facility for fitness of transport, length of journey, and headroom within the vehicle. There has been a successful partnership between Canada and the U.S. in developing the rules for transportation of slaughter horses. The regulation on the handling of non-ambulatory livestock requires uniformity between the provinces. The infrastructure of farm animal welfare in Canada is being documented with all the stakeholders and participants and will be placed on the web. An invitation was extended to the membership to attend the Animal Transport Association's meeting in Toronto, Canada on April 29 to May 2, 2001 (http://www.npsmgmt.com).

Dr. Ron De Haven, Deputy Administrator Animal Care division of USDA-APHIS reported on the many issues facing USDA including the recent activities of the USDA Animal Well-Being Task Group, the Animal Welfare Act issues including the pain and distress initiative, the inclusion of rats, mice, and birds, the policy on the psychological well-being of non-primates, the position statement on private ownership of exotic cats as pets, and the increased focus on enforcement of commercial dog breeders. Additionally, Dr. De Haven discussed the ongoing issues related to the partnering with certified horse industry organizations to enhance the enforcement of the Horse Protection Act. The major issues for the 2001 show horse season are the definitions of sore and scar, appropriate penalties, and conflict resolution between horse industry organizations and USDA. Dr. De Haven discussed the development and activities of the Farm Animal Well-being Task Group which is a Department level, internal group. The top four issues identified were enforcement of the Humane Slaughter Act with a goal of zero tolerance for inappropriate stunning, induced molting in layer flocks, the genetic selection of broilers, and the slaughter of non-ambulatory animals. An action plan was discussed to address these issues including a public forum for induced molting.

Ms. Cathy Liss, Animal Welfare Institute, presented an update on Congressional bills concerning animal protection introduced in the last legislative session. She discussed two legal cases allegedly involving greyhounds sold fraudulently into research and primates in research deprived of psychological stimulation. The AWI continues to support and preserve small farms, and has been instrumental in aiding Poland to preserve family farms.

Dr. Julie Morrow, Research Leader, Director of the USDA-ARS Livestock Issues Research Unit located at Texas Tech University, Lubbock, Texas reported on feed lot cattle research into bullying behavior, feeding behaviors which can minimize dust, the effects of weather on behavior, and
the economic and production benefits in providing shade to cattle. Additionally, she presented the description and projects associated with the Sustainable Pork Facility located at Lubbock, Texas. Since the same genotype of pigs can be located in a conventional intensive facility on campus, comparisons with the sustainable system can be demonstrated for meat quality, pathogen levels, mortality, ergonomics, dietary needs, behavior, dust, and grass/forage management.

Mr. Gene Gregory representing the United Egg Producers, a national organization located in Atlanta, Georgia discussed several of the welfare issues facing the egg producers in the U.S. and the formation of the Scientific Advisory Committee to recommend to the industry solutions based on science rather than personal experience or opinion. The UEP Producer Committee established a recommended "phase-in" plan. The four primary issues include cage space allowance, beak trimming, induced molting, and handling/transport. The Producers Committee insists that increased costs to meet the guidelines be passed onto the customer.

Dr. Steve Halstead, Vice Chair of Animal Welfare Committee, presented a draft model law for the protection of non-ambulatory livestock at markets or in market channels. Discussion was generated on the selected wording of the draft, the current urgent need of the model at state level, and the lack of the draft's circulation to animal industries prior to the meeting. The following recommendation was approved by the Committee (Motion by P. Sundberg, seconded by N. Robinson):

Humane livestock management is recognized as a critical component of animal agriculture. Failure to manage livestock with attention on the welfare of the animal degrades performance and viability of the operation and the individual. Marketing of livestock compromised by disease or injury further degrades the welfare of the animal, damages the prestige of the livestock production industry, and potentially endangers public health. The model state law shall promote a common, uniform national standard for protection of non-ambulatory livestock at markets or in market channels and shall discourage conflicting state and local regulation. The Committee recommends that the USAHA send a letter with the attached proposed draft model law to all stakeholders within the membership for their consideration and review, and request a written reply within 120 days. The Task Force Committee, chaired by Dr. Halstead, will consider the remarks received and report to the Committee in 2001 of the possibility of an approval of a resolution of the USAHA endorsing the non-ambulatory model law.

Another recommendation was passed to request USAHA to write a letter to FSIS to request the enforcement of the Humane Slaughter Act, as was approved through resolution in 1998.

There being no further business to bring before the Committee, adjournment took place at 12:05 P.M.
REPORT OF THE AAVLD/USAHA COMMITTEE
ON AQUACULTURE

Chairman: Dr. Eric D. Park
Vice Chairman: Dr. Scott E. LaPatra

Dr. Gary L. Brickler, WA; Dr. James A. Brock, HI; Dr. Jones W. Bryan, SC; Dr. William W. Buisch, IA; Dr. Robert Busch, WA; Dr. H. Michael Chaddock, MI; Dr. George C. Edwards, NC; Dr. Robert G. Ehlenfeldt, WI; Dr. Anthony M. Gallina, PA; Dr. Joe S. Gloyd, DE; Dr. Larry M. Granger, MI; Dr. S. W. Jack, MS; Dr. Robert F. Kahrs, FL; Dr. Delorias M. Lenard, SC; Dr. Jo-Ann C. Leong, OR; Dr. Vader M. Loomis, PA; Mr. Larry D. Mark, VA; Dr. Robert W. Mead, WA; Dr. Robert B. Miller, IA; Dr. Andrea M. Morgan, MD; Dr. Victor F. Nettles, GA; Dr. Roger J. Odenweller, KY; Dr. Roger E. Olson, MD; Dr. Charles Palmer, CA; Dr. Gary G. Pearl, IL; Mr. Richard P. Peterson, CA; Dr. H. Graham Purchase, PA; Dr. Frank Y. Rogers, MS; Dr. Harvey L. Rubin, FL; Dr. John P. Sanders, WV; Dr. Roy A. Schultz, IA; Dr. Gary L. Seawright, NM; Dr. Sang J. Shin, NY; Dr. Lewis P. Thomas, WV; Dr. Peter H. Timm, CA; Dr. Michael S. VanderKlok, MI.

The meeting was called to order at approximately 1:05 pm by Dr. Skip Jack, Chairman. Dr. Otis Miller, USDA-APHIS, reviewed some of the programs of USDA-APHIS regarding aquaculture. He would like for some members of this committee to review the VS Aquaculture Strategic Plan, (April, 1999) which USDA-APHIS has formulated. Dr. Jack asked for a subcommittee to review this document and provide feedback to the committee. Drs. J. Heidel, T. Baldwin, P. Parnell and R. White agreed to work on this subcommittee. Dr. Miller also provided a brief review of services provided by USDA-APHIS to the aquaculture industries as well as informed this group of the services that are not currently provided to this industry. Dr. Miller informed the group about Infective Salmon Anemia and its threat as an emerging disease to the net pen salmonids in the Bay of Fundy, in close proximity to Maine.

Dr. Scott LaPatra provided a report to the committee regarding the American Fisheries Society, Fish Health Section. Dr. LaPatra has been very active in this organization of several years. Dr. LaPatra provided an update regarding the certification program that would allow adequately trained veterinarians to be certified by this group as Fish Health Inspectors or Fish Pathologists. Dr. LaPatra also informed this group of the newer affiliate membership of the Fish Health Section.

Dr. Jack discussed two recent issues from the AVMA Aquaculture and Seafood Advisory Committee. This included information regarding the possible formation of an association of veterinarians involved in aquaculture. He also informed this group that this committee had recommended to the executive branch of the AVMA their endorsement of research initiatives from the Joint Subcommittee on Aquaculture.

Regional reports were given as follows: Dr. Tom Baldwin from the Northwest, Dr. Randy White from the Midwest, Dr. Jack from the Southeast. Dr.
Baldwin informed the group that they see a large number of cases of *Streptococcus iniae* infection in tilapia, while Bacterial Kidney Disease and Whirling Disease in salmonids continue to be a problem. Dr. White discussed the research project involved with IPNV indicating that the field isolate obtained from a natural outbreak of IPNV in one of the state hatcheries a couple of years ago, does not appear to be pathogenic in age-susceptible, species-susceptible fish. Dr. Jack informed this group of two new emerging diseases in farm-raised channel catfish, a trematode parasite which affects the gills and has snails as a part of its intermediate host and "visceral toxigenic syndrome", a disease characterized by intussusception and cholestasis.

Dr. Jack briefly discussed MUMS ("minor use, minor species") legislation. This is a bill that originated in the House, which, if approved, would allow veterinarians to use drugs, which were currently unlabelled for minor use and/or in minor species. Bill is pending approval of the US Senate.

Dr. LaPatra introduced a resolution requesting that the USAHA request USDA-APHIS to work together with EPA regarding the Joint Subcommittee on Aquaculture’s Effluent Task Force Resolution. However, after much discussion, the vote on this resolution was tabled, primarily due to questions arising about the resolution.

The following mission statement of this committee was approved:

*The AAVLD/USAHA Aquaculture Committee serves to foster cooperation and communication between aquaculture animal industries and regulatory agencies by providing a forum:*

> To discuss issues and exchange current scientific information regarding aquaculture species;
> To promote the development and application of quality diagnostic techniques for aquaculture species; and
> To serve in an advisory capacity to those agencies impacting aquaculture.

Dr. Jack reminded the members that this was an "open committee" and to encourage its current membership to invite other AAVLD/USAHA members to join this committee. A list of the members present at this meeting is attached to the meeting minutes.

Dr. Randy White was voted the new chairman of this committee, and Dr. Scott LaPatra was voted the new vice-chairman of this committee.

Dr. Baldwin will draft a document regarding the issue of reporting fish diseases on a state and federal level for the next meeting.

The issue regarding standardization was discussed. It was agreed that the 1994 issue of the AFS/FHS, *Bluebook* was the current basis of standards for much of the activities of the committee members and that members were encouraged to provide information to AFS/FHS for updating this book as needed.

Meeting was adjourned at 4:30 pm.

Respectively submitted,
M. Randy White

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON BIOLOGICS AND BIOTECHNOLOGY

Chairman: David A. Espeseth, Perkasie, PA
Vice-Chairman: Mary Lou Chapek, Ralston, NE

Mr. J. Bruce Addison, MO; Dr. Gary A. Anderson, KS; Dr. Joan M. Arnoldi, WI; Dr. Charles A. Baldwin, GA; Dr. Charles W. Beard, GA; Dr. Gerald M. Buening, MO; Dr. Robert Busch, WA; Dr. Jerry J. Callis, NY; Dr. John A. Cobb, GA; Dr. Robert A. Crandell, TX; Dr. Elizabeth A. Curry-Galvin, IL; Dr. Vergil S. Davis, DE; Dr. Wendell L. Davis, KS; Dr. William C. Davis, WA; Dr. James J. England, ID; Dr. William H. Fales, MO; Mr. John E. Finnell, IL; Dr. Patricia L. Foley, IA; Dr. Cyril G. Gay, NY; Dr. E. Paul J. Gibbs, FL; Dr. Joe S. Gloyd, DE; Dr. Belinda Goff, IA; Dr. Harvey S. Gosser, MO; Dr. James A. Gourlay, NY; Dr. Keith N. Haffer, SD; Dr. Louise M. Henderson, IA; Dr. Richard E. Hill, IA; Mr. Joe N. Huff, CO; Mr. Majon Huff, CO; Dr. Richard D. Hull, IL; Mr. Tony A. Janes, TX; Dr. Wade L. Kadel, KY; Mr. Steven A. Karli, IA; Dr. John P. Kluge, IA; Dr. Hiram N. Lasher, DE; Dr. Lloyd H. Lauerman, WA; Mr. Hank M. Lefler, NV; Dr. Joan Leonard, KS; Dr. Randall L. Levings, IA; Dr. Raymond W. Loan, TX; Dr. Stewart McConnell, TX; Dr. Robert W. Mead, WA; Mr. Thomas R. Mickle, GA; Dr. Robert B. Miller, VA; Dr. Larry F. Moore, MO; Dr. Robert M. Nervig, NC; Dr. Jerry B. Payne, TX; Dr. Marshall Phillips, PA; Mr. Robert E. Pitts, GA; Mr. Ronald E. Plylar, KS; Dr. Donald Randall, Jr., CO; Dr. John A. Schmitz, NE; Dr. Thomas C. Schooler, TX; Dr. Roy A. Schultz, IA; Dr. George P. Shibley, KS; Dr. Clyde J. Stormont, CA; Dr. Deoki N. Tripathy, IL; Dr. Percy R. Turner, CA; Dr. George B. E. West, CA; Dr. Philip W. Widel, MO; Ms. M. Gwen Wilder, MO; Ms. Mary Anne Williams, CA; Dr. Saul T. Wilson, Jr., AL; Dr. Richard L. Witter, MI; Dr. W. H. Wohler, TX; Dr. Erwin F. Workman, ME.

The committee on Biologics and Biotechnology met during the annual meeting on Sunday October 22, 2000, at 12:30 P.M.. Twenty-three members and 15 guests were present. The Chairman welcomed the participants to Birmingham and the meeting of the Committee on Biologics and Biotechnology. Following a round of introductions, he briefly reviewed the agenda for the meeting and USAHA's proposed guidelines for conduct of committee meetings.

Center for Veterinary Biologics Program Updates and Issues: The committee received reports from the three Directors of the USDA, APHIS, VS, Center for Veterinary Biologics (CVB), and also from Ann Wiegers and Frank Ross. Dr. Richard Hill, Director, CVB-Licensing and Policy Development, reported that CVB-Licensing and Policy Development activities in
Fiscal Year 2000 resulted in three new establishment licenses and termination of one establishment license resulting in 102 licensees, that are authorized to distribute products in or from the United States under the provisions of the Virus-Serum-Toxin Act. Ninety-three new product licenses were also issued, including ten unique new products. One hundred forty-nine product licenses were terminated, resulting in 2,469 active licenses at the end of the year; the first net drop in the total number of licensed products in the last two decades. Four new permits for distribution and sale were issued and one was terminated resulting in 12 permittees at the end of the fiscal year. The number of research and evaluation permits continued to increase with 196 permits issued in addition to seven transit shipment permits. The Center continued to adjust to the transition of the LPD staff from Riverdale, Maryland, to Ames, Iowa, having completed the fourth year of the transition. As of October 1, 2000, two positions remain in Riverdale on the LPD Operational Support Staff (with one vacancy) and three Reviewer positions remain vacant in Ames. Other key issues facing LPD include a focus on quality licensing submissions and continued progress towards updating program documentation with a focus on biotechnology-related standards and guidelines. The status of recently Proposed Rules, and upcoming Proposed Rules and guidance documents, was reviewed as well as Progress made by the CVB on international harmonization initiatives in fiscal year 2000. The CVB announced the dates for the tenth Veterinary Biologics Public Meeting (April 10-11, 2001) and requested agenda suggestions for the meeting. Dr. Hill informed the Committee that Veterinary Services is discussing the phase out of Pseudorabies Virus (PRV) and Brucellosis Vaccines because the diseases have nearly been eradicated in the US livestock population. The Committee expressed concern because Brucellosis and PRV are still present in feral swine and Brucellosis is also present in wild ruminants in the US. If the vaccines are phased out, vaccine will not be available if reinfection of commercial livestock occurs. It was suggested that the production of these vaccines be allowed in the US for export only based on proper risk assessment. These vaccines would then be available for use, if needed, in the US and for the export market for countries that remain infected with these diseases.

Steven Karli, Director, CVB-Inspection and Compliance (CVB-IC), reported that CVB-IC activities in the last fiscal year have resulted in continued compliance with the regulations and standards promulgated by authorities in the Virus-Serum-Toxin Act (VSTA). CVB-IC monitors 97 active licensees and permittees located at 175 sites. This last year CVB-IC conducted 60 in-depth inspections, four follow-up inspections and 21 special inspections. Many of the special inspections were at the request of the CVB Licensing and Policy Development unit as a part of the prelicensing stage for new products and facilities. Inspection activities also include inspection of products presented to CVB for marketing. This last fiscal year
CVB-IC reviewed and processed 18,016 serials; 17,388 of these were released to the marketplace. In addition, they reviewed and processed 336 firm requests, 174 facility documents and facilitated export of US products abroad by issuing 3,871 export documents. One area of improved customer service was a reduction in the review time required for the processing of export documents. The CVB worked together to review the backlog of documents and maintain a current review time of less than two weeks. CVB-IC has taken 41 regulatory actions in the last year and initiated 11 investigations. The increase in regulatory actions may stem from a fully staffed unit including fully trained inspectors for the first time in over three years. This was the second year CVB has been able to track baseline reaction rates using information from the US Pharmacopoeia (USP) Veterinary Practitioners Reporting Program. This year CVB received 1,364 reports from USP, as well as 48 reports taken directly by CVB-IC personnel. The next steps for CVB-IC are posting regulatory actions for the public, updating the APHIS Form 2008 submission/release information, hiring a Team Leader for Post Licensure Product Monitoring, and maintaining a full staff of inspectors to perform the needed monitoring inspections. Several biologics manufacturers in the meeting raised questions concerning the CVB action discontinuing facsimile notification to licensees of the release of biological serials. One biologics manufacturer, however, supported CVB's recent decision to discontinue the facsimile release notification procedure. This licensee indicated that as long as CVB returns the APHIS Form 2008's the same day as the serials are released, it does not adversely impact the supply of product from his firm. A request was made to address this subject further in the business portion of the meeting.

Dr. Randall Levings provided an update on CVB-Laboratory staffing, priorities, risk-based testing of product post-license, and upcoming reagents including West Nile Virus antiserum and virus. Productivity (GPRA) measures, activity-based-costing and CVB budget, including additional biotechnology funding for plant- and animal-derived biologics to be used for specialist hiring were summarized. The work of the VICH Biologicals Quality Monitoring working group, including residual moisture, formaldehyde, mycoplasma, and extraneous virus testing was described. Encouraging congressional language and USAHA plans to support the APHIS-ARS Consolidation and Modernization Plan, and a summary of Veterinary Services' upcoming US Animal Health Safeguarding Review were also shared.

Ann Wiegers provided an update on the CVB/NVSL Quality Assurance program. She indicated that significant steps in the areas of organization, calibration and traceability, procuring of equipment for the QA unit and QA equipment for the laboratories, training, providing international leadership, and implementing 17025 have occurred since the last USAHA meeting. These included increased staffing, acquisition of additional standards, installation of equipment monitoring systems, setting up electronic document
control databases, completion of management and equipment SOP's, progress on technical document completion, and increased interaction with the accreditor, the American Association for Laboratory Accreditation.

Frank Ross described the collaborative studies used to validate the proposed residual moisture and formaldehyde testing methods proposed by the VICH Biological Quality Monitoring working group. The studies followed the internationally accepted AOAC guidelines for such studies. Government and industry collaborators from the US, EU, Japan, and Canada (an observer on the VICH Steering Committee) participated. The gavimetric moisture assay was performed on a freeze-dried lactose carrier. The Ferri chloride method for determining formaldehyde content was performed on three diverse licensed, released, US vaccines. Data and collaborator comments were shared. The study validated the use of the proposed protocols with some modifications. Among the modifications were alternatives to ultracentrifugation for emulsion separation that reduce the cost of the proposed method.

The Impact of Reference Requalification on the Animal Health Industry: Karen Brown, Ph.D., Parkville, MO, presented a history of serial release testing. She reported that initially, all vaccine serial release testing was conducted in animal vaccination/challenge tests. In the 1970s the first breakthrough in the development of in vitro testing occurred with the adoption of the Master Seed Lot Principle. These in vitro tests involved titration of live viruses and bacteria that had been produced using a Master Seed. An immunogenicity test had to be conducted on a vaccine prepared using frozen Master Seed. The vaccine had to demonstrate protection of host animals in a vaccination/challenge test. One requalification of this Master Seed was required at some later period of time (3-5 years). After one satisfactory animal requalification test, no further animal testing was required. All serials were released on the basis of the in vitro titration.

Later, ELISA tests were developed for quantitation of antigens in vaccines to serve as serial release tests. ELISA technology was applied to serial release testing to reduce the unnecessary use of animals in the testing of inactivated vaccines. Additionally, ELISA tests are useful for optimizing the manufacturing process and reducing the addition of excess antigen in vaccines, which can reduce the reactivity of vaccines when used in the field.

Current reference requalification procedures were reviewed followed by a discussion of the continued concern still surrounding the limited dating that is permitted for Master or Working References, even though they are maintained at temperatures below -70 degrees centigrade. Such references still need to be requalified in host animal tests or laboratory animal tests that are correlated to the host animal immunogenicity tests every two-five years. This requires excess use of animals, requires a considerable amount of resources taking time away from development of new products.
or improvement of old products, and may result in removal of low volume sales products from the market.

Two solutions were presented: 1) Develop Master References that are qualified, requalified, and held by USDA. Firms could have a working reference that would initially be qualified in host animals and then requalified by in vitro methods against the USDA Master Reference thereafter. This would require the least amount of animal testing; 2) Adopt a Master Reference Program patterned from the Master Seed lot principle. Each firm would hold a Master Reference that would be qualified in a host animal vaccination/challenge test. Only one requalification would be required, after which no further animal testing would be necessary. All serials of inactivated products could then be released by in vitro ELISA tests.

Significant discussion followed. It was suggested that further discussions take place in Ames, Iowa and that the experts in the FDA-Center for Biologics Evaluation and Research that are familiar with the procedures used for serial release testing of human biologics could be consulted.

International Harmonization: J. Bruce Addison, Addison Biological Laboratories, Inc., Fayette, MO, requested committee discussion on several questions concerning international harmonization that were raised at the Association of Veterinary Biologics Companies meeting on World Trade in Veterinary Biologics, September 19-20, 2000, in Arlington, VA. The desire for international trade in veterinary biological products has resulted in the initiation of several efforts such as: (1) negotiation of a Mutual Recognition Agreement (MRA) with the European Union (EU) concerning manufacturing procedures, (2) harmonization of technical requirements under the Veterinary International Cooperation in Harmonization (VICH) between the EU, Japan, and the United States, (3) harmonization and negotiation of a possible MRA with Canada under the Canada-United States Free Trade Agreement (CUSTA), and (4) harmonization involving the United States and Central and South America under the Committee of the Americas for the Harmonization of Registration and Control of Veterinary Medicinal Products (CAMEVET). These activities have raised serious questions on the potential enormous impact that changing regulations could have on the US Veterinary Biologics Industry that AVBC thought a larger, objective audience in the field of animal health should discuss.

Mr. Addison thus posed the following questions to the Committee: 1) Since negotiations on the development of a MRA between the US and the EU have been put aside for the time being (as was stated at the AVBC meeting, the European manufacturers apparently think they would be at an economic disadvantage under such an agreement), does the US change its regulations to be more like the European system or does Europe look at a lessening of red tape to make them more competitive on a world market? 2) Under the VICH process, will new trade barriers be raised in spite of harmonization? 3) Since there is no guarantee that adoption of harmo-
nized standards will result in the allowance of products to enter foreign markets, will the assumed increased expenses associated with facilities and testing improve existing products or simply raise the cost of veterinary technology? 4) Will harmonization under VICH affect the availability of products; i.e., will needed products be dropped from product lines due to low profitability? 5) Are there any practicing veterinarians, livestock producers or company owners involved in the decision-making process at the working group or steering committee level of VICH? 6) Will biologics that have demonstrated safety and efficacy for many years be removed from the market if they fail new VICH testing? 7) How would CAMEVET be affected if they adopt the 9CFR quality standards only to have those standards drastically changed? Mr. Addison indicated that both quality and value must be considered if products are to be of any benefit to consumers and that quality at any price could put animal health at risk.

There was considerable discussion concerning these issues. CVB is attempting to make the VICH process more transparent. Constituents will now be informed of the issues and have an opportunity for input earlier in the development of harmonized requirements by the VICH working groups. CVB believes it is important for new requirements published in 9CFR to be harmonized internationally. However, they questioned if the VICH slate should have top priority in the development of new APHIS regulations.

Biotechnology Products Update: Louise M. Henderson, Chief, Biotechnology and Diagnostics, Center for Veterinary Biologics-Licensing and Policy Development, Ames, IA. Dr. Henderson reported that exciting new technological advancements are driving the development of new biotechnology-derived biologics and creating a need for new regulatory policies. In addition to new products created by recombining viruses and bacteria, recombinant plants expressing vaccine markers are currently under development. Many such constructs have been created and are currently being tested for use in the production of biologics. In April 2000, an interagency USDA-FDA-IICAB Plant-Based Biologics Seminar and Public Hearing were held in Ames, IA, in conjunction with the APHIS Public Meeting. The seminar explored many issues involved in the production and testing of these products. Shared FDA-USDA regulatory considerations are being drafted and will be discussed. In addition, cancer biologics are on the horizon and the CVB is currently working with the FDA to organize another interagency scientific meeting to be held in conjunction with the APHIS 2001 Public Meeting. April 12-13, 2001, Biologics for Cancer Diagnosis, Prevention, and Immunotherapy will be held in Ames, IA. This is intended to facilitate the drafting of appropriate regulatory standards for both human and veterinary biologics. Finally, CVB has a number of regulatory documents under construction that will provide additional guidance for development of new biotechnology products.
Cattle Genomics and the Applications to Animal Health and the Animal Health Industry: Dr. Steven Niemi, President and CEO, AniGenics Inc. stated that we are not at the point where we can identify individual genes responsible for specific characteristics in cattle and swine, but the time is coming. Genomics has the potential to identify the genes responsible for productivity traits such as: reproductive potential, nutritional requirements, disease resistance, and the ability to do well in confinement. Through the use of this technology to identify the presence of genes for desired traits in the selection of breeding animals, Genomics will be able to identify and enhance marketing traits in livestock. For example, by identifying genes that relate to rapid rate of gain, we could possibly eliminate the need for growth promotants. We may be able to develop more uniformity and quality of food produced in animals. By selecting animals with genes that relate to disease resistance, we could reduce the use of antimicrobials in animal production. This could have a significant effect on improving food safety. Genomics will be developed that can identify genetically related disease conditions in animals. Based on their genetic profile, it may be possible to select animals free of such genes. With proper treatment, such as special diets or administration of neutraceuticals, the onset of certain genetic diseases such as hip dysplasia or kidney disease may be prevented or delayed due to genetic profiling.

Delivering the Future: Delivering Animal Healthcare in an Edible Form: Joseph M. Jilka, ProdiGene, Inc., College Station, TX, reported that recent developments in the technology of the transformation of plants allows the generation of transgenic plants at reliable and high frequencies. Delivery of animal healthcare products in an edible form through the transformation of grain crops, in particular, maize, is now possible. Such products could include vaccines, growth promotants, monoclonal antibodies, protein therapeutics and proteins with antimicrobial activity. We have expressed the spike (S) protein of swine transmissible gastroenteritis virus in transgenic corn. Preliminary data indicates that when swine are fed this corn, they are protected from a subsequent virulent challenge of the virus. This approach to animal healthcare is unique in both the delivery form and production of the product in fields and requires novel approaches to containment of the product. Such approaches require a crop containment system that minimizes exposure of the environment, humans and non-target animals to the product.

PCR for Intraspecies Differentiation of Mycoplasma hyopneumoniae Field Strains: Dr. Boh Chang Lin, Research Scientist, Department of Biological Research and Development, MVP Laboratories, reported on the intraspecies differentiation of Mycoplasma hyopneumoniae field strains isolated in the United States. He indicated that vaccination against Mycoplasma hyopneumoniae with commercial vaccines could re-
result in variable efficacy in protection against swine enzootic pneumonia. This is because the virulence mechanisms used by *M. hyopneumoniae* to cause the disease in pigs are not fully known. The commercial vaccines may not contain the important antigens that the field strains have and the subunit vaccines may not contain enough antigens to induce effective protection. A molecular approach to the study of intraspecies differentiation of *M. hyopneumoniae* field strains may lead to the development of effective vaccines to prevent this disease. During 1998 and 1999, some 50 field strains of *M. hyopneumoniae* isolated from pig herds located in the major pork producing states of the U.S. were used for the study. Results from the analysis of total protein profile, glycoprotein profile, sialylated glycoprotein profile, and size differences in the amplified PCR product of P97 adhesin gene R1 repeat region indicates that there exists an intraspecies variation among the natural population of *M. hyopneumoniae* isolated in the U.S. This study could help provide a way for a particular farm to select the right strain of *M. hyopneumoniae* for autogenous bacterin. This may lead to more effective preventive measures against this important pig pathogen.

**Committee Discussions and Resolutions:** The issue concerning the discontinuation of CVB facsimile notification of serial release was reopened for further discussion. CVB indicated it had discontinued this notification because it became too time consuming to enter serial releases into the computer as well as fax them to the licensees. This duplication also has the potential for errors. Serial release by e-mail will not be available until 2003. CVB was receptive to further discussion of this issue.

Manufacturers expressed concern regarding the impact that delays in the release of APHIS licensed products would have on the livestock producers. It was stated that: 1) APHIS-CVB is charged with the legal responsibility for the timely release and use of all biological products to the poultry and livestock industry. 2) Modern production and husbandry practices depend on timely delivery of products for disease control and prevention. 3) Seemingly minor procedural adjustments can cause extended delays due to the perishable nature of biological products, i.e., normally there is only a 3-day weekly time frame for distribution of these products. 4) Age of communication has created an expectation for more rapid processing of information and distribution of products. 5) Given an annual US veterinary biological market of approximately $500 million, a 1-7 day delay in distribution of products results in a significant economic impact to the industry.

Following this discussion, a motion was made and seconded that a recommendation, including the discussion points raised, be sent to APHIS requesting that facsimile and/or telephone notification of serial release to licensees be reinstated until such time as electronic procedures are established for release that are consistent with the Government Paperwork Elimination Act. This motion was passed by unanimous vote of the Committee.

The Committee proposed no additional resolutions or recommendations.
REPORT OF THE COMMITTEE ON BLUETONGUE AND BOVINE RETROVIRUS

Chairman: Dr. James O. Mecham, Laramie, WY
Vice Chairman: Dr. Donald R. Monke, Plain City, OH

Dr. Gary A. Anderson, KS; Dr. T. Lynwood Barber, CO; Dr. William C. Davis, WA; Dr. Edward J. Dubovi, NY; Dr. James F. Evermann, WA; Dr. Robert W. Fulton, OK; Dr. Chester A. Gipson, VA; Dr. Bert A. Gore, AK; Dr. Christopher M. Grocock, DC; Dr. Robert B. Hillman, NY; Dr. Thomas J. Holt, NC; Dr. Thomas H. Howard, WI; Dr. Michael M. Jochim, CO; Dr. Karen R. Jordan, NC; Dr. Robert F. Kahrs, FL; Dr. Jorge W. Lopez; Dr. N. James MacLachlan, CA; Dr. Stewart McConnell, TX; Dr. Robert W. Mead, WA; Dr. Hugh E. Metcalf, CO; Dr. Janice M. Miller, IA; Dr. Lyle D. Miller, IL; Dr. Andrea M. Morgan, MD; Dr. John Nehay, CA; Dr. Victor F. Nettles, GA; Dr. Bennie I. Osburn, CA; Dr. James E. Pearson; Dr. Ronald Schultz, WI; Dr. Theron G. Snider, III, LA; Dr. David E. Stallknecht, GA; Dr. Jeffrey L. Stott, CA; Dr. Mark C. Thurmond, CA; Mrs. Michele C. Turner, CA; Dr. Percy R. Turner, CA; Dr. Thomas E. Walton, CO; Dr. William C. Wilson, WY; Dr. George O. Winegar, MI.

The Bluetongue and Bovine Retrovirus Committee met in the Medical Forum C Room, Sheraton Birmingham Hotel, Birmingham, Alabama from 12:30 PM to 4:40 PM, Monday, October 23, 2000. Chairman James Mecham opened the meeting.

Dr. Don Monke of Select Sires, Inc., Plain City, Ohio led a discussion on topics of concerns to practicing veterinarians on bovine leucosis virus. Previous meetings of the retrovirus segment of this committee have often focused on advancements in diagnostic technology, viral pathogenesis, and epidemiology. Dr. Monke focused his comments on practical issues for exporters and for veterinarians in bovine practice. For example, when virus control programs for bovine leucosis virus (BLV) are implemented, either solely for control of BLV or in concert with control programs for other diseases, selected problems repeatedly arise. Questions pertinent to calf management and colostrum management, particularly in the early years of a herd control program, are of concern. Another issue concerns the accuracy of the serologic tests for BLV. The veterinary literature reports the sensitivity and specificity of the serodiagnostic assays to be greater than 98%. However, the field experiences of some suggest the accuracy to be lower. The reasons for these discrepancies are not readily apparent, but several possibilities exist. Meaningful responses are required if BLV control programs are eventually to gain acceptance.

The possibility of an educational program, perhaps in conjunction with the American Association of Bovine Practitioners, was briefly discussed.
Several members suggested that many producers may not yet have adequate economic incentives to implement a complete BLV control program. Furthermore, numerous scientific and review articles have been published. An educational effort for BLV control programs may be better received in the future if conducted in conjunction with other disease control efforts.

A current export issue is the regulatory recognition of the equivalence between the AGID and ELISA techniques. The AGID test has been the traditional test used in BLV control programs. But when the AGID test became unavailable in September 1998, many herds that were regularly tested to qualify bovine semen or embryos for export fully converted their health test programs to the ELISA. The USDA/VS team was largely successful in getting many countries to accept the ELISA as an alternative diagnostic method. Diagnostic standards need to include either the ELISA or the AGID as an official serologic test for BLV.

The need for diagnostic evaluation of BLV beyond the AGID or ELISA is uncommon. However, to diagnostically demonstrate that selected semen specimens collected from a BLV-seropositive bull were not contaminated with BLV, or to resolve a serologic discrepancy, a nucleic acid detection test may be needed. The Texas Veterinary Medical Diagnostic Laboratory has developed and made commercially available a PCR test for BLV. This effort is appreciated.

The final segment of the bovine retrovirus report reviewed data pertinent to carcass condemnations at slaughter due to lymphosarcoma. The September 2000 issue of the Bovine Veterinarian reported the 1999 National Market Cow and Bull Beef Quality Audit. Of the 6,190,000 market cows and bulls (split evenly between dairy and beef cattle), 1.06% were condemned post-mortem. Of these 65,600 carcass condemnations, 14.9% (or almost 10,000) were due to lymphosarcoma. Only epithelioma, or cancer eye, exceeded lymphosarcoma as a cause of carcass condemnations. A reduction in financial loss associated with lymphosarcoma is only possible with an educational effort to reduce the numbers of BLV infected cattle.

Dr. Eileen Ostlund, National Veterinary Services Laboratories, Ames, Iowa, gave an update on diagnostic observations for bluetongue, epizootic hemorrhagic disease and bovine leucosis virus in the U.S.

**Bluetongue Virus (BTV) and Epizootic Hemorrhagic Disease Virus (EHDV) Isolations/PCR positives.**

**Calendar year 1999 submissions:**

In calendar year 1999, diagnostic submissions for BTV or EHDV isolation included 112 cattle, 45 sheep, 8 white-tailed deer, 5 mule deer, 4 bighorn sheep, 2 reindeer, 2 pronghorn antelope, 2 alpaca, 1 camel, 1 zebu, 1 kudu, and 1 bison. Two cell culture preparations were submitted for isolate characterization. Isolation studies for export cases included 242 submis-
BLUETONGUE AND BOVINE RETROVIRUS

sions of bovine blood samples, 12 bovine semen and 4 bovine embryo flushing samples for BTV, EHDV, or BTV and EHDV isolation. The viruses isolated are listed in Tables 1 and 2. There were 174 submissions of imported fetal bovine serum for bluetongue safety testing by sheep inoculation requiring 344 sheep. No bluetongue seroconversions were observed from safety testing of fetal bovine serum.

Samples submitted for BTV polymerase chain reaction (PCR) testing included 60 bighorn sheep, 17 bovine, 7 goats, 4 white-tailed deer, 2 sheep, 2 mule deer, 2 llama, 2 gazelle, 1 elk, 1 pampas deer, and 1 giraffe. Ten goat and 4 cattle samples were submitted for EHDV PCR. The positive PCR results are listed in tables 1 and 2.

Calendar year 2000 submissions to date (January 1- October 15, 1999):

During the period of January 1 to October 15, 2000 there have been 7 positive identifications of BTV by isolation or PCR. One sheep from Maryland was positive by PCR and 3 sheep each from Oregon and Kansas were found positive by virus isolation. The Oregon virus isolates were BTV serotype 17 and the Kansas isolates were BTV serotype 11.

In calendar year 2000 to date, one white-tailed deer from Idaho tested positive for EHDV by PCR.

Serologic testing of 1996 dairy and 1997 beef cattle serum bank samples.

Serologic examination of stored samples from the National Animal Health Monitoring System (NAHMS) was conducted at NVSL to facilitate the transition towards a bluetongue sentinel survey system and provide background information about the prevalence of seropositive animals in selected states. From the 1996 dairy cattle serum bank, 9,042 samples were tested. The dairy samples originated from cattle in IA, IL, IN, KY, MN, MO, OH and TN. From the 1997 beef cattle serum bank, 4,338 samples were tested. The beef samples originated from cattle in IA, IL, KY, MO, MT, ND, NE, SD, TN, VA. The NAHMS samples were tested for antibodies to BTV by competitive ELISA (C-ELISA). When a single positive C-ELISA sample was identified in a herd, the positive sample was tested for neutralizing antibodies to BTV serotypes 2, 10, 11, 13, and 17. Results of testing were provided to the USDA, Centers for Epidemiology and Animal Health for analysis.

Bluetongue Survey.

No bluetongue survey was conducted in 1999. The 2000 bluetongue survey using slaughter samples from market cattle is underway. The 2000 bluetongue survey includes 18 north central and northeastern states comprising 10 geographic areas. States assessed individually are Indiana, Michigan, Minnesota, New York, North Dakota, and Wisconsin. Areas consisting of more than one state are New England (Connecticut, Maine, Mas-
REPORT OF THE COMMITTEE

massachusetts, New Hampshire, Rhode Island, and Vermont) and combinations of Maryland/Delaware, Ohio/West Virginia, and Pennsylvania/New Jersey. These regions were also included in the 1998 bluetongue survey. Two additional states, South Dakota and Oregon are included in the 2000 bluetongue survey by request. The testing costs for these states are being covered with state funds.

Bluetongue Proficiency Exam.
Fifty seven laboratories participated in the 2000 bluetongue proficiency exam. Laboratories used either the AGID or CELISA test method to complete the proficiency exam. The average number of samples missed was 0.11 and no laboratory missed more than one sample. All laboratories passed the exam on the first attempt with 51/57 laboratories agreeing 100% with each other and with NVSL on all 20 samples.

Bovine Leukosis (BL) Proficiency Exam.
A total of 64 laboratories participated in the 2000 BL proficiency exam. The proficiency panel was examined using either AGID or ELISA methods. The average number of samples missed was 0.64. While 46 of 64 laboratories agreed 100% with each other and with NVSL on all 20 samples, 6 laboratories missed more than 2 samples and failed the proficiency panel on the first attempt. Of these, 2 laboratories voluntarily dropped BL approved status. Four laboratories performed a BL proficiency retest and 3 of the 4 were successful in their second BL proficiency attempt. One laboratory lost official BL approved status due to poor performance on the retest.
### Table 1. Bluetongue Virus Isolation/PCR positives at NVSL Calendar Year 1999

<table>
<thead>
<tr>
<th>State</th>
<th>No.</th>
<th>Species</th>
<th>Serotype</th>
<th>VI only</th>
<th>PCR only</th>
<th>VI/PCR</th>
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</thead>
<tbody>
<tr>
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<tr>
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<td></td>
<td></td>
<td>X</td>
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</tr>
<tr>
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<td>sheep</td>
<td>17</td>
<td></td>
<td>X</td>
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<tr>
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<td>X</td>
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<tr>
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<tr>
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<td>2</td>
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</tr>
<tr>
<td>FL</td>
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<td>sheep</td>
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<td>X</td>
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<tr>
<td>ID</td>
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<td>sheep</td>
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<td></td>
<td>X</td>
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</tr>
<tr>
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<td>X</td>
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<tr>
<td>OK</td>
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<tr>
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<td>sheep</td>
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### Table 2. Epizootic Hemorrhagic Disease Virus Isolation/PCR positives at NVSL Calendar Year 1999

<table>
<thead>
<tr>
<th>State</th>
<th>No.</th>
<th>Species</th>
<th>Serotype</th>
<th>VI only</th>
<th>PCR only</th>
<th>VI/PCR</th>
</tr>
</thead>
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<td></td>
<td>X</td>
<td></td>
</tr>
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<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SD</td>
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<td>White-tailed deer</td>
<td>2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Dr. David Stallnecht, Department of Medical Microbiology, Veterinary Medicine, University of Georgia, Athens, Georgia gave an update on EHDV surveillance in wildlife. As of July 28, 2000, 34 samples from suspected hemorrhagic disease cases in deer were submitted to the Southeastern Wildlife Disease Study, College of Veterinary Medicine, University of Georgia. Of these, 23 were from free-ranging animals and 11 were from captive animals. All but one of these animals were white-tailed deer (one Sika deer). Viruses were isolated from 24 white-tailed deer from Georgia, Kansas, Maryland, North Carolina, South Carolina, Texas, and Virginia. These consisted of 23 isolates of EHDV serotype 2 and one isolate of BTV serotype 17. Two additional samples were negative on virus isolation and positive for EHDV on PCR. In addition to these samples, virus isolations were attempted from five deer from Mecklenberg County, North Carolina where an outbreak of EHDV serotype 1 was documented during 1999. A sample from this population taken during 1999 demonstrated a 100% prevalence of antibodies to EHDV serotype 1. A random sample of five deer from this population this year revealed that 3 of 5 deer were viremic to EHDV serotype 2. Unlike last year, clinical disease was not reported from this herd this year. Virus isolations also were attempted from 40 penned fawns in Kerr County, Texas. Although no mortality has been reported in these animals, virus has been isolated from at least six animals and two of these viruses have been identified as EHDV serotype 1.

A report on the status of the bluetongue surveillance pilot project was presented to the committee by Dr. Nora Wineland, USDA, APHIS, Centers for Epidemiology and Animal Health, Fort Collins, Colorado. The objectives of the project are to develop a pilot sentinel system as a tool to substantiate disease freedom and compare it to other surveillance options, to test for bluetongue disease freedom in demarcated populations and develop data on the epidemiology of bluetongue in seasonally endemic areas and to evaluate the spatial distribution of anaplasmosis in the study area. This pilot project represents a collaborative effort between the USDA, APHIS, Centers for Epidemiology and Animal Health; State and Federal Veterinary Medical Officers and Animal Health Technicians; the USDA, APHIS, National Veterinary Services Laboratory (NVSL); the USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, Wyoming; and the USDA, ARS, Animal Disease Research Unit, Pullman, Washington. The full text of the report is published in these proceedings.

Ms. Molly Murphy, Southeastern Cooperative Wildlife Disease Study and the Department of Medical Microbiology, College of Veterinary Medicine, University of Georgia, Athens, Georgia presented information on the genetic variation in EHDV isolates collected from the southeastern U.S. between 1978 and 1998. EHDV, the causative agent of highly variable disease in wild and domestic ruminants, is endemic in the southeast, with outbreaks of severe clinical disease occurring in white-tailed deer periodi-
BLUETONGUE AND BOVINE RETROVIRUS

cally. EHDV specific antibodies in deer peak in late summer to early fall, concordant with the activity of the potentiating vector, *Culicoides spp.* A member of the Orbivirus subgroup of the Reoviruses, the EHDV genome is comprised of ten double-stranded RNA fragments, encoding three non-structural and seven structural proteins. The high error rate of RNA proof-reading enzymes, in concert with the potential for segment reassortment indicates that genetic variation in EHDV is quite likely. The contributing factors to genetic variation in EHDV are currently unknown. The goal of this study was to determine the effects of time and geographic space on genetic variation in EHDV isolates collected from southeastern white-tailed deer, over a twenty-year period. Gene segments encoding two genes were sequenced, including the gene encoding a highly conserved protein (NS3), and the gene encoding a potentially variable neutralizing epitope protein from the virion surface (VP2). Phylogenetic analyses were performed and cladograms produced through the utilization of a genetic distance matrix, with the application of the Kimura 2-parameter model (unequal rates of transitional and transversional mutations). At both loci, isolates grouped temporally rather than spatially, and an indication of a segment reassortment event was noted for two isolates at the VP2 gene locus.

Dr. James Mecham, USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, Wyoming then presented information on the sequence analysis of the S7 genome segment of EHDV. This genome segment codes of VP7, which is a highly conserved viral protein among isolates of BTV and is the basis of diagnostic tests for both BTV and EHDV. This protein has also been shown to play a role in infection of the *Culicoides* insect vector with BTV. Analysis of nucleic acid sequences of S7 and the deduced amino acid sequences of VP7 for temporally and spatially distinct isolates of EHDV serotype 2 from the southeastern U.S. and Wyoming revealed a high degree of conservation of both the genome segment and the protein which it encodes. This high degree of conservation suggests an important structural and/or functional role for VP7 in the virus or during its replication.

Dr. Elizabeth Howerth, Department of Veterinary Pathology, Veterinary Medicine, University of Georgia, Athens, Georgia gave a presentation on EHDV induced apoptosis. EHDV are closely related to BTV and infects and damages endothelium causing hemorrhage and tissue necrosis. A number of viruses have been shown to cause cell death by apoptosis. This has not been previously investigated with orbiviruses. Dr. Howerth presented data showing that EHDV serotype 2 induces apoptosis in cow carrotid artery endothelial cell cultures using electrophoretic DNA fragmentation, TUNEL, and annexin V binding assays. Apoptosis was also detected in tissues from white-tailed deer infected with EHDV serotype 2. The mechanisms involved in apoptosis and the viral protein (s) responsible for apoptosis need to be determined.
Dr William Wilson, USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, Wyoming presented an overview of the molecular virology and evolution of bluetongue and related orbiviruses. Since the first orbivirus gene sequence was reported in 1984, over 200 sequences have been reported and are available from genetic databases. These reports include information about virus relationships and evolution that has facilitated the identification of neutralization epitopes, virulence determinants, and other virus characteristics related to viral replication. It has also been the basis for the development of nucleic acid based diagnostic tests. Science is moving into an exciting new era with growing databases from several genome projects, including completion of the human genome. The Arthropod-borne Animal Diseases Research Laboratory intends to be a part of this new era by development of a Culicoides genomic database. This Culicoides genetic database combined with the growing orbivirus genetic database and the bovine database, which is being developed at the USDA, ARS, Meat Animal Research Center, Clay Center, Nebraska will provide powerful tools to address questions related to arboviral disease cycles. The full text of this presentation are published in this proceedings.

Mr. Robert Frost, Third Vice-President of the USAHA and California llama producer, Lincoln, California gave a presentation on the need to validate tests for BTV and EHDV in South American camelids (SACs). He started out by saying that we need to recognize that there has not been a definitive diagnosis of either BTV or EHDV in SACs. Simply stated there have not been virus isolations in llamas or alpacas. However, there have been positive diagnostic test results for infection with these viruses in SACs in the Americas. The animals that have tested positive have not had clinical signs of disease nor has there been virus isolated from any of the test positive animals. There is evidence that antibodies are found in SACs, but there is no evidence to suggest that they are reservoirs for the disease. Additional research needs to be done in regards to BTV and EHDV infections in SACs.

Presently there are six U.S. states and all of Canada that require BTV testing in SACs. Mr. Frost asked if the current BTV tests are valid for llamas and alpacas and if it is fair to regulate animals that react positively to cattle and sheep tests without having knowledge of their validity in regards to SACs? The need to know the disease status of BTV and EHDV disease is necessary not only in our domestic trade and movement, but also in the international marketplace. Clinical signs of BTV and EHDV disease must be differentiated from vesicular disease and rinderpest.

Steps can be taken to insure that SACs are BTV and EHDV disease free. Each of these steps require research that in turn will require a great deal of time and money. Prior to the research, there must be commitment from government agencies and industry with an agreement from both to
BLUETONGUE AND BOVINE RETROVIRUS

work together to accomplish the task of understanding the pathogenesis of BTV and EHDV in SACs and validating diagnostic tests specifically for these diseases in lamas and alpacas.

Efforts to begin research and establish valid tests for these diseases in SACs began this year in a meeting at the National Centre for Foreign Animal Disease in Winnipeg, Canada. Agencies from both Canada and the U.S. were represented. The commitment to begin these research efforts and to validate protocols, that were agreed upon by laboratory and research personnel of both countries, is moving forward. The extent and duration of viremia in SACs caused by infection with these viruses must be established. The next step will be to determine which, if any, of the current diagnostic tests used for cattle, sheep, and other livestock can be validated for llamas and alpacas.

In reviewing the Bluetongue and Bovine Retrovirus Committee Meeting report from the 1999 Proceedings it was found (reported for the 1998 calendar year by NVSL) that diagnostic submissions for BTV or EHDV isolations included 1 alpaca and 1 llama. After further examination of the two cases it was confirmed that they were submitted to NVSL for diagnostic testing in 1998. "Three blood samples were submitted from an alpaca (NM case) and one set of tissue from a llama (MI case). No serology was done. Both cases were negative for virus isolation."

In the early 1980's an experiment was conducted on two llamas. The two were artificially infected with BTV. Both remained clinically normal throughout the ten-week experiment. Both developed antibody titers by two weeks post inoculation. The titers remained high for the duration of the ten-week study. One suspect case of BTV disease in a female llama occurred in the 1980's. The pregnant llama had an episode of a respiratory distress followed by an abortion. Paired serum samples demonstrated 4-fold increase in BTV antibody titer.

Discussions on prevention and treatment of disease in SACs have been almost nonexistent because there has been no prevalence data. Treatment might include supportive therapy and administration of antibiotics to prevent secondary infection. Vaccines that are routinely used in sheep are not recommended for use in SACs.

In conclusion there is evidence that SACs respond to BTV (and possibly to EHDV) with the formation of antibodies. There are no reports of natural clinical disease. There are no reports of BTV or EHDV isolations in SACs.

References:

Mr. Frost, along with Randall Levings, USDA, APHIS, Center for Veterinary Biologics, Ames, Iowa and Gary Steinke, Government Relations, Iowa State University, Ames, Iowa then presented a resolution to the committee related to the modernization and operation of the USDA facilities at Ames, Iowa. This resolution has been circulated throughout the various committees to show their combined support for this effort. The committee members present voted to support the resolution.

A brief discussion concerning the future of the Bluetongue and Bovine Retrovirus Committee was led by Dr. Don Monke. Committee members voiced strong support for continuing the committee and its efforts because export/import regulatory concerns for BLV and especially for BTV continue to exist.
Introduction:
Arboviruses (insect-transmitted viruses) comprise one third of the Office of International des Epizooties List A diseases. These are infectious diseases that have the potential for very serious and rapid spread, irrespective of national borders. Two fifths of these arboviruses are of the Reoviridae family, orbivirus genus. Among orbiviruses that are transmitted by biting midges in the genus Culicoides, Bluetongue virus (BTV) has the greatest economic impact, with losses attributed to effects on animal health and productivity, as well as non-tariff trade restrictions that effect the sale and movement of animals. Losses to U.S. livestock industries attributed to BTV have been estimated at $120 million annually, and losses worldwide attributed to BTV have been estimated at $3 billion annually. The second orbivirus in List A is African horse sickness virus (AHSV). The potential introduction of this virus into non-endemic areas is always a concern, especially around international horse events. Another closely related orbivirus is Epizootic hemorrhagic disease of deer virus (EHDV). The economic loss due to outbreaks of EHDV are not known, but the growing wild-game farm industry and the potential for cross-infection to domestic livestock have increased the concern for this virus..

Vertebrate host
BTV causes an infectious, noncontagious disease that occurs in domestic and wild ruminants (13). Once infected, a sheep may have high fever and distinctive lesions in the mouth, including a tongue that becomes severely affected and turns dark blue. Infection of cattle with BTV is usually asymptomatic, however, infection of pregnant cows can result in abortion. The cost of this disease is due to a number of factors including high mortality in infected flocks, lowered production in meat, milk and wool, decreased reproductive performance in the survivors, and restriction of livestock and germplasm movement from disease-occurring countries, such as the U.S., to disease-free countries. EHDV has primarily been associated with hemorrhagic disease in white-tailed deer (6) but there is evidence for infection of domestic livestock as well (30; 48). AHSV can cause four clinical types of disease in horses: Acute (pulmonary), subacute (cardiac), mixed and febrile (46).

Virus
Bluetongue virus has been considered the prototype orbivirus, and much
of what we know about the molecular virology of these viruses is based on studies of BTV. There are 24 BTV serotypes worldwide, and five serotypes (2, 10, 11, 13 and 17) have been isolated in the U.S. The BTV genome consists of ten segments of double-stranded RNA with each segment encoding for primarily one protein. The virus is comprised of seven structural and four non-structural proteins. The structural proteins are numbered VP1 to VP7 based primarily on their molecular sizes and electrophoretic migration by polyacrylamide gel electrophoresis (PAGE). The nonstructural proteins are designated NS1, NS2, NS3, and NS3a. The genomic and protein makeup of BTV and AHSV has been very clearly defined (43;44). Not as much is known about EHDV, but it appears to be similar to BTV and AHSV (30; 31). The properties and functions of the individual proteins has been compiled by Mertens (34) and summarized in Table I.

Insect vector

BTV is transmitted biologically by certain species of biting midges belonging to the genus Culicoides. Although there are over 1000 species of Culicoides in the world, only six of them (C. sonorensis, C. imicola, C. fulvus, C. actoni, C. wadai, and C. nubeculosus) have been shown to transmit the virus. A wild Culicoides adult female is infected with BTV by ingesting viraemic blood from an infected vertebrate host. If the midge is susceptible to infection, virus attaches to the luminal surface of the midgut cells and replicates. Progeny virus is released through the basement lamina into the hemocoel. Circulation of virus in the hemolymph leads to infection of secondary sites including the salivary glands (14). The infected vector then transmits the virus to another susceptible vertebrate host by taking another blood meal. Because biting midges have good flying ability and can be widely transported by prevailing winds, infection of susceptible vertebrate hosts is often both enzootic and epizootic.

The primary insect vector of BTV in North America is Culicoides sonorensis (18). Other distinct geographical areas have different primary vector species; for example, Culicoides insignus is the primary vector in the Caribbean basin. Different BTV serotypes are found in the U.S. (2, 10, 11, 13, and 17) compared to serotypes found in the Caribbean basin (1, 3, 4, 6, 8, 12 and 17) (36). Serotype 17 is the only serotype common to the U.S. and the Caribbean basin; whereas, serotypes 1, 3, and 4 are common to South Africa and the Caribbean basin. These viruses appear to be transmitted by Culicoides bottinios and C. imicola in South Africa (51). BTV serotype 2 has been isolated in South Africa and the U.S., but not the Caribbean basin. Serotype 1 and 2 of EHDV are indigenous to the U.S. and Australia (30; 53). AHSV is primarily found on the African continent with an occasional incursion into Spain, Portugal and Morocco (33; 41). The presence of different viral serotypes/strains and vector species in distinct geographical areas suggests a virus-vector relationship that is important in
determining the incidence of disease caused by these orbiviruses.

Orbiviruses have undoubtedly evolved and continue to evolve in response to selective pressures from both vertebrate and invertebrate hosts. Understanding which viral genes are responsible for different viral functions and characteristics in both hosts will allow the development of more effective diagnostics and control strategies. Knowledge of the genetic relatedness and evolution of orbiviruses will help us comprehend the epidemiology of disease caused by these viruses. This allows the objective evaluation of the risks from these viruses and provides the basis for formulating reasonable animal regulatory statutes to reduce the economic impact of these pathogens on U.S. livestock.

Information derived from sequence analysis:

Orbivirus genome
The keys to understanding the genetics, evolution and characteristics of orbiviruses lie in the acquisition and analysis of complete sequence databases. There are currently over 223 published or soon to be published nucleic acid sequences for orbiviruses that are available in the GenBank nucleic acid sequence databank. This is the result of work from laboratories too numerous to list. The left side of Table 2 summarizes the available genetic data that can be obtained from GenBank. The relatedness of specific genes from different orbiviruses is summarized on the right side of Table 2.

Structural proteins
This discussion will start at the outer surface of the virus and move toward the center. The L2 gene that encodes the outer capsid protein, VP2, has the greatest degree of genetic variability. This is not surprising since this protein is responsible for virus neutralization and serotype-specificity (32; 42) and is most likely to be affected by immune pressure from the vertebrate hosts. Such immune pressure may result in variants with increased virulence (3). A number of neutralization determinants have been identified (11; 15; 24). VP2 has been shown to be the protein primarily responsible for attachment and entry into mammalian host cells (16). The variation between serotypes generally results in segregation of viruses based on serotype regardless of geographic origin of isolation when phylogenetic analysis is used (4; 38). In a study of EHDV L2 genes, however, a sequence distinction was noted between comparisons of viruses isolated from the southeastern U.S. to those isolated from the western U.S. (7). The L2 gene is the target for serotype-specific nucleic acid detection assays (1; 2; 54). The deduced amino acid sequence identity is shown in Table 3 for all the orbiviral proteins. The protein sequence identity reflects the nucleic acid identity but also provides an indication of the extent to which amino
acid changes are allowed. The second protein that can cause conformational alterations of the outer capsid structure, and changes in neutralization characteristics, is VP5 (8; 10). This protein may also contribute to host cell recognition (42). The gene that encodes VP5, M5, is the second most variable gene, showing 51-71% identity within a serogroup.

The inner core of the virus is composed of two proteins, VP3 and VP7. VP3 provides the inner scaffolding for the virus and is coated by VP7 trimers (28). Viral genotypes based on the geographic origin of virus isolation were first noted by sequence analysis of L3 (39). This finding may be useful in tracking virus incursions into new geographical areas. It may also provide insight into virus distribution as a function of Culicoides species distribution. BTV core particles, where the VP2 and VP5 outer capsid proteins have been removed exposing the inner core consisting of VP3 and VP7, are just as infectious as intact virus particles to vector insects. However, core particles are less infectious than intact viruses to mammalian cells (35). Although VP7 is an inner core protein, its amino terminus is accessible to the outer surface in intact virus particles (12; 21). Investigations in our laboratory have shown that VP7 is involved in binding to the insect membrane proteins (56). Thus VP7 and possibly VP3 are important in infection of the insect vector. This suggests that there may be a relationship with a given Culicoides species in a geographical region and the viruses present in that same region as determined by the S7 (VP7) genotype. However, phylogenetic analyses of S7 do not clearly show geographical grouping of genetic types (5; 55).

Inside the virus core are the remaining structural proteins and the virus genome. The orbivirus RNA polymerase, VP1, is encoded by L1 (50). Relatively little sequence information is available for this gene (19; 52). From the available sequence data, the percent identity is high indicating that a high degree of conservation is needed to maintain function of the RNA polymerase. The guanylyl transferase, VP4, is encoded by M4 (27). The final internal structural protein is VP6 and is encoded by S9. This gene is moderately conserved within serogroups but variable between serogroups. The VP6 protein contains single-stranded and double-stranding RNA binding and helicase activities (47). No sequence data is available for S9 from EHDV, but the deduced amino acid sequences are quite different between AHSV and BTV (see Table 3).

Non-Structural genes

Of the genes that encode non-structural proteins, M6 (coding for NS1) is the most highly conserved within serogroups, but distinct between serogroups. This makes this gene an ideal target for nucleic acid based diagnostic procedures (9; 25; 45; 54). Characteristic tubule formation in orbivirus infected cells is due to NS1 (29;37). Genome segment S8 encodes for NS2 which has been associated with virus inclusion bodies and
RNA binding. Different serogroups show differences in single-stranded RNA binding characteristics (49). The S10 gene has two open reading frames and encodes two related proteins designated NS3 and NS3a (22; 23). This gene has also been extensively studied because it has been shown to display geographical grouping of nucleic acid sequence types (4). This is of interest because the NS3 protein may play a role in virus budding (20). Of additional interest is the observation that this protein has also been shown to be important in virulence of AHSV (26). Further investigation of the role NS3 plays in orbivirus replication in the insect vector is needed.

Summary and future plans:

A considerable amount of nucleic acid sequence information has been determined since the first orbivirus gene sequence was reported in 1984 (40). The result is an orbiviral genetic database consisting of over 200 sequences that has provided information about virus relationships and evolution and has facilitated the identification of neutralization epitopes, virulence determinants, and other virus characteristics related to replication. It has also been the basis for the development of nucleic acid based diagnostic tests. This growing database will prove to be an invaluable reference as we address additional questions related to virus-vector-host interactions. With the completion of several genome projects, including the human genome, science is moving into an exciting new era. The Arthropod-borne Animal Diseases Research Laboratory intends to be a part of this new era by development of a Culicoides genomic database. The Culicoides and orbivirus genomic databases combined with the bovine database, which is being developed at the USDA, ARS, Meat Animal Research Center (17), will provide powerful reference tools to address questions related to arboviral disease cycles. Essentially, we are developing the language translation dictionaries for the three components (virus, vector and host) of this cycle. With these dictionaries, we will be able to more clearly determine how the virus communicates and interacts with its vertebrate and invertebrate hosts. This will lead to new detection and control strategies for arboviral diseases that may not have been discovered otherwise.
### Table 1.
Orbivirus genes and encoded proteins with location, properties and functions of proteins.

<table>
<thead>
<tr>
<th>Genome segment</th>
<th>Protein</th>
<th>Location</th>
<th>Properties and Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 (3954 bp) (150 kDa)</td>
<td>VP1</td>
<td>Within the sub-core at the 5 fold axis</td>
<td>RNA dependent RNA polymerase.</td>
</tr>
<tr>
<td>L2 (2926 bp) (111 kDa)</td>
<td>VP2</td>
<td>Outer capsid (trimer)</td>
<td>Outer capsid, serotype specific antigen, mammalian cell attachment protein, neutralising epitopes.</td>
</tr>
<tr>
<td>L3 (2770 bp) (103 kDa)</td>
<td>VP3</td>
<td>Sub-core capsid layer (T=2 symmetry)</td>
<td>Innermost protein capsid shell, sub-core capsid layer, self assembles, retains icosahedral symmetry, RNA binding, interacts with internal minor proteins.</td>
</tr>
<tr>
<td>M4 (2011 bp) (76 kDa)</td>
<td>VP4</td>
<td>Within the sub-core at the 5 fold axis (dimer)</td>
<td>Capping enzyme, guanylyltransferase</td>
</tr>
<tr>
<td>M5 (1638 bp) (59 kDa)</td>
<td>VP5</td>
<td>Outer capsid (trimer)</td>
<td>Inner outer capsid protein, can affect virus serotype characteristics.</td>
</tr>
<tr>
<td>M6 (1769 bp) (64 kDa)</td>
<td>NS1</td>
<td>Cytoplasm</td>
<td>Forms tubules in the cell cytoplasm.</td>
</tr>
<tr>
<td>S7 (1156 bp) (38 kDa)</td>
<td>VP7</td>
<td>Outer core (T=13 symmetry, trimer)</td>
<td>Outer core surface protein, immuno-dominant major serogroup specific antigen, attachment protein for vector insect cells, reacts with &quot;core neutralising&quot; antibodies.</td>
</tr>
<tr>
<td>S8 (1124 bp) (41 kDa)</td>
<td>NS2</td>
<td>Cytoplasm, viral inclusion bodies (VIB)</td>
<td>Important viral inclusion body matrix protein, ssRNA binding, phosphorylated, can be associated with outer capsid.</td>
</tr>
<tr>
<td>S9 (1046 bp) (36 kDa)</td>
<td>VP6</td>
<td>Within the sub-core at the 5 fold axis</td>
<td>ssRNA and ds RNA binding, helicase, NTPase.</td>
</tr>
<tr>
<td>S10 (822-bp) (24 kDa)</td>
<td>NS3, NS3a</td>
<td>Cell Membranes</td>
<td>Glycoproteins, membrane proteins, involved in cell exit</td>
</tr>
</tbody>
</table>
Table 2.
The number of available nucleic acid sequences from GenBank as of October 2000. Percent identity within and between serogroups based on multiple alignment analysis.

<table>
<thead>
<tr>
<th>Gene</th>
<th>Number of Sequences</th>
<th>Percent Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number AHSV</td>
<td>BTV</td>
</tr>
<tr>
<td>L1 (VP1)</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>L2 (VP2)</td>
<td>5</td>
<td>16**</td>
</tr>
<tr>
<td>L3 (VP3)</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>M4 (VP4)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>M5*** (VP5)</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>M6 (NS1)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>S7 (VP7)</td>
<td>2</td>
<td>39</td>
</tr>
<tr>
<td>S8 (NS2)</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>S9 (VP6)</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>S10 (NS3)</td>
<td>17</td>
<td>31</td>
</tr>
</tbody>
</table>

* Total is the total orbivirus sequences or total identity among all published full-length nucleic acid sequences.

** 16 becomes 31 if partial nucleic acid sequences are included.

*** Eight sequences are duplicate published sequences of the same serotype. AHSV M6 codes for VP5 and M5 for NS1; therefore, the sequences that code for the same protein are compared (i.e. AHSV M6 genes are compared to BTV and EHDV M5 genes).

# Includes one published sequence for Broadhaven virus, a tick-borne orbivirus.
### Table 3.
The number of deduced amino acid sequences available for prototype strains (one sequence/serotype) as of October 2000. Percent identities within and between serogroups are based on multiple alignment analysis.

<table>
<thead>
<tr>
<th>Protein</th>
<th>Number of Sequences</th>
<th>Percent Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AHSV</td>
<td>BTV</td>
</tr>
<tr>
<td>VP1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>VP2</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>VP3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>VP4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>VP5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>NS1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>VP7</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>NS2</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>VP6</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>NS3</td>
<td>9</td>
<td>11</td>
</tr>
</tbody>
</table>

* Total is the total orbivirus prototype sequences or total identity among orbivirus prototype deduced amino acid sequences (i.e. one sequence per serotype).
** Value in bracket includes one published sequence for Broadhaven virus, a tick-borne orbivirus.

Reference List


STATUS OF THE BLUETONGUE SURVEILLANCE PILOT PROJECT

Jeffrey C. Mariner (1), Edward T. Schmidtmann(2), Paul S. Morley(3), Bruce A. Wagner(1), Lindsey P. Garber(1), and Nora E. Wineland (1).

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Objectives:
The objectives of the BSPP are the following:

- **Primary objective:** To pilot a sentinel system as a tool to substantiate disease freedom and compare it to other surveillance options
- **Secondary objective:** To test BT disease freedom in demarcated populations and develop data on the epidemiology of BT in seasonally endemic areas
- **Tertiary objective:** To evaluate the spatial distribution of anaplasmosis in the study area

The pilot sentinel program is a collaborative effort between the Centers for Epidemiology and Animal Health (CEAH), State and Federal Veterinary Medical Officers and Animal Health Technicians, the National Veterinary Services Laboratory (NVSL), the Arthropod Borne Animal Diseases Research Laboratory (ARS-ABADRL, Laramie, WY) and the Animal Disease Research Unit (ARS-ADR, Pullman, WA).

Background:
Bluetongue and anaplasmosis are vector-borne diseases in which the epidemiology is strongly linked to ecologic and environmental factors. In North America, BT viruses are transmitted primarily by the biting midge *Culicoides sonorensis* (Holbrook et al. 2000) and the range of BT corresponds closely to the known range of this vector. Anaplasmosis is transmitted biologically by ticks and mechanically by biting flies or veterinary interventions resulting in blood transfer. In the Northern Plains States, anaplasmosis is believed to be transmitted primarily by the ixodid tick *Dermacentor andersoni*.

As a result of these ecologic links, both diseases are believed to have a naturally defined regional distribution that makes them candidates for disease zonation under the terms of the Sanitary and Phytosanitary (SPS) Agreement of the General Agreement on Tariffs and Trade. Several US trading partners, particularly Canada and the European Union, fall into very
low risk categories for these diseases due to the environmental determi-
nants of vector habitat and marginally competent or incompetent vector populations. The potential benefits of better bluetongue surveillance to trade are access to new export markets and preservation of existing markets through increased confidence in disease freedom.

Current slaughter surveillance for BT using samples collected as part of the Market Cattle Identification (MCI) system is insufficiently specific and representative from the perspective of international trade. The traceability to the county level of slaughter samples used in BT surveillance has been calculated to be on the order of 69% (Metcalf et al. 1981). Currently available BT tests are highly specific and on-farm surveillance systems that include the movement history of test animals are less likely to detect antibody outside of BT’s true ecologic range than the current slaughter surveillance method.

Information on the spatial distribution of anaplasmosis is not well developed. Publications for Idaho and Washington (Long et al. 1974) suggest local foci interspersed with areas of disease freedom may be the pattern in the Northwest. Simple state level prevalence estimates (McCallon 1973) could be very misleading due to the apparent clustering of disease transmission. In the past available anaplasmosis tests were not highly sensitive, however, competitive enzyme linked immunosorbent assay (C-ELISA) technology developed by Animal Disease Research Unit of the ARS offers a greatly enhanced level of sensitivity (96%) and specificity (95%) (Torioni de Echaide et al. 1998).

The area participating in the BSPP has been selected on the basis of its trade situation, interest, and BT epidemiologic status. The pilot area is a contiguous group of four states that spans the border between the BT disease free and seasonally affected zone. These states are Montana, Nebraska, North Dakota and South Dakota. The gradient of environmental determinants of vector distribution and disease transmission can be measured as one moves from north to south through the states of North Dakota, South Dakota, and Nebraska. The identification and correlation of risk factors with disease transmission will permit risk maps to be drawn. This has the potential to reduce surveillance costs by allowing surveillance intensity to be weighted to risk maps.

**Preliminary Serologic Assessments:**

Due to the limitations of the use of MCI samples as a basis for BT surveillance, only minimal epidemiological information was available at the outset of the BSPP on the dynamics of BT transmission in the transition states. For example, hard data on within herd prevalence rates or the likely position of the border between seasonally infected and non-infected counties were not available.

Samples from the National Animal Health Monitoring System (NAHMS)
Dairy 96 and Beef 97 serum banks were used as sources of sera and risk data for the formulation of realistic hypotheses on within state disease distribution for testing in the sentinel project. The NAHMS serum bank is a randomized, cross sectional sample that can be compared with the sentinel cohorts in the overall assessment of methods.

The objectives of examining the serum bank for antibody to BT viruses are presented below in order of priority:

- Establish a county level boundary between BT infected and BT free zones
- Measure approximate within herd prevalence rates in transition areas

Sixteen states located in the transition zone were identified for testing. Inventories indicated that up to 296 dairy herds and 187 beef herds for a total of 14,700 sera from 16 states were available for testing. The majority of the testing has been completed by NVSL. Preliminary analysis of the spatial distribution of antibody in the pilot states has been completed at CEAH. Competitive ELISA positive sera from herds with only one C-ELISA positive will be retested by the BT virus neutralization test. The herd cutoff for scoring a herd as definitively BT positive will be two C-ELISA positives or one C-ELISA positive confirmed positive by the virus neutralization test (VNT).

**Sentinel Project Design and Implementation**

Based on the results of the serum testing for BTV antibodies and Culicoides sonorensis collection records provided by ABADRL, three cattle sampling population areas have been identified within the pilot area. These include one disease free zone and two transitional zones. The disease free area consists of North Dakota and 23 counties of northeastern South Dakota. One transitional area is the state of Montana. The second transitional area is made up of 33 counties in southwestern South Dakota and the state of Nebraska. The sampling rate has been set at both the herd and within herd level to a 95% confidence of detecting BT if it were present with 5% prevalence. Assuming perfect tests, this is a multistage sampling process and calls for the selection of 59 herds in each population and up to 60 animals per herd (Beal 1983), (1982).

Dairies and cow-calf operations have been selected for inclusion as sentinel farms as the most representative and practical approach for deriving estimates for the general cattle population. This combination balances the need for longevity of the herd with the representativeness of the sample.

Criteria for participation in the pilot phase are limited. Questionnaire data will be collected to assess impact of replacement and cattle identification practices on the quality of sentinel surveillance. The enrollment criteria for farms are:
STATUS OF THE BLUETONGUE
SURVEILLANCE PILOT PROJECT

- Dairy or beef cow-calf operation
- Eighty percent of replacements raised on farm
- Ninety-five percent of all cattle have a physical identifying mark (ear tag, neck chain, etc.)

Within population zones, the area was divided up into 75 geographic strata and one herd was selected per strata. Due to the longitudinal nature of the study and historically high drop out rates in randomized national studies, the selection of herds within strata was non-random (purposive) with the operations willingness to participate considered. Selection followed guidelines on the percentage of dairy versus beef operations within states or areas and the state distribution of farm sizes as reported in the 1997 NASS Census.

Field Activities

Preliminary activities and selection of farms will take place during 2000 and biological sample collection will begin in 2001. It is anticipated that a pre and post vector season blood sample will be collected from all selected animals and that vector sampling will be done on one half of all participating farms. Two light traps will be placed per farm. On a subset of vector trapping sites, a CO2 trap will also be placed to validate the sensitivity of the light traps. Larval vector and soil samples from probable vector breeding sites will be collected on half of the farms where vector traps are placed.

The field activities for the 2000 calendar year are:
- Orientation and technical training of participating field staff
- Telephone selection of 75 farms per population
- On farm participant interviews
- Signing of consent form

Activities for 2001 are:
- Selection and pre-vector season bleeding of up to 60 sentinel cattle per farm
- February 15 to May 15
- Individual sentinel history and ID
- Adult vector sampling during height of vector season
- July – September.
- Two black light traps per farm placed for 10 to 14 days
- One CO2 trap on a subset of farms
- Larval vector and soil sampling
- Soil sampling from vector breeding sites on one half of the farms where traps are placed
- Post-vector season bleeding
- November to December 15
- Delivery of incentive for participation
Laboratory Testing and Analysis of Data:

Serology: The pre-vector and post vector season serum samples will be tested by BT C-ELISA. As with the NAHMS sera, BT C-ELISA positive sera from herds with only one C-ELISA positive will be retested by BT virus neutralization test. The herd cutoff for scoring a herd as definitively BT positive will be two C-ELISA positives or one C-ELISA positive confirmed positive by VNT. Pre-vector season serum samples will be tested for anaplasmosis antibody using the C-ELISA test.

Vector samples: The species of the adult Culicoides in trap collections will be determined. The larvae in aquatic samples will be reared and the species of Culicoides identified. A limited number of Culicoides populations reared from larval samples will be assessed for BT vector competence. Chemical analysis will be completed on the soil samples as part of the assessment of environmental determinants of vector habitat (Schmidtmann et al. 2000).

Analysis: Standard epidemiologic measures (odds ratios, relative risks, and regression coefficients) will be calculated for management, environmental and climatologic risk factors. The results will be analyzed spatially using geographic information systems technology. Point data will remain confidential and interpolation techniques (Moore and Carpenter '99) will be used to create risk surfaces and contours. Area mapping and analysis at the county level will also be completed while maintaining confidentiality of the data.

Discussion:

The sentinel program should generate information on the factors that contribute to the threshold for disease transmission in the transition zone. As a result of the pilot, disease free areas will be spatially defined and empirically substantiated both in terms of the absence of disease transmission and the distribution of competent vectors. The pilot program should generate sufficient data for the participating transition states to demarcate and substantiate a credible disease free zone within state. Work in infected areas will contribute to a better understanding of the epidemiological, environmental and climatic factors that determine the distribution of vectors and disease transmission. In general, this information will contribute to the states’ ability to present rational ecological arguments to further substantiate disease freedom where appropriate.

References

1 Beal, V.C., 1983. Regulatory Statistics. Efficacy of random samples of herds in exotic disease detection. USDA/APHIS/VS.


REPORT OF THE COMMITTEE ON BRUCELLOSIS

Chairman: Dr. J. Lee Alley, Montgomery, AL
Vice Chairman: Dr. Claude E. Barton, Nashville, TN
Dr. Sam D. Holland, Pierre, SD

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The committee on Brucellosis met on Sunday and Monday, October 22-23, 2000, at the Sheraton Birmingham Hotel, Birmingham, Alabama. A total of 23 presentations were given during the two half-day committee meetings. A summary of presentations and actions taken by the committee are given below.

The FY year 2000 status report of the Cooperative Brucellosis Eradication Program was presented by Valerie Ragan, National Brucellosis Epidemiologist, APHIS, VS. Significant progress continued to be made as reflected by the disclosure of only 14 newly affected herds during FY 2000 as compared to 28 in FY 1999, a decline of 50%. There were only three quarantined herds remaining at the end of FY 2000 compared to 10 a year
earlier.

Dr. Ragan emphasized that the Brucellosis Emergency Action plan, approved and implemented in 1997, remained in effect during FY 2000 and would remain so until brucellosis in cattle is eliminated. No class free state disclosed a newly affected herd during FY 2000.

As of September 30, 2000, 45 states, plus Puerto Rico and the Virgin Islands were brucellosis class free and five states were class A. One State, Louisiana, qualified for class free status during FY 2000. The States of Florida and South Dakota are currently in the qualifying stage for Class Free status. The complete text of Dr. Ragan’s report is included in these proceedings.

Dr. Eduardo Luna Martinez, Director of Mexico’s Brucellosis Program, gave a report on program activities and progress during the past year. RB51 vaccine is used extensively in Mexico, including multiple doses in affected and high-risk herds. Dr. Luna cited major progress in eliminating brucellosis from dairy herds using whole herd vaccination with test and slaughter of reactors and improved herd management. Mexico has *B. abortus* in cattle, *B. melitensis* in goats, and *B. suis* in swine. Brucellosis in humans is a serious public health problem with an average of 4,000 human cases reported each year. In studied cases, 98% are due to infection with *B. melitensis*, 1.5% due to *B. abortus* and 0.5% due to *B. suis*.

Bob Hillman, Idaho State Veterinarian, gave an update on the activities of the Greater Yellowstone Interagency Brucellosis committee (GYIBC). The full text of the report is included in the proceedings.

Klaus Neilson, Animal Disease Research Institute, Agriculture Canada, presented a paper titled, "Fluorescence Polarization Assay Test for the Field Diagnosis of Brucellosis". The paper dealt primarily with the use of the FPA in testing whole blood for brucellosis. The full text of the paper is included in these proceedings.

Michael Gilsdorf, APHIS, VS, presented a summary of actions taken by APHIS, VS to correct the deficiencies in brucellosis slaughter surveillance that were identified by the 1997 slaughter surveillance review. A national surveillance coordinator has been appointed to coordinate surveillance in all program species. Additionally, field coordinators for both the eastern and western APHIS, VS regions have been designated. They are responsible for the implementation of slaughter surveillance standards and for assisting with field coordination. Also, they are responsible for dealing with problems across state lines and documenting responses to deficiencies.

Currently there are 42 major plants that slaughter more than 20,000 cattle per year, which accounts for 90% of the adult cow kill in the country. Dr. Gilsdorf reported that all slaughterhouses have been reviewed and corrective actions taken at most, where deficiencies existed.

Validation of efficacy in the slaughter surveillance system has been a
BRUCELLOSIS

major concern. Dr. Gilsdorf reported that National Veterinary Services Laboratory (NVSL) has developed a low-cost test method for evaluating serological fingerprints of paired serums. This procedure has been field tested in a pilot study and shows promise as an effective validation tool. The pilot study of 59 paired serum samples will be expanded nationally to 500 pairs to further verify this procedure known as, "Simple Method of Identifying Paired Sera (SMIPS)".

The State Veterinarians of five states that have achieved class free status in recent years presented a panel discussion of post-first-point brucellosis testing. Carter Black, Georgia, reported that Georgia has two major slaughterhouses that slaughter a total of 1,600 to 1,800 cull cattle per day. A validation procedure has been initiated by collecting paired samples at both the livestock market and slaughter. Dr. Black stated that the system is not yet good enough and needs more fine-tuning. First point testing at livestock markets was discontinued in July 2000. Ron Wilson, Tennessee, reported that first point testing at livestock markets was discontinued about a year ago. However, 27 markets continue to do some testing of back-to-farm cattle. The number of market tests has dropped about 50%. There are no major slaughterhouses in Tennessee. J. Lee Alley, Alabama, reported that there are no major slaughterhouses in Alabama. Approximately 4-5 years ago public funds ran short and the producers took over the cost of testing at markets. It is planned that, on April 1, 2001, first point testing at livestock markets in Alabama will be discontinued. Jim Watson, Mississippi, reported that plans are to first point test at markets for 3-5 years after achieving class free status. There are no major slaughterhouses in Mississippi. Maxwell Lea, Louisiana, stated that Louisiana has been Class Free for 60 days. Tentative plans are to continue market testing for three years from when Class Free status was achieved, which will be five years from the last reactor. There are no major slaughterhouses in Louisiana. The vast majority of Louisiana cattle are slaughtered in Texas.

Tom Roffe, U.S. Geological Survey, Department of Interior, was not present, but had forwarded his presentation, "Brucellosis Research Report", to the committee. His report was read by Claude Barton. There are 12 ongoing projects, with three having to do with the natural course of brucellosis in wildlife of the Greater Yellowstone area. The remaining nine projects deal with the biosafety, efficacy, and deliverability of brucella vaccines. Dr. Roffe reported that his group is turning to oral delivery methodology studies because of the logistical, ecological, labor intensity and economic concerns with parenteral delivery.

Philip Elzer presented a paper entitled "Safety of Brucella Vaccines in Pronghorn Antelope". This paper reported the results of research on oral vaccination of antelope with RB51 and S19 vaccines. The full text of this paper is included in these proceedings of the scientific session.

Tom Thorne presented a report entitled "Wyoming Wildlife Brucellosis
Update”, that included the results of research on the efficacy of RB51 vaccine in elk and, research and field studies being carried out by the Wyoming Game and Fish Department. The full text of this report is included in these proceedings.

Bob Frost presented an update on camelid brucellosis. He reported there has been no reported cases of *B. abortus* in South American camelids, which includes llamas and alpacas. However, old world camelids are infected with *B. abortus* and *B. melitensis*. He expressed a need for validation of serologic tests for South American camelids.

Lisa Lemieux, Idexx Corporation, gave a brief status report on the future availability of the CITE test. She stated that there would be enough CITE test kits to last to the end of 2002 and that the price would remain the same. The availability could be extended further with conservation, the conjugate being the controlling factor that will determine shelf life. She will be giving quarterly updates on the supply and availability.

Mark Drew, Idaho Department of Fish and Game presented a paper entitled, "Brucellosis in Elk in Idaho". His paper details the results of efforts to determine the scope of brucellosis in Idaho Elk. The full text of this paper is included in these proceedings.

Terry Conger, State Epidemiologist, Texas Animal health Commission, presented a paper on an outbreak of *B. melitensis* that involved one cow and a herd of sheep and goats. The complete text of this report is included in these proceedings.

Donald Davis, Wildlife Brucellosis Researcher, Texas A & M University, presented a paper on the “Safety of Brucella Vaccines in Coyotes”. This was a scheduled committee scientific paper and the complete text is included in these proceedings.

Mark Bridges, Montana Department of livestock, gave a report on the Montana brucellosis situation. Montana is continuing to operate under the 1995 Bison Interim Operating Plan. During the previous month 16 head of bison were hazed back into the Yellowstone national park (YNP). The current estimate of the YNP bison population is 3,100, including 2,700 adults and yearlings and 400 calves. Since the separation by the federal government agencies from the State of Montana regarding the Federal EIS for Management of bison in the YNP, Montana and the federal agencies have continued federal court ordered mediation, with the next mediation date being October 31, 2000. Montana officials are also working on their own bison management EIS, which should be published by November.

Jim Logan, Wyoming State veterinarian, gave an update of brucellosis activities in Wyoming. He gave data showing the states breeding animal population to be approximately one million animals. Because of the risk of brucellosis being transmitted to cattle from elk, the Wyoming Livestock Board enforces regulations governing vaccination and surveillance. These regulations include mandatory vaccination of all heifers; mandatory identifica-
tion of all test eligible cattle and bison prior to change of ownership; and the requirement that all imported female cattle and bison be official calfhood vaccinates. He also gave further data on the level of surveillance conducted in Wyoming during the past year. Dr. Logan stated that Wyoming ranchers are doing all they can do, but are very frustrated because they have no control of the wildlife brucellosis situation in the Greater Yellowstone area.

Terry Beak, Texas State Veterinarian (Retired), Texas Animal Health Commission, presented a case for more attention being given to the importation of sexually intact cattle from Mexico. He urged State Veterinarians to review the basic import requirements for Mexican cattle in part 93.427(d) CFR. Dr. Beak stated that he mistakenly thought that sexually intact cattle were required by federal regulations to originate from a herd in Mexico with status, meaning a closed herd where the cows and bulls giving rise to the animals being imported would have had a negative complete herd test.

In reality, herds of breeding cattle, usually heifers, are congregated from various sources and tested for brucellosis and tuberculosis in Mexico and become a herd. These herds are required to be isolated for no less than 30 days nor more than 90 days and then presented at one of the U.S. border ports where they are re-tested by the U.S. Port Veterinarian. If there are no reactors or suspects, the cattle may enter the U.S. without further restriction. If only suspects are disclosed, they can be removed and the remainder of the consignment released into the U.S. with no additional restrictions. If there are reactors, they are removed and the remainder of the consignment turned back. However, they can be presented again after 30 days if a negative herd test is performed. If the consignment is negative to the required brucellosis test at the port, the cattle may be released for entry into the U.S without further restrictions.

Dr. Beak submitted to the committee the opinion that long incubation periods, latency, serologic diagnostic difficulties in cattle that have not calved, and even adult parturient females that remained open for abnormally extended periods have rendered the federal brucellosis importation requirements for Mexico inadequate, and they need to be strengthened.

Dr. Beals proposed that the brucellosis committee send forth a recommendation to USDA, APHIS, VS to review part 93.427(d) CFR and make necessary changes consistent with the status of brucellosis eradication in the U.S. compared to the situation in Mexico. He suggested further that until these changes can be made that State Veterinarians and their federal counterparts consider their risks and act accordingly. He feels that the importation of sexually intact females from Mexico presents the greatest risk of brucellosis being reintroduced from outside the U.S.

Sam Holland, South Dakota State Veterinarian, presented a brucellosis status update on the Triple U Buffalo Ranch. He gave a detailed history of the brucellosis situation of the herd, going back to 1960 when it was
established. He reported that the main herd of older, chronically infected animals was depopulated in January 1999. Younger, uninfected animals from calf crops that had been intensively vaccinated with RB51 and tested, were retained on the ranch to rebuild the herd. Dr. Holland stated that a retest of the animals remaining in the herds is scheduled between November 1-10, 2000, and if negative would qualify the herd for release from quarantine, and the State of South Dakota for Brucellosis Class Free status. Then celebrate!

John Kopek presented a review of the brucellosis eradication effort in the United States, including brucellosis in bison and elk in the Greater Yellowstone Area. He also presented a resolution for consideration by the committee that was actually five resolutions in one. The Brucellosis Committee and USAHA had previously responded to most of the issues raised in Dr. Kopek’s proposed resolutions. Three of the proposed resolutions were rejected by the Committee, and was referred to the Scientific Advisory Subcommittee and one was approved by the Committee and forwarded to the Committee on Resolutions.

**BRUCELLOSIS SCIENTIFIC ADVISORY SUBCOMMITTEE MEETING**

Presiding: Dr. Philip H. Elzer  
Members Present: Drs. Evans, Davis, Olsen and Elzer  
Members Absent: Drs. Schuring and Slenning  
Proxys: Evans held Slenning’s  
Davis held Schuring’s

The Subcommittee met on Sunday morning, October 22nd and Monday morning, October 23rd, 2000. The meeting included research, industry, inventers, special interest groups and regulatory personnel. The subcommittee voted and discussed critical issues during closed-door sessions.

Agenda as per our charge from Dr. Alley:
1. Review the FPA test in swine  
2. Review the FPA test in bison  
3. Review the FPA technologies using 3 different machines  
4. Discussion of different Rivanol dilutions  
5. PCR technologies on Brucella identification which was withdrawn by S. Olsen.

The committee unanimously makes the following conclusions:

I. The committee recommends that the Fluorescence Polarization Assay (FPA) be approved as an official test in swine.  
II. The committee recommends that the Fluorescence Polarization Assay
BRUCELLOSIS

(FPA in bison be approved as an official test.

III. Data was presented from 3 FPA machines: Polarion, FPM-1, Sentry-FP using swine, bison and cervid serum samples and suggests that these sensitivities and specificities were equivalent.

IV. Dr. Terry Conger was selected to collect and compile data on different Rivanol dilutions in states using the CITE test.

V. The committee requests that NVSL report next year on the USDA serum bank.

VI. As per direction of Dr. Sam Holland the committee met to examine 5 resolutions introduced by Dr. J. D. Kopec. Our response is as follows:

The USAHA Executive Committee has previously responded to most of these issues raised in the resolutions 1-5. Therefore the committee recommends that:

Resolution 3 be referred to the scientific advisory committee via Dr. Thorne through Dr. Holland.

Resolution 3 – The USAHA should encourage USDA, APHIS, VS to fund a scientifically based field trial to determine whether bio-bullets will penetrate the skin of bison. If penetration does take place, one method of vaccinating bison can be done using bio-bullets loaded with the appropriate strain of Brucella vaccine.

Resolutions 1, 4, and 5 be dropped.

The committee accepts and endorses, with one abstention vote, Resolution 2.

Resolution 2 – The USAHA should encourage USDA, APHIS, VS to support financially and with personnel, the efforts of the personnel of WY Game and Fish Dept. in their effort to improve the elk winter habitat. These efforts will interrupt the cycle of transmission of brucellae among the elk in WY.

A motion was made, seconded and passed to accept the Subcommittee report.

SUBCOMMITTEE ON SWINE BRUCELLOSIS

The subcommittee met on Saturday evening from 8:00 to 10:25 P.M. with 41 dedicated USAHA attendees present. There was a good mix of representation from industry, and both state and federal personnel. As the subcommittee chair, I opened the meeting with the observation that if anyone would have suggested, even 5 years ago, that brucellosis would be
REPORT OF THE COMMITTEE

more difficult to eliminate from swine than from cattle, we would all have laughed at such a thought.

Dr. Arnold Taft gave a report on the status of the national program. During FY 2000 there were 55 newly disclosed swine herds with brucellosis. This compares unfavorably with only 18 such herds from the previous FY. The 55 herds were discovered in 8 different states, and the most probably source of the infection was from feral swine in most, if not all, the cases. There is currently only one quarantined herd in the country and that is in Texas. There were 54 herds depopulated during the year with 1023 hogs at a cost of $173,617. First point testing; testing of herds at increased risk and epidemiological tracing and testing lead us to the 55 herds.

The 4 states that are not swine brucellosis free give reports:

> Dr. Jim Amend reported that Texas had 9 new herds in FY 2000 and 6 of the 9 could be documented and justified as of feral origin. He noted that during the past 2 years, 14 herds have been found in Texas and that all have been east of Interstate 35, or the eastern 2/3 of the state.

> Dr. Maxwell Lea reported that Louisiana had one herd for the year and that it was infected with both brucellosis and PRV and was a feral origin herd. He stated that in LA, 5 markets handle 75% of their swine sales and that running the card test on swine blood collected in those markets has been a big help to their program. He mentioned progress with a plan to deal with feral/wild swine and developing criteria for determination as to whether a case is feral related.

> Dr. Ashby Green from Florida reported 5 newly disclosed herds for the year, stating all were feral associated. He told the group that they had tested 7,797 hogs in 828 herds and disclosed 13 reactors as a result of on-farm testing and 1,346 hogs with 8 reactors by testing at markets.

> Dr. Conley Byrd, reporting for Arkansas, said they have 60 of their 75 counties where feral swine are known to exist. He described that a great majority of their swine brucellosis has been in the extreme southwest extremity of their state, where they adjoin Texas, Oklahoma and Louisiana. Dr. Byrd talked about new state regulations for hog surveillance that go into effect November 1st. He also described the backyard type of operations that are most commonly the problem and made a point that these are not usually garbage feeders. In Arkansas, state personnel are also doing the surveillance testing.

Four examples of feral origin PRV or brucellosis cases from previous years were described by Dr. Gene Eskew. Dr. Eskew detailed several factors and case specific conditions that were the basis for reporting, but not affecting the state status of Oklahoma. Dr. Eskew made it quite clear that he felt strongly that the situation in feral/wild swine should not reflect upon a domestic swine population that had achieved a free status, though he was also clear that he felt it was the state’s responsibility to thoroughly
investigate, complete the epidemiology, and justify and document the feral implication.

Last year's resolution 14 and 15 from this subcommittee through the parent committee were reviewed and discussed. Dr. Gilsdorf gave the group an update on some progress and plans on the cull sow and boar surveillance review, patterned after a similar study for cattle. Dr. Linda Logan, formerly with ARS, shared some information with the group that there were some research dollars that could possibly be directed at the feral swine problem and added that continuing our resolution #15 at this time might positively influence the decision-making process on research funding that is currently under consideration.

A review of a “white paper” entitled An Outline for a National Action Plan on Feral/Wild Swine was given by Dr. Max Coats. The paper gives the background and then identifies two goals:

1. The first goal is to reduce the risk of disease transmission between feral/wild and domestic swine populations caused by local production and marketing practices.
2. The second goal is to reduce the intrinsic risks posed by feral/wild swine populations.

Seven action items are listed in the paper and, maybe most importantly, there is a proposed budget of 70.5 million dollars, to be directed at the problem beginning in FY 2002 through FY 2006. Also important is that the paper includes Wildlife Services of APHIS as a partner.

A follow-up to the “white paper” discussion was given by Dr. Taft to explain a proposed UM&R for feral/wild swine pseudorabies and brucellosis for control and eradication. Dr. Taft told the group that the draft certainly was only a work in progress and was put together and put forward as a basis for dialogue that might be more productive than previous discussions.

Committee discussion followed and a decision on the draft UM&R was held in abeyance and generally the group felt that the states with the problem should begin, in earnest, on a plan of their own to address their situation...as Florida, Louisiana and Arkansas have done. There was support for providing input and comments to Dr. Taft on the “white paper” to be finalized and be available to decision makers, industry and others as the foundation document for understanding the issues and advocating for the resources necessary to begin resolution of the problem.

The subcommittee voted to renew their resolutions from last year with Wildlife Services of APHIS to be added to the list of agencies to receive the resolution directed at feral/wild swine research. Further, the sub-committee voted to ask the membership of the parent committee to request the chairman to work with the Chairman of the PRV committee to name a working group, to include representation from the Wildlife community, to attack and bring to bear the expertise and track record of USAHA to build on the
"white paper", draft UM&R, and draw on the best of plans from various states to begin to find, implement and administer, measures that will, if not eliminate, reduce the negative impact of feral swine on our domestic swine industry.

The cull sow and board slaughter surveillance resolution from last year read as follows:

**Background Information** - A joint task force made up of industry, regulatory officials and practitioners has developed a long-range plan for swine brucellosis and pseudorabies surveillance after the eradication programs are completed. The joint task force has also developed a series of recommendations regarding the seine-slaughter surveillance program, which is the program of choice for surveillance in the final stages of the eradication program in many states.

**Resolution** - USAHA urges APHIS-VS and cooperators to conduct a review of cull sow and boar slaughter surveillance for brucellosis and pseudorabies. As suggested in the swine brucellosis subcommittee report of 1998, and restated in 1999, this review could be patterned after a recent review of the cattle slaughter surveillance program.

The feral/wild swine research dollars resolution from last year read as follows:

**Background Information** - Feral/wild swine continue to pose an increasing threat of acquiring, harboring and transmitting diseases with significant animal and human health importance and trade impact. There is a crucial need for pertinent research and field studies that address threats related to feral wild/swine.

**Resolution** - USAHA urges the Secretary of Agriculture to recognize the feral/wild swine threat as a high priority for funding for research through ARS and CSREES and field studies through USDA-APHIS-VS and Wildlife Services. In particular, funding is necessary to: 1) Conduct population studies needed to support the development of threat-management strategies...2) Define the role of Brucella strain RB51 for use as a dual vaccine and conduct field trials to determine its efficacy...3) Conduct further study and field trials in relation to swine brucellosis and pseudorabies infection in feral swine and their transmission to domestic swine.

A motion was made, seconded and passed to accept the Subcommittee report.

**REPORT OF THE BRUCELLOSIS SUBCOMMITTEE ON EDUCATION**

The Brucellosis Subcommittee on Education met on October 22, 2000. Over the past 46 years, a significant amount of progress in the reduction of both bovine and porcine brucellosis has been made. Over that period of time we've gone through several periods of despair and elation, but
the eradication of brucellosis in our domestic cattle population now appears to be imminent with only three infected herds presently known in the United States. In the middle 70s and early 80s, the industry in the Southern Region especially was questioning whether the disease would or could be eradicated. We cannot lose sight of the fact that the two primary factors which revitalized the program during those "dark times" were the promotion of calfhood and whole herd vaccination and education about the disease and the program.

The major challenge that we now face in the brucellosis eradication program is related to the wildlife reservoirs of infection [Brucella abortus in the elk and bison in Yellowstone National Park (YNP) and the Greater Yellowstone Area (GYA); and, Brucella suis in feral swine which are widespread, particularly in the Southern Region]. We shouldn't minimize the importance of education and the dissemination of factual information, as we develop strategies to combat those problems in the public arena.

On October 22, 2000, the Brucellosis Education Subcommittee convened to discuss the educational issues important to the brucellosis eradication program. Ten members and interested patrons participated in fruitful discussions about those topics.

Dr. Jim Logan, Wyoming State Veterinarian, presented an update on Program Activities in Wyoming. The Wyoming Livestock Board has endorsed the following regulatory requirements in an effort to minimize the perpetual risk of brucellosis infection in YNP and the GYA:

1. Mandatory vaccination of all resident, and imported, replacement bovine and bison heifers with Brucella abortus strain RB 51.
2. Mandatory identification of all test-eligible bison and bovine prior to change-of-ownership.

Dr. Logan also presented data pertaining to the MCI surveillance testing program. A total of 112,647 (well over the 10% figure required to maintain Class Free status) cattle have been tested in Wyoming between January 1, 2000 and September 30, 2000, without infection being disclosed.

Dr. Bob Hillman, Idaho State Veterinarian, and President of the U.S.A.H.A., gave an update of the activities of the Greater Yellowstone Interagency Brucellosis Committee (GYIBC) and the elk feeding grounds in Idaho. He pointed out that there are two Environmental Impact Statement (EIS) documents involved in the brucellosis situation in the three state area around YNP:

1. EIS between the State of Montana and the Department of Interior concerning the management of bison in YNP. Since those negotiations are being conducted under a court mandated gag order, that information is not available.
2. The EIS on the management of the bison herd in the Jackson Hole/Teton Park area is not expected to be completed for another 3 years.

Dr. Hillman mentioned that the philosophy of the "special interest groups"
involved in the dispute is that the solution to the problem is the abolishment of grazing rights in the GYA. That notion obviously has an adverse effect of numerous cattle producers in the area. GYIBC has produced a short videotape about brucellosis in the GYA which is available upon request, and it distributes a quarterly newsletter which is widely circulated.

Dr. Arnold Taft, Senior Staff Veterinarian of APHIS, Veterinary Services, National Animal Health Programs Staff in Riverdale, Maryland, reported on the proposed Feral Swine Uniform Methods and Rules that is in the draft stage. There was significant discussion about ways to reach the grassroots/backyard swine producer with information about the disease transmission risk of allowing contact between feral swine and his/her domestic herd. The committee agreed that the development of that information in the form of PSA's and articles is important.

Dr. Claude Barton conducted a discussion on the need to resurrect and promote the principles, concepts, and procedures, which are outlined in the Brucellosis Emergency Action Plan, which was originally published in 1997. Dr. Barton also emphasized the importance of continuing to interact with veterinary colleges and associations in order to maintain the rapport and information exchange with that important segment of the industry.

Mr. Larry Mark, USAHA Webmaster, agreed to facilitate link-up between the USAHA webpage and the webpages of Wyoming and GYIBC in order to expand the educational network concerning the critical issues of the GYA.

The Education Subcommittee encourages the Brucellosis Committee to promote the following activities to enhance the educational initiative:

1. The submission of articles about the widespread (national) impact of perpetuating the reservoir for Brucella abortus in YNP/GYA to the GYIBC for publication in their quarterly newsletter.

2. In order to expand the distribution of their quarterly newsletter, submit names and addresses of commodity groups/associations, educational institutes, and clubs, to the GYIBC.

3. Since the last reservoir for Brucella abortus and B. suis will likely be in wild ungulates, encourage the development of a greater rapport with local, county, and state wildlife management agencies at the grassroots level with frequent personal contact and interaction.


5. Promote a greater interaction with veterinary colleges and associations.

The committee resolved to remain active via frequent conference calls and E-Mails throughout the year in order to address the important issues associated with brucellosis education.

A motion was made, seconded and passed to accept the Subcommittee report.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
This report on activities during the past year to control brucellosis in wildlife in Wyoming will summarize recently completed research conducted at the Wyoming Game and Fish Department's Sybille Wildlife Research and Conservation Education Unit. In addition, it will address surveillance to monitor the progress of elk brucellosis control efforts, ballistic vaccination of free-ranging elk against brucellosis, plans for updating and revising Brucellosis Management Action Plans, and the status of Wyoming's lawsuit against Secretary of Interior Babbitt regarding the Department of Interior's refusal to cooperate with or allow Wyoming to vaccinate elk on the National Elk Refuge.

Research

Strain RB51 was evaluated in captive elk to determine if it protected against abortion following subsequent challenge. Thirty elk were vaccinated intramuscularly with $1.0 \times 10^{10}$ colony-forming units (CFU) of strain RB51 in March 1998. Fourteen of these were given a booster dose of $1.13 \times 10^{10}$ CFU exactly one year later. All vaccinated elk seroconverted to strain RB51 with the booster group having higher titers ($P < 0.001$). Seventeen other elk served as unvaccinated controls. All elk were bred and determined pregnant using pregnancy-specific protein B analysis. Elk were challenged in March 2000 with $1.1 \times 10^7$ CFU of \textit{B. abortus} strain 2308 administered intraconjunctivally and all elk seroconverted to strain 2308. Fifteen of 17 control elk aborted; 16 of 16 elk given a single vaccination aborted ($P = 0.44$); and 13 of 14 elk given a booster aborted ($P = 0.86$). There were two viable calves in the control group and one in the booster group. Strain 2308 was recovered from fetuses and nonviable calves in all groups. Based on the results of this and other studies, the use of strain RB51 to prevent abortion in elk cannot be recommended and the Wyoming Game and Fish Department will continue to use strain 19 in its elk vaccination program.

To assess biosafety in non-target species, bighorn sheep ($n = 10$), pronghorn ($n = 9$), mule deer ($n = 11$), moose ($n = 10$), and coyotes ($n = 24$) were given a single oral dose of at least $1.0 \times 10^{10}$ colony-forming units of \textit{Brucella abortus} strain RB51 vaccine. Animals were randomly divided into Challenged and Control Groups. Ungulates were captured, blood sampled, and swabs taken from the nares, rectum, and vagina for bacterial culture on Day 0, 42, and 84 post-inoculation (PI). On Day 42, the Vaccinated Group became a Control Group and vice versa in a crossover design. Blood and swab samples were taken from coyotes on Days 0, 14, 28,
and 42 PI. There was no crossover for the coyote study. Two coyotes from each group were also euthanized and cultured for RB51 on Days 42, 84, 168, and 336 PI. Blood samples were analyzed for 1) hematological changes, 2) titers to strain RB51 using a modified dot-blot assay, 3) titers for antibodies to the LPS O-side chain using standard tests, and 4) acute phase reactants. No morbidity or mortality as a result of challenge was observed in any animal. There were no differences in hematologic parameters at any time for ungulate species; challenged coyotes had higher hematocrit, hemoglobin, and eosinophil counts (P < 0.006). All species seroconverted to strain RB51, except for moose in which 5 of 9 seroconverted. Strain RB51 was cultured from oropharyngeal lymph nodes from one coyote 42 days PI and from a moose 117 days PI. This study indicated that a single oral dose of RB51 vaccine was safe in these species.

Brucellosis Surveillance

In order to monitor progress of brucellosis control efforts, elk are trapped and bled on representative winter feedgrounds. Sera are tested using four standard tests (standard plate, card, rivanol, and complement fixation) and a competitive ELISA (cELISA) that has been shown valid for distinguishing strain 19-induced titers from field strain Brucella abortus-induced titers in elk.

For the third consecutive winter, elk were trapped at Dell Creek Feedground. A total of 65 elk were trapped with 22 adult females tested. Serology results indicate prevalence is high with 45% (n=10/22) of the females testing positive. Average seroprevalence for the three year period 1998-2000 has remained higher than any other feedground tested at 53% (n=49/93). These results are consistent with the fact that due to the secretive nature of elk at this feedground, there is no active vaccination program and there remains a high degree of brucellosis exposure. The elk on Dell Creek Feedground are used as a control for comparative purposes to evaluate the vaccination program on other feedgrounds.

Elk were trapped for the eighth consecutive year at Greys River Feedground. A total of 115 animals were trapped and 38 adult females were tested for brucellosis antibodies. Standard brucellosis testing indicated 45% (n=17/38) of females tested positive. However, after removing vaccine titers through cELISA testing, 26% (n=10/38) of the females were seropositive. These data add further evidence that the strain 19 vaccination program has reduced brucellosis-related abortions and subsequent exposure to the disease.

A total of 124 elk were trapped at Horse Creek Feedground with 42 adult females bled for brucellosis evaluation. Based on the standard serologic tests, 48% (n=20/42) of the females, tested positive for Brucellosis abortus antibodies. However, after removing vaccine titers using the cELISA
test, 19% (n=8/42) of the test eligible females were reported positive. The last time this feedground was surveyed was 1988 when 32% (n=9/28) of the adult females tested positive. Strain 19 vaccination was initiated in 1989 and since then, over 4,400 elk have received inoculations. The marked decline in seroprevalence (41%) since 1988 suggests the strain 19 vaccination program has reduced the occurrence of abortion and enhanced immunity in elk to brucellosis.

Elk were trapped, tagged, and tested for \textit{Brucella abortus} antibodies at Black Butte Feedground for the first time since 1989 when 17% (n=4/24) of the adult females were classified as seropositive. During the 1999-2000 winter, a statistically valid sample of 34 adult females was tested. Standard serologic tests indicated 21% (n=7/34) of the adult female sample was positive for \textit{Brucella} antibodies. Additional evaluation cELISA test to identify vaccine induced antibodies revealed 9% (n=3/34) of the elk tested were actually exposed to field strain \textit{Brucella}. Statistical evaluation (Fisher Exact Test of 2 Proportions) comparing Black Butte (Treatment) to Dell Creek feedground (Control) indicates that seroprevalence at Black Butte is significantly lower than Dell Creek. Strain 19 vaccination was initiated at Black Butte in 1989 while no vaccine has been administered at Dell Creek. The treatment versus control comparison suggests that after 12 years of strain 19 vaccination at Black Butte, brucellosis seroprevalence has been significantly reduced. This trend has also been reported at other feedgrounds where strain 19 vaccination and other brucellosis management activities have been in place for at least one decade.

\textbf{2000 Brucellosis Vaccination}

Strain 19 calfhood vaccination was again very successful this winter with a majority of the feedgrounds reporting complete calfhood coverage. In fact, many feedgrounds reported over 100% coverage, which suggests yearling females were boostered at several areas during calfhood vaccination. A total of 2720 calves were vaccinated at 18 state feedgrounds. In the Gros Ventre, gray wolf predation concentrated elk at Patrol Cabin Feedground for much of the winter feeding season. Normally elk in the Gros Ventre would be spread out among 3 feeding sites. While elk densities were much greater at this feedground than desired, all calves were successfully vaccinated. Due to mild winter conditions, calves at the Bench Corral Feedground were not vaccinated. Next winter, in addition to the normal calfhood vaccination, adults will also be vaccinated to cover the 2000 juvenile age class that was not covered. Since the inception of the strain 19 program in 1985, over 47,000 elk have been vaccinated.

The air-powered ballistic delivery system for brucellosis vaccination is extremely effective and it likely the most reliable, humane, efficient, and safe system currently available for delivery of vaccines to free-ranging ungulates. To make the ballistic delivery system work, it is necessary to rec-
REPORT OF THE COMMITTEE

Recognize its limiting capabilities and devise ways to work within these them (e.g., range, accuracy).

Equally important to the elk vaccination program is the National Veterinary Services Laboratory which loads lyophilized strain 19 vaccine into biobullets.

**Brucellosis Management Action Plans**

The Department developed Brucellosis-Feedground-Habitat (BFH) Action Plans through intra-agency working groups in 1990. These BFH Action Plans were developed for each elk herd in Wyoming’s portion of the Greater Yellowstone Area (GYA). BFH plans for 14 elk herds were completed by December 1990 covering site-specific management problems and proposed strategies. These plans were a collaborative effort of biologists, wardens, feedground managers, and veterinarians. The plans had general support from Department administration and field personnel but federal land managers and the public did not review the documents.

Since 1990, many components of individual plans have been integrated into management actions. The plans are now more than 10 years old and contain outdated information. In addition to outdated data, several other justifications for revision have surfaced:

1. Provides forum for internal review of existing management actions to address brucellosis in elk.
2. Opportunity to consolidate internal working documents related to brucellosis management (Habitat Plans, Feedground Plans, BFH Plans) into a single reference document.
3. Could serve as Department document to address WGFD position on brucellosis management activities in reference to future Federal/NEPA activities.
4. Could serve as Department document to address WGFD position on brucellosis management activities for future Federal funding requests (i.e. APHIS Grants).
5. Provide an opportunity for public information and participation.
6. As a cooperating agency with the Greater Yellowstone Interagency Brucellosis Committee (GYIBC), completing a revision of existing WGFD plans addresses the mission of the interagency committee which states: *Facilitate the development and implementation of brucellosis management plans for elk and bison and their habitat in the GYA.*

During the next 1-2 years, all the plans will be updated and revised as Brucellosis Management Action Plans. This will include a public information and outreach process.

**Wyoming Versus Babbitt (Elk Vaccination on the National Elk Refuge)**

The State of Wyoming brought suit against the federal government re-
questing the court provide declaratory relief by ordering that the Fish &
Wildlife Service is without power to keep the Wyoming Game and Fish
Department from managing the spread of brucellosis on the National Elk
Refuge. The State’s contention is that the Refuge Act reserves the author-
ity of the states to manage wildlife within their borders.

Federal Judge Brimmer dismissed all of the state’s claims on August
24, 1999 on the grounds that the federal government did not waive sover-
eign immunity. Brimmer also concluded that the federal government has
complete authority to manage wildlife on federal lands pursuant to the Prop-
erty clause of the Constitution, and that because they have such plenary
power, Secretary Babbitt was not acting outside the scope of his authority
when he denied the state access to vaccinate elk.

Wyoming has filed an appeal in the 10th Circuit Court of Appeals be-
cause the decision drastically misinterprets the power of the Secretary of
Interior under the Property Clause. The property clause provides that Con-
gress has the power to preempt state law on federal property if it chooses
to do so. However, in this case, Congress not only did not expressly pre-
empt state law, it purposefully chose to endorse state authority to manage
wildlife with the savings provision which states “Nothing in this act shall be
construed” to override state authority to manage wildlife on refuge lands.
Rather than upholding Congress’ directive, Secretary Babbitt acted in spite
of that language, and construed the act to preempt the state’s authority.

The International Association of Fish and Wildlife Agencies has filed an
amicus brief in support of the state’s position. The 10th Circuit decided not
to hear oral arguments, but rather to decide the issue after reading the
briefs. We are currently awaiting that decision.

SAFETY OF BRUCELLA VACCINES
IN PRONGHORN ANTELOPE

Philip H. Elzer, Julie A. Smith, John F. Edwards,
Thomas J. Roffe, Donald S. Davis

Background and Justification
A major concern in using brucellosis vaccines is that non-target spe-
cies may come in contact with the vaccines, and exposure to these agents
may cause reproductive failure in such species. The purpose of this pro-
posal is to determine if there are any detrimental effects from such expo-
sure on reproduction in a non-target ruminant, the pronghorn antelope.
These non-target ruminants could possibly be exposed to Brucella vac-
cines (Brucella abortus strain 19 or RB51) (Enright and Nicoletti, 1994:
Jimenez et al 1994, Roop et al 1991, Schurig et al 1991) used in the eradi-
cation and control of brucellosis in elk and bison.

Wild ungulates are susceptible to the infection and disease known as
Brucellosis. *Brucella abortus* can infect elk (*Cervus elaphus*); and under experimental procedures, elk have transmitted the disease to cattle (Thorne et al, 1978). There is circumstantial evidence that elk have transmitted brucellosis to cattle under natural conditions. The Greater Yellowstone Area (GYA) contains the largest free-ranging populations of elk and bison (*Bison bison*) in the world. For economic and human health purposes, a cooperative state/federal bovine brucellosis eradication program began in 1934 with the goal of eliminating bovine brucellosis from the United States. The target date for achieving that goal was year's end 1998. The presence of brucellosis in wildlife in the GYA creates a conflict with this goal because of the continuing presence of *B. abortus* and the possible risk of brucellosis transmission from wildlife to livestock (Thorne and Morton, 1975; Davis, 1990).

Elimination of *B. abortus* has been addressed in livestock by three methods: 1) depopulation of all animals within a herd upon infection or exposure to brucellosis by any member of that herd; 2) test and slaughter within a herd those individual animals that are infected with brucellosis; and 3) whole herd vaccination which decreases infection and transmission with the eventual elimination of the disease through testing and attrition of infected animals. For either of the first two methods to be employed to eradicate brucellosis in the GYA, thousands of elk would have to be slaughtered. It is highly unlikely that the American public, through legal and political opposition, would allow this to occur, even if this action were feasible. Thus, widespread vaccination of elk and bison is probably the only acceptable means of controlling or eliminating brucellosis in wildlife from the GYA.

There are three primary vaccination methods that could be used for wildlife: 1) ballistic vaccination whereby vaccine is delivered to individual animals by means of a biobullet or dart; 2) widespread oral vaccination using baits or treated food distributed within the target animal's environment; or 3) recombinant viruses expressing desired antigens that spread by contagious infection among target animals.

Although successfully used on elk on feedgrounds, there are limitations to ballistic vaccination: 1) individual animals must be located; 2) animals must be approached to within a distance of 100 ft.; and 3) target animals must be successfully struck and inoculated with the vaccine. Oral vaccination may address the limitations of ballistic delivery.

Widespread oral vaccination for rabies in foxes (*Vulpes vulpes*) has been developed and successfully implemented in several countries (Winkler and Bögel, 1992). Thus, oral delivery holds promise for the brucellosis vaccination of elk. Oral vaccination would potentially expose more target animals to the vaccine at a lower cost per animal than would ballistic vaccination. However, successful oral vaccination would require that: 1) the target animal come in contact with the vaccine; 2) the vaccine be ingested by the target animal; 3) the target animal consume a dose sufficient to
BRUCELLOSIS

invoke the desired immune response; and 4) non-target animals are not adversely affected.

Objectives
1. Determine the effect of oral vaccination with Strain 19 in pregnant pronghorn antelope.
2. Determine the effect of oral vaccination with Strain RB51 in pregnant pronghorn antelope.

To test the hypothesis that “exposure to strain 19 or RB51 will not cause any adverse effects on reproduction in pronghorn antelope,” the following experimental design was performed.

Methods and Approach
Source and Husbandry:
Pronghorn antelope were captured with the assistance of the Wyoming Department of Game and Fish. The animals were transported to Texas A&M University, College Station, TX. The animals were housed at the Texas A&M large animal biocontainment research farm throughout this study which is approved for brucellosis research through the USDA and the CDC.

Animals: 90 pronghorn antelope females - sexually mature
Vaccines: Strain 19 administered at 1x10^10 colony forming units (cfu)
Strain RB51 administered at 1x10^10 cfu

These doses will be used in accordance with previously published results using the oral vaccination route (Elzer, et al 1998; Hagius et al, 1995; Nicoletti and Milward, 1983; Xin, 1986).

Route: Oral vaccination was performed through scarification of the oral mucosa with a wire brush, and the vaccine was placed into the animal's oral cavity. This method for oral vaccination is similar to what the investigators have used to orally expose cattle, goats, elk and bison to Brucella vaccines (Elzer, et al, 1998).

Groups: 1. Saline - 30 animals
2. Strain 19 - 30 animals
3. RB51 - 30 animals

Delivery status was monitored for each animal; and abortions, live and dead births were recorded. Fetuses and dams were necropsied to obtain samples for histology and bacteriology. The following samples were taken: liver, spleen, lung, abomasal fluid, various maternal lymph nodes and the entire reproductive tract.

Due to unforeseen mortality problems, acute (45 days post vaccination) and epidemic, the pronghorn were subsequently euthanized throughout the experiment. Acute mortality was due to capture-related problems that included stress, heat, pasturella pneumonia, and trauma. Foot-rot and
gram negative pneumonia contributed to epidemic mortality. Therefore, the effects of vaccines on colonization, infection, and maintenance of pregnancy during the early, mid and late phases of gestation were determined.

Results
All of the pronghorns remained pregnant throughout the experiment regardless of vaccine exposure or other health-related problems.

Histopathologic examination of the reproductive tracts and lymphoid tissues revealed no Brucella-associated lesions in any of the animals. The reproductive tracts appeared healthy and normal in all of the animals.

Tissues were cultured for the presence of the Brucella vaccines. Of the animals necropsied in early gestation, one animal had 3 cfu of RB51 in its abomasal fluid and another stomach fluid sample had 2 cfu of S19. Two animals in mid gestation were culture positive for strain 19, 1 cfu in a fetal liver and 1 cfu in from a placenta. There were no Brucella culture positive animals in the saline control group or in any of the late gestational animals.

Conclusions
RB51 and S19 rarely colonized maternal and fetal tissues of pregnant pronghorn and when present occurred at very low numbers and without pathology. Neither vaccine at this dose appears to be a hazard to pregnant pronghorn when orally delivered to maximize vaccine uptake.

References
BRUCELLOSIS


BRUCELLOSIS IN ELK IN IDAHO –
AN UPDATE AND SUMMARY

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Introduction

Brucellosis was identified in elk in eastern Idaho in 1998. Since that time, surveillance efforts have been instituted using 2 techniques – hunter test kits and trapping and testing of elk that are fed during winter. Data from samples submitted by elk hunters have indicated a background level of 8-10% in elk that are not associated with winter feed grounds. There are at least 3 and likely more sites in eastern Idaho where private landowners feed elk on an annual basis during the winter. To date, the majority of trapping and testing of elk has been conducted at the Rainey Creek feed site. Elk that are seropositive for brucellosis have been found at the Conant Creek and Teepee Creek, but numbers of elk tested at these as well as the Victor site are small (< 20 animals per site). The elk herd located at Rainey Creek in eastern Idaho comprises the most heavily sampled and infected elk herd in Idaho. Elk in this herd are infected with Brucella abortus biovar 1 and 4, with biovar 4 being predominant. Seroprevalence in this herd is a 53%, but varies by sex and age group. Continued surveillance of cattle has not identified any infected herds in Idaho, even in herds that have direct contact with known or suspected infected elk. Extensive winter habitat improvement programs on public and private lands are currently underway,
but will take several years to provide enough winter habitat to allow winter feeding of elk to be discontinued.

Materials and Methods
Sampling of elk is a cooperative effort between IDFG, ISDA and USDA personnel and facilities. Elk that are trapped are bled and tested on site using the Standard Plate and the Card tests. Serum from all animals is then retested using the Card, Standard Plate, Rivanol, Complement Fixation and BAPA test at the ISDA Animal Health Laboratory in Boise. All seropositive animals identified at the trap sites using the Standard Plate and Card tests are shipped to either the Caine Veterinary Teaching Center in Caldwell for euthanasia and tissue sampling or the Wildlife Health Laboratory in Caldwell for subsequent testing and temporary holding. Serological data from testing at the ISDA Animal Health Laboratory generally identified higher numbers of animals than the tests used at the trap site.

Trapping was conducted at Rainey Creek and the Tepee Creek feedgrounds. Overall, trapping conditions were difficult due to mild winter conditions, which resulted in fewer elk at feedgrounds. Trapping was initiated at Tepee Creek in early January 2000 but not at Rainey Creek until mid-February 2000.

Continual monitoring of cattle within Idaho via the required testing imposed by ISDA and USDA for market cattle and dairy cattle is essential to effective surveillance of cattle within Idaho. Whole herd testing of cattle on premises where feeding of elk that are known or suspected to be infected with brucellosis is conducted on an annual basis and continues.

An intensive and ongoing effort to educate landowners about elk feeding and disease concerns is underway. Considerable effort is underway to assist willing landowners with CRP acreage to convert from the smooth brome plantings to bitterbrush and native grasses. In addition, significant efforts are underway to assist landowners in providing refuges for wintering elk from harassment by snow machines.

Results and Discussion
Blood collection kits were distributed to holders of Idaho controlled elk hunt permits in the Brucellosis Risk area of the Upper Snake Region as well as two Game Management Units in the McCall Subregion of central Idaho around a long-term feed site at Gold Fork. A total of 900 kits were sent out in eastern Idaho and 300 were sent out in central Idaho. In eastern Idaho, 45 useable samples were returned. Four (8.9%) of the 45 useable samples were seropositive for brucellosis. In central Idaho, 14 useable samples were returned; none of the samples were positive for brucellosis. A summary of data collected to date is provided in Table I.

Based on two years of data collection, the area of concern for brucellosis is limited to eastern Idaho. Seropositive animals have been identified in
7 hunt zones (60A, 62, 62A, 64, 62A-1, 67, and 67-3). The geographic
distribution of seropositive elk does not appear to vary significantly by year,
but sample sizes in many zones are small. Further testing of elk in other
areas of Idaho with consistent winter feeding is needed to ensure that bru-
cellosis is limited to eastern Idaho.

Trapping and testing data from the Rainey Creek trap site are summa-
rized in Table 2. The trap site at Rainey Creek was operated between
February and March 2000. A total of 45 elk were captured and tested for
brucellosis. Of these 45 animals, 21 (46.7%) were seropositive for brucel-
losis. Seroprevalence by age and sex are shown in Table 1. Seventeen
seropositive elk were transported to either the Wildlife Health Laboratory (9
cows) or the Caine Veterinary Teaching Center (5 calves and 3 cows). Three
seronegative adult female elk were radio-collared and translocated to the
Burns Creek winter range. Two of the 3 individuals returned to the Pal-
sades Creek area. The third remained on private land in the riparian habi-
tat along the South Fork of the Snake River. Additionally, 14 female calves
were vaccinated with RB51; 3 of these animals were subsequently found to
be seropositive for brucellosis and removed while the remaining 11 animals
were translocated to Burns Creek about 20 miles away.

Twenty-three elk, first radio-marked in 1998 at Rainey Creek, were
monitored through 2000. Elk that use the Rainey Creek feed site were
distributed primarily throughout the southeastern portion of hunt unit 67
from Pine Creek southeast and into the western portion of Wyoming Game
and Fish elk hunt area 73. No apparent shifts in elk distribution across
State lines or watersheds were observed in relation to hunting season ac-
tivities. Telemetry flights in 1999 and 2000 supported the 1998 findings
indicating this group of elk is available to both Idaho and Wyoming hunters.

Trapping at Tepee Creek was complicated and largely unsuccessful.
Ranch personnel were feeding an estimated 30 pounds of hay/elk/day to
bait elk away from the nearby cattle feeding operation and elk were difficult
to trap. Trapping efforts were suspended in late January in hopes that
increases in snow and cold through the winter might provide better trapp-
ing. Trapping was resumed in late March with 2 adult females and 2 bull
calves captured, bled and radio-collared. One of these animals was serop-
ositve for brucellosis. Further testing of the animals that winter at this
location is needed to determine the prevalence of brucellosis within this
group of elk. The elk radiocollared at the Tepee Creek site were moni-
tored through the spring and early summer of 2000. The 2 calves and 1 of
the cows moved east into the Bitch Creek/Jackpine drainages of Wyoming
while the second cow moved south approximately 15 miles south into the
Spring Creek/Darby Creek drainages. While these elk may be available to
Idaho hunters for a short time in the fall prior to their movement to the feed
ground, they are most likely only available to Wyoming hunters throughout
their seasons.
Trapping of elk was not conducted at the Conant Creek site because the landowner was unwilling to grant permission for access or construction of the trap. Although elk were not trapped at Conant Creek during the 1999-2000 winter, 3 elk radio-collared during the winter of 1997-1998 were monitored. Seasonal movements of these 3 individuals suggest the Conant Creek animals are likely based in Yellowstone National Park during spring, summer, and fall. In all years, the elk spent their summers centered around the Bechler River area of southwestern Yellowstone National Park. Movement out of the park and to the Conant Creek winter range occurred in December of both 1998 and 1999. As such, these elk are likely not available to hunters in either Wyoming or Idaho.

Although no plans were made to trap elk at the Victor site, elk distribution in the area was monitored. There were no known congregations of elk on the Victor site where elk have traditionally been fed, but elk may have been fed on other private feed grounds in the area. Four elk, radio-collared in 1998, were monitored through the spring and summer of 2000. These elk were distributed across the Idaho/Wyoming border from Spring Creek in the north to Trail Creek to the south. One individual traveled as far south as Mosquito Creek in Wyoming but subsequently returned to the Victor area. The Victor elk may be available to both Idaho and Wyoming hunters depending on hunting pressure and environmental conditions affecting distribution.

Elk feeding was done during the winter of 1999-2000 at the private feed site at Gold Fork in north central Idaho and the 6 sites in the vicinity of Featherville and Fairfield in east central Idaho. No elk were tested at Gold Fork. A total of 17 elk were darted at the feed sites in Region 4 and sampled for brucellosis; all 17 were negative.

All seropositive elk as defined by the USDA UMR were transported to either the Caine Veterinary Teaching Center or the Wildlife Health Laboratory. A summary of data collected to date is provided in Table 3. Of the 9 cows trapped and transported to the Wildlife Health Laboratory in 2000, all nine were pregnant. All nine cows gave birth, although one calf was stillborn. Culture results indicated that 2 cows (22.2%) were positive for *Brucella abortus* (both with biovar 4). Among the calves, one was infected with a mixed infection of *Brucella abortus* (both biovar 1 and 4). Of the eight animals taken to the Caine Veterinary Teaching Center in 2000, two were culture positive (one with *Brucella abortus* biovar 4 and one with RB51). The animal with a positive culture for RB51 was vaccinated with RB51 at the trap site two weeks prior to euthanasia.

Active surveillance of brucellosis within Idaho cattle in 2000 was conducted for three beef herds on premises where elk were or had been fed and 1 sentinel herd located on the periphery of the brucellosis impact area (Table 4). Of the 245 cattle on premises with active feeding of elk, 242 were negative, 2 were low-level suspects, and 1 was hemolyzed (not tested).
None of the low-level suspects were negative on retesting.

Passive surveillance using the Market Cattle Identification program and the Milk Ring test was also done in 2000, but data collection is not yet complete for this calendar year. To date, a total of 278,553 beef cattle were tested, of which 2178 (0.06%) were seropositive. Among dairy cattle, 944 were tested, 25 herds (1.03%) were found to be responders for brucellosis. None of the responding herds were positive on follow-up testing.

Habitat enhancement projects have focused on three main activities: 1) reduce human disturbance; 2) enhance private land habitats; and 3) enhance public land habitats.

In order to minimize disturbance of wintering elk by limiting human activities in wintering areas and to educate winter recreationists on how to minimize disturbance to wintering big game plastic signs were provided to landowners in the key elk wintering areas in Teton and Fremont Counties. The signs stating "Private Property, Big Game Wintering Area, Access With Permission Only" were put up by at least eight landowners encompassing 3,800 acres in Teton County. A large block of 4,500 acres and numerous landowners along the north side of Teton Canyon in Fremont County was posted with signs stating "No Trespassing, Closed To Public Access by the Landowners from December 1 to May 1, To Protect Wintering Big Game". These voluntary closures of private lands were moderately to highly successful. Additionally, a winter closure was once again implemented on the 280-acre Rainer Access Area in Teton Basin. The Teton County properties received considerable use by 100-150 elk during the winter. IDFG staff is currently coordinating with BLM to implement a closure of nearly 5,500 acres of winter range along the Teton Front to protect wintering big game.

Copies of the pamphlet "Weathering the winter" produced by the Rocky Mountain Elk Foundation were supplied to ski and snowmobile-related businesses throughout the Upper Snake Region. A map showing broad areas of important big game winter range in the Big Hole and Teton Mountains was produced and supplied to ski and snowmobile-related businesses.

Private landowners with lands enrolled in the Conservation Reserve Program (CRP) were assisted in efforts to enhance existing CRP lands or, in newly enrolled acres, to encourage planting of seed mixes with high wildlife value. Staff of IDFG and ISDA worked closely with NRCS staff to identify landowners in Teton and Fremont Counties who were interested in enhancing their CRP acres for big game habitat.

In addition, IDFG and ISDA staff are coordinating with Targhee National Forest staff as they implement various treatments related to the Big Holes Vegetation Treatment Project in the Big Hole and Teton Mountains. Several prescribed fire units were successfully burned in fall 1999. Staff of IDFG and ISDA is working closely with the Targhee National Forest, BLM, and Wyoming Game and Fish Department to complete planning for the Teton Front Vegetation Treatment Plan. This project will implement pre-
scribed burns in a number of winter range areas straddling the Idaho-Wyo-
mimg border on the west slope of the Tetons. The Targhee NF has been
delayed in completing the NEPA for this project.

Although the situation in Idaho is difficult, control of the disease in elk is
possible. The current situation must be put into context of the elk popula-
tion in Idaho. The elk herds in the brucellosis impact area in eastern Idaho
number approximately 2000 animals. The Rainey Creek herd numbers about
300-400 animals. These represent less than 1% of the elk in Idaho indicat-
ing that the degree of infection and risk of disease transmission in Idaho is
small. Continual monitoring and increased efforts to remove seropositive
animals should allow control of the disease within Idaho. Ultimately, eradi-
cation of the disease in elk in Idaho will be dependent on the status of
brucellosis in elk and bison in the Greater Yellowstone Area and the actions
of the GYIBC.

Table 1.
Results of hunter test kits sent to controlled

<table>
<thead>
<tr>
<th>Date</th>
<th>Kits sent</th>
<th>Samples returned</th>
<th>Samples useable</th>
<th># seropositive</th>
<th>% seropositive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>1000</td>
<td>183</td>
<td>173</td>
<td>10</td>
<td>6.8%</td>
</tr>
<tr>
<td></td>
<td>eastern ID</td>
<td></td>
<td></td>
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<tr>
<td>1999</td>
<td>900</td>
<td>56</td>
<td>45</td>
<td>4</td>
<td>8.9%</td>
</tr>
<tr>
<td></td>
<td>eastern ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>2700</td>
<td>22</td>
<td>14</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>central ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2.
Seroprevalence by age and sex for elk trapped and tested for brucellosis, Rainey Creek, 1999-2000. Serological data are based on results from the Idaho State Animal Health Laboratory.

<table>
<thead>
<tr>
<th>Age and sex</th>
<th>1999 Total trapped</th>
<th>1999 Total seropositive (%)</th>
<th>2000 Total trapped</th>
<th>2000 Total seropositive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult female</td>
<td>61</td>
<td>49 (80.3%)</td>
<td>11</td>
<td>10 (83.3%)</td>
</tr>
<tr>
<td>Adult male</td>
<td>3</td>
<td>1 (33.3%)</td>
<td>1</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Yearling female</td>
<td>5</td>
<td>3 (60%)</td>
<td>3</td>
<td>1 (33.3%)</td>
</tr>
<tr>
<td>Yearling male</td>
<td>1</td>
<td>0 (0%)</td>
<td>4</td>
<td>1 (25%)</td>
</tr>
<tr>
<td>Calf female</td>
<td>14</td>
<td>5 (35.7%)</td>
<td>14</td>
<td>5 (42.8%)</td>
</tr>
<tr>
<td>Calf male</td>
<td>27</td>
<td>5 (18.5%)</td>
<td>12</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Total</td>
<td>111</td>
<td>63 (56.8%)</td>
<td>45</td>
<td>21 (46.7%)</td>
</tr>
</tbody>
</table>

Table 3.
Summary of data collected from elk from Rainey Creek transported to the Caine Veterinary Teaching Center or the Wildlife Health Laboratory, 1999-2000

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th># animals</th>
<th># culture positive</th>
<th>Biovar 1</th>
<th>Biovar 4</th>
<th>RB51</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Caine</td>
<td>11</td>
<td>6 (54.6%)</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Caine</td>
<td>8</td>
<td>2 (25%)</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Wildlife Lab</td>
<td>12 cows</td>
<td>5 (46.6%)</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>Wildlife Lab</td>
<td>9 calves</td>
<td>3 (37.5%)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Wildlife Lab</td>
<td>9 cows</td>
<td>2 (22.2%)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Wildlife Lab</td>
<td>9 calves</td>
<td>1 (1.1%)</td>
<td>1 (mixed)</td>
<td>1 (mixed)</td>
<td></td>
</tr>
</tbody>
</table>
REPORT OF THE COMMITTEE

Table 4.
Summary of brucellosis testing data from cattle herds in Idaho associated with known or suspected infected elk herds, 1998-2000.

<table>
<thead>
<tr>
<th>Year</th>
<th># herds</th>
<th># cattle tested</th>
<th># low-level suspects</th>
<th># retest positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>4</td>
<td>508</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>1999</td>
<td>3</td>
<td>715</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>3</td>
<td>763</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

BRUCELLA MELITENSI S IN SOUTH TEXAS

Terry H. Conger, State Epidemiologist,  
Texas Animal Health Commission

Brucellosis in Texas livestock has a long history of prevalence. The incidence of bovine brucellosis in Texas caused by *Brucella abortus* has, for many years, been among the highest in the nation. Swine brucellosis (*Brucella suis*) is endemic due to the presence of the disease in the resident feral swine population. For at least 30 years, however, *Brucella melitensis* infection in Texas, and the United States, livestock had not been documented in the literature until the episode described in this report.

In 1969, *B. melitensis* was reported Starr County, Texas, located in the lower Rio Grande Valley, when 77 goats and 8 sheep representing 3 herds were found to be seropositive on one or more serological tests for brucellosis. *Brucella melitensis* was isolated from 9 seropositive goats. The initial infected herd was found as the result of the diagnosis of brucellosis in children who had come into contact with cabrito carcasses being prepared for home use. Cabritos are young goats weighing approximately 15 pounds which are savored as a delicacy in the Hispanic culture.

Prior to this incident, the last *B. melitensis* disclosed in Texas was in Presidio County which is located approximately 480 miles west of Starr County along the border with Mexico. That episode was not recorded in the literature. After an absence for 25 years, *Brucella melitensis* infection occurs again in Texas livestock.

In August 1999, a cattle producer in Starr County, sold an 8-year-old cow through 22 the local livestock market that was positive for brucella antibodies on the buffered brucella antigen (BBA, or more commonly known as the card test) and CITE tests. The animal had no evidence of prior vaccination with *Brucella abortus* strain 19 vaccine. She was neither pregnant nor was she
nursing a calf at the time. The animal had previously borne calves, but there was no record as to how many. She was sold because she was losing weight and wasn't doing well. Udder secretions were collected for microbiological examination subsequent to the positive serological assays conducted at the market. Laboratory tests on the blood were positive on the particle concentration fluorescence immunoassay (PCFIA) with a value of 0.15 (any value below 0.31 is considered to be a reactor-range titer), and on the complement fixation (CF) with a complete hemolysis at a serum dilution of 1:160. The animal was classified as a brucellosis reactor and was consigned to slaughter where cervical, prescapular, and supramammary lymph nodes were collected for additional microbiological studies. Because of the prevalence of cattle brucellosis in Texas, she was assumed to be affected with *Brucella abortus*, so no unusual precautions or necropsy procedures were performed.

*Brucella* organisms were isolated from both the udder secretions and tissue samples at the State-Federal Cooperative Brucellosis Laboratory in Austin. The isolate was identified as *Brucella melitensis* biovariety 1 at the National Veterinary Services Laboratory (NVSL) in Ames, Iowa. This was the first time *Brucella melitensis* had been confirmed in a bovine in this region of the United States.

The remainder of the herd of 149 head was tested and 4 additional cows were identified as brucellosis suspects. All four serological suspects were euthanized and udder secretions and tissue samples were collected for microbiological examination. No additional *Brucella* isolates were recovered. The herd was voluntarily depopulated with compensation provided to the owner.

In an effort to establish the source of infection and prevent possible further spread of infection, all of the cattle, sheep and goats in the 10 herds located within a one-mile radius of the infected premises were identified and tested. All of the herds were tested negative for brucellosis except for a sheep and goat herd which was located one-quarter of a mile from the index farm. Fifteen animals of 115 in the herd tested positive on the 8% (Brucella antigen concentration) BBA, and 20 animals were positive on the 3% BBA test, both of which are traditionally used as presumptive serological assays for *B. melitensis*. Udder secretions were collected from 8 of the seropositive females and the testes and selected lymph nodes from a euthanized seropositive male were forwarded to NVSL for bacteriological examination. The udder secretions were reported negative, however *Brucella melitensis* biovariety 1 was cultured from the testes of the goat. Additional animals tested on the ranch with the seropositive sheep and goats, which included 28 cows, 3 horses, and 5 dogs, were seronegative. The sheep and goats were subsequently depopulated with compensation.

During the depopulation procedure, a thorough necropsy procedure was performed on each adult animal regardless of the previous serological
test results that was attributed to them. Serum samples, amniotic fluid from all pregnant ewes and nannies, cervical lymph nodes, supramammary lymph nodes from all females, external iliac lymph nodes from all castrated males, testes from all intact males, and unusual lesion specimens were collected from all of the animals. Inflammation was noted in some lymph nodal tissue.

*Brucella melitensis* biovariety 1 was isolated out of four more animals. A castrated male goat from which the pathogen was isolated (ID # 6675) displayed an antibody titer that would be considered in the "suspicious range" according to the bovine classification scheme. Another male goat (I.D. # 6606) showed a "moderate-range" (reactor range on the CF and PCFIA tests), but negative on the conventional serological agglutination tests. Two nanny goats displayed a high antibody titer on all of the serological assays (Table 1).

The epidemiological investigation of the infected sheep and goat herd was challenging because records of transactions had not been maintained by the owner; however, one goat herd from which he had purchased goats was identified and was tested negative for brucellosis. The owner of the index cow reported that he had purchased 5 cow-calf pairs from the affected sheep and goat ranch approximately 4-5 years previously, thereby establishing the epidemiological link between the two operations. An additional 8 previously untested livestock operations were identified within a 1-mile radius of the second farm, and all livestock on those farms were tested and found to be seronegative.

The results of the epidemiological investigation were therefore largely based on circumstantial evidence. The most probable source of the infection in the cow was the infected sheep and goat herd because no other infection was found in the livestock tested around the index herd and there was no record of other livestock movement into, or out-of, the index herd. Due to the lack of eartag or brand identification, there was no definitive proof that the infected cow was among the 5 cows involved in the transaction between the two livestock producers 4-5 years previously. However, available circumstantial evidence would lead to that conclusion. Two possible explanations for the lack of transmission within the cattle herd over the alleged 4-5 year period that the animal was in the herd are: (1) the infection may not have localized in her uterus; and, (2) cattle are, by nature, not as susceptible to *Brucella melitensis* as are sheep and goats.

Since epidemiological investigations and testing failed to identify the source of the infection in the sheep and goat herd, a surveillance testing program was completed of all goats that could be located in a 5-county area (Cameron, Hidalgo, Starr, Willacy, and Zapata) along Rio Grande border with Mexico in deep south Texas.

The Texas Agriculture Statistics Service had estimated that there were about 2,500 goats residing in that 5-county area. However, during the area test, a total of 9,519 goats on 525 farms were tested. Of those, two goats
BRUCELLOSIS

displayed a suspect-range titer on the initial test. Both of those goats sub-
sequently tested negative. So the source of the infection for the sheep and
goat flock was not identified.

The owner of the infected sheep and goat flock also maintains a ranch
in Mexico, so it is suspected that infected or exposed animals may have
been transported across the border to his ranch in Starr County, Texas. 
*Brucella melitensis* has been reported as being endemic in goats in the
Mexican State of Tamaulipas directly across the Rio Grande River from 4 of
the 5 counties, including Starr County, that were included in the area test.

This study demonstrated the potential difficulty of diagnosing *Brucella
melitensis* infection on an individual animal basis by serological test re-
sults. Of the six animals from which *B. melitensis* was isolated, two dis-
played a moderate- to low-range antibody titer based on the conventional
serological assays available in the United States. There is not always a
direct correlation between the strength of the antibody titer and the infec-
tious status of the animal. Therefore, it is the conclusion of this author that
diagnosis must be addressed from a herd, rather than the individual ani-
mal, basis.

This case is also significant in that it not only identified a foci of *B.
melitensis* in a Texas livestock population, but it also reestablished the po-
tential local zoonotic risk to the human populace in that part of the state.
Every year in Texas several human cases due to *Brucella melitensis* are
diagnosed. Since 1980, an average of 17.66 human brucellosis cases due
to *Brucella melitensis* have been reported in Texas at a consistent level.
Over that same period of time, the incidence of human infection due to *B.
abortus* and *B. suis* has been steadily going down due to the reduction of
the disease in their respective livestock reservoirs.

Since 1980, there has not been a livestock reservoir identified for *B.
melitensis*, so the manifestation of the infection invariably has been the
result of consumption of contaminated unpasteurized dairy products from,
or in, Mexico. Educational efforts are being implemented in order to try to
avert human exposure to the disease through the potential local livestock
reservoir. To this date, no human infection has been known to be associ-
ated with the infectious incursion of *B. melitensis* described in this report.
### Table 1
BSerological test result comparison with *Brucella melitensis* culture positive animals.

<table>
<thead>
<tr>
<th>Animal I.D.</th>
<th>PCFIA</th>
<th>3% BBA</th>
<th>8% BBA</th>
<th>SPT*</th>
<th>STT*</th>
<th>Rivanol***</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index Cow Index</td>
<td>0.15</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4+@1:160</td>
</tr>
<tr>
<td>Male Goat # 6603</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4+@1:160</td>
</tr>
<tr>
<td>Fe. Goat #6835</td>
<td>0.20</td>
<td>+</td>
<td>+</td>
<td>+@1:200</td>
<td>+@1:200</td>
<td>+@1:200</td>
<td>4+@1:160</td>
</tr>
<tr>
<td>Fe. Goat #2411 RT</td>
<td>0.15</td>
<td>+</td>
<td>+</td>
<td>+@1:200</td>
<td>+@1:200</td>
<td>+@1:200</td>
<td>4+@1:160</td>
</tr>
<tr>
<td>Male Goat #6604</td>
<td>0.21</td>
<td>+</td>
<td>+</td>
<td>+@1:25</td>
<td>+@1:25</td>
<td>neg.</td>
<td>1+@1:40</td>
</tr>
<tr>
<td>Cast. Male # 6675</td>
<td>0.37</td>
<td>neg.</td>
<td>neg.</td>
<td>+@1:25</td>
<td>neg.</td>
<td>neg.</td>
<td>3+ @ 1:20</td>
</tr>
</tbody>
</table>

*Standard Plate Agglutination
**Standard Tube Agglutination
***Common supplemental test

All serological assays used *Brucella abortus* antigen
BRUCELLOSIS

STATUS REPORT - FISCAL YEAR 2000
COOPERATIVE STATE-FEDERAL BRUCELLOSIS
ERADICATION PROGRAM

Valerie E. Ragan, DVM
Michael J. Gilsdorf, DVM, MS

Significant progress continued to be made in the National Brucellosis Eradication Program in fiscal year (FY) 2000. The number of newly disclosed affected herds under quarantine continues to decline. There were 14 newly affected herds disclosed in FY 2000, compared to 28 in FY 1999, a decline of 50 percent. In addition, there were only 3 herds quarantined at the end of FY 2000, compared to 10 on the same date a year earlier.

The Brucellosis emergency Action Plan (EAP) was approved and implemented in July 1997, and continued on into FY2000. As part of the Plan, all activities involving brucellosis surveillance and management of new cases are now conducted as an emergency action and are given top priority. Additional personnel and fiscal resources are made available where needed. The specific critical program elements of the EAP may be found in the 1999 USAHA proceedings. The Emergency Action Plan remains in effect however, and will remain in effect until brucellosis in cattle has been eliminated.

A major modification was made to the Brucellosis Eradication Program in fiscal year 1998, allowing a State to retain Class Free status if one affected herd is disclosed, if certain criteria are met. Although this program modification remains in place, no Class Free states disclosed a single affected herd in FY 2000.

Management of brucellosis continued to be an issue in Yellowstone National Park (YNP) and in the greater Yellowstone area during FY 2000. The Yellowstone National Park Environmental Impact Statement (EIS) for bison management became available for public comment in the summer of 1999. It included seven separate alternatives that could be implemented by the National Park Service in their bison management plan for bison in Yellowstone National Park. The comment period was open until October 1999. Over 67,000 comments were received, and analyzed. APHIS was a cooperating agency in the development of the EIS, not a lead agency. In December 1999, after the Federal agencies and the state of Montana were unable to resolve disagreements regarding the development of a final EIS for long-term bison management, the Federal agencies (National Park Service, US Forest Service, and APHIS) sent Montana a notice of withdrawal from the joint Federal-State Environmental Impact Statement (EIS) process. The state of Montana then filed a petition asking the court to prevent the Federal withdrawal from a 1992 Memorandum of Understanding (MOU) and a 1995 settlement agreement that called for Federal and State development of the final EIS. On February 4, 2000, all parties ap-
Report of the Committee

appeared in U.S. District Court in Helena, Montana for a hearing. In a settlement conference held after the hearing, a seven-point agreement was reached under which the MOU between the Federal agencies and the state of Montana was to be terminated, and the Federal agencies were to move forward with efforts to complete the final EIS. This ensures that the National Environmental Policy Act (NEPA) process for the formulation of a long-term bison management plan will be completed, including full disclosure of the environmental impacts of various bison management alternatives. The final EIS (FEIS) was completed at the end of August 2000, and was open for comments until mid-October. During the time of the preparation of the FEIS, the Federal agencies and the state of Montana agreed to voluntary mediation with the assistance of a US magistrate judge, to resolve outstanding differences regarding a plan for bison management. Representatives of the Federal agencies and the state of Montana have met several times for mediation discussions, and are currently operating under a confidentiality agreement per the federal judge. The mediation has not been officially completed. A Record of Decision (ROD) for bison management is expected to be completed in the Fall of 2000, once comments on the FEIS have been received and reviewed.

Research is continuing on the use of RB51 vaccine in bison, in anticipation of its potential use in the eradication efforts in the Greater Yellowstone Area.

In the Greater Yellowstone Area, due to a mild winter, it was not necessary to slaughter any bison that migrated out of Yellowstone National Park (YNP) to prevent transmission of brucellosis to surrounding livestock. Approximately 415 bison migrated out of the park, but were successfully hazed back within the Park's boundaries.

The progress made in the Brucellosis Eradication Program during FY 2000 continues to add credibility to the goal of eradicating brucellosis from the United States. During FY 2000 the number of reactors, and as mentioned earlier, newly affected herds were less than the previous year. One more State (Louisiana), attained Class Free status during fiscal year 2000. Two of the remaining Class A States have currently reentered the qualifying stage for Class Free status.

Brucellosis program reviews were conducted in four States during Fiscal Year 2000. These reviews were conducted to either affirm that a State had qualified for Class Free status prior to being awarded that status, or to assess the progress of a Class A state in order to make recommendations for program enhancements.

As progress continues towards the goal of eradicating brucellosis from domestic livestock, more emphasis is being placed on surveillance activities to assure that the last affected herd is found, and to maintain surveillance after brucellosis is eradicated in order to prove to our international trading partners that the country is indeed free of the disease. In the future,
BRUCELLOSIS

it is anticipated that slaughter surveillance will be the primary form of surveillance for brucellosis. To assure that slaughter surveillance is adequate and effective, significant effort was put forth in FY 2000 to enhance such surveillance. A national surveillance coordinator was selected at the end of FY 1999. In addition, in FY 2000, Western Region and Eastern Region slaughter surveillance coordinators were selected to assist with field coordination. They are also working to implement earlier recommendations for enhancement of the system. In addition, the National Veterinary Services Laboratory (NVSL) developed a method of validating the slaughter surveillance system, by means of assessing the correct correlation of blood sample and identification. To do this, NVSL developed a method to assess an animal’s “serological fingerprint” which can be used to compare blood samples collected from an animal at slaughter to one collected at another point in the marketing system, in order to ensure that the animal’s identification is being maintained throughout the process. The test was evaluated under field conditions and is now in the process of being implemented on the field on an ongoing basis.

In the Fall of 1999, Brucella melintensis was identified in a cow tested during routine market testing in south Texas, in a county adjacent to the border with Mexico. Brucella melintensis was last found in sheep and goats in the U.S. in the early 1970s, but is currently found in much of the world, including Mexico. An epidemiologic investigation of this case disclosed that several years prior, the owner of the index animal had purchased several cows from a neighbor who owned sheep and goats, which were subsequently discovered to also be infected with B. melintensis. None of the other cattle in the herd were found to be infected. However, the entire cattle herd and the associated sheep and goats were all depopulated. Significant surveillance of sheep and goats in the vicinity revealed no additional positive animals, although over 8,000 sheep and goats on more than 400 premises in 5 counties were tested.

Due to normal reporting delays from the field stations, certain of the following graphics regarding the cattle brucellosis eradication program contain estimated data for the last month of the FY.

As of September 30, 2000, 45 States, Puerto Rico, and the Virgin Islands held Class Free status and 5 States were Class A (Figure 1). 63 percent of the Nation’s 34 million beef cows that have calved are located in Class Free States, and 37 percent are located in Class A States (Figure 2). Of 9.2 million dairy cows, 90.7 percent are in Class Free States and 9.3 percent are in Class A States (Figure 3). Of all beef and dairy cattle, 70 percent are in Class Free States and 30 percent are in Class A States (Figure 4).

There was a total of 24 brucellosis affected herds in FY 2000. This was a decrease of 33 percent from the 36 affected herds in FY 1999 (Figure 5). These 24 herds were in 5 States, with 62.5 percent located in one State
(Texas) and 37.5 percent in the remaining States. There were no affected herds in 45 States (plus Puerto Rico and the Virgin Islands). Texas, with 15 brucellosis affected herds, represented 62.5 percent of the national total. The State of Missouri with 5 affected herds; Oklahoma with 2 affected herds, and Florida and South Dakota with 1 affected herd each, together represented 37.5 percent of the total for the year. (Figure 6).

We will again explain the two preceding figures to clarify this traditional method of presenting annual reactor herd data. As shown, the data implies that all of the herds were found during the FY covered by the report. However, the reactor herd totals in these figures include not only those herds found affected this year but also those found last year which were still under quarantine at the beginning of FY 2000. If the herds carried over from FY 1999 are subtracted, the number of affected herds actually found in FY 2000 was 14 in 3 States (Figure 7).

The number of herds under quarantine for brucellosis at the end of the FY decreased by 7 herds, from 10 on September 30, 1999 to 3 on September 30, 2000. (Figure 8).

Brucellosis Milk Surveillance Test (BMST) surveillance detected no brucellosis affected dairy herds in FY 2000. A total of 207 suspicious BRT laboratory reports resulted in 86 herds being blood tested for a herd test rate (HTR) of 42 percent. The HTR in FY 1999 was 40 percent (Figure 9). There were 9.5 million Market Cattle Identification tests conducted in FY 2000, 0.2 million more than collected the previous FY. Of these, approximately 5.5 million samples (58 percent) were collected at slaughter plants and approximately 4.0 million (42 percent) were collected at stockyards. (Figure 10). Stockyard testing is primarily conducted in the Central and Southern regions, where the majority of the states are that have recently attained class free status, or area still Class A. Market testing has been a very valuable tool in finding newly affected herds in those states.

The total number of cattle tested for brucellosis in FY 2000 was 10.8 million, approximately the same number tested in FY 1999. Of these, 1.3 million (12 percent) were sampled on farms or ranches and 9.5 million (88 percent) were tested under the MCI program. There was an 8 percent decrease in reactors from 1,905 in FY 1999 to 1,758 in FY 2000, 31 of which were found on farms (Figure 11). This is a significant decrease from the 318 reactors found on farms in FY 1999.

There were 4.4 million calves vaccinated for brucellosis in FY2000. This represents a decrease of 8.3 percent over the 4.8 million calves vaccinated in FY 1999 (Figure 12).

Of the 14 newly affected herds found in FY 2000, 9 (64 percent) were found as a result of MCI testing at markets and stockyards; 1 (7 percent) from adjacent herd testing; and 4 (29 percent) from epidemiological traces (Figure 13).

Nineteen (19) brucellosis affected herds were depopulated in the U.S.
BRUCELLOSIS

in FY 2000, at a cost of $1,138,750 in indemnity. An additional $956,292 was spent to purchase cattle that were traced out of affected herds. Depopulation continues to be the preferred method of handling affected herds under the Emergency Action Plan.

The Brucellosis Eradication Program is making rapid progress towards realization of its goal to eradicate brucellosis in cattle in the United States. However, it is imperative at this stage to the program to maintain a high level of surveillance, and to continue to act rapidly and thoroughly when each new case is disclosed, in order to finally achieve eradication.
Distribution of Beef Cattle by Brucellosis Status

September 2000

Class A States: 37.0%
Class Free States: 63.0%

Figure 2

Distribution of Dairy Cattle by Brucellosis Status

September 2000

Class A States: 97.5%
Class Free States: 2.5%

Figure 3
BRUCELLOSIS

Distribution of All Cattle by Brucellosis Status
September 2000

Figure 4

Brucellosis Eradication
Number of Reactor Herds During FY00 (According to State Classification)

Figure 5

225
REPORT OF THE COMMITTEE

Brucellosis Eradication

Percent of Total Reactor Herds Found

- Total Reactor Herds = 35
  - Status 7: Herds = 2
    - FY 2000
      - Total Herds = 24
      - 29% of Total Herds
  - Status 1: Herds = 1
    - Total Reactor Herds = 2

Figure 5

Brucellosis Eradication

Newly Affected Herds

- October 1999 Through September 2000: 14
- October 1998 Through September 1999: 29

Figure 7

Class Free

Class A

USDA

226
BRUCELLOSIS

Brucellosis Eradication
Brucellosis Affected Herds

AS OF SEPTEMBER 30, 2006 - 2
AS OF SEPTEMBER 30, 1989 - 10

Figure 8

Brucellosis Eradication
Milk Surveillance Test Results (BMST)

Figure 9
REPORT OF THE COMMITTEE

Bovine Tuberculosis
MCI Blood Tests: Cattle

![Graph showing MCI Blood Tests: Cattle](image)

Figure 10

Bovine Tuberculosis
Reactors Found

![Graph showing Reactors Found](image)

Figure 11
BRUCELLOSIS

Brucellosis Eradication
Calves Vaccinated

Figure 12
Fiscal Year

Brucellosis Eradication
Newly Affected Herds: Reason for Testing

FY 2000

Market 64%

Epidemiology 29%

Adjacent Herd 7%

Figure 13
REPORT OF THE COMMITTEE

GYIBC REPORT TO
USAHA COMMITTEE ON BRUCELLOSIS

Bob Hillman, DVM
Boise, Idaho

Introduction
This report will be rather short and will address general topics relative to GYIBC. It will not address specifics for each state or research efforts. These will all be addressed as individual reports to the committee.

Strategic Plan and Budget

> At the 1999 meeting of the Brucellosis Committee I reported that GYIBC was in the process of developing a Strategic Plan and Budget under which the Committee would work to develop and implement solutions to the wildlife brucellosis problem
> The GYIBC completed the Strategic Plan and Budget in December and submitted it to the Governors and Secretaries.
> The Budget request has not been funded and is unlikely to be funded in the near future.
> The agencies are working to implement those portions of the plan that can be achieved with available funding

MONTANA, YELLOWSTONE NATIONAL PARK BISON MANAGEMENT EIS

> The FEIS has been published by National Park Service. It had a 30 day comment period, which closed on October 2, 2000.
> WE do not know at this time what elements the Record of Decision will contain. We can surmise from the FEIS that bison will be allowed outside YNP, vaccination of bison calves and yearlings may occur outside the park, vaccination may occur at some future time in YNP, the population size will probably be 3,000 head and there will be no disease control efforts or population control efforts in YNP.
> It is safe to say that the comments developed and submitted by USAHA and comments from the states have been largely discounted or ignored by the National Park Service in development of the FEIS.
> Montana and Federal Agency officials are continuing to work under court mandated mediation to develop the Record of Decision.

JACKSON ENVIRONMENTAL IMPACT STATEMENT

> Last year the Department of Interior completed an Environmental Assessment for management of the Jackson bison herd.
BRUCELLOSIS

Implementation of this EA was blocked by an injunction.

> The Department of Interior is now planning to develop a fullblown Environmental Impact Statement for management of the Jackson bison and elk herds. The US Fish and Wildlife service is responsible to develop the EIS. The USFWS claims that the EIS can be achieved in four years.

STATE ACTIVITIES

> Each of the states continues to work to develop and implement herd unit management plans.
> The animal health officials of the three states and USDA, VS is working to assure that livestock prevention and surveillance activities are effective in preventing or reducing potential for transmission of disease from wildlife to livestock.

STATE FUNDING

> For the 2000FY the congressional delegations of the three states, through the leadership of Senators Craig and Burns, secured $610,000 in funding for the three states to aid in wildlife brucellosis management activities in the three states.
> Our congressional delegation has secured $650,000 for FY2001. $400,000 for the three states and $250,000 for the Idaho Brucellosis program
> These funds have enabled the state agencies to move forward with development and implementation of herd unit management plans.

FLUORESCENCE POLARIZATION ASSAY FOR FIELD DIAGNOSIS OF BRUCELLOSIS

Brucellosis Committee Presentation
United States Animal Health Association Meeting
Birmingham, Alabama USA

Nielsen K¹, Gall D¹, Smith P¹, Kelly W¹, Yeo J¹, Kenny K², Heneghan T³, McNamara S³, Maher P⁴, O'Connor J⁵, Walsh B⁶, Carroll J⁶, Rojas X⁷, Rojas F⁸, Perez B⁹, Wulff O¹⁰, Buffoni L¹¹, Salustio E¹¹, Gregoret R¹¹, Samartino L¹¹, A. Dajer¹², E. Luna-Martinez ¹³, R. Serrano¹⁴, T. Renteria¹⁴, R. Bermudez¹⁴ and D. Joly¹⁵.

¹ Canadian Food Inspection Agency, Animal Diseases Research Institute, 3851 Fallowfield Rd., Nepean, Ontario, Canada K2H 8P9.
² KeyLabs Ltd., 11 Synge Place, Dublin 8, Ireland.
³ Department of Agriculture and Food, Cork, Ireland.

231
Abstract:
The fluorescence polarization assay (FPA) was used to test whole blood samples, collected using EDTA as an anticoagulant, from cattle in various locations and bison. In a previous study it was observed that the cutoff values for freshly collected blood and blood stored in anticoagulant for more than a few hours were different. Therefore cutoff values between negative and positive reactions were set at 105 mP for freshly drawn blood and 95 mP for blood stored more than 3 hours. The overall relative sensitivity and specificity values for the field FPA (freshly drawn blood) performed for cattle were 95.3% and 97.3%, respectively and 97.4% and 100%, respectively for bison. These data were based on samples from areas with Brucella abortus infection in Argentina, Canada, Chile, Ireland and Mexico (n=524 for cattle, 74 for bison). Whole blood shipped (stored blood) to the laboratory (n=1205) was also tested and the relative sensitivity and specificity, each at 100%. Matched serum samples were tested by other serological tests. Negative samples were those that did not react in the buffered antigen plate agglutination test (BPAT) and the competitive enzyme immunoassays (CELISA). Positive samples gave a positive result in both assays.

Introduction:
The fluorescence polarization assay (FPA) for detection of antibody to Brucella sp. has been validated for use for the serological diagnosis of brucellosis in cattle (Nielsen et al, 1996; Dajer et al, 1999; Samartino et al, 1999), pigs (Nielsen et al, 1999), bison (Gall et al, 2000) and various species of deer (Gall et al, 2000).

The premise of FPA technology is that a molecule in solution rotates randomly at a rate inversely proportional to its size. The rate of rotation can be measured in the horizontal and vertical planes using a fluorescent label and polarized light. The rotational rate of a small labelled antigen molecule will be altered if antibody is attached to it and this change in rotation can be
BRUCELLOSIS

measured.

The FPA is a homogeneous assay which requires only addition of labelled antigen to appropriately diluted test samples. There is no requirement for removal of excess reagents. Because of the reported sensitivity and specificity values for the FPA for detection of bovine serum antibody to B. abortus (99.02 and 99.96%, respectively; Nielsen et al, 1996), its speed and ease of performance it is an ideal candidate for adaptation to use in the field. To expedite field testing, it would be useful to test whole blood rather than serum.

Materials and Methods:

1. Serological tests:
   Buffered antigen plate agglutination test (BPAT) was performed according to the OIE protocol (OIE, 1996).
   The complement fixation test (CFT) was adapted from Samagh and Boulanger (1978).
   The competitive enzyme immunoassay (CELISA) was described by Nielsen et al (1996).
   The fluorescence polarization assay (FPA) was described by Nielsen et al (1996). A portable fluorescence polarization analyzer (FPM Sentry, available from Diachemix Corp., Wisconsin) connected to a laptop computer was used. Tests were performed using 0.01M tris, pH 7.2 containing 0.15M sodium chloride, 15mM EDTA and 0.05% Igepal A-630 buffer. Briefly, 1.0 ml of buffer was placed in a 10x75 mm glass tube, followed by 20 ul whole blood or 10 ul serum. After mixing, a background reading was taken with the FPM analyzer. Ten ul of antigen (O-polysaccharide from B. abortus strain 1119.3, prepared and conjugated with fluorescein isothiocyanide (FITC) as described by Lin and Nielsen, 1997) was added and after mixing a second reading was taken in the analyzer 15 seconds after the addition of antigen for whole blood samples and 2 min after antigen addition for serum samples. The analyzer automatically subtracts the initial reading and calculates a value for the sample in millipolarization units (mP).

2. Blood and serum samples:
   The FPA was used in the field to test samples as they were obtained from cattle in Canada (n=198), Argentina (n=32), Chile (n=108), Mexico (n=101) and Ireland (n=85). In all cases, blood was collected in EDTA, tested immediately and then transported to the laboratory where the whole blood was tested again by FPA. Serum samples from clotted blood were tested by FPA, CELISA, CFT and BPAT. Bison samples collected in Wood Buffalo National Park, Canada (n=74) were treated similarly.
   A number of bovine blood samples (n=1205), collected in EDTA from various sources were shipped to the laboratory and tested on arrival as above.
3. Data analysis:

The cutoff values of the FPA for testing whole blood in the field and in the laboratory were previously determined to be 105 and 95 mP, respectively (Nielsen et al, 2000).

The cutoff value for bovine serum was 90 mP in the FPA, 30% inhibition in the CELISA, 50% hemolysis at a 1/5 serum dilution in the CFT and agglutination within 8 min in the BPAT.

Positive samples selected were positive in the BPAT and the CELISA and negative samples gave no reaction in the BPAT and were below the threshold of the CELISA.

The sensitivity and specificity values of the FPAs and CFT were calculated relative to the BPAT and CELISA results.

Results:

In a previous study, it was concluded that rather than incubating the sample for a minimum of 2 minutes as determined for the serum FPA, the final FPA measurement with freshly drawn whole blood samples should be done within 15 seconds of adding the tracer as a longer incubation period was found to increase background fluorescence.

The data was collected on the farm using freshly drawn blood tested immediately after sampling. The samples were subsequently divided into the BPAT/CELISA positive or negative groups for a total number of 100 and 424, respectively. The sensitivity and specificity values for the fresh whole blood FPA, relative to the BPAT/CELISA, were 95.3% and 97.3% (Table 1). When the blood samples were subsequently tested in the laboratory using a cutoff of 95 mP, the relative sensitivity and specificity values were 100% and 100%, respectively (Table 1).

Matched serum samples tested by the FPA, using 90 mP as the cutoff, gave relative sensitivity and specificity values of 100% and 100% while the CFT gave a relative sensitivity value of 100% (none of the positive sera were anticomplementary, (AC)). When the BPAT/CELISA negative sera were tested in the CFT, a number of the sera were AC. If the AC sera were treated as positive, the relative specificity was 66.7% and if they were treated as negative, the relative specificity was 98.1% (Table 1).

Of the 1205 whole blood samples matched with serum samples shipped directly to the laboratory, 236 were BPAT/CELISA positive and 969 were BPAT/CELISA negative. Using the 95 mP cutoff value, the relative sensitivity and specificity of the whole blood FPA was 98.6% and 98.9%, respectively. The relative sensitivity and specificity values for the serum FPA were 98.6% and 100%, respectively and for the CFT 97.7% and 66.5%, respectively. These data are presented in Table 2.

Of the 74 bison samples, 38 were characterized as positive by the reference tests and of these, 37 were positive when tested in the field. The remaining 36 gave no reactions in the reference tests and were negative when tested in the field, resulting in relative sensitivity and specificity val-
Discussion:

The FPA is based on the rate of movement of molecules in solution. A small molecule will rotate more rapidly than a larger molecule and therefore depolarize light more. Molecular movement in solution is influenced by environmental conditions such as temperature but in the normal range of temperatures the effect is minimal on the result. It is recognized that extremes in temperature will change the viscosity of the diluent buffer and may alter the test characteristics such as the cutoff value and therefore the test interpretation. Therefore, when field testing, care should be taken to ascertain the fluidity of the buffer, especially in very cold temperatures. For this reason, the initial buffer used for FPA, phosphate buffered saline with lithium dodecyl sulfate and sodium azide could not be used as the lithium dodecyl sulfate precipitates when cooled to about 10°C. As a result Igepal 630 was used. Similarly, it was found that phosphate buffer precipitated when dissolved in water containing calcium and as a result, tris replaced it for field use.

For use in the field with freshly drawn blood, the cutoff for the FPA was previously determined to be 105 mP and 95 mP for anticoagulated blood stored for a few hours based on ROC analysis of the data (Nielsen et al, 2000).

Data from blood samples tested immediately in the field was recorded and analyzed. Since the individual animal status was unknown at the time of testing, a comparison was made after the BPAT and CELISA were performed in the laboratory. In addition, the CFT and FPA were done on matching serum samples. The relative sensitivity of the field whole blood FPA was 95.3%. This value is 3.7% lower than the sensitivity value obtained for the serum FPA (Nielsen et al, 1996) most likely due to the short incubation period with the tracer. The relative specificity of the field FPA was 97.3%; 2.7% lower than the specificity obtained with the serum FPA (Nielsen et al, 1996). These discrepancies could also be a reflection of buffer problems, a premise partly confirmed by retesting the blood samples under laboratory conditions, resulting in relative sensitivity and specificity values of 100% each. Similarly, matched serum samples resulted in FPA relative sensitivity and specificity values of 100% each while the relative sensitivity of the CFT was 100% with no AC results. The relative specificity of the CFT varied from 66.7 to 98.1% depending on the interpretation of AC results (Table 1).

Positive BPAT/CELISA results were obtained with 236/1205 blood and serum samples shipped to the laboratory and 969/1205 were BPAT/CELISA negative. The FPA with whole blood and serum resulted in a relative sensitivity value of 98.6% each and the relative specificity was 98.9% and 100% respectively; values similar to those reported previously. The CFT gave a relative sensitivity value of 97.7% and due to a substantial number of AC reactions, its relative specificity was 66.5% (Table 2).
From these data, it is clear that the AC results occasionally obtained with the CFT sometimes cause diagnostic problems. These problems can be overcome by the use of the CELISA which has the added feature of in over 90% of cases differentiating vaccinal (strain 19) from field infection induced antibody 30 days or more post vaccination. The CELISA does not lend itself to field use as it is currently performed, necessitating the shipment of samples to the laboratory, causing a time lag in obtaining results and adding expense to the control program. This led to the development of the FPA, a homogeneous assay which, because of its simplicity, can be performed under severe conditions in the field with only a small loss in sensitivity and specificity which may also be at least partly due to problems experienced with the buffer. While it is clear that further data is required, based on the data presented, the FPA will be a valuable asset to brucellosis control programs by providing an accurate test result while the animal is still in the chute, allowing its removal from the herd without delay and without the expense of shipping samples to the laboratory.

Acknowledgments:
This project was supported in part by Diachemix Corp, Wisconsin, USA. The authors gratefully acknowledge the contribution of Dr. M. Sheridan, Department of Agriculture and Food, Cork, Ireland.

References:
BRUCELLOSIS


Table 1:
Cutoff values and relative sensitivity and specificity determinations of whole blood FPA using fresh whole blood (FWBFPA), stored whole blood (SWBFPA), serum FPA (SFPA) matched with the SWBFPA samples and the CFT of the serum samples. The S+S column represents the sum of the % sensitivity and specificity values. This value is indicative of the performance of the test.

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1. Anticomplementary reactions were considered positive.
2. Anticomplementary reactions were considered negative.
SAFETY OF BRUCELLA ABORTUS AND RB51 AND STRAIN 19 VACCINES IN COYOTES (CANIS LATTRANS)

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Introduction:
Bison (Bison bison) and elk (Cervus elaphus canadensis) infected with Brucella abortus in the Greater Yellowstone Area (GYA) are an obstacle in the effort to eradicate brucellosis from the United States and a source of potential reinfection for livestock in the States of Wyoming, Idaho, and Montana. The free-ranging infected bison and elk migrate from public lands in the GYA onto private lands and come into contact with domestic livestock. Abortions induced by brucellosis have been documented on numerous occasions in bison and elk under controlled experimental and free-ranging field conditions (Aune and Schladweiler, 1992; Clark and Kopec, 1985; Davis, et al., 1990: 1991; Rhyan, et al., 1994; Roffe, et al., 1997; Thorne et al., 1978a; 1978b; Williams, et al., 1993). Bison have been shown to transmit brucellosis to cattle under range conditions (Flagg, 1983). To reduce the risk of transmission from infected elk and bison to livestock, several scenarios for prevention and control of brucellosis in the GYA have been proposed and many of these include vaccination. One of the concerns of a vaccination program in free-ranging wildlife is the possible deleterious effects of the vaccine on non-target species.

Method and Materials:
The purpose of this investigation was to evaluate and document the safety of RB51 and Strain 19 (S19) in coyotes. Coyotes are ubiquitous predators and scavengers, and coyotes are known to become naturally exposed and infected with B. abortus (Davis, et al., 1979). While there may be little concern for the any possible deleterious effects of Brucella vaccines in coyotes, any negative effects due to the use of Brucella vaccines in the GYA on wolves (Canis lupus) would be disastrous. Both RB51 and S19 vaccines have been widely used in cattle to reduce the risk of abortions and therefore transmission of B. abortus to susceptible individuals.

Coyotes for the investigation were trapped by personnel of Wildlife Services, Texas Agricultural Experiment Station by either snares or leg hold
SAFETY OF BRUCELLA ABORTUS AND RB51 AND STRAIN 19 VACCINES IN COYOTES (CANIS LATRANS)

traps in Southeastern Texas and then transported to the Veterinary Medical Research Park, Texas A&M University, College Station, Texas. From March 1999 to May 2000, a total of 94 coyotes (35 males and 59 females) were included in the study. Upon arrival the coyotes were aged, weighed and a 5-10 ml blood sample was collected from the cephalic vein. Pregnancy status of the females was determined by manual palpation.

Individual coyotes were randomly assigned to one of three treatment groups (RB51, S19, and non-vaccinated controls). The vaccinated animals were orally exposed to 1x10⁹ colony forming units (cfu's) of either RB51 or S19 while the non-vaccinated controls (NVC) were orally exposed to physiologic saline. The coyotes were individually housed in 2m x 3.5m concrete floored dog runs with chain link walls and roofs. The coyotes were fed a commercially available dog ration and watered on a daily basis.

Six weeks post-exposure (P.E.) to the vaccines or the saline, or at the termination of pregnancy, all coyotes were euthanized and blood and tissues were collected at necropsy. The tissues collected from adult coyotes included tonsils, retropharyngeal lymph nodes, liver, lung, spleen, inguinal lymph nodes, supramammary lymph nodes, uterus, testes. Tissues collected from pups or fetuses included lungs, stomach contents, liver, and spleen.

Results:

The mean litter size for the three treatment groups did not differ significantly (3.4 RB51; 3.3 S19; 3.2 NVC). A total of 94 coyotes were used in the study, and the numbers and compositions of the research groups is shown on Table 1.

Fourteen (9 females and 5 males) of the 37 coyotes in the S19 group were positive on conventional serology at 25 days post exposure (P.E.). Two of the females were Card positive at the day of euthanasia (also the day of termination of pregnancy). All of the 19 coyotes in the RB51 group were negative on conventional serology, and 18 of 19 (95%) were positive at day 21 P.E. as determined by Western Blots, and 5 (3 females and 2 males) were positive on the day of euthanasia. All of the NVC group were serologically negative throughout the study.

S19 was recovered from the spleen and liver from one female coyote at day 21 P.E., and from the tonsils and spleen of another female coyote at day 38 P.E. No isolations of Brucella were made from the tissues of the RB51 or the NVC groups.

Conclusions:

Since no isolations of B. abortus RB51 or S19 were made from the reproductive tissues of either adult males or females and no isolations were made from any of the 84 pups, it would appear that coyotes orally exposed to either of the vaccines at a dose 1 x 10⁹ cfu will not suffer any negative
reproductive effects. Both the vaccines were cleared from the majority of the coyotes prior to 42 days post exposure, so chronic infections with either RB51 or S19 do not seem to be a problem in coyotes. The results of this investigation are consistent with the results of other experimental infections of coyotes with *B. abortus* and surveys of *B. abortus* in populations of free-ranging coyotes (Davis, et al., 1979; 1988). The results are also consistent with data from the field. Coyote populations in areas with large numbers of animals infected with virulent field strains of *B. abortus* do not suffer adverse reproductive effects.

If coyotes are a representative model for other closely related canids such as wolves that might be exposed accidentally to either of these vaccines in the GYA, then one would expect no significant effect on other non-target canid species.

**Literature Cited:**

SAFETY OF *BRUCELLA ABORTUS* AND RB51 AND STRAIN 19 VACCINES IN COYOTES (*CANIS LATRANS*)


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<th></th>
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<tr>
<td>Total</td>
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</tbody>
</table>

Table 1. Coyotes utilized in the RB51 and S19 *Brucella abortus* vaccine safety study.
REPORT OF THE COMMITTEE ON
CAPTIVE WILDLIFE AND ALTERNATIVE LIVESTOCK

Chairman: Dr. Robert M. Temple, Bristolville, OH
Vice Chairman: Dr. Robert A. Cook, Bronx, NY

Dr. Wilbur B. Amand, PA; Dr. Jack N. Armstrong, NV; Dr. Mark L. Drew, ID; Ms. Barbara R. Fox, MD; Dr. Robert M. Harbison, AR; Dr. Sam D. Holland, SD; Dr. David L. Hunter, MT; Dr. David J. Ligda, IN; Dr. Thomas F.T. Linfield, MT; Ms. Cathy A. Liss, Washington, D.C.; Dr. Jim Logan, WY; Dr. Calvin W.S. Lum, HI; Dr. Chester J. Mikel, OK; Dr. Lyle D. Miller, IL; Dr. R. Eric Miller, MO; Dr. John J. Schiltz, IA; Dr. David D. Schmitt, IA; Dr. Dale F. Schwindaman, MD; Mr. J. Gary Shoun, CO; Dr. Morton S. Silberman, GA; Dr. Pamela K. Swift, CA; Dr. Charles O. Thoen, IA; Dr. Tom Thorne, WY; Dr. Michael S. VanderKlok, MI; Mr. Dave Whittlesey, CO; Dr. Richard W. Winters, TX; Mr. Steve Wolcott, CO; Dr. Peregrine Wolff, FL; Ms. Jill Bryar Wood, TX; Dr. Glen L. Zebarth, MN.

The meeting of the committee on Captive Wildlife and Alternative Livestock was called to order by Chairman Robert Temple, DVM at 7:00 am on October 24, 2000. There were 61 people in attendance of which 19 were committee members. In the opening remarks, the chairman introduced Mr. Bob Frost, who presented a resolution requesting support for appropriation of funds for a proposed facility to replace the Ames, Iowa National Animal Health facilities. After discussion on the background for the request, the committee voted unanimously to support the resolution.

Dr. Ron DeHaven from USDA APHIS Animal Welfare was the first speaker of the program. He gave a review on APHIS Animal Welfare Current Activities. The final rule for perimeter fencing was published October 18, 1999. This requires a minimum 6-foot fence for non-dangerous animals and 8-foot fence for dangerous animals outside their primary enclosure. There is no requirement for traveling exhibits, although they must provide an alternative method/barrier.

Several bills have been introduced to Congress. The Shambala Bill (HR5057) would require APHIS to permit private ownership of exotic/wild animals. These permits would be in addition to any permits required by state or local regulatory agencies, or Department of Fish and Game. HR 5360 was introduced on October 3, 2000. This bill would direct APHIS to survey current state and federal legislation regulating private ownership of exotic/wild animals and make recommendations for improvements.

Current litigation has challenged the definition of "animal" and exclusion of rats, mice and birds in the AWA. Lawsuit has been settled but requires that APHIS initiate the rulemaking process to amend the definition. Appropriation language precludes any action on the rulemaking pro-
cess in FY01. There has also been a request to reclassify reindeer from "wild/exotic" animal to "farm" animal. APHIS is investigating changing the classification of animals to "nondomestic" versus "domestic".

Recent confiscation actions under AWA have increased due to greater use of this authority under the interpretation of "suffering". Partnerships with humane organizations and privately licensed sanctuaries have allowed housing and placement of confiscated animals. APHIS published a position statement entitled "Large Wild and Exotic Cats Make Dangerous Pets" in February, 1999. Currently there is no authority to regulate private ownership of exotic cats. Based on comments received to date, next printing may include rewording of some statements regarding care and handling by trained professionals.

Budget appropriations for AWA have increased $2 million for FY01, up to a total of $12.1 million. This permit an increase in the number of inspectors on staff and possibly increased surveillance of airline transport regulations. Other activities include reexamining the definition of pain and distress in the research setting and possible changes to the categories currently used for the biomedical community.

An update on the US West Nile Virus outbreak was presented by Dr. Linda Glaser, Wildlife Disease Specialist, USGS NWSC. West Nile virus (WNV) is an arthropod-borne virus that appeared in the Western Hemisphere in the fall of 1999. Wild birds (primarily crows), horses, and humans were affected in last year's outbreak in the New York City area. In May 2000, WNV was detected in wild birds in southeastern New York and northeastern New Jersey. Based on surveillance data, the virus has expanded in both geographic area and species infected. Currently the virus has been isolated from over 60 species of birds, including free-ranging species from 11 states and Washington, D.C. Infected wild mammal species (including bats, chipmunk, raccoon, and squirrel) have been found in New York this year.

Wild birds appear to play a critical role in maintenance of the cycle between mosquitoes and birds. The American crow appears to be highly susceptible to this virus and can be used in an enhanced passive surveillance system. The system for reporting and testing dead birds has been the primary surveillance method for state public health agencies. WNV positive birds were found in areas before detection of virus in mosquitoes, horses, people, or sentinel chickens.

Horses and humans are considered dead end hosts for WNV. Twenty-nine horses from 6 states and 17 humans from 3 states have occurred during this year's outbreak. The European Union has issued import restrictions for horses originating from the 5 states (CT, MA, NY, NJ, PA) with equine cases of WNV. Twelve mosquito species have been shown to carry WNV. These include species that are active at dawn and dusk, during the day, and that feed on avian and mammalian hosts. Public education on
mosquito bite prevention and mosquito control efforts are credited with reducing human cases.


**Elephant handling legislation** was discussed by Mr. David Blasko, elephant manager at Six Flags Marine World. Bill HR2929, the Elephant Accident Prevention Act, was heard in the congressional subcommittee on Crime. This would prohibit elephant rides and elephants traveling in circuses. The Elephant Managers Association sponsored representatives to travel to Washington, D.C. to discuss the bill. The outcome was a “no vote” in the subcommittee.

Mr. Blasko discussed the perceptions of the media, legislators, celebrities, and the public with regards to captive elephant. Attention is focused on individual incidents and public misperceptions of elephant staff and handling methods. The industry’s response has included: development of the Elephant Husbandry Manual (in final draft form); closer working relationships with USDA and state Fish and Game Departments; education of the public in training methods and tools; and annual AZA Principles of Elephant Management course and private training opportunities. A video demonstrating public education of training techniques was shown.

Dr. Lynn Creekmore presented an update on surveillance for Chronic Wasting Disease (CWD) in captive cervids. During 1997-2000, greater than 2100 animals were tested. Surveillance in farmed deer has been minimal. Animals from MA, OK, UT, and SD were tested during the 1999/2000 hunting season and were all negative. USDA will fund testing of 1500 animals during the 2000/2001 hunting season.

Dr. Mike Miller, Wildlife Veterinarian for the Colorado Division of Wildlife, discussed CWD surveillance in free-ranging cervids. Goals of the survey were to provide reliable distribution and prevalence estimates, epidemiologic information, and develop and improve diagnostic techniques. Strategies included “targeted” surveillance for clinical cases and random sampling via harvest and road-kills. Surveillance has occurred in 30 states and 3 Canadian provinces. No cases of CWD were detected in animals outside the endemic areas of Wyoming and Colorado during the last 3 years. The basis for management of animals in endemic areas has been reduction of CWD occurrence and limiting spread. Interim measures include preventing deer and elk population growth in endemic areas, aggressive culling of suspect cases, and experimentally evaluating density reduction as a management tool.

Dr. Brian Peart (CFIA) presented information on CWD in Canada. Due to an outbreak of TB in farmed elk in Alberta in the early 1990's, federal permits are current required for inter-farm movement of elk in Canada. There is impetus to make CWD a reportable disease in all elk over 16
months of age with clinical signs. A proposed CWD monitoring and control program would regulate elk movement based on the degree of premise contamination or exposure to clinical case. Surveillance of "at risk" animals would include quarterly inspections. All elk imported from the US between 1985 and the present have been traced and herds investigated. Infected herds are currently quarantined.

Drs. Creekmore and Miller reviewed information regarding a proposed program for CWD. In 1998, USAHA recommended the development of a model program for surveillance, control, and eradication of CWD in captive elk. The current draft proposal represents an attempt to apply current scientific and diagnostic information to the management practices and economics of captive elk. Components of the program are summarized. Goal of the program is eradication of CWD from captive elk herds in the US. States would design and implement CWD certification programs that would meet USDA/APHIS guidelines. Interstate movement of captive elk would only be allowed from herds participating in the certification program. Indemnity would be provided for depopulation. Requirements for participation include adequate fencing, herd inventory, animal identification, proper sample collection and submission to NVSL certified laboratories, and surveillance. A herd plan would be developed in response to a positive or trace herd. Actions range from whole herd depopulation to selective depopulation with additional surveillance and management plans.

Input on the current proposal stress that indemnity is critical to the success of the program. Other comments indicate concerns about length of proposed quarantine (5 yrs), the presence of CWD in wild cervids and its impact on potential eradication from the captive population, and potential implications for the deer industry. Future directions include continued surveillance, diagnostic and research support, epidemiology of CWD, and program development.

Dr. Steve Schmitt (Michigan Division of Wildlife) provided information on the status of T.B. in free-ranging cervid herds in Michigan. A sporadic case of M. bovis in a white-tailed deer (WTD) was identified in 1975. No action was taken until another case was found in 1994. In 1995, a surveillance program identified 27 positive deer. As the program area expanded, the number of positive deer increased. M. bovis has also been found in bobcat, opossum, dairy and beef cattle, and a domestic cat in this area during 2000. Carnivores appear to be infected by feeding on infected deer. Identical DNA fingerprints have occurred in all positive animals.

Maintenance of TB in the deer population is speculated to be related to high deer density and focal concentrations of deer associated with feeding and baiting. Eradication strategies include elimination of supplemental feeding and baiting and reduction of deer numbers to a population level that can be supported by natural vegetation. NRC banned feeding and baiting in counties with infected deer starting in June 2000. Limited amounts are
Currently allowed in other counties. Extra rifle seasons were added in limited areas to reduce populations.

It is estimated that 25,000-30,000 deer will be tested in 2000. Surveillance will primarily be through hunter kills. TB prevalence in core areas has decreased from 4.4% in 1997 to 2.4% in 1999; prevalence in noncore areas was 0.2% in 1999.

An update on tuberculosis (T.B.) in captive cervids in Michigan was given by Dr. Michael Vanderklok (Veterinarian for the Michigan Dept. of Agriculture, Animal Industry Division). Michigan has approximately 1000 privately-owned cervid herds consisting of approximately 25,000 animals. In 1994, a small elk herd was depopulated due to the presence of TB. A herd of 400 WTD were found positive in December 1997; infection was probably started in 1994 when the herd was started from a wild population. Surveillance program for captive herds in the high risk area was primarily focused on whole herd single cervical tests (SCT) or slaughter-based surveillance in herds that weren't easily handled. A state-wide surveillance of herds was initiated in January 1999. The majority of herds were tested by SCT. 55 herds were tested with no evidence of TB. There was a 2.8% suspect rate based on SCT although none were found to be infected. 810 animals were surveyed at slaughter with no culture positive animals detected.

T.B. in elephants was reviewed by Dr. Janet Payeur of USDA-APHIS, NVSL. During 1994-1996, 3 elephants from a facility in Illinois died from M. tuberculosis. A fourth surviving elephant was culture positive. Both elephants and animal handlers from this facility were tested. Positive skin reactions occurred in 11/22 animal handlers with one culture-positive individual. DNA fingerprinting of isolates from the elephants and handler were identical.

In October 1996, the National Working Group for Zoo and Wildlife Species (NTWGZWS) was formed. Their mission was to develop guidelines to control and eradicate M. TB complex and control other mycobacterial disease in zoo and wildlife species. Based on the work of this group, USDA implemented guidelines in November 1997 requiring annual testing of all elephants owned by licensed exhibitors. A revision was published in January 2000. Currently culture of trunk wash samples is the recommended diagnostic method. Guidelines for testing are available on the website www.aphis.usda.gov/ac/ElephaTBGuidelines2000.

From 1997 to 2000, over 4000 trunk washes or swabs have been submitted to NVSL. M. tb has been isolated 33 times from 20 different elephants. DNA fingerprinting has identified at least 6 different strains. Based on identification of new cases annually, ongoing surveillance is necessary and includes both animals and handlers. The guidelines provide recommendations for testing of employees and animals as well as necropsy instructions. Treatment and management of infected animals can be difficult.
and expensive. Currently, there are 3 elephants undergoing treatment that are resistant to Isoniazid and Streptomycin. All of these animals have undergone previous treatment.

The present program has successfully identifies 6 elephants with M. tuberculosis and 1 with M. bovis on necropsy, and 14 elephants with M. tuberculosis by culture.

Dr. Michele Miller (Disney's Animal Kingdom) reviewed *Salmonella in Wildlife and Zoo Animals*. Salmonella is a ubiquitous organism consisting of greater than 2300 serotypes. Infection may be inapparent or result in acute or chronic disease. Diagnosis is based on culture. However, Salmonella can be isolated from ill and asymptomatic animals, complicating diagnosis. Intermittent shedding of the organism requires multiple cultures for detection. Recently, PCR has been used to detect Salmonella. Significance of Salmonella in wildlife/exotic animals includes clinical disease, inapparent shedding into the environment, and public health concerns (zoonoses). Salmonella has been reported in a wide variety of vertebrate species. Birds and rodents may present a special concern as reservoir species. Some species may have increased susceptibility to disease. Epizootics have occurred in captive rhinos and elephants. Preliminary survey of asymptomatic rhinos and elephants using fecal culture and PCR suggest that PCR is a more sensitive indicator of carrier status. Serologic tests developed for domestic species have not been validated for exotic species and may present regulatory challenges if false positive results occur. Salmonellosis in humans is primarily a food-borne disease. However, contact with feces, contaminated feed, or infected animals may present a zoonotic threat. Guidelines for handling of animals, animal waste and utensils, and implementation of proper hygiene practices should be developed to minimize the human health risk. Further studies to determine the epidemiology and prevalence of Salmonella in exotic species is warranted.

The committee members reviewed two recommendations. The first recommendation requests that a federal program be developed for the eradication of CWD in captive elk. Federal indemnity is vital to promote participation of producers and ensure the success of this program. The committee recommends that USAHA support the continued development and implementation of a federal program for the eradication of CWD in captive elk with provision of indemnity. The second recommendation regarding CWD surveillance was rejected by the committee.

The meeting was adjourned at 12 pm.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON ENVIRONMENTAL RESIDUES

Chairman: Dr. John Reagor
Vice Chairman: Dr. Gavin Meerdink

Dr. Gary Osweiler, Dr. Frank Ross; Visitors: Dr. Ramesha Gupta, Dr. Steve Nicholson, Dr. Mike Murphy, Dr. David Osheim, Dr. Howard Casper, Dr. Wilson Rumbeiha, Dr. George Rottinghaus, Dr. Tom Carson, Dr. Gerald Ounis, Dr. Jane Robens, Dr. Bob Everson, Dr. Birgit Puschner, Dr. Merl Raisbeck, Dr. Dirk Hostege, Dr. Diane Gerken, Dr. Bob Poppenga, Dr. Irina Rudik, Dr. Christina Wilson, Dr. Steve Hooser, Dr. Cat Barr, Dr. Dwane Hamar, Dr. Randall Lovell, Dr. Larry Thompson, Dr. Paula Imerman.

In a joint meeting with the AAVLD Veterinary Analytical Toxicology committee.

Environmental Contaminants (with particular attention to emerging or exotic agents)

Dr. Bert Mitchell, FDA-CVM Director of Policy and Regulations, reviewed the 1999 dioxin contamination event which occurred in Belgium. Although the contamination did not pose a significant public health threat, the public's perception and the response of government resulted in over a billion dollars loss to the Belgium economy.

The chronology of the episode was discussed in relation to the response to science and performance of public authorities. Societal responses fueled by the media were not satisfied by the perceived lack of attention to the safety of the food supply. Of the 250 media reports, only 4 dealt with the scientific facts, most of the remainder focused on what was perceived to be a cover-up. Officials were forced to resign.

The presentation focused on lessons learned from this event and how we might better respond. Dr. Mitchell listed 10 lessons learned and interjected examples of how these may apply to diagnostic toxicology and environmental residue detection.

Animal health professionals in the field and regional diagnostic laboratories are the first line of defense in the detection and control of emerging and exotic animal disease. Veterinary diagnostic laboratories perform the initial studies which may require the assistance of our national laboratory system, namely National Veterinary Services Laboratory for conformation or diagnosis. Communication between regional laboratories and the national laboratories is vital in the rapid determination of the etiologic agent and implementation of control procedures.
Mr David C. Ailor, DC; Dr. Chris D. Ashworth, MO; Dr. Charles W. Beard, GA; Dr. George W. Beran, IA; Mr. Dalton R. Berry, LA; Dr. Fred D. Bisplinghoff, FL; Dr. Roy Blister, AR; Dr. Morris S. Cover, MD; Mr. Kevin G. Custer, GA; Dr. Nicholas M. Dorko, Jr., CT; Dr. Robert J. Eckroade, PA; Dr. Don A. Franco, VA; Dr. G. Yan Ghazikhanian, CA; Dr. Eric Gonder, NC; Dr. Carl H. Graham, MO; Dr. Michael Hellwig, AR; Mr. Larry E. Hendricks, IL; Dr. Sakchai Himathongkham, CA; Dr. G. Thomas Holder, MD; Dr. John P. Honstead, MN; Dr. Elizabeth A. Lautner, IA; Dr. Bert A. Mitchell, MD; Dr. F. J. Mulhern, CA; Dr. Kakambi V. Nagaraja, MN; Dr. Gary D. Osweiler, IA; Dr. William E. Pace, FL; Mr. Jeff Panas, AR; Dr. Gary G. Pearl, IL, Dr. Benjamin S. Pomeroy, MN; Dr. Peter E. Poss, MN; Dr. Morris E. Potter, DC; Mr. Stephen Pretanik, DC; Dr. David G. Pyburn, IA; Dr. Kurt E. Richardson, GA; Dr. Hans P. Riemann, CA; Mr. Michael C. Robach, GA; Dr. Jane F. Robens, MD; Dr. John A. Schmitz, NE; Dr. Paul Shadbolt, Canada; Mr. F. Barry Shaw, PA: Mr. James E. Stocker, NC; Dr. Arnold C. Taft, MD; Dr. H. Wesley Towers, DE; Dr. Stanley A. Vezev, GA; Dr. W. Douglas Waltman, GA; Dr. Gary L. Waters, MT; Dr. Douglas L. Weiss, GA.

The meeting on Feed Safety was called to order by Chairman Charles L. Hofacre at 8:00 A.M. on Wednesday, October 25, 2000. There were 21 committee members and guests present.

Dr. David Pyburn, Director of Veterinary Science, for the National Pork Producers Council began by describing the Trichinae Herd Certification Program. This program is a pre-harvest pork safety program that will provide documentation of swine management practices which minimize risk of exposure of swine to the zoonotic parasite *Trichinella spiralis*. The program establishes a set of criteria that enable producers to market swine which are not considered a risk to human health due to exposure to this parasite. This program has been developed as a cooperative effort among the USDA agencies (Animal and Plant Health Inspection Service [APHIS], Agricultural Research Service [ARS], Cooperative States Research, Education and Extension Service [CSREES], Food Safety and Inspection Service [FSIS]) the National Pork Producers Council [NPPC], and the pork processing industry. The concept of risk management for control of *Trichinella* in the domestic swine population is endorsed by the U. S. Animal Health Association, the National Institute for Animal Agriculture and the American Association of Swine Practitioners. It is also recognized by the International Commission on Trichinellosis in their Recommended Methods for Control of *Trichinella* in swine. This Program is seen as a model for
FEED SAFETY

future on-farm animal agriculture food safety programs.

Even with evidence that trichinae infection is becoming very rare, if not nearly non-existent in humans and swine, the perception of trichinae infections from pork still exists with some consumers. The lack of a national testing or on-farm program to address trichinae may also be an impediment to the U.S. Pork Industry reaching its full market potential internationally.

In response to consumer perceptions and to further the development of U.S. pork export markets, the National Trichinae Research Project (NTRP) was undertaken in 1994. This is an ongoing collaborative effort between the National Pork Producers Council (NPPC), government—USDA’s Agricultural Research Service (ARS), Animal and Plant Health Inspection Service (APHIS) and Food Safety and Inspection Service (FSIS), and allied industry. The following summarizes the project progress and program development to date.

Prevention of human trichinellosis resulting from the ingestion of pork is variously accomplished through meat inspection, through processing of pork products by heating, irradiating, freezing or curing, and through consumer education with respect to meat preparation. In modern pork production systems there is essentially no risk to pigs of acquiring Trichinella infection, and the absence of the parasite from domestic pigs raised in these systems has been established through extensive testing. Documentation of trichinae-safe good production practices is a viable economic alternative to individual carcass testing to assure product safety.

A pilot trichinae herd certification study was conducted in three states in the Midwestern U.S. (Iowa, Minnesota, South Dakota) to evaluate a process verification system for the production of trichinae-free pork. An on-farm audit, consisting of 55 questions, was developed for use in determining the presence of risk factors for exposure of pigs to potential sources of Trichinella. The audit was administered by trained, USDA accredited veterinary practitioners on 198 pork production sites in the 3-state area. All pigs raised on sites where audits were conducted were slaughtered at a single packing plant and a sample from each carcass was tested by pooled diaphragm digestion and an enzyme-linked immunosorbent assay (ELISA). Few production sites met all criteria established within the audit for risk-free management practices. Most of the deficiencies were noted in the lack of a regular rodent control program around swine rearing buildings. However, it was estimated that greater than 85% of these sites could meet good production practice criteria with minor improvements in management. From a total of 221,123 carcass samples tested from audited farms during a 6-month period, no Trichinella positive carcasses were detected by diaphragm digestion or ELISA. Based on the outcome of this study, an improved, more succinct audit was developed with objective measures of good production practices which reduce or eliminate risk of exposure of
The new version of the audit is being used in large-scale pork production chain pilots of the certification program that will lead up to the implementation of the voluntary program in the U.S. The large-scale pilots of the system began this summer and they will continue through the end of 2001. These pilots involve a packing plant in Minnesota and a packing plant in Iowa. The pilot production sites that supply pigs to these plants are located in Iowa, Minnesota, Nebraska, and South Dakota. The pilots will follow the flow events as has been proposed for the program (see Flow of Events in Certification diagram). At this point in the pilot the herd veterinarians for the pilot producers have been identified and trained in a day-long training session. The educational materials for the producers were delivered in early October thus the on-farm audits will begin this fall. These large-scale pilots will test the entire proposed system for the certification of trichinae-safe farms.

The proposed certification process includes the following elements: 1) Veterinarians, trained in good production practices relative to trichinae, work with their producers to ensure that trichinae risk factors are minimized on their farms; 2) The on-farm audit will serve as a method to document the absence of trichinae infection risks. Audits will be done periodically to ensure that good production practices relative to trichinae remain in place; 3) On a regular basis, a statistical sample of the national trichinae certified herd will be tested at slaughter using diaphragm digestion or ELISA to verify the absence of infection; and 4) USDA veterinarians will conduct random “spot audits” of certifications to ensure completeness and the integrity of the program.
Flow of Events in Certification

Producer requests Accredited veterinarian program information

Accredited veterinarian requests qualification information

Producer assesses good management practices and makes changes as necessary

Veterinarian receives training and is awarded Qualification status

Producer requests program application through Qualified Accredited Veterinarian or APHIS VMO

Audit is conducted and application filed with appropriate fee

Program status decision made by APHIS Administrator

Program status granted (by APHIS); and production site can market animals as trichinae certified if in Stage II or III

Program status denied

Certified animals (Stage II or III program status) enter marketing channels with TIN number; animals are identified through sale and slaughter by identification or segregation

Producer works with their herd veterinarian or the Qualified Accredited Veterinarian to implement Good Production Practices necessary to achieve program status

Packer verifies the TIN number when receiving animals for processing; carcasses are tracked through the slaughter and fabrication processes; FSIS monitors packer records of certified animals

Blood or tissue samples are collected from a subset of certified animals for testing by digestion or ELISA by plant personnel on a monthly basis

FSIS monitors results of testing and reports any positive results with site trace back information to APHIS

Loss of program status by any production site is immediately communicated to producers (by APHIS) and to the packer (by the producer), and entered into the trichinae certification status database accessible via the internet

Periodic auditing of certified production sites and spot audits assure maintenance of good production practices (APHIS), audit integrity, and program consistency

253
## Waste Feed Log

(Top portion of factors to evaluate is to be filled out every time a new batch of waste is cooked)

| Owner: |  |
| Premises Address: |  |
| State/Federal Swine Health Protection License Number: |  |
| Cooking Method: |  |

### Factors to evaluate:

| Date Processed: |  |

Please fill in the below areas to be recorded and include the initials of the site verifier in each area to be recorded.

| Batch Number (if applicable to operation) |  |
| Temperature to which Waste is Cooked |  |
| Time the Cooked Waste is Held at Above Temperature |  |

### Method of Time and Temperature Verification

### Sources of Waste Containing Meat

### Sanitary Conditions of the Premises:

Please record below with date and initials of the person checking the sanitation of the production area on a monthly basis

- Garbage containers clean and covered with lids
- Sanitation of cooking area and equipment
- Sanitation of feeding areas and waste disposal
- Sanitation of storage areas
- Rodent control system around equipment, storage and feeding area
- Sanitation of waste hauling trucks
- Access of other animal species to waste (wild animals, dogs, cats, etc.)
- Cross-contamination between cooked product and raw waste is avoided
Dr. Daniel G. McChesney, Ph.D., Deputy Director, Office of Surveillance and Compliance, Center for Veterinary Medicine then discussed the FDA issues of Dioxin and the Codex Alimentarius.

In June 2000, EPA issued a dioxin risk assessment. Regardless of your view of the report, it is clear that the dioxin levels in food and feed are not known or well documented, and that dioxin levels in food and feed products are a potential trade issue for all countries. FDA is reviewing its current sampling of products for dioxin and may increase this sampling for FY 2001 and FY 2002. Currently, CFSAN collects approximately 200 samples per year under its market basket survey. FDA field personnel have recently completed a CVM assignment in which samples of deodorizer distillates, fish meal, rendered pork and beef products, mixed species rendered products, poultry byproducts, egg byproducts, corn, and molasses were collected. A total of 47 samples was collected and will be analyzed by EPA for dioxin, PCB, and furan congeners. We expected to have the results sometime after the January 2001. For 2001, CVM anticipates collecting and additional 50 samples of feed products through a direct assignment to our Field offices.

The Ad Hoc Codex International Task Force on Animal Feeding held its First Session in Copenhagen, Denmark from 13 to 15 June 2000, at the invitation of the Government of Denmark. The objective of the Code was to encourage adherence to Good Animal Feeding Practice at the farm level and Good Manufacturing Practice (GMP) during the procurement, handling, storage, processing and distribution of animal feedingstuffs for food producing animals in order to ensure the safety of food for human consumption.

It was the consensus of the delegates that the Code should apply to both commercial and on-farm manufacturing of feed, cover the entire feed chain including grazing or free-range feeding, forage crop production and aquaculture, and to any feeding practices which could effect human food safety. The delegates noted that there might be differences in procedures for commercial and on-farm manufacturing but that the safety of the feed or feed ingredient should be the deciding factor. With regard to animal health issues, it was noted that the mandate of the Commission is human food safety and that animal health issues not directly related to human food safety, such as animal welfare, were outside of the Commission mandate and were not to be considered by the Task Force. The Task Force addressed the issue of antibiotics used for growth promotion purposes. Opinions varied between those delegations that supported a statement in the Code that would prohibit such uses and those delegations that were of the opinion that the use should be based on a public health safety risk assessment. It was agreed that further discussion of this issue should be undertaken in the light of an upcoming WHO Consultation, as well as information from other groups such as OIE, FAO, other Codex Committees, and other relevant scientific information. It was also decided that further discussion
on the use of fermentation products and the definition and of waste products was needed.

With regard to a negative list or a list of undesirable substances for use in feed, the Task Force agreed to request by means of a Circular Letter to Member countries information on lists established by different governments to control the use of prohibited and undesirable substances in animal feedingstuffs, or other approaches.

Governments and international organizations should submit their comments on the revised text of the Proposed Draft Code of Practice on Good Animal Feeding, information on validated methods of analysis and sampling for the examination of feedingstuffs used for regulatory purposes, and comments or information on lists established to control the use of prohibited and undesirable substances in animal feedingstuffs or other approaches. Comments should be submitted to the Codex Alimentarius Commission. The next meeting of the Task Force will be held in Denmark in March 2001.

In June of 2000, FDA's Center for Food Safety and Applied Nutrition, and its' Center for Veterinary Medicine issue a guidance document on the use of grains containing fumonisin in human food and animal feed. In support of this document, both Centers developed a paper outlining the scientific support in the literature for the levels listed in the guidance document. The time period for public comment closed August 7, 2000 and both Centers are reviewing the comments. Upon review of the comments changes in the guidance may be made. Initial review, suggests that clarification of the guidance in the area of pet foods may be needed. The guidance for pet food was that corn and corn products not exceed 10 ppm and that the total diet contain 5 ppm or less.

Salmonella contamination of pig ear and other natural dog treats continues to be a concern and issue for FDA. We are still involved in follow-up investigations of some manufacturers of these products and continue to receive occasional reports of new lots or sources of the treats testing positive for salmonella. Several of the large companies involved in this segment of the business have requested permission to irradiate finished and packaged product. While irradiation is not specifically approved for this use, FDA because of public health concerns has permitted product to be irradiated provide specific conditions are met. CVM is currently reviewing a food additive petition to amend the current feed irradiation approval to permit the use of irradiation of pet treats. Independent of FDA's actions, the pet treat manufacturers in conjunction with the American Pet Products Association have been very active in establishing processing, handling, and packaging guidance for their industry.

CVM/FDA is committed to the concept of HACCP. HACCP for the rendering industry and other segments of the feed industry is still recommend and this recommendation is in line with that of the Codex Alimentarius Commission. FDA/CVM has drafted the preamble and codified sections of HACCP, but we still need to prepare the paperwork reduction section and
the economic evaluation. The proposed rule will provide for comments.

CVM's Office of Research, has conducted a multi-laboratory study which validated a PCR based method that they adapted from the method published by the Italians. Our Office of Research is actively working on an ELISA method that will use antibodies prepared on meat and bone meal, a similar approach has been used in England, and has also investigated the possibility of use feed microscopy. CVM recently awarded a $193,000 contract to Auburn University to support the development of an ELISA method. Work on this project is currently underway.

The BSE regulation was implemented in October 1997. The regulation restricts the use of protein derived from mammalian tissues, with certain exceptions, in ruminant feed. Based on information collected over nearly three years, 94% of licensed feedmills, 79% of non-licensed feedmills, and 87% of renderers are aware of the rule and attempting to comply. FDA and the States are continuing the inspections, and CVM plans to review the data by time periods to better define the compliance level.

The fact that 13.7% (down from 22%) of non-producers firms inspected were not aware of the regulation is a concern. FDA and the States are continuing the inspections.

Richard Sellers of the American Feed Industry Association, Arlington, VA gave an industry perspective of the dioxin issue. The food and feed industry have formed a coalition to address the Environmental Protection Agency's recent release of a draft dioxin risk reassessment. The Coalition provided written and oral comments to EPA addressing the paucity of exposure data. Moreover, the Coalition expressed concern about the conclusions drawn and lack of a good scientific basis for stating a significantly increased risk of cancer in the human population.

EPA is now moving to hold a Science Advisory Board meeting in November. This board will make the final determination of dioxin risks. The industry Coalition will again provide comments to EPA to address a new draft of the risk reassessment.

Dan Rollins, Director of Feedmill, Ross Breeders, Incorporated, Huntsville, Alabama discussed Ross Breeders' method of bacterial decontamination of poultry feed.

Feed quality and the impact that it has on food safety is a growing concern of the consumer base. This has become apparent with the mandated removal of several feed additives in recent years and restrictions which have been placed on certain ingredients. Some of these restrictions are products of government regulation, but most are consumer driven. As recently stated in "FEEDSTUFFS" (Volume 72, Number 37), "We live in an age where consumer power frequently outweighs scientific persuasion". We have seen this power expressed in Europe in such a manner that the end result was growth stimulant exclusion, antibiotic exclusion, and a regulatory requirement which mandates pathogen free feeds. The terms "food
borne pathogens, Salmonella, and coliform levels" are frequently associated with feed and animal processing.

This paper will address the issue of feed milling as it relates to the reduction and elimination of microbial contamination in animal feed. The issues will be presented in outline form in the following.

Feed Milling Technology

Current milling technologies offer design parameters, equipment, and additives that will eliminate the challenge of microbial contamination. Equally as important is the fact that control processes and the operational protocol are now defined that must be implemented in order to achieve the desired level of feed hygiene.

A. FEED MILL DESIGN

The most current feed: milling designs in Europe, Brazil, and the United States are designed in such a manner as to offer specific control of the traffic, air flow, air filtration, and process separation. The first feed mill to be built in the United States for the specific purpose of pathogen elimination was completed in August, 1999, by Ross Breeders, Incorporated in Athens, Alabama. This feed mill design is unique in the fact that the three main milling processes are housed in three independent structures. The incoming raw materials are received in an area that is separated from the remainder of the facility. All materials received into the plant are considered to be contaminated. This includes feed materials, replacement parts, and supplies. The receiving area is encapsulated within a sealed building that incorporates an automated process control and air control system systems. The feed is stored, and ground within a building that also incorporates an air filtration and dust collection system. The ground material is transferred from the grinding system to the process building through a sealed conveyor and elevator.

The process building is a totally sealed building which houses the conditioning, pelleting, and cooling equipment. The process building has three levels that are independently sealed one from another, each having an independent air control system. The interior of the building is designed as to allow complete wash down and disinfecting on a scheduled basis. This building contains the processing equipment which conditions, pellets, crumbles and dries the feed to the desired moisture level. This building is a secured area that requires showering in upon entry. After showering the entrant must change into sterile clothing and foot wear before entry into the processing area of the plant.

The equipment being utilized for the thermal processing of the feed is manufactured by Wenger Manufacturing Company in Sabetha, Kansas. The machine is the 15K Model of the Universal Pellet Cooker. This equipment incorporates technology from the food processing industry and effec-
FEED SAFETY

tively does the combined work of a feed conditioner, an angular gap expander, and a pelleting mill all in one piece of equipment. After the feed is processed through the pellet cooker, it then must pass through the pellet cooler which will lower the temperature to ambient temperature and dry the feed to a target moisture if 12.5% moisture. After drying the feed is conveyed via a sealed conveyor to the storage bins which are located in the shipping building.

The shipping building houses the finished feed storage tanks as well as an encapsulated loading area for the feed delivery trucks. The entire tractor and trailer are inside the loading building during the time of loading. This allows the entire area to be purged with filtrated air prior to the loading of the trailer. The trucks are loaded through a process which incorporates a computerized loading system and a closed circuit television system. The truck driver does not exit the truck while the truck is inside the shipping building.

B. PROCESS CAPABILITY AND RESULTS

In order to eliminate food borne pathogens from feed you must incorporate a combination of certain process variables at the required levels. The conditioning process must include a combination of key elements which include either moisture, high temperature, and time or moisture, temperature, and pressure. It is accepted in Europe, where Salmonella free feeds are mandatory, that the feed must be retained for a minimum of 6 minutes at 180 degrees Fahrenheit with a moisture content of 16% to effectively remove Salmonella from the finished feed. This technique incorporates the conditioning process which utilizes time, temperature and retention. The process utilized by Ross Breeders, Inc., is base on moisture, temperature, and pressure. The feed is conditioned for two minutes at a temperature of 210 degrees Fahrenheit, and a moisture content of 17%. After conditioning the feed then passes to the pelleting area of the Universal Pellet Cooker where due to pressurization the feed temperature is elevated to 235 degrees Fahrenheit for 3 to 4 seconds.

Another key element in pathogen reduction in feed is the grist size (particle size) of the ash feed. There is adequate data which suggests that grinding methods and particle size can have tremendous impact on pellet durability and starch gelatinization. Information now available indicates that the particle size of the mash feed entering the conditioning chamber of the pelleting process is equally important in the process of pathogen elimination. The smaller particle size allows a much faster rate of permeation to the core or center of the feed particle. With the total permeation of the feed particle by the correct levels of moisture and temperature, the gelatinization and pathogen elimination are achieved simultaneously. Figure #1 will indicate the relation between particle size and the heat transfer in time.

The transfer of moisture into the raw material particle also changes
relative to the particle size of the raw material. The moisture in the feed during the conditioning process acts as the conduit for the heat transfer into the feed particle. Therefore it is imperative that the moisture reach the core of each feed particle during conditioning. Figure #2 shows the moisture transfer time in relation to the particle size. As you can see the time increases dramatically as the particle size increases. The Wenger Universal Pellet Cooker successfully removes heat sensitive microbial contamination in feed due to the fact that the automated system has complete control of the moisture, heat and pressure.

The Ross Breeders Inc. Feed Processing Unit in Athens, AL. has been in operation since August, 1999. During this time period there has been no Salmonella found in finished feed. Ross Breeders Inc. test several samples of the feed produced at this facility each week for the levels of bacteria, coliform, and all types of Salmonella. The coliform levels are measured and serve as the marker for the elimination of microbial contamination. Ross Breeders Inc. accepts the feed as Salmonella free if no coliforms are present after processing. Figures #3 and #4 are indicative of finished feed microbial levels before and after processing.

Construction Cost

The construction costs of building this type of feed processing facility as compared to the cost of building a conventional feed mill are minimal. The areas of cost increase would be the foundation, air filtration, air control, and the additional building length which allows the receiving and loading process to be totally incapsulated. There are rewards also in this type operation such as improved animal performance, less feed shrink loss, and product safety.
Figure 1.

Reference: Wenger Manufacturing, Robert T. Strathman 8/17/00

Figure 2.

Reference: Wenger Manufacturing, Robert T. Strathman 8/17/00
### REPORT OF THE COMMITTEE

#### FEED - THERMAL PROCESSING VALIDATION

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*All TSA plates had mold.*

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*All TSA plates had mold.*
The meeting was called to order by Dr. Richard Breitmeyer, Chairman, at 12:35 p.m. on October 22, 2000. There were 19 members and 48 guests in attendance. Most guests in attendance indicated they would like to become members of the Committee. It was announced that after the meeting, all committee members not present at this meeting would be contacted to determine interest in remaining on the Committee. Those failing to respond would be eliminated the Committee.

Dr. Breitmeyer proposed that the emphasis of the Committee be to address current animal production food safety issues. Because of the many food safety issues impacting animal agriculture, it is critical that animal health professionals become involved in discussing and influencing national policies. Within USAHA, this Committee is the appropriate forum to discuss issues and formulate recommendations. There was general consensus to prioritize animal production food safety issues.

Dr. Breitmeyer presented a draft document, Animal Production Food Safety Model Program Guidelines, An Outline to Assist Development of a State Program, which could be used to assist in the development of state food safety programs. While there was not sufficient time to discuss this
document, a subcommittee will review this proposal and make recommenda-
tions at the next meeting. The draft outline is printed at the end of the
Committee Report.

Mr. Dan Daniel J. Vitiello, Domestic Program Leader, Animal Produc-
tion Food Safety Staff, Food Safety and Inspection Service, USDA, pre-
presented Market Demands for Animal Production Food Safety Programs –
What Will the Marketplace Require? He noted that the recent HACCP rule
is fostering change in food animal marketing. Packers are now more con-
cerned about pathogens and residues in animal entering their plants. Pro-
ducers are more concerned about marketability and liability. Producers are
attempting to meet packer demands through quality assurance programs.
The question remains if producers will be compensated for increased costs
or if liability will be affected. He closed by stating that FSIS currently had 24
state and 10 university animal production food safety partnerships.

Mr. Vitiello then presented a draft document, Animal Production Food
Safety Model State Statute. Federal and state legal structures do not re-
flect animal production food safety needs. Of the federal agencies, only
FDA has limited authority for interstate commerce. At the state level, there
is limited authority by public health agencies and agriculture departments
typically do not have food safety authority at the farm. The 1999 USAHA
Food Safety Committee survey of state veterinarians found that 85% sup-
ported development of a Model Code on Animal Production Food Safety.
Components of the could include producer education, investigation of resi-
dues violations, assist producers involved in pathogen outbreaks, support
for voluntary animal identification programs, authority to review records,
certification of animal production food safety practices and verification of
private veterinarians in food safety/quality assurance programs. Possible
reasons to develop a Model State Statute forAnimal Production Food Safety
include: formally sanction state animal health offices to undertake food
safety activities, clarify roles and responsibilities of animal health agencies
in food safety, provide basis for funding to state animal health offices, pro-
vide mechanisms for animal health staff and accredited veterinarians to
address food safety issues, and maintain markets for small producers. The
Committee recommended that this proposed Model Guideline be further
developed by a subcommittee and be brought back to the next meeting for
discussion.

Dr. Bonnie Buntain, Assistant Deputy Administrator, Office of Public
Health and Science, USDA, FSIS presented Emerging International Stan-
dards for Animal Production Food Safety – What Will be Required for Ex-
ports? The overarching goals of global risk reduction systems are to re-
duce foodborne illness. The presentation reviewed some actions of the
Codex Alimentarius Commission to develop general principles, standards,
guidelines and related codes of practices essential to the management of
the safety of food in international trade. A summary of the presentation is
Dr. Dave Pyburn, Director, Veterinary Science, National Pork Producer Council presented *National Trichinae Herd Certification Program – An Update for 2000-01*. He outlined the current program and discussed the process and advantages of the certification program. A video was also shown which is used to educate accredited veterinarians of their role in certification. A summary of the presentation is printed at the end of the Committee Report.

Mr. Doug Saunders, Program Manager, Office of Dairy and Foods, Virginia Department of Agriculture and Consumer Services and Vice Chair of the Steering Committee for the National Food Safety Systems Project presented an overview of *The National Food Safety System*. This is a cooperative effort among local, state and federal agencies to improve the nation's food safety system. He encouraged Committee members to join one of the workgroups, assist with on-farm issues, participate in state food safety task forces and work with other organizations, which are participating in the project, especially the Association of Food and Drug Officials. A summary of the presentation is printed at the end of the Committee Report.

Dr. Sam Holland, State Veterinarian, South Dakota, presented *South Dakota Beef Quality Assurance Program – A Certification Model*. The South Dakota Beef Quality Assurance/Critical Management Plan was developed by an alliance of industry, regulatory, academic, public health and related stakeholders, as a result of producers recognizing the "trickle down" effect of HACCP requirements by packers, as well as recognizing the increasing demands consumers place on documentation of food safety practices. The program is targeted to assist primarily small independent producers but is intended to include the entire beef production chain, including dairy beef.

The program involves 4-hour initial training sessions for producers and the producer's veterinarian. The producer then completes a certified management plan of operation, which is available in computer-generated modules. The critical management plan is a HACCP-like system of production with signed agreements and guidelines producers abide by including: feedstuffs, additives, treatments, animal welfare, and maintenance of a valid veterinary/client/patient relationship for the premise. The accredited premise veterinarian and the producer co-apply for a certificate from the State Veterinarian. Training is verified, and based on training, maintenance of the critical management plan and the accredited veterinarian's concurrence a certified premise card and number are issued. The certification is valid for 3 years and future plans include audits – both random and in-depth review audits in event of violations.

Dr. John Huntley, State Veterinarian, New York, presented *Public Health Partnerships in Animal Production Food Safety*. Major challenges facing producers include animal health, public health and environmental steward-
ship. Many examples were given emphasizing the importance of animal health partnerships with local, state and federal public health agencies. In addition, many proactive quality assurance programs were described. A summary of the presentation is printed at the end of the Committee Report.

Dr. Richard Breitmeyer, State Veterinarian, California, presented California Dairy Quality Assurance Program, Team Building Model. This quality assurance program has three components, environmental stewardship, food safety and animal health/welfare. To facilitate the environmental stewardship program, a partnership agreement was signed by state and federal agencies, university officials and industry representatives. All partners agreed to develop a checklist to use for dairy evaluations when considering state and federal environmental regulations. The educational components of the program are led by University of California Extension personnel. Milk inspectors from the California Department of Food and Agriculture are conducting the voluntary evaluations. Funding for the education and evaluations was provided by a grant from U. S. EPA. To date, about one-half of the producers in the state have been trained and the evaluations are just getting started. The education modules for the food safety component are being developed and the need for a comparable certification component will be evaluated.

Dr. John Wiemers, National Animal Identification Director, USDA, APHIS, Veterinary Services presented Animal Identification Considerations for Food Safety. With the successful eradication of brucellosis, the number of animals being routinely identified is declining. There is a need to establish a national identification system. Such a system is necessary to identify animal movements from birth to slaughter. A serious animal disease outbreak, such as BSE, will be catastrophic for the beef and dairy industries if all animals associated in such an outbreak cannot be successfully traced to their source. A Canadian example was given and noted that most countries have or are developing national identification systems. The United States must develop such a system before existing brucellosis program identification declines below an acceptable level.

Dr. John Ragan, Animal Production Food Safety Staff, USDA, FSIS, presented National Residue Program – A Brief Overview and Highlights of the National Conference on Animal Production Food Safety, St. Louis, Missouri, September 6-7, 2000. An overview of the various components of FSIS' national residue program was presented, including monitoring, special projects, surveillance sampling and enforcement sampling. Over 200 people participated in the National Conference on Animal Production Food Safety held last month in St. Louis. Participants included representatives from a wide segment of industry, government and academia. Breakout groups addressed many issues related to education and research. A proceeding from the meeting is being drafted which will be available soon.

Dr. Dale Boyle, Executive Director, National Association of Federal
FOOD SAFETY

Veterinarians and Karen Henderson, USDA, FSIS, presented New Direction for FSIS Veterinarians. At the request of the FSIS Administrator, a working group was convened to explore new opportunities and develop recommendations for the future of FSIS veterinarians. Included in the review was the role of the field veterinarian, the role of veterinarians internationally and the role of a new position, the Chief Veterinary Medical Officer for FSIS. Education, training, recruitment and recognition were also considered. Field veterinarians can address new areas such as validating HACCP plans, analyzing data, bioterrorism and animal welfare issues. Partnering opportunities with other public health and animal health officials are also available. An implementation team should now be put in place to carry out the recommendations.

Two resolutions were presented. Dr. Andrew Clark presented a resolution to support the APHIS/ARS Master Plan for Facility Consolidation and Modernization, Ames, Iowa. The resolution was moved by Dr. Joe Blair, seconded by Dr. Dale Boyle and passed unanimously. Dr. Ken Olson presented a resolution to support training of accredited veterinarians for certification of on-farm food safety programs. The resolution was moved by Dr. Lyle Vogel, seconded by Dr. Joe Blair and passed unanimously.

The meeting was adjourned at 5:45 p.m.

ANIMAL PRODUCTION FOOD SAFETY MODEL
PROGRAM GUIDELINES
An Outline to Assist Development of a State Program

Dr. Richard E. Breitmeyer
State Veterinarian, California

-Draft-

A. Team/Organization – Team members will vary by commodity/issue, etc.
   I. Industry
      a. Commodity organization(s) – industry leaders
      b. Veterinary practitioners
      c. Other allied industries (feed, nutrition, pharmaceuticals)
   II. Government
      a. State Veterinarian – will usually play a lead role
      b. Other Department of Agriculture programs as appropriate
      c. State public health
      d. USDA (personnel located within state)
      e. FDA (within state)
      f. EPA (within state)
      g. Local environmental health
      h. Others as needed
III. Academia
   a. Education - Extension
   b. Researchers
   c. Veterinary diagnostic laboratory personnel

B. Prevention/Program Development
   I. Identify issues/needs
      a. Regulatory requirements (or threat of new regulations)
      b. Marketplace demands
      c. Timing and purpose
      d. What is industry incentive to participate?
   II. Identify facilitator
      a. Keep records/correspondence
      b. Arrange meetings
      c. Key communicator
   III. Identify program components/goals
      d. Needs assessment/survey
      e. Set standards (critical to do at start or near start)
      f. Education (foundation for any program)
      g. Determine core components (management strategies)
         i. Information on specific disease(s) (S. e., E. Coli O157:H7, etc.)
         ii. Biosecurity practices
         iii. Residue prevention practices
         iv. Animal health/care practices
         v. Environmental stewardship practices
         vi. Feed safety issues
         vii. Water/ manure handling practices
      h. Identify information gaps/research needs
         i. Certification
         ii. Decide if needed
         iii. Economic incentive?
         iv. Needed to maintain market?
      j. Record keeping
      k. Animal/premises identification
   l. Assess progress
      i. Numbers of participants
      ii. Pre/post evaluation of education
      iii. Level of participation (if tiered program)
   m. Validate program
      i. Testing/monitoring (S.e. example)
      ii. Residue violation increase/decrease
   n. Identify roles and responsibilities
      i. Partnership agreement needed?
C. Response  (if there is a public health or regulatory need)
   I. Communication networks to include all partners/participants
   II. Roles and Responsibilities
      a. Authority at each step in food chain, including the farm/ranch
         i. Review – assess need for new legislation/regulations
         ii. Traceback protocols
            1. Role of animal health officials
            2. Who goes on farm if needed?
         iii. Epidemiological investigations
            1. Including who can/should go on farm
         iv. Record review
      v. Opportunities for new information
         1. Field studies
         2. Traceback information
         3. Collect data
      b. Partnership agreements
         i. Formal clarification of roles and authorities
      c. Share resources

EMERGING INTERNATIONAL STANDARDS IMPACTING ANIMAL PRODUCTION SYSTEMS

Bonnie Buntain, DVM, MS
Assistant Deputy Administrator, Office of Public Health and Science, USDA-FSIS

This presentation will frame the overarching goals of global risk reduction systems to reduce foodborne illness. It will review some actions of the Codex Alimentarius Commission to develop general principles, standards, guidelines and related codes of practices essential to the management of the safety of food in international trade. In particular, it will focus on the overarching Codex General Principles of Food Hygiene for Primary Production and guidelines for animal feeding operations and quality assurance systems.

The purpose of Codex is to develop international food standards, ensure consumer protection and facilitate fair trade among its member nations. The Codex Alimentarius Commission (commonly referred to as Codex) was established in 1962 as a subsidiary body of two United Nations organizations: the World Health Organization (WHO) and the Food and Agriculture Organization (FAO). It currently has 165 member nations that represent approximately 98% of the world population. The Executive Committee recommends the general direction of the Commission but all international standards are set via consensus of the member nations. The World Trade Organization recognizes Codex standards in resolving technical trade
REPORT OF THE COMMITTEE

disputes regarding food safety and quality.

The presentation reviews the basic foundation text of the Codex Alimentarius Commission to develop general principles for food hygiene for primary production, draft concepts for animal feeding guidelines, and the current thinking behind the draft guidelines for quality assurance systems. Actions of various committees and working groups that are reviewing issues related to primary production are covered in this overview. The purpose of this presentation is to reinforce the importance of continued involvement of the USAHA with international Codex issues impacting animal production.

NATIONAL TRICHINAE HERD CERTIFICATION PROGRAM – UPDATE FOR 2000-01

Dr. Dave Pyburn
Director, Veterinary Science, National Pork Producers

The Trichinae Herd Certification Program is a pre-harvest pork safety program that will provide documentation of swine management practices which minimize risk of exposure of swine to the zoonotic parasite *Trichinella spiralis*. The program establishes a set of criteria that enable producers to market swine, which are not considered a risk to human health due to exposure to this parasite. This program has been developed as a cooperative effort among the USDA agencies (Animal and Plant Health Inspection Service [APHIS], Agricultural Research Service [ARS], Cooperative States Research, Education and Extension Service [CSREES], Food Safety and Inspection Service [FSIS]) the National Pork Producers Council [NPPC], and the pork processing industry. The concept of risk management for control of *Trichinella* in the domestic swine population is endorsed by the U. S. Animal Health Association, the National Institute for Animal Agriculture and the American Association of Swine Practitioners. It is also recognized by the International Commission on Trichinellosis in their Recommended Methods for Control of *Trichinella* in swine. This Program is seen as a model for future on-farm animal agriculture food safety programs.

Even with evidence that trichinae infection is becoming very rare, if not nearly non-existent in humans and swine, the perception of trichinae infections from pork still exists with some consumers. The lack of a national testing or on-farm program to address trichinae may also be an impediment to the U.S. Pork Industry reaching its full market potential internationally.

In response to consumer perceptions and to further the development of U.S. pork export markets; the National Trichinae Research Project (NTRP) was undertaken in 1994. This is an ongoing collaborative effort between the National Pork Producers Council (NPPC), government - USDA's Agri-
FOOD SAFETY

cultural Research Service (ARS), Animal and Plant Health Inspection Service (APHIS) and Food Safety and Inspection Service (FSIS), and allied industry. The following summarizes the project progress and program development to date.

Prevention of human trichinellosis resulting from the ingestion of pork is variously accomplished through meat inspection, through processing of pork products by heating, irradiating, freezing or curing, and through consumer education with respect to meat preparation. In modern pork production systems there is essentially no risk to pigs of acquiring *Trichinella* infection, and the absence of the parasite from domestic pigs raised in these systems has been established through extensive testing. Documentation of trichinae-safe good production practices is a viable economic alternative to individual carcass testing to assure product safety.

A pilot trichinae herd certification study was conducted in three states in the Midwestern U.S. (Iowa, Minnesota, South Dakota) to evaluate a process verification system for the production of trichinae-free pork. An on-farm audit, consisting of 55 questions, was developed for use in determining the presence of risk factors for exposure of pigs to potential sources of *Trichinella*. The audit was administered by trained, USDA accredited veterinary practitioners on 198 pork production sites in the 3-state area. All pigs raised on sites where audits were conducted were slaughtered at a single packing plant and a sample from each carcass was tested by pooled diaphragm digestion and an enzyme-linked immunosorbent assay (ELISA). Few production sites met all criteria established within the audit for risk-free management practices. Most of the deficiencies were noted in the lack of a regular rodent control program around swine rearing buildings. However, it was estimated that greater than 85% of these sites could meet good production practice criteria with minor improvements in management. From a total of 221,123 carcass samples tested from audited farms during a 6-month period, no *Trichinella* positive carcasses were detected by diaphragm digestion or ELISA. Based on the outcome of this study, an improved, more succinct audit was developed with objective measures of good production practices, which reduce or eliminate risk of exposure of pigs to sources of *Trichinella*. The new version of the audit is being used in large-scale pork production chain pilots of the certification program that will lead up to the implementation of the voluntary program in the U.S.

The large-scale pilots of the system began this summer and they will continue through the end of 2001. These pilots involve a packing plant in Minnesota and a packing plant in Iowa. The pilot production sites that supply pigs to these plants are located in Iowa, Minnesota, Nebraska, and South Dakota. The pilots will follow the flow events as has been proposed for the program (see Flow of Events in Certification diagram). At this point in the pilot the herd veterinarians for the pilot producers have been identified and trained in a daylong training session. The educational materials
for the producers were delivered in early October thus the on-farm audits will begin this fall. These large-scale pilots will test the entire proposed system for the certification of trichinæ-safe farms.

The proposed certification process includes the following elements: 1) Veterinarians, trained in good production practices relative to trichinæ, work with their producers to ensure that trichinæ risk factors are minimized on their farms; 2) The on-farm audit will serve as a method to document the absence of trichinæ infection risks. Audits will be done periodically to ensure that good production practices relative to trichinæ remain in place; 3) On a regular basis, a statistical sample of the national trichinæ certified herd will be tested at slaughter using diaphragm digestion or ELISA to verify the absence of infection; and 4) USDA veterinarians will conduct random "spot audits" of certifications to ensure completeness and the integrity of the program.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
FOOD SAFETY

Flow of Events in Certification

Producer requests program information

Accredited veterinarian requests qualification information

Producer assesses good management practices and makes changes as necessary

Veterinarian receives training and is awarded Qualification status

Producer requests program application through Qualified Accredited Veterinarian or APHIS VMO

Audit is conducted and application filed with appropriate fee

Program status decision made by APHIS Administrator

Program status granted (by APHIS); and production site can market animals as trichiniae certified if in Stage II or III

Certified animals (Stage II or III program status) enter marketing channels with TIN number; animals are identified through sale and slaughter by identification or segregation

Packer verifies the TIN number when receiving animals for processing; carcasses are tracked through the slaughter and fabrication processes; FSIS monitors packer records of certified animals

Blood or tissue samples are collected from a subset of certified animals for testing by digestion or ELISA by plant personnel on a monthly basis

FSIS monitors results of testing and reports any positive results with site trace back information to APHIS

Loss of program status by any production site is immediately communicated to producers (by APHIS) and to the packer (by the producer), and entered into the trichiniae certification status database accessible via the internet

Program status denied

Producer works with their herd veterinarian or the Qualified Accredited Veterinarian to implement Good Production Practices necessary to achieve program status

Periodic auditing of certified production sites and spot audits assure maintenance of good production practices (APHIS), audit integrity, and program consistency
The National Food Safety System project began as a vision of the Association of Food and Drug Officials to develop a fully integrated, seamless, nationwide food safety system that would effectively and efficiently incorporate all food safety resources at the Federal, State and Local levels. The overall objectives of such a system are to improve the level of food safety within the United States and to significantly reduce the incidence of foodborne illness. The U.S. Food and Drug Administration hosted the "50 State Meeting" in Kansas City, MO in September 1998; this meeting included representatives from health and agriculture departments from all 50 states, Washington, DC and Puerto Rico, as well as the FDA, USDA and CDC. Participants at this meeting began developing a vision on ways to make the U.S. food supply safer. This meeting led to the development of the National Food Safety System project, which is composed of five workgroups and a national steering committee. The membership of each work group and the steering committee represent a broad geographical mix of individuals from Federal, State and Local agriculture, health and epidemiology disciplines. Each workgroup, with the oversight and guidance of the Steering Committee, is focusing on numerous projects with the ultimate goal of developing a seamless nationwide food safety system. Possible areas where the U.S. Animal Health Association can become involved with the National Food Safety System project might include:

- Membership on the five workgroups; those workgroups include:
  - Roles and responsibilities
  - Outbreak coordination
  - Laboratory operations and coordination
  - Information sharing and data collection, and
  - National uniform criteria

- Assistance with on-farm issues such as:
  - Good agricultural and good management practices
  - Incorporation of HACCP principles, when and where applicable
  - Development and implementation of effective traceback protocols, and
  - Education at the production level relative to on-farm food safety issues
Involvement/participation with State Food Safety Task Forces
Involvement/liaison with organizations such as the Association of Food and Drug Officials

PUBLIC HEALTH PARTNERSHIPS IN ANIMAL PRODUCTION AND FOOD SAFETY

John P. Huntley DVM, MPH
NYS Department of Agriculture & Markets
Director, Division of Animal Industry

Background

Today’s food animal producer must thrive in a challenging, rapidly changing, operational environment. This environment is continuously being shaped by consumer demands, animal herd health status and environmental protection issues. The major challenges facing the food animal production industry today can be considered to be a member of one of the three major categories listed below:

1. Animal Health
   - Animal diseases that impact production
   - Animal welfare and cow comfort
   - Production efficiency
2. Public Health
   - Zoonotic disease control
   - Food safety
   - Chemical residue
3. Environmental Stewardship
   - Nutrient management
   - Pathogen runoff from production animal facilities
   - Nuisance factors

The production of safe and wholesome food has always been an important consideration within the food animal production community. Recent well-publicized food origin outbreaks have demanded a closer cooperative working relationship between the production animal/animal health infrastructure and public health agencies. The following discussion describes the cooperative partnerships that have been developed between public health agencies and production animal/animal health agencies in New York State. The success of these relationships as measured by an increase in food safety and the implementation of more sensitive systems to detect potential problems is already evident.
REPORT OF THE COMMITTEE

THE NEED FOR A CLOSE COLLABORATIVE WORKING RELATIONSHIP

The defining issue establishing the need for a close cooperative working relationship between the animal production/health industry sector and the food safety/public health control agencies was the emergence of *Salmonella enteritidis* in shell eggs in the late 1980's. Public health regulatory actions in response to these outbreaks were directed at high-risk institutional food service facilities and the production units associated with the eggs contributing to the outbreaks. Actions including product recalls, directed product marketing and other restrictions threatened the viability of the poultry industry in the Northeast. It was obvious that a process for addressing public health concerns while maintaining a viable food production industry was required. This process involved the active participation of the food production industry, animal health agencies and public health. Recognition of the need for a collaborative approach to these issues led to a decade long process of establishing, evaluating and refining an appropriate public health response to foodborne contaminants. The process established to resolve this issue has been expanded to address the entire spectrum of public health/production agriculture common concerns.

ESTABLISHING THE PLAYERS

The establishment of a cooperative group capable of addressing the development of an appropriate *Salmonella enteritidis* response required an assessment of agencies and groups that controlled every aspect of the production of shell eggs from farm to market.

Identification of Jurisdictions and Authorities

It became clear early in the initial attempts at SE control that several governmental agencies had authority and control over key areas impacting poultry health, egg sales and human disease. Program success depended upon the coordination and integration of these authorities. The following agencies have statutory authority and responsibility for the marketing of shell eggs, animal health, human health and egg transport, storage and sale.

III. USDA

USDA has responsibility for the protection, promotion and preservation of livestock health including poultry. This definition caused some early concern within the agency since the chickens themselves were not affected by the SE phage types that were present in the US at that time. They are the only agency on a federal level with specific authority to implement on-farm disease control programs and the only federal agency with a field force that is trained in animal disease control and agricultural practices.
FOOD SAFETY

IV. FDA

FDA has the statutory responsibility to protect human health by ensuring that the nation's food supply is safe and free of adulterants. They exercise this authority over all food products that enter into or may enter into interstate commerce.

V. Center For Disease Control (CDC)

CDC’s authorities and responsibilities include the maintenance of an active surveillance system designed to monitor trends in the health of the human population of the United States. The goal of the CDC is to recognize emerging threats early in the course of their appearance in the human population and to try to illuminate etiology, vectors and other risk factors associated with the propagation and transmission of the disease. CDC maintains databases that utilize information from hospitals, clinics and local health departments to assess the health status of the human population.

VI. New York State Department of Health (NYSDOH)

The New York State Department of Health played a key role in the development of the national and state Salmonella enteritidis control policy. The mission of the Department of Health is to enhance the health of New York’s population through health education, engineering, prevention and promotional activities applied at the community or population level. The NYSDOH implements many of its policies through individual county health departments, which operate with NYSDOH authority. The local county health departments are the operational or outreach arms of the health department. They are likely to be called to investigate foodborne outbreaks, conduct sanitary inspections of food preparation facilities and facilitate the submission of samples to the New York State Health Department.

VII. New York State Department of Agriculture and Markets (NYSA&M)

The statutory authority embodied within the Department of Agriculture and Markets (A&M) represents a confluence of agricultural industry, public health, environmental protection, food protection and marketing concerns. It is for this reason that Agriculture and Markets was to assume a key role as the coordinator of the Salmonella enteritidis response and control program for New York State.

Some of the responsibilities of this agency that made it an appropriate point to implement a Salmonella enteritidis control program include:

- Food Inspection - The Division of Food Inspection supervises the packing, grading and distribution of shell eggs. The distribution of shell eggs is also monitored to ensure that processes are consistent with the production of safe and wholesome food. The agency has regulatory powers and can recall potentially hazardous product at
any point in the food distribution process. This includes recall authority at the retail level.

- Animal Industry - The Division of Animal Industry conducts disease control programs designed to preserve, protect and promote the health of the livestock population in New York. Zoonotic disease control and foodborne pathogen reduction programs in food producing animals are major areas of responsibility.

VIII. State Poultry Industry Coordinated Effort (SPICE)

SPICE is an industry group dedicated to the promotion of the poultry industry in New York State. Their voice and standing with the member poultry producers is important to the success of any program that requires the active participation of the industry.

FORMING THE ADVISORY COUNCIL

Representatives from the public health, animal health and the production industry were assembled to form an advisory council to deal with mutual issues of public health and food safety issues. Care was taken to include individuals representing food production at all levels of the production continuum. In the case of *Salmonella enteritidis*, a compromise control/public health response document was developed and endorsed by the various constituent groups. The document was then processed as a Memorandum of Agreement between the production industry, animal health and public health officials. This MOA establishes operating procedures and describes government action in response to future outbreaks.

RESULTS

Since the ratification of the MOA, there have been no human outbreaks of *Salmonella enteritidis* in humans associated with the consumption of program-produced eggs. Encouraged by the success of this effort, other food animal production groups have developed similar initiatives to deal with public health threats. The New York State Cattle Health Assurance Program (NYSCHAP) uses a similar risk assessment/risk mitigation strategy to reduce pathogen loads and subsequent food product contamination on the farm.

THE NYSCHAP PROGRAM

The program consists of two basic components, the core and the targeted modules.

The Core: The base or core component is the program foundation. It consists of a set of those health management practices designed to prevent the introduction of a disease agent and reduce the transmission of the disease within the farm animal population. Additional core practices are designed to prevent the escape of the agent into the environment and re-
duce the chance that an infected animal will be moved to a new, naïve animal population.

The core program can best be described as those general health and biosecurity practices that are implemented on the farm to improve the general health and well being of the animals. These are often preventive in nature.

**Targeted Modules:** The targeted module is designed to address specific health issues or diseases on the farm. They are incorporated into the herd plan that is tailored to the farm situation and designed to provide resolution of these issues. The decision to implement a particular module depends on the nature of the problem, the resources available and producer goals and intentions.

Modules are designed to supplement the core biosecurity measures described previously. Food safety based modules include residue avoidance, mastitis control, Salmonella outbreak control, paratuberculosis management, and environmental pathogen control.

**PROGRAM COMPONENTS**

**RISK ASSESSMENT:** The risk assessment is a key component of all modules associated with the NYSCHAP program. The risk assessment involves an actual on-farm walk through for the purpose of identifying risk factors for disease transmission. These risk factors are then matched to intervention strategies designed to mitigate the identified risk.

**HERD PLAN:** The final component of the NYSCHAP module materials set consists of the herd plan. The herd plan results from the assignment of a priority to the intervention strategies that were identified during the risk assessment process. Consideration of which factors to include in the herd plan include the estimate of the magnitude of effect, the resources available for implementation, the producers' desired rate of progress and the farm goals.

The herd plan also includes a designation of the individual responsible for the implementation of the management strategy and the frequency (usually monthly) that an assessment of this factor is made.

**PUBLIC HEALTH AGENCY INVOLVEMENT**

Several aspects of public health concerns are represented in the herd based food production systems mentioned above. Some of the disciplines represented include:

- Occupational health and safety
- Communicable Disease
- Zoonotic disease control
- Environmental health
- Solid waste disposal
Program flow

Summary:
Public health agencies can contribute significantly to the development of effective strategies designed to improve food safety and control zoonotic disease. Their presence as part of a collaborative group representing all interests is essential to ensure program success in these areas. Involvement in the developmental process also serves to improve communication and contributes to recognition of the efforts that are taking place at the farm level. This knowledge often serves to modify regulatory responses to an outbreak event to the advantage of the production industry.
REPORT OF THE COMMITTEE ON FOREIGN AND EMERGING DISEASES
(Formerly the Committees of Foreign Animal Diseases & Epizootic Attack)

The combined meeting of the Foreign Animal Disease Committee and the Epizootic Attack Committee was held 12:30-5:30 on October 23 and 7:30-12:00 on October 24, 2000.

COMMITTEE ON EPIZOOTIC ATTACK

Chairman: Dr. Bret D. Marsh, Indianapolis, IN
Vice Chairman: Dr. Saul T. Wilson, Jr., Tuskegee, AL

Dr. J. B. Anderson, TN; Dr. Richard E. Breitmeyer, CA; Dr. William W. Buisch, IA; Dr. Jerry J. Callis, NY; Dr. H. Michael Chaddock, MI; Dr. Dorothy Davidson-York, CA; Dr. Wallace A. Deen, MO; Dr. Debbi A. Donch, MI; Dr. George C. Edwards, NC; Dr. A. Konrad Eugster, TX; Mr. Joe B. Finley, TX; Dr. Don A. Franco, VA; Dr. Chester A. Gipson, VA; Dr. Billy R. Heron, CA; Dr. Owen W. Hester, AL; Dr. John P. Huntley, NY; Dr. John L. Hyde, NY; Dr. Brian R. Jamieson, CAN; Dr. Edward T. Mallinson, MD; Dr. Richard H. McCapes, CA; Dr. Harless A. McDaniel, MD; Dr. Norvan Meyer, VA; Dr. James E. Novy, TX; Dr. Lorraine O'Connor, MA; Dr. Richard E. Omohundro, AZ; Dr. John S. Orsborn, Jr., CA; Dr. Bennie L. Osburn, CA; Dr. Kelly R. Preston, AA; Dr. John J. Schiltz, IA; Dr. William G. Sterritt, CAN; Dr. Kenneth L. Thomazin, CA; Dr. Dennis L. Thompson, CA; Dr. Alfonso Torres, DC; Mrs. Michele C. Turner, CA; Dr. Max A. Van Buskirk, PA; Dr. Stanley A. Vezey, GA; Dr. Gary M. Weber, DC; Dr. John L. Williams, MD; Dr. John H. Wyss.

COMMITTEE ON FOREIGN ANIMAL DISEASES

Chairman: Dr. Mo D. Salman, Fort Collins, CO
Vice Chairman: Dr. Corrie C. Brown, Athens, GA

Mr. John B. Adams, VA; Dr. Bruce L. Akey, VA; Dr. J. B. Anderson, TN; Dr. Joseph F. Annelli, MD; Dr. Joan M. Arnoldi, WI; Dr. Edgardo Arza, GA; Dr. Charles A. Baldwin, GA; Dr. Fred D. Bisplinghoff, FL; Dr. Bob H. Bokma, MD; Dr. Theresa L. Boyle, TX; Mr. Philip E. Bradshaw, IL; Dr. Richard E. Breitmeyer, CA; Dr. Victoria E. Bridges, CO; Dr. William W. Buisch, IA; Dr. Conley Byrd, AR; Dr. Jerry J. Callis, NY; Dr. Hector Campos, ; Dr. Yung Fu Chang, NY; Dr. Terry H. Conger, TX; Dr. Philip J. Corrigan, DC; Dr. Robert A. Crandell, TX; Dr. Dorothy Davidson-York, CA; Dr. Wallace A. Deen,
Dr. David Huxsoll, the new Director of the Plum Island Animal Disease Center (PIADC), shared his vision for the facility. He noted increasing concern about foreign animal diseases, citing examples of the current global pandemic of foot-and-mouth disease as well as recent outbreaks of classical swine fever and Rift Valley fever. The response to an outbreak is critical and diagnosis must be rapid and accurate. There is a need to look beyond the facility of PIADC and in the event of a large-scale outbreak, off-site, noncentralized testing using noninfectious material should be considered, with essential backup by PIADC. The scientific efforts and expertise at Plum Island were lauded, and Dr. Huxsoll indicated that there is a great need to maintain these people and support them. Training more veterinarians in foreign animal diseases was emphasized and should be done at all levels. The U.S. has a serious need for BSL-4 laboratories and the USDA will go forward with plans to construct these laboratories at PIADC, in order
Dr. Paul Sutmoller delivered a presentation, "Importation of beef from countries infected with foot and mouth disease: a review of risk mitigation measures." Measures to reduce the risks associated with importing beef from countries infected with foot and mouth disease (FMD) consist of controls at the farm of origin, inspection of slaughterhouses and maturation and deboning of the carcass. He relayed results from a study evaluating these measures on the mitigation of risk for meat from cattle infected with FMD in different stages of the disease. The four disease stages considered were the incubation period, the period of clinical signs, convalescence and the carrier stage. Efficient animal health systems, disease surveillance, and ante-mortem and post-mortem inspection of all cattle effectively reduced the risk of FMD from cattle slaughtered during the period of clinical signs or convalescence. These measures failed for cattle slaughtered during the incubation period, before the appearance of clinical signs. In these cattle maturation of the carcass reduced the risk of the presence of virus in muscular tissue. In addition, deboning and removal of major lymphnodes and large blood vessels eliminated a source of FMD contamination of the beef. However, the slaughter of viraemic cattle created an additional – until now unrecognised - hazard of gross environmental viral contamination of the slaughterhouse facilities. Therefore, the maturation process may create a false sense of security. Cattle slaughtered during the carrier stage did not pose a risk for the international beef trade.

"Vesicular stomatitis in western hemisphere: Update of research activities," was presented by Dr. Luis Rodriguez. Two serotypes of vesicular stomatitis, Indiana-2 (Cocal) and Indiana-3 (Alagoas) are exotic to North and Central America. These two diseases have created confounding factors in eradication of foot-and-mouth disease from parts of South America. Dr. Rodriguez reviewed the various projects on vesicular stomatitis. Colorado State University is involved in several collaborative projects, including the study of sentinel herds to monitor seroconversion and epidemiology, and disease patterns in Costa Rica and El Salvador. In cooperation with the Centers for Epidemiology and Animal Health, CSU is using geographic information systems (GIS) to evaluate various risk factors. Work at the ARS Arthropod-Borne Animal Disease Laboratory (ABADRL) and the University of Wyoming is focusing on the presence of wild reservoirs of the disease. In addition, scientists at ABADRL are examining the role of arthropods in the disease cycle. University of Georgia scientists have developed effective animal models of vesicular stomatitis and are beginning pathogenesis studies in horses. The Plum Island Animal Disease Research Center is studying molecular evolution and pathogenesis of vesicular stomatitis viruses, as well as various pathogenesis studies. Dr. Rodriguez indicated that there was good communication among the various partners and that all were effectively sharing information and attempting to synergize
Dr. Aida Boghossian presented "Battling non-traditional foreign animal diseases." In the past the regulatory community has considered the traditional OIE list A & B diseases, such as foot-and-mouth disease, classical swine fever and rinderpest, to be the most economically devastating diseases. Governmental agencies have spent years of planning, developing policy and specific disease eradication strategies, training personnel, and preparing for these known diseases. The radar was focused on these traditional threats. However, now, non-traditional diseases are on the rise. The last few years has seen other countries battling with Nipah virus and avian influenza H5N1 (Hong Kong), as well as our own challenges with West Nile virus, rabbit calicivirus, invasive species and the re-emergence of domestic diseases in captive and free ranging wildlife. Strategies and protocols used for traditional foreign animal diseases don't apply to these new emerging problems. Learning from other countries' control and eradication efforts with these diseases provides an opportunity to develop and tailor U.S. eradication protocols to address these new threats. These and other diseases are demanding more attention due to the increased risk of entry, public health concerns and the effect on international trade. It is expected that the Animal Health Emergency Management System will provide a national framework to deal with the uncertainty that a "new" disease brings. It is important for emergency preparedness to respond rapidly and effectively by developing an "all hazards" approach. This is being accomplished by proactively developing policies, emergency preparedness planning and building networks, and forming partnerships with other state, federal, and industry groups.

Dr. Mark Schoenbaum delivered a paper, "Preliminary studies of hypothetical outbreaks of foot-and-mouth disease using a Windows-based computer model for contagious disease spread." Using the concepts of an Australian model (Garner and Lack, 1995) reported on by Dr. John Belfrage at this committee meeting last year, an improved computer model was developed in the Delphi programming language for Windows. The model simulates, using state transition techniques, the spread of infection via the airborne route, and direct/indirect contact. Disease eradication/control strategies are also modeled including ring vaccination, slaughter of clinical herds, ring herds, and contact herds. The improved model visually displays spatial relationships of herds, spread of infection among herds, and mitigation activities during an outbreak. The costs of disease eradication activities are tracked. The model has potential application in planning and developing strategies for potential outbreaks of foot and mouth disease. This report presents preliminary data on the cost-benefit of vaccination and various slaughtering strategies during an outbreak of FMD.

"The EU policy for controlling infectious animal diseases," was presented by Dr. Alberto Laddomada. He reviewed the various programs and policies for dealing with foreign and emerging animal diseases.
Dr. Susan Trock presented "The NY foxhound kennel diagnosed with leishmaniasis." On February 10, Dr. Ed Breitschwerdt at North Carolina State University (NCSU) contacted Dr. John Huntley to inform him that he had identified *Leishmania* from a foxhound residing in New York State. The dog had been taken to NCSU by the manager of the foxhound kennel who reported that other dogs in the kennel were experiencing similar, undiagnosed clinical illness. The kennel has been operating as a working foxhound kennel for nearly 100 years. In August 1999 and into the fall, it was observed that the hounds were experiencing an unusual illness. The clinical signs included wasting, anorexia, weakness, renal failure, skin lesions, exercise intolerance and exhaustion. Several of the dogs had been euthanized and necropsied by the private practitioner who observed splenomegaly, hepatomegaly and renal pathology. The dogs were tested for a variety of tick-borne pathogens in October. The results indicated that they were antibody positive to various *Ehrlichia, Babesia* and *Rickettsia* organisms. The dogs were treated with an insecticide to control the ticks. Various treatments such as doxycycline and oxytetracycline were attempted but did not resolve the clinical illness. Imidocarb treatment was initiated but it appeared to be killing some of the hounds and so was stopped. The kennel lost 18 dogs to this illness. During October and November 1999, the kennel was losing one dog per week. In February 2000, the Huntsman delivered two ill hounds to NCSU. *Leishmania* was identified via direct observation from a bone marrow and joint tap sample from one dog at necropsy. Serologic testing of dogs identified 46.2% of the hounds with positive titers to *Leishmania*. Of these positive dogs approximately 50% had died (samples tested had been archived). Thirteen dogs were clinically ill at the time of diagnosis. Subsequent investigation and follow up by the Division of Animal Industry, Walter Reed Army Institute of Research and the Center for Disease Control identified *Leishmania* from the complex *donovani*. Tests on wild rodents and ticks collected near the kenneled hounds were negative for *Leishmania*. Similar negative results were obtained from nearby hound kennels that were also sampled. Subsequent to identifying leishmaniasis in this kennel, the Masters of Foxhound Association of America issued an official statement on canine leishmaniasis to all member clubs. In it they requested that all hounds be tested. Testing of foxhounds and other hunting dogs has now identified infection in numerous American states and also in Canada. To date, there have been no human infections associated with these hounds.

Dr. Ruben Donis presented "Onset of immunity after vaccination against classical swine fever virus." He reviewed the status of vaccine availability and types from Europe. This study was conducted to determine the efficacy of three different vaccines. Vaccines used included two E2 subunit vaccines (CSF E2 Marker and Porcilis Pesti) as well as the C (Chinese) strain which is the live attenuated vaccine. Haiti-96 was chosen as the challenge stock. When the challenge was given 21 days after vaccination,
all three vaccines were effective in eliminating clinical disease and eliminating shedding. However, when the challenge was given 7 days postvaccination, only the C strain was effective at eliminating shedding or preventing clinical disease. Those pigs given the subunit vaccines had no difference from unvaccinated controls.

Dr. Bill Buisch reported on “Procedures for the laboratory testing for foreign animal diseases: current and proposed changes.” There is current dialog concerning the role of state laboratories in foreign animal diseases. A memorandum of understanding is being developed addressing a policy regarding the interfaces between state and federal laboratories regarding diagnosis of foreign animal diseases. It was recommended that further conversations regarding this issue be undertaken through the AAVLD, which might be a more appropriate forum.

Dr. Bev Schmitt gave an update on West Nile Virus. In the current year, there have been 3,400 positive birds but only 6 positive sentinel chickens. The low positivity rate for sentinel chickens was surprising – it is thought that either the mosquitoes are not attracted to the chickens or the chicken IgM response doesn’t last long enough for the test to pick up the response. To date this year, there have been 29 cases in horses that have met the confirmed case definition. These horses were in 6 different states – Pennsylvania, New York, Massachusetts, Connecticut, Rhode Island, and New Jersey. Of these 29 cases, 16 have died or were euthanized. There have been 387 positive mosquito pools, in 5 states. Three states have reported human cases. Other positive mammals this year include: a bat, cats, rabbits, raccoons, squirrels, chipmunks, and a skunk. Testing for virus includes viral isolation and PCR. Serologic tests undertaken include the plaque reduction neutralization test (PRNT) and the IgM capture ELISA test.

“Communication systems for emerging animal health issues,” by Dr. Victoria Bridges, was a description of four different systems used for sharing current information on animal diseases. As agricultural producers and scientists around the world are discovering and identifying emerging animal diseases and issues that threaten animal production and related industries, it is important to communicate these findings. By communicating events as they occur, others can be more vigilant and targeted in their observations, resulting in being better able to take preventative measures and being able to identify health issues earlier if they do occur. In order to develop more integrated and coordinated communication systems, many are turning to the Internet and other forms of electronic communication. There are several examples of recent or current efforts to establish electronic communication systems for emerging animal health issues. These examples include ProMED, a public access list serve; the Animal Health Network of Colorado, an Internet linked network of private practicing veterinarians; an Internet site initiated by the National Animal Health Emergency Management Steering Committee and USAHA; and a tracking system for
emerging animal health issues within USDA's Veterinary Services. There are many issues that must be dealt with and overcome if a communication system for emerging animal health issues is to be successful. The level of resources that are required to keep the content of Internet sites fresh is significant. These include resources for expertise in animal health in addition to technical computer resources needed. Another issue is overcoming the passiveness of the Internet and getting people to visit the site on a frequent basis. A third issue is the vagueness of the term "emerging". When dealing in the realm of emerging animal health issues, it is difficult to specify exactly what type of data is to be included.

**Dr. Alfonso Torres** discussed the initiative for the new building for animal diagnostic facilities in Ames, Iowa. Some planning money has been received from Congress that will be used to develop a comprehensive plan to justify the need for a complex facility. This plan must be presented to the Secretary of Agriculture by March 2001.

"Direct and indirect contact among California livestock facilities," by TW Bates, MC Thurmond and TE Carpenter was presented by **Dr. Tom Bates**. A study was conducted in a 3-county region of California to estimate disease transmission potential among livestock premises, either directly from movement of animals, or indirectly via vehicles or persons. Questionnaires and surveys were used to obtain information from beef, dairy, goat, sheep, and swine producers; artificial inseminators, hoof trimmers, and veterinarians; sales yards; and a sample of truck routes for creameries, rendering plants, and feed companies. The number of direct animal contacts for dairies reporting animal movement to the dairy ranged from 1.6 to 2.6 animal shipments/mo and indirect contacts increased from 234 to 419/mo, as herd size increased from <1000 to 1000-1999 animals. The average number of direct contacts for beef herds reporting animal movement to the ranch was 0.4/mo, and indirect contacts for beef herds increased from 22.1/mo for <250 cows to 46.0/mo for herds with >250 cows. The 3-day range of travel for indirect contacts varied from 58km for AI technicians to 210km for commodity vehicles. On average, milk trucks visited 9.4 dairies/day and 1.8 dairies before returning to the creamery (min=1, max=5), with a travel range of 209km. Of livestock arriving at sales yards, 7% came from a location more than 60 km away, and of those sold, 31% were destined for a location more than 60 km away. These data will provide some basis for developing herd biosecurity strategies, including those necessary if exotic diseases, such as foot and mouth disease, should they enter California.

**Dr. Mark Thurmond** discussed "Foreign animal diseases: Education and awareness of practicing veterinarians and veterinary students." The US continues to face increasing risks of acquiring Foreign and Emerging Animal Diseases (FEAD) at any time, as illustrated by recent outbreaks of West Nile Virus in the USA. In countries considered to have very good systems in place to prevent introduction of exotic diseases, foot- and-mouth
disease, classical swine fever, and bovine spongiform encephalopathy (BSE) have recently occurred despite extensive surveillance and prevention efforts. As more and more countries acquire these diseases, the likelihood of accidental introduction into the US also increases, with agroterrorism adding an additional element of risk for an FAED epidemic. The accredited veterinarian is one of the first lines of defense against FAED in the US. In being accredited by APHIS, these veterinarians are considered to be qualified to have a current awareness of FEAD and to be able to recognize signs and lesions of FEAD. Should a FEAD enter the US, it is anticipated that an accredited veterinarian, probably a private practitioner, would most likely be the first to identify the disease. Consequently, it is vitally important to our national interests that accredited veterinarians will have received FEAD education and training in their veterinary school curriculum, and that they will have passed an accreditation examination indicating they possess the skills necessary for the early recognition of an animal with a FEAD. Over the past several years the curricula of some veterinary schools have been modified in ways that may not offer students an opportunity for education in FEAD. Factors influencing curricular modifications include changes in demographic representation of administrators, faculty, and students that reflect more of an urban experience and outlook, with less awareness of livestock and agriculture, and more interest in and focus on companion animal medicine and diseases. Standards for veterinary school curricula are developed by the AVMA Council on Education to ensure that veterinarians receive an appropriate and quality education. These standards must be met before a veterinary school can become accredited or approved. The curriculum standards of the AVMA, however, do not specifically require instruction in FAED. In addition, Dr. Thurmond addressed the perceived problem in adequate training with respect to federal accreditation of veterinarians. About 8 years ago, changes were recommended in the process whereby veterinarians were accredited by APHIS. (Federal Register, 1992; vol 57, p 23540). The test that had been used to examine an applicant's skills in FEAD was considered to be out of date and was discontinued. In addition, because veterinary schools do not necessarily offer or require coursework in FEAD, or an applicant may not have taken available coursework in FEAD, APHIS was to confirm that the applicant had the coursework that would indicate he/she possessed the necessary FEAD skills. Unfortunately, it is extremely difficulty to identify appropriate coursework taken by an applicant and, therefore, there is no confirmation of coursework. Consequently, veterinarians are being accredited who have not had FEAD instruction or training and who do not possess the necessary skills to recognize signs and lesions of a FEAD.

Dr. Gale Wagner presented “International transfer of students and harmonization of veterinary curricula regarding trade.” There is a current movement from several veterinary colleges to educate students regarding the following emerging issues in veterinary medicine: new diseases, food
FOREIGN AND EMERGING DISEASES

safety, food security, bioterrorism and risk management. However, these are not subjects that are routinely taught in the veterinary curriculum. Along with individuals from some other colleges, Dr. Wagner is exploring the creative use of grant funds to begin global veterinary leadership programs to look at these issues. Within this program, students will be exposed early in the curriculum to leadership training, agricultural economics, political science, and be expected to complete externships in an international or emerging area. This may serve as a model for other colleges to follow.

“Educational programs for foreign animal diseases” was presented by Dr. Jim Roth. A stand-alone web-based course on foreign animal diseases will be created using funds from the USDA Higher Education Challenge Grants program. The course will contain modules giving overviews of the importance and impact of foreign animal diseases as well as numerous scenarios depicting foreign animal disease incursions. Each disease will be linked to existing information available on the web concerning foreign animal diseases (OIE, USAHA). There will also be a searchable database. This course will be made available to all colleges of veterinary medicine.

An update on the progress concerning the conversion of the USAHA “Gray book” to web-based format was reviewed by Dr. Corrie Brown. Bayer Corporation has contributed funds to digitize the information and create CD’s for massive distribution. This project is expected to be completed within this year. Distribution will be to veterinary colleges, industry, and practicing veterinarians.

Dr. Mo Salman reported on “Surveillance methodologies for diseases approaching zero prevalence in a country/region: A report from the international workshop that was held in August, 2000. An international panel of scientists working in the field of surveillance and risk analysis met in Fort Collins, Colorado to discuss different methods regarding the use of survey and surveillance data to determine the disease status of countries and zones as prevalence approaches zero. The objectives of this workshop were to: 1) identify and discuss the issues involved in determining the disease status at a country or regional level, when prevalence approaches zero; 2) discuss different methods and approaches used internationally for disease status recognition; and 3) provide a set of tools applicable to different epidemiological conditions. The workshop was structured into brief presentations by participants outlining their approaches to the issue. Presentations included both current application of the concept of disease freedom as well as methods being currently researched. Group discussions on three main topics followed the presentations: 1) current needs in the international recognition of disease freedom; 2) methods currently available to assess disease freedom both quantitatively and qualitatively; and 3) requirements for field application of existing methods and necessary modifications to existing surveillance and monitoring systems to assess disease freedom. Conclusions from each group discussion are included in the workshop notes.
which are available on the website <www.cvmbs.colostate.edu/cveadss>. New methods and approaches need to be developed to integrate all the relevant factors in a quantitative way. To conclude the workshop, collaborative teams were formed to draft a series of papers that will be published as a special issue of *Preventive Veterinary Medicine*. For each topic, authors and a contact point were identified.

**Dr. Corrie Brown** reviewed the proposed action plan that was developed by a subcommittee subsequent to last year’s meeting. The action plan was approved.

**Drs Bret Marsh** and **Mo Salman** gave background on the merging of the two committees – Foreign Animal Diseases and Epizootic Attack. A new name for the fused committee was suggested – “Foreign and Emerging Diseases.” The committee unanimously approved the change.

Three resolutions were presented and discussed.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
EMERGENCE AND RE-EMERGENCE OF FOOT-AND-MOUTH DISEASE IN ASIA: IDENTIFICATION AND CHARACTERIZATION OF NEW STRAINS OF AN OLD ENEMY

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Foot-and-mouse disease (FMD) is an extremely contagious viral disease of cloven-hoofed animals, most notably cattle, pigs, and sheep. FMD is characterized by fever, vesicular lesions, and erosions of epithelium of the mouth, tongue, nares, muzzle, feet, and teats of affected animals (Pereira, 1981). Despite recent success in controlling the disease in Europe and portions of South America, FMD remains one of the most important infectious diseases of farm animals due to the impact an outbreak can have on trade in animals and animal products.

In spite of the low mortality rate of FMD (usually less than 5% among adult animals) the economic losses it causes are great. These include losses due to the slaughter and disposal of FMD-affected animals, destruction of infected products, drop in productivity of FMD-affected animals, restriction/elimination of markets, vaccination costs, and zoosanitary measures aimed at eradication of outbreaks. FMD virus (FMDV), which is found in the form of 7 different serotypes (A, O, C, Asia1, and SAT1, SAT2, and SAT3), is widely spread. The virus is enzootic in parts of Asia, Middle East, Africa, and South America. The Office International des Épizooties (OIE) has received reports on FMD outbreaks from over 30 countries in the 18-month period between February 1999 and August 2000 (see Table 1).

From the 1950s through the 1980s, much of the worldwide attention on FMD was concentrated on eradication of the disease from Western Europe and South America. In the case of Europe, a combination of slaughter and vaccination was able to eliminate the disease, and prophylactic vaccination was stopped in western Europe in 1991. Currently, the only prophylactic vaccination programs being conducted in Europe are in Russia, in the Moscow region (due to the presence of large vaccine plants) and along its southern borders, where the introduction of disease from Middle Eastern neighbors is a constant threat (the introduction of the A22 virus from this region into Russia in the 1960s was responsible for the countries most devastating epizootic). In South America, several countries (Chile, Uruguay, Paraguay, and Argentina) appear to have eradicated FMD, and Brazil is
making considerable progress, especially in its southern states. Despite the progress in eradication from South America, FMD still causes considerable hardship in this hemisphere, and outbreaks in August of 2000 in Argentina and the southern-most state of Brazil (see Table 1) emphasize the continued importance of FMD in the Americas.

Interestingly, the eradication campaigns in South American countries never included the routine prophylactic vaccination of swine. Rather, the focus of FMD control has been on cattle, due, in part, to the relative higher value per animal, the longer life-span of productive animals (especially dairy animals), and the wider range of individual animals. Figure 1 shows the changes in FMD distribution over the last 35 years. The map from 1965 FAO-WHO-OIE data (Figure 1A) shows countries with known FMD activity and those not known to be experiencing FMD. Thus countries with known activity were undoubtedly experiencing FMD, but unreported outbreaks could have occurred in other countries. The map prepared with 2000 OIE information (Figure 1B), shows countries that had acquired OIE-approved FMD-free status and OIE "special" status (see legend to Figure 1) by August of 2000.

The importance of FMD in Asia was emphasized by an outbreak in the Philippines in 1995, which was characterized by the rapid spread of the disease among swine populations throughout the country. Although the outbreak was severe enough to warrant the declaration of a state of emergency by the Philippine authorities, the outbreak did not receive much international attention since FMD was enzootic in the Philippines and thus the country had no significant export market for livestock products. Two years later, however, the outbreak in Taiwan POC had much graver consequences, due to Taiwan's large, export-based pork industry (Wilson and Tuszynski, 1997; Yang et al., 1999). In this outbreak, over 0.18 million swine died of the disease, and an additional 3.85 million were slaughtered in attempts to control the epizootic (Yang et al., 1999). Furthermore, this high mortality rate (FMD is usually not a fatal disease), and the overall severity of the outbreak suggested that the virus causing this outbreak was hyper-virulent in swine. Controlling the outbreak had a direct cost of over $US 400 million (Yang et al., 1999), and an indirect cost associated with the complete loss of an estimated loss of $US 1.6 billion per year in pork export to Japan (Yang et al., 1999). Thus, the overall economic impact has been astronomical, with estimates as high as $US 6.9 billion (Wilson and Tuszynski, 1997).

The outbreak in Taiwan POC did not spread from swine to ruminants, although cattle or goats were present on infected farms or on nearby premises (Yang et al., 1999). Furthermore, the virus isolated from swine was not able to cause FMD when inoculated into cattle (Dunn and Donaldson, 1997). Interestingly, the virus from the 1997 Taiwan outbreak encodes a dramatically altered nonstructural protein 3A, which was shown to be responsible, in part, for the inability of this isolate to infect cattle (Beard and
Mason, 2000; see Figure 2). This same altered 3A protein is also present in
the virus that caused the 1995 outbreak in the Philippines, as well as a
number of viruses from Hong Kong and Vietnam (See Figure 2; Knowles et
al., submitted). Interestingly, while evaluating these viruses, it became clear
that other changes in 3A were observed in another group of type O viruses,
this time from Southeast Asia (Knowles et al., submitted). Although it is
unclear how the changes in these 3A proteins arose, the only previously
reported changes in 3A were reported for viruses that had been deliber-
ately passed through embryonated eggs, in an attempt to produce attenu-
ated viruses for use in live-attenuated vaccines (Girauldo et al., 1990; see
Figure 2).

Of the 30 countries that filed FMD outbreak reports with the OIE be-
tween March of 1999 and August of 2000, 18 are found in Asia (see Table
1). Among these countries, the majority of the outbreaks were caused by
serotype O viruses. Recent type O virus outbreaks in Asia have included
appearance of a porcinophilic strain of FMDV in an island prefecture
(Penghu) of Taiwan POC that had escaped the 1997 epizootic, and the
appearance of a bovine-infectious virus on the Taiwanese island of Kinmen
in 1999. This strain subsequently appeared in cattle and young goats in
2000 on the main island of Taiwan. The Kinmen Island isolate caused a
mild disease in bovines, contrasting with the 1997 porcinophilic isolate.
Interestingly, this strain of serotype O virus encodes a typical 3A protein
(see Figure 2). In 2000, four countries that had not experienced FMD out-
breaks for many years were added to the list of FMD-affected nations. 1) In
March & April, outbreaks were reported in cattle in Japan (Japan had been
FMD-free since 1909). 2) In March & April, outbreaks were reported in cattle
in the Republic of Korea (South Korea had been FMD-free since 1935). 3) In
April, outbreaks were reported in cattle, sheep, goats, and camels in
Mongolia (Mongolia was FMD-free since 1974). 4) In April, an outbreak
was reported on a pig-farm located in the Asian part of Russia – in the
Primorsky region (the Territory was FMD-free since 1964) (see Figure 3).

The 2000 outbreaks in Japan, the Republic of Korea, and Russia were
quickly controlled, and all four 2000 outbreaks listed above were caused
by viruses closely related to the 1999 Kinmen isolate (Knowles et al., 2000).
Interestingly, the outbreaks in Taiwan, South Korea and Japan were limited
to cattle, which displayed mild signs of disease, whereas the outbreak in
Russia was limited to swine, which suffered from severe FMD. The limita-
tion of spread to cattle in Russia was undoubtedly due to the fact that cattle
in this region are vaccinated against FMD (due to their proximity to the
Chinese border; V.V. Drygin and V.M. Zacharov, personal communication,
2000), but it is unclear why the disease did not spread to swine in South
Korea or Japan.

Analyses of sequences encoding the 3A region of selected type O vi-
ruses from Asia over the last 30 years have also revealed a third group of
viruses, similar to the Vietnamese isolate shown in Figure 2. These viruses
also have a deletion in their 3A coding region, but, unlike the virus from Taiwan and the Philippines, these viruses were isolated from both bovine and swine outbreaks (Knowles et al., submitted).

Taken together, these data show that serotype O viruses currently circulating in Asia are comprised of at least three distinct genetic lineages, and that it is likely that evolution of these viruses could produce variants with altered host range, complicating disease detection and control.

Table 1.
OIE reports on FMD outbreaks between February 1999 and August of 2000*.

<table>
<thead>
<tr>
<th>Country</th>
<th>Date of most recent report</th>
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<tbody>
<tr>
<td>Algeria</td>
<td>26 March 1999</td>
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<tr>
<td>Argentina</td>
<td>19 August 2000</td>
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<tr>
<td>Botswana</td>
<td>16 July 1999</td>
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<tr>
<td>Brazil</td>
<td>12 May 2000</td>
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<td>Georgia</td>
<td>23 June 2000</td>
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<td>Greece</td>
<td>18 August 2000</td>
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<td>Guinea</td>
<td>23 April 1999</td>
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<td>Iran</td>
<td>15 October 1999</td>
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<td>Israel</td>
<td>12 February 1999</td>
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<td>Japan</td>
<td>9 June 2000</td>
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<td>Jordan</td>
<td>9 April 1999</td>
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<td>Kazakhstan</td>
<td>28 July 2000</td>
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<td>Korea</td>
<td>18 August 2000</td>
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<td>Kuwait</td>
<td>9 June 2000</td>
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<td>Kyrgyzstan</td>
<td>12 February 1999</td>
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<tr>
<td>Malawi</td>
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<td>17 September 1999</td>
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* From the OIE Internet site (www.oie.int) August 30, 2000.
References:

FIGURE LEGENDS:
Figure 1. Worldwide distribution of FMD in 1965 and FMD-free countries in 2000. Panel A, countries of the world reported to have FMD in 1965. Taken from the FAO-WHO-OIE Animal Health Yearbook, 1965. Black, countries reported to have FMD activity, white, countries with no reported activity. Panel B, countries declared FMD free by the OIE (data taken from the OIE Internet site (www.oie.int) on August 30, 2000). White areas, countries declared FMD free. Shaded areas, countries having either an FMD-free zone where vaccination is not practiced (Botswana, Colombia, Namibia, and South Africa) an FMD-free zone where vaccination if practiced (Brazil), or considered FMD-free with vaccination (Paraguay). Black areas, all other countries.
EMERGENCE AND RE-EMERGENCE OF FMD IN ASIA

Figure 2. Sequence of the protein encoded by the last half of the 3A-encoding region of genomes of selected FMDV strains. O1 Campos and O1 Campos O/E (egg-adapted) from Giraudo et al., 1990; O Taiwan 97 from Beard and Mason, 2000; S. Korea 00, Henry and Mason, unpublished; all others from Knowles et al., submitted.

Figure 3. Location of selected outbreaks of FMD in eastern Asia. Stars indicate the location of recent serotype O outbreaks; the 1999 outbreak in Taiwan and the 2000 outbreaks in Japan, Mongolia, Russia, and South Korea were all caused by related viruses, see text and Figure 2.
Figure 1A, Mason and Knowles.
Figure 1B, Mason and Knowles.
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</table>
Figure 3, Mason and Knowles

Mongolia, 2000 (bovine, ovine, caprine, camelid)

Russia, 2000 (swine)

South Korea, 2000 (bovine)

Japan, 2000 (bovine)

Taiwan, 1997 (swine)

Taiwan, 1999 (bovine)

Taiwan, 2000 (bovine, caprine)
The 2000 meeting of the United States Animal Health Association Government Relations Committee was conducted Monday, February 14 through Friday, February 18, 2000, in Washington, D.C. In addition to members of the Government Relations Committee, USAHA Committee chairs were invited to the meeting.

Monday, February 14, 2000

In the first session the chair of the Subcommittee on Operating Procedures for USAHA Committee Chairs and Committees, Dr. Elvinger, presented a revision of the draft Manual of Operating Procedures. The subcommittee had been charged to prepare a written document to assist committee chairs in efficiently and effectively carrying out their assumed responsibilities and provide guidelines for committees to function effectively and in a reasonably uniform manner. The first draft of these procedures was first presented at the Annual Meeting of the Program Committee in San Diego, and suggestions for change and revisions from chairs and officers were incorporated prior to this presentation. The USAHA Board of Directors had reviewed the revised draft and proposed changes, in particular establishing options for the association president to take action if needed, to ensure the proper functioning of committees. Following the presentation, the assembled officers and chairs agreed to have the subcommittee proceed to prepare a version to be published and incorporate the items proposed in the subsequent presentation by Dr. Hillman. It was pointed out that given the dynamic nature of the subject the subcommittee would remain appointed and the document undergo review and revision at appropriate intervals or when needed.

Dr. Bob Hillman, USAHA President Elect, reviewed the responsibilities and timetable expectation for USAHA Committee reports. There was considerable discussion concerning the theme for the 2000 USAHA An-
nual Meeting. Dr. Hillman presented the potential two themes for the 2000 USAHA annual meeting. The two proposed themes are: (1) The animal health impact of the interaction between wildlife and domestic animal species; and (2) A follow-up and continuation of the last year session on the Office Internationale Des Epizooties (OIE) role in animal health issues. Each of these themes can use approximately 3 hours of the scientific sessions. Dr. Hillman, as chairman of the program committee, is planning to evaluate the final schedule with its themes after speakers for the scientific session are proposed by the chairmen of the Committees. Dr. Hillman emphasized that these are only proposed sessions and he asked for other proposed themes from the participants. He will work with Dr. Zirkle and others to identify topics and speakers for these themes.

Mr. Kirk Ferrell, Executive Secretary for the Animal Agriculture Coalition, spoke about the administration's proposed federal budget and specifically those areas affecting livestock diseases, animal disease research, emergency management, and laboratory services. Mr. Ferrell described how the Animal Agriculture Coalition works and its membership base noting that USAHA is a member and has taken a more active leadership role recently. He encouraged members of the USAHA Government Relations Committee to actively become involved and visit with Congressional and Senate offices to show support for increased fundings for the USDA in the areas of animal disease control programs, emergency management preparedness, and infrastructure for laboratory and research services.

Dr. Zirkle presented the responses from the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS) and USDA, Animal Research Service (ARS) for the resolutions passed last year. Most of the responses were positive. A comment was made to reflect the effectiveness of the USAHA approach to build scientific consensus among the involved parties as indicated by the adoption of a USAHA resolution as a model for salmonelosis in poultry meat.

Mr. Larry Mark, USAHA Webmaster, presented a short summary of the activities related to the use and application of the USAHA website. He presented the frequency of the use of the website classified by the topics/issues. A new logo is used with several other features and links. The intention is to make this website as the premier animal health website in the USA. The participants commented on the outstanding job and useful website of the organization and expressed appreciation for Mr. Mark's dedication to this task.

Dr. Curt Mann, Executive Director of the American Association of Veterinary Medical Colleges addressed "Change and Transition" and the psychological process that people go through to manage change. He pointed out that historically veterinary medicine focused on horses in the 1800's and early 1900's, then moved on to focus on food producing animals in the 1900's and evolved to include pet animals by the "mid" 1950's and beyond. Dr. Mann referred to the "megastudy" the comprehensive
study on veterinary medicine which was developed to discuss the evolving role of the veterinary colleges. In the future, the focus will be on the overall economic health of veterinary medicine. He stated that the challenge is to become involved in the future of veterinary medicine. He explained that veterinary colleges must become more cognizant of the need to train veterinary students for veterinary accreditation. The level of awareness must be raised with the colleges. This is becoming more important than ever due to increased international trade in animal products, the concern for foreign animal disease and the danger of bioterrorism. He pointed out that the “PEW Report” which was done in the 1980’s spoke directly to expanding the career choices in veterinary medicine to many areas of public practice including regulatory veterinary medicine.

Dr. Niall Finnegan, director of the Government Relations Division (GRD) of the AVMA, updated the committee on AVMA issues. The Legislative Action Committee (LAC) reported that the LAC conducted a survey to determine the priority issues facing veterinary medicine today. The top six priorities from the survey were determined in ranking order and the GRD is addressing them as follows: (1) Animal Welfare, Food Safety—FAA bill for conditions for air travel for animals. (2) Animal Drugs—Antibiotic resistance and minor use minor species issues; (3) Education and Research—Money for Ames and Plumb Island, also Foreign Animal Disease Diagnosticians Course; (4) Public Health—Antimicrobial resistance issues, bison brucellosis issue, wastewater runoff; (5) Taxes and Small Business—Association tax issues and Capital Gain tax issues; and (6) Environmental—Wastewater runoff, bison, collaborative work with human, animal, and environmental groups to solve multidisciplinary problems such as West Nile Fever, brucellosis, hanta virus plague. The AVMA is working with VS in developing a new accreditation procedure for veterinarians but it is not expected to be complete for two to four years. In May 1993, AVMA signed a Memorandum of Understanding (MOU) with the Office of Emergency Preparedness of the U.S. Public Health Service (USPHS). This MOU officially incorporated the AVMA into the Federal Response Plan for disaster relief for the National Disaster Medical System (NDMS). NDMS responds only when invited by the Governor of the state when, in his opinion, all local and state capabilities have been exhausted. NDMS is made up of four agencies or departments: the USPHS, Federal Emergency Management Agency (FEMA), Department of Defense (DOD), and Director of Veterinary Services (DVS). AVMA designed four Veterinary Medical Assistance Teams (VMAT) to respond to federal call for help. AVMA has signed a MOU with USDA, APHIS that makes it possible for the AVMA to assist APHIS with the control, treatment, and eradication of animal disease outbreaks. This agreement is in effect until 2004. AVMA also has an agreement with the American Red Cross (ARC). The ARC will send all questions regarding animal health and welfare to the AVMA who will work closely with the ARC to de-
velop materials to train their responders and to work closely with the local humane groups to coordinate efforts during disaster. The goal is to achieve a cooperative effort during times of disasters between VMAT, state and local officials, the state veterinarian, state and local VMAs, emergency management personnel, humane groups, American Red Cross volunteers, and search and rescue groups. AVMA does publish an emergency preparedness and response guide and the AVMA will always accept contributions to the AVMF disaster emergency relief fund.

Dr. Bernadette Dunham, American Veterinary Medical Association and Dr. Beth Lautner and Lea Becker, National Pork Producers, met with the committee Monday afternoon. They reviewed the mission and activities of the Animal Agriculture Coalition (AAC). The AAC is a coalition of livestock and poultry trade associations, and veterinary and scientific communities. The AAC monitors and influences animal health, environmental, food safety research, and education issues of common concern to food animal agriculture industries. These common interests are addressed before federal agencies, international organizations, and Congress allowing AAC members to provide safe, high quality, and affordable products to the domestic and international marketplace. The following issues were reviewed with the committee: the need for increased animal agriculture funding for ARS, Cooperative State Research Education and Extension Services (CSREES), and APHIS; the need for increased funding for the National Animal health Emergency Monitoring System (NAHEMS) activities for expanded development of comprehensive emergency plans, enhanced training and opportunities for test exercises; the need for funding for bioterrorism initiatives to be new funds; support for the National Animal Disease Center (NADC), National Veterinary Services Laboratory (NVSL), Center for Veterinary Biologics (CVB) Master Plan and continued modernization of facilities at Ames, Iowa, and Plum Island, New York; the importance of increased funding for food safety, criminal and microbial genomics and antimicrobial resistance monitoring and research; and support for consolidating the animal health statutes.

Tuesday, February 15, 2000

Dr. Caird Rexroad, Associate Deputy Administrator, ARS, Animal Production Product Value and Safety (APPVS) staff, reviewed the distribution of funds in the current (FY2000) ARS budget as well as requests for funds in the FY2001 budget sent to Capitol Hill by the Office of Management and Budget (OMB) this month. He explained the budget process and where constituent groups can impact the budget at various steps. ARS is beginning work on the 2002 budget. Emerging diseases funds in Fiscal Year 2000 were all earmarked by Congress resulting in only $350,000 of $3,775,000 allocated going to animal diseases. Those funds were earmarked for avian pneumovirus and poult-enteritis-mortality-syndrome. Congressional one-time add-ons in FY2000 included funds for genomics and better vac-
cine and diagnostic testing for *Mycoplasma* in poultry, swine and exotic mycoplasma (FAD); avian influenza endemic strain epidemiology and ecology and fish diseases. Ag genomics and genetics portions of current and future budgets are intended to utilize DNA based analysis and manipulations to identify microbial pathogen segments related to virulence and host specificity; improve diagnostic testing; identify gene markers for traits in animals, i.e. double muscling; and improve and preserve seedstock. Steve Kappas is the national coordinator for the National Animal Germplasm Program.

Dr. Linda Logan-Henfrey, National Program Leader Animal Health Staff, detailed how ARS research priorities are developed including input from congressional directives, USDA priorities, commodity groups, Animal Ag Coalition, APHIS, Food Safety Inspection Service (FSIS), Environmental Protection Agency (EPA), Centers for Disease Control (CDC), professional societies (AVMA, USAHA, American Association of Veterinary Laboratory Diagnosticians (AAVLD)). ARS also utilizes workshops to discuss priorities and ARS program reviews. Selected research projects must have a federal priority (i.e. required by: federal law or by Congress or support national or international policy, etc). Dr. Logan-Henfrey stated information on ARS activities are available on the Web site www.nps.ars.usda.gov. The Healthy Animal Section contains a compilation of new articles related to animal health. Though the ARS budget has increased 5-6 percent/year, the animal health component has only grown 1.3 percent/year which has not kept pace with inflation. Dr. Logan-Henfrey reviewed the NVSL, NADC, and Plum Island facilities' history, current needs, and proposed joint NVSL/NADC/CVB building project estimated at $379 million. The FY2001 budget includes $9 million for planning and represents a good faith effort to bring to fruition an anticipated 9-year building program. ARS is still trying to obtain funding for a BL4 facility on Plum Island. A packet of information and CD-Rom are available on the master plan for the new shared Ames, Iowa facilities.

Dr. Jane Robens, National Program Leader Food Safety and Health, reviewed current and FY2001 proposed distribution of funds within pre-harvest food safety area. The food safety base budget is $70 million. Further details of projects are available on the ARS web page. Projects funded in the food safety program include mycotoxins, pathogen reduction, improved detection, risk assessment, antimicrobial resistance, prevention and control programs, manure handling and distribution, poisonous plants, heavy metals and residues. Dr. Robens provided brief updates on hide and fecal testing for *E. Coli* 0157:H7 at slaughter plants; Campylobacter in poultry and future projects to address impact of 4 control points (hatch cabinet disinfection, new papers for each hatch, competitive exclusion and litter decontamination); and public health action plan components related to antimicrobial resistance.

Dr. Geoff Letchworth, Research Leader, Arthropod-borne Diseases
Research Lab at Laramie, Wyoming, presented updates on two current projects. Vesicular stomatitis virus projects will focus on where the virus persists in nature between outbreaks; can culicoides, in addition to black flies and sand flies, be a vector; will a vaccine that induces mucosal immunity prevent transmission between contact animals; and development of a rapid field test to identify VSV and distinguish from Foot and Mouth Disease (FMD). Research plans on West Nile Virus will address whether the horse can serve as a reservoir for mosquitoes and ticks allowing virus transmission via these vectors to other horses or humans. Also to be addressed is which insect species are competent to transmit the disease and investigate development of a sub unit vaccine and companion diagnostic test.

Dr. Carole Bolin, Research Leader of Bacterial Diseases of Livestock at NADC, reviewed NADC programs on tuberculosis, brucellosis, Johne's disease, and *Leptospira* and other spirochetes. Areas of focus on brucellosis include vaccine efficacy and delivery systems for bison and elk, development of specific serologic tests for post-eradication surveillance, and identification of genes associated with organism persistence. Work on tuberculosis has focused on pathogenesis in white-tailed deer and other cervids, mechanisms of transmission between deer and cattle, and improved diagnostic tests and vaccination of wildlife. One study found within 42 days contact deer became infected when placed with tuberculosis infected deer. An indirect contact study between deer and calves found all nine calves were infected within 56 days when they utilized the same feed and shelter area previously used by tuberculosis infected deer. A feed temperature and time study found that after inoculation all of 8 different feedstuffs eaten by deer still harbored *Mycobacterium* when stored at 0° F for at least 12 weeks. All feedstuffs tested except carrots were also positive when stored at 46° F after 12 weeks. Johne's disease work has focused on improving the sensitivity of the fecal PCR test by reduction of preparation steps. This test has also been used successfully on blood. NADC has also been working on improving the gamma-interferon test, which will be commercially marketed in the US.

Dr. Peter Mason, Research Leader, Foot-and-Mouth Disease Unit at Plum Island, presented an update on FMD outbreak in pigs in Taiwan. Unique features included uncharacteristically rapid spread, very high mortality (1.5 million died of disease), and inability of the virus to infect cattle. The latter was due to a short gene deletion in what was once thought a stable region of the virus genome. The Taiwan strain was similar to other Asian strains which have been circulating for a long time. The Philippines 1996 FMD outbreak that was also severe in swine was a very similar strain. This appears to be adapted to swine in the Far East.

Dr. Joe Urban, Research Scientist, Immunology and Disease Resistance Laboratory, Beltsville, Maryland, discussed novel ways to improve animal health through a better understanding of protective and disease immune responses. Strongly polarized responses toward Th1 (viral and
bacterial immune response) or Th2 (helminthic parasite immune response) can produce interleukins which down regulate the opposite response. For example, a study in pigs showed *Trichuris suis* infection lead to clinical disease and enhanced cell uptake of *Campylobacter jejuni* when pigs were co-infected with both organisms. The immune response approach will be used to better understand bovine and swine respiratory disease syndromes and how multiple agents interact with immune system to produce disease.

The committee appreciated the opportunity to visit with Dr. Mark Mina and his staff concerning current FSIS accomplishments as well as future initiatives. FSIS is to be congratulated on having successfully implemented all three phases of their new Hazard Analysis Critical Control Point (HACCP) inspection system. Achieving 92 percent compliance with the new system is a real accomplishment. As FSIS implements its new HACCP slaughter pilot projects with increased levels of microbial monitoring, new opportunities to work hand-in-hand with AAVLD and USAHA on shared technology can be realized. FSIS will be supporting some anticipated legislation allowing for the interstate shipment of meat products from state inspected plants. FSIS is seeking USAHA input as it is planning to embark on several ambitious new food safety programs and educational initiatives.

**Wednesday, February 16, 2000**

USAHA Government Relations Committee members met at USDA,APHIS offices in Riverdale, Maryland. Dr. Craig Reed, APHIS Administrator, greeted committee members and welcomed the Government Relations Committee to the USDA offices and introduced key staff members Dr. Dan Sheesley, International Services; Bill Clay, Wildlife Services; and Dr. Alfonso Torres, Veterinary Services. Dr. Torres then introduced members of his staff and stated that he would provide the overview and discussion of programs rather than have various members of his staff provide overviews. Dr. Torres provided an overview of the structure and organization of Veterinary Services and provided highlights of the programs. Veterinary Services is organized into two regional hubs—Eastern Hub in Raleigh, North Carolina, with Dr. Robert Nervig as Director (which is operational) and Western Hub which is to be located in Fort Collins, Colorado when completed, with Dr. Rube Harrington as Director. Center for Veterinary Biologics (CVB) was moved to Ames, Iowa in early 1999. CVB consists of three units, each with a chief staff officer. The units are Licensing, Laboratories and Inspection, and Compliance. In 1999 CVB licensed approximately 20,000 serials from 170 companies. Center for Epidemiology and Animal Health (CEAH) is located in Fort Collins, Colorado and consists of three units. The selection process for a new director for CEAH should be completed within the next month. When the new Western Hub is completed, CEAH will co-locate with the office of the Western Region Director. National Veterinary Services Laboratory (NVSL), Ames, Iowa, is currently without a director. Dr. Bill Buisch is serving as Acting Director until a permanent
REPORT OF THE COMMITTEE

director is selected. Veterinary Services has approximately 1,320 employees, of which approximately 420 are veterinarians and a number of other professionals. In 1983-84, VS had 1,850-1,900 employees, however since that time International Services and Animal Care have been split off from VS. NVSL/ARS consolidation plan would combine NVSL, NADC, and CVB in a single facility at Ames, Iowa. The cost for construction of a single facility would be approximately $379 million which is approximately $40 million less that would be required to construct separate facilities and would take approximately eleven years less time to complete. There is only $9 million in the administration's budget proposal for FY 2001, which is substantially less than needed. National Animal Health Program Staff is managed by Dr. Mike Gilsdorf and consists of several teams, including Domestic Ruminants Team, Swine/Equine Team, Surveillance and Animal Identification Team, Wildlife, Vectors and Pests Team, and Support Team. There were five herds quarantined for bovine brucellosis at the end of January (1—North Dakota, 1—Missouri, 2—Texas, and 1—Florida). Forty-three states are Class Free, the remaining states are Class A. There were three herds quarantined for Swine Brucellosis at the end of January (1—Louisiana and 2—Florida). There are currently six tuberculosis infected bovine herds in the United States—three in Texas and three in Michigan. Texas and New Mexico are classified as Modified Accredited and Michigan’s classification is currently under review. All other states are classified as Accredited Free. On February 10, 2000, there were 48 flocks in the United States listed as infected with scrapie. A national surveillance plan is being developed for scrapie. On December 31, 1999, there were 222 pseudorabies infected herds in the country. One hundred twenty million dollars in CCC funds has been expended on the accelerated PRV program. Hot spots include Iowa and portions of Indiana. Chronic Wasting Disease is an emerging disease problem. The disease is endemic in wild deer and elk in portions of Colorado and Wyoming and has been diagnosed in domestic cervidae herds in South Dakota, Nebraska, Oklahoma, Montana, and Colorado. West Nile Virus is present in areas of the northeast. Positive horses have been found on Long Island. Positive birds have been found in Maryland, Delaware, Pennsylvania, New York Connecticut, and Vermont and positive humans in New York. The European Union placed ban on horse shipments through JFK airport, but has now lifted the ban. There is a lot of interest and hype about WNV, especially whether horses can serve as biological hosts. This appears to be similar to EEE.

Bioterrorism continues to be a major concern for USDA. Veterinary Services' role is to control outbreaks, clean up the problem and get industries back in business as soon as possible. VS does not have a major role in prevention of bioterrorist acts. Four to five hundred foreign animal disease (FAD) investigations are conducted each year. Dr. Torres commented that there appeared to be some states that did not report any FAD investigations. This appears to be a breakdown in communications with those
states that handle their own FADD investigations. Dr. Torres also discussed the need to use FAD efforts to tell the complete story to OIE/EU. However, no investigations were made in California, Nevada, South Dakota, and Montana last year. This is important in trade talks, as it appears as a very large livestock producing area with no FAD investigative activity. It is important for states to follow through with formal FAD investigations so that good surveillance statistics can be developed for international trade purposes.

Some industries are still opposed to reporting of disease data collected or the National Animal Health Reporting Systems (NAHRS) to trading partners. This appears to result from inadequate communication with industries, especially the poultry industry. Industries do not want to report until they are assured that other countries are making similar reports. Dr. Torres stressed that industries need to understand what listing of list A and B diseases means. List A diseases are to be reported to OIE within 48 hours of diagnosis. List B diseases are to be reported every 30 days. He also stressed that some diseases, such as bovine spongiform encephalopathy (BSE), are on the wrong list (BSE is a list B disease) and we need to find a mechanism to restructure the listing system. Dr. Torres also stated that the U.S. has to report even if the report is not accurate. Dr. Torres also offered to host a meeting with leaders of the poultry industry to inform them about NAHRS, discuss the needs, and clarify reporting requirements.

The National Center for Import and Export has been restructured into three units: Sanitary Trade Issues Team, Sanitary International Standards Team, and Technical Trade Services Team. The Sanitary Trade Issues Team is responsible for Regionalization Evaluation and Regional Coordination. The Sanitary International Standards Team coordinates information and is the keeper of standards. The Technical Trade Services Team provides technical services to countries and provides permit and information services. CEAH serves as the OIE risk center and coordinates risk assessment among CEAH/VS/APHIS/PPQ.

APHIS, VS staff is gearing up for the May OIE meeting. The Inspector General and all members of the Commissions are up for election this year. This factor plus the one-country one-vote procedures for OIE make coalition building critically important. USDA is building coalitions with the countries of the Americas as well as unilateral, tripartite, and quadrilateral countries. OIE Americas will nominate one person for each commission position. Sharing of proposed OIE actions for feedback by USAHA has started slower than hoped, but will continue to fine tune. Unfortunately, the turnaround time for feedback will always be short - usually no more than 30 days. The OIE must also address the dynamics of the World Trade Organization and the role the OIE plays as a Scientific Advisory Body to the World Trade Organization (WTO) on issues relevant to animal health and disease. Many volatile issues emanating from the use of unverified statistics about animal disease prevalence (or the perception of) as a non-tariff
trade barrier must be resolved. USDA, APHIS, Veterinary Services will be meeting with members from the Quadrilateral Group as well as the Tripartite Group of countries to arrive at a consensus on the resolution of certain contentious animal disease issues of common interest. Since the General Assembly is composed of over 120 countries, each with one vote, it becomes necessary to broaden coalitions with countries holding similar views. These coalitions are necessary not only to aid in moving issues through the Assembly with results acceptable to the U.S., but also to elect commission members sensitive to our national interests.

Domestic zoning of Michigan and Texas are being evaluated. Agencies are learning and setting the stage so that zoning can be accomplished, in case of an outbreak, in order to protect trade. International zoning of Mexico and Brazil are being evaluated. Risk assessments are being evaluated. Many areas of South America are nearing freedom from FMD and will be seeking regionalization. A total of 91 requests for regionalization have been received since beginning of 1998. Forty-two are new requests, 30 have undergone VS review, and 19 are complete.

Federal animal health laws are currently located in 17 different statutes and many originated in the early 1800s. USDA is rewriting the animal health statutes into a single statute and plan to introduce it to Congress this year.

Dr. DeHaven, APHIS, Animal Care, provided a handout referencing the legal authority (Animal Welfare Act, 1966 and later amendments), regulations (Title 9, CFR), limitations, and interpretive rules by which APHIS, Animal Care operates. Activities regulated include: Biomedical Research; Animal Dealers: domestic, wild, and exotic; Animal Exhibitors: zoos, circuses, and animal acts; and Animal Transporters. The numbers include: Approximately 8,000 Facilities; 65 Inspectors (with 6 to added soon); Approximately 10,000 Inspections/Year; $10.2 Annual Budget; 3 Regional Offices (Raleigh, Ft. Worth, Sacramento). Regulations cover: Facilities; Primary Enclosures; Feeding and Watering; Cleaning; Sanitation; Pest Control; Employees; Veterinary Care; and Transportation. Penalties may be civil or federal with the goal to reach innovative solutions that may include training, renovations, or research and may include license suspension or revocation. New policy is being drafted to cover training and handling of dangerous animals such as elephants, exotic cats, and primates. Dr. DeHaven distributed a brochure detailing the agency's position relative to these species.

The goal of APHIS, Investigative and Enforcement Services (IES) (75 total staff members, 56 investigators) was discussed by Mr. Alan Christian. The goal is to ensure that a good regulatory framework is maintained to protect states from spread of disease. IES was established in 1997, separating from Regulatory Enforcement and Animal Care (REAC) with the specific mission of encouraging and supporting compliance with APHIS programs, law, and regulations by providing effective investigation and uniform enforcement. One method by which this mission is promoted is by
publicizing actions taken in the hopes of achieving a deterrent effect, since the most common excuse used by defendants is "I didn't know." IES works out of the headquarters office in Riverdale and of two regional offices located in Raleigh, North Carolina and Fort Worth, Texas. These regional offices are scheduled to be combined in Fort Collins, Colorado with other APHIS operations. IES provides approximately 1,600 investigations of alleged violations of the Animal Welfare Act each year. Enforcement includes the use of civil penalties at the agency level or bringing federal charges that may reach four times the proposed civil penalty. Cases resolved through civil penalties do not require the admission of guilt and the fines are directed for repairs or restitution. IES also provides training for search and seizure, chain of custody, and authority. IES provides support for other APHIS programs such as delivering legal documents and border blites, along with support of state programs when resources allow.

At the end of the work day, members of the Government Relations Committee and Committee Chairs and their guests and colleagues from the federal agencies enjoyed good fellowship and excellent spirits and food at Sir Walter Raleigh's Restaurant in Riverdale, Maryland. Thanks to Dr. Granville Frye and his staff for making the arrangements. President Zirkle presented Senator John Melcher, D.V.M. with a USAHA honorary membership during this very enjoyable evening.

Thursday, February 17, 2000

Dr. John Melcher, veterinarian and former Congressman and Senator from Montana, provided a very interesting and informative look into how things get done in Washington, D.C. and what can be done to help promote those ideas and principles that the USAHA feels are important for furthering science-based animal health in this country. Dr. Melcher graduated from Iowa State University in 1950 and practiced in Forsyth, Montana. In addition to serving in Congress, Dr. Melcher has served the public as an alderman, mayor, and state legislator. He still resides in Washington, D.C. and works as a lobbyist for a number of groups including the AVMA. Dr. Melcher urged attendees to contact their representatives in Congress and make them aware of your thoughts and feelings on issues which affect you and your profession. He stressed the importance of bringing forth those points and concerns to members of Congress and/or their staff which affect the most people. He placed great value on the formation of coalitions to support and promote ideas and issues in order to show broad support from large segments of the public for the issues and ideas of concern. Dr. Melcher has provided invaluable advice, help, and contacts to USAHA in its efforts to positively affect animal health in this country.

The Committee also heard from Mr. Tom Williams, a former congressional staffer and now a legislative consultant. Mr. Williams gave an in-depth account of the workings of Congress through the use of professional and personal staffs. The staff members provide the research, background
information, and details that Congressmen and Senators need to be informed on legislation in which they are involved. Each congressional committee has a professional staff to provide information on matters before that Committee and each member of Congress also has a personal staff to keep each member current on issues on which he is involved. According to Mr. Williams, the way to influence legislation on programs controlled by Congress is as much a matter of informing and connecting with the appropriate staff as it is contacting the Congressmen themselves. Dr. Melcher and Mr. Williams both urged interested parties to contact members of Congress who are on the Committee to which a particular bill is assigned. The bill’s committee is the key to its passage or defeat and it is that committee’s members who are the critical contacts for influencing legislation.

An afternoon block of time was allowed for USAHA Government Relations Committee members to visit Capitol Hill. Dr. Melcher organized a luncheon which was held on the Senate side of the Capitol Building. After the luncheon Dr. Melcher conducted a tour of both the Senate and House Chambers. Later in the afternoon, committee members visited offices of both Representatives and Senators and discussed the role of USAHA and the importance and need for appropriate federal funding and support for animal disease control programs, emerging preparedness programs, and the need for infrastructure and facilities for research and laboratory services.

**Friday, February 18, 2000**

The final morning of the meeting was spent with representatives from the Food and Drug Administration (FDA). Mr. Louis J. Carson, Deputy Director, Food Safety Initiative Staff, Center for Food Safety and Nutrition (CFSAN), FDA reviewed the organization of CFSAN and the President's Food Safety Initiative. CFSAN has 900 employees and three-fourths of them are located in three buildings in the Washington, D.C. area. Mr. Carson noted that the Food Safety Initiative is comprised of several presidential actions taken since 1997. The first, the 1997 Food Safety From Farm-to-Table Initiative, provided a blueprint for the following four: 1997 FDA Produce Initiative; 1998 FDA Joint Institute for Food Safety Research Initiative; 1998 AD Presidents Council on Food Safety Initiative and; 1999 FDA Safety of Imported Foods Initiative. The goal is to achieve horizontal and vertical coordination among and between federal, state and local food safety agencies and industries in the areas of surveillance, research and risk assessment, inspection and compliance and, education. Mr. Carson stated the Food Safety Initiative has been entirely implemented through Presidential Executive Orders rather than legislation. For that reason, it may be thought of as a “virtual” organization that could be changed by a new administration. In order to obtain the necessary emphasis at the state and local levels, FDA will probably move from partnership to contract ar-
rangements. Fiscal year 2000 and 2001 priorities were reviewed. Mr. Carson discussed the Egg Food Safety Action Plan issued by FDA in December 1999. The goal is to achieve a 50 percent reduction of Salmonella enteriditis illness in humans by 2005. Two strategies are being pursued. Strategy 1 would establish standards at each level of the food chain, starting on the farm. Strategy 2 would add a salmonella kill-step at a critical control point, such as in-shell pasteurization, and place somewhat less emphasis at the farm level.

Dr. Sharon Thompson, Center for Veterinary Medicine (CVM), FDA discussed drug resistance and risk assessment. She indicated that FDA is in the process of formulating its response to public comments received on its framework document that was published last year in the Federal Register. It is difficult to establish thresholds of anti-microbial resistance and, for that reason, such efforts will be limited to drugs seen as absolutely necessary to human health. CVM has posted on its web page a draft of its risk assessment model for direct transfer of anti-microbial resistance from animals to humans. It models the human health impact of fluoroquinolones on human campylobacter infections associated with chickens. CVM plans to develop a second risk assessment model to examine indirect transfer of resistance from animals to humans.

Dr. Mika Llewynse, nutritionist at the CVM, discussed FDA regulation of genetically modified (GM) plants. GM plants, like all plants, are considered food by FDA and, therefore, are not regulated. FDA does, however, regulate two qualities of GM plants. While not regulating the inserted DNA itself, FDA does regulate the enzyme produced by the gene and evaluates the "intended effect" of the genetic modification on the food. Besides the FDA, USDA and EPA agencies are involved in the review process. FDA has held three listening sessions on labeling of GM foods and has received 25,000 comments. Generally, labeling is not required unless there is a meaningful change in the product.

Dr. Dan McChesney, Deputy Director, Office of Surveillance and Compliance, CVM, stated that the agency had received $1.4 million for the animal side of the Food Safety Initiative and discussed how it was being utilized. He commented that funding for the food side of the FDA is growing rapidly in relation to the drug side. This is a result of public demand for safe food. The agency is considering user-fees for food regulatory matters similar to the drugs. FDA considers on-the-farm food safety activities as a part of the farm-to-table concept and has authority to regulate at the farm level. New funding will be directed to state and third-party contracts in order to accomplish what needs to be done.
The committee was called to order at 7:10 am with eighteen members and twenty-six guests present.

Dr. George Winegar presented the report of the subcommittee on embryo movement. Concerned about lack of attendance to subcommittee meetings because of scheduling conflicts with the International Embryo Transfer Society (IETS) Import/Export Committee, Dr. Winegar moved that the subcommittee be disbanded. Pertinent information from the IETS and other embryo transfer issues would be folded into the full committee on Import/Export. The motion was seconded and unanimously passed.

Dr. Ralph Knowles presented a review of past and present procedures for external parasite inspections. He pointed out that horses are harder to handle due to their inherent “flight” behavior. Well-trained handlers are needed in quarantine facilities to conduct the inspections. Concern was expressed that use of private practitioners for administration of chemical restraints compromises the biosecurity of the facility. Dr. Knowles underscored the significant need for specific “state of the art” training for handling and restraint, both physical and chemical.

Discussion followed on the level of integrity of the biosecurity of a facility. It was pointed out the people in place at the import facilities are well trained to handle a broad spectrum of animals.
A copy of Dr. Knowles’ presentation accompanies this report.

Dr. Richard Fite gave a presentation entitled “Disease Freedom: An obsolete concept for sanitary Regulation in the 21st Century?”

The concept or belief of disease freedom being “If in doubt, keep it out,” no longer works. Today, risks must be quantified. It is impossible to prove “freedom” from a specific disease and it is difficult to define a “free” population. “Free” of a disease such as swine brucellosis may mean only freedom in the domestic herd, but not in the feral swine population.

Also problematic with the concept of disease freedom is the lack of consideration of adjacent countries and regions that are not free. The concept is actually backward looking. It does not look at what will be happening and what associated risks may be in the future.

Regionalization also has problems as it does not look at all the risks, for instance, it does not differentiate between different commodities. Dr. Fite concluded by highlighting the need to look beyond the disease status of a region and begin to look at the risks associated with importation from those regions.

Dr. Robert McDowell then discussed a closed-form model for assessing risk to countries importing animals from areas of “near-zero” disease prevalence. “Don’t have a clue – let it through” has almost replaced the “when in doubt, keep it out” motto. All SPS regulations are to be established on science-based risk analysis and must be uniformly imposed and transparent. Mr. McDowell reported that the USDA Risk Analysis Staff has developed various Bayesian models to incorporate active and passive surveillance data, other points of analysis. All of these models have problems which include misclassification errors not random and non-reactors not re-tested. To overcome these problems with current models the system becomes unwielding. In addition, there is no distinction for near-zero or assumed zero risks. Mr. McDowell then explained a new model for growth of infected curve prior to detection. He believes this is a compact, closed form, few factors model that avoids massive, dense, impenetrable spreadsheet models. It can provide an idea of how many infected animals were imported prior to a disease outbreak detection in the country of origin.

Next, Dr. Lisa Ferguson and Dr. Roger Perkins presented the annual report of the National Center for Import/Export. A copy of that report is included with this report. Both Dr. Ferguson and Dr. Perkins highlighted staff reorganization within the NCIE. Concern was expressed regarding a lack of communication and coordination between USDA, APHIS, VS and states on special requests, such as a recent request for a temporary private quarantine station for dairy heifers. It was agreed that there is a need for early cooperation in the response to these kinds of requests and the suggestion was made to Dr. Perkins that a courtesy call be made at any time the staff recommends to an applicant that the state veterinary official be contacted.

On another business matter, a recommendation to encourage USDA,
REPORT OF THE COMMITTEE

APHIS, VS to provide specific training and inspection techniques of horses in quarantine stations was approved.

Dr. Reed Holyoak was appointed to oversee the inclusion of embryo movement issues in the full committee meetings.

Finally, the committee approved the nomination of George Winegar as the incoming chairman of the Committee on Import/Export.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.

ANNUAL REPORT TO THE UNITED STATES ANIMAL HEALTH ASSOCIATION FISCAL YEAR 2000-
NATIONAL CENTER FOR IMPORT/EXPORT

Lisa Ferguson and Roger Perkins

(I) ANIMAL IMPORT ACTIVITIES

Overall, the number of imported animals was up over the previous year, and consistent with numbers for 1998. This was attributed to the increase in equine imports, other fluctuations being less remarkable than the dramatic increase in the number of horses. Because of the nature of racing and showing activity, it is more likely the increase in equine imports reflects movements of horses in temporarily and US horses returning from shows and races rather than an increase in the national herd due to imports.

The regulation change declaring a large region of the Republic of South Africa to be from foot-and-mouth-disease (FMD) and rinderpest (RP) was published as a final rule effective May 2, 2000. The National Center for Import and Export (NCIE), drafted a protocol for the importation of semen and embryos of sheep and goats from RSA, and had just completed negotiations for certifications and tests when South Africa reported an outbreak of FMD on the eastern border of the country. All protocol negotiations have been suspended, and no animal or germ plasma importations will be allowed until resolutions of the outbreak are confirmed. South Africa responded quickly and decisively to this incursion, and began stamping out procedures. NCIE is waiting to be sure the outbreak has been contained, and is over before resuming negotiations for importation.

The United Kingdom experienced an outbreak of hog cholera in August of 2000. Importations were suspended pending a review of the eradication and containment of this outbreak. A site visit was conducted. NCIE published an interim rule in the Federal Register declaring the region within the UK to be removed from the list of regions free from hog cholera.

A final rule was published allowing the importation of Pure Breed horses from Spain under the same conditions as for the importation of thoroughbred horses in training. Because of some confusion as to the intention of these published conditions, we are proposing to publish a rule in the Federal Register clarifying the requirements which must be met in order for intact stallions and mares over 731 days of age to be imported.
A major renovation is pending at the port of Miami, Miami international Airport. The Miami Dade County Developers are going forward with a project to add additional runway and to build brand new facilities for APHIS inspections and animal quarantine. There have been concerns expressed regarding availability of an approved export facility near the airport during the time between demolition of the existing animal export facility and completion of construction of the new one. Veterinary services, Dade County and interested exporters and brokers are working together to insure that an approved temporary facility can be available. Construction is scheduled to begin January 1, 2001.

NCIE will soon publish proposals in the Federal Register for Standards to approve Private import quarantine facilities for Horses, standards for privately operated quarantines for large ruminants and standards for privately operated quarantines for swine.

A final rule deregulating equine semen from Canada, and canine semen from anywhere in the world was effective October 20, 2000.


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<thead>
<tr>
<th>SPECIES</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
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Embryos

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<td>Caprine</td>
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<td>134</td>
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<tr>
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<td>Deer</td>
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<td>89</td>
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<td><strong>577</strong></td>
<td><strong>594</strong></td>
<td><strong>1,390</strong></td>
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REPORT OF THE COMMITTEE

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<td>2,137,416</td>
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<td>2,894,307</td>
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<td>Equine</td>
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<td>2,966</td>
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<td></td>
<td>4,687</td>
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<tr>
<td></td>
<td>13,653</td>
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<td>Porcine</td>
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<td>3,361</td>
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<td></td>
<td>7,653</td>
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<td></td>
<td>12,556</td>
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<td>970</td>
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<td></td>
<td>45</td>
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<td></td>
<td>1,871</td>
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<td>Elk</td>
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<td></td>
<td>2,087</td>
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<td>3,316</td>
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<td>5,007</td>
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<td>Deer</td>
<td>470</td>
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<td>250</td>
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<td></td>
<td>1,245</td>
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<td><strong>TOTAL</strong></td>
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<td>2,169,527</td>
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<td></td>
<td>2,155,116</td>
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<td></td>
<td>2,928,639</td>
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<table>
<thead>
<tr>
<th>Bovine Imports by Port of Entry</th>
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<tr>
<td></td>
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<tr>
<td>Canadian Ports</td>
</tr>
<tr>
<td>Mexican Ports</td>
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<tr>
<td><strong>TOTAL</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Swine Imports by Port of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Canadian Ports</td>
</tr>
</tbody>
</table>

(II) AVIAN IMPORT ACTIVITIES

A. Poultry and Hatching Eggs
   There were 15,612,799 poultry, including day old chicks, and 14,270,208
   poultry hatching eggs imported into the United States during fiscal year
   (FY) 2000.

B. Commercial Birds
   The imports of commercial birds are limited to those that are exempt
   from the Wild Bird Conservation Act, serviced by the U.S. Fish and Wildlife
   Service. There were 3,452 birds released from USDA-operated commer-
   cial bird quarantine facilities in FY 2000.

   Velogenic Newcastle disease was isolated from a Francolin (Francolinus
   jacksoni) and an undetermined avian species in a quarantine facility in
   Florida. These birds as well as the commercial shipments from which they
   originated were denied entry into the United States.

C. Pet Bird Program
   There were 412 pet birds imported into the United States and quaran-
   tined at a USDA-operated animal import center during FY 2000.
D. Smuggled/Confiscated Birds

There were 58 birds seized by the USDA and/or the U.S. Customs Service for illegally entering the United States in FY 2000.

Velogenic Newcastle disease was isolated from an Amazon parrot confiscated by the U.S. Customs Service in California. The bird was denied entry into the United States.

E. Ratite Importations

During FY 2000, no ratites or hatching eggs of ratites were imported into the United States. The current price of ratites and hatching eggs of ratites does not justify the costs of importing such animals.

(III) ANIMAL EXPORT ACTIVITIES

During FY 2000, APHIS' Veterinary Services negotiated new or revised health conditions for exporting poultry, livestock and germplasm to various countries. As global trade in the agricultural field expands, Veterinary Services is challenged with not only trying to expand existing markets, but also with accessing new markets and with retaining existing ones. The market to China is opening slowly. We have exported increasing numbers of live swine and bovine embryos to this market, and hope to increase access for other products in the future. A new market in Mongolia for ovine semen and embryos was developed. A shipment of 750 live cattle to Lebanon was sent during the past year, which was a new market. We continue to have a steady market for various species exported to Japan, although we are working with Japan on some Johne's disease issues relative to live cattle exports. We have new protocols in place for the export of ovine and caprine germplasm to Australia. While the scrapie provisions in this protocol are fairly stringent, this is a new market which has not been open in the past. We continue to work with various countries in the Americas, such as Brazil and Argentina, to favorably revise various protocols for export. In the future, we anticipate seeing new markets open up with live cattle to Taiwan, and future markets in Iran, Syria and Cuba.

The first shipment of slaughter swine to Canada took place this spring. Canada amended their regulations in 1998, with additional changes in October 1999, to allow for the export of immediate slaughter swine from states which had achieved Stage IV or V status in the pseudorabies eradication program. The first shipments went from Michigan in April and May 2000.

The export of restricted feeder cattle to Canada continues to increase. The following States are approved for participation in the restricted feeder cattle program - Hawaii, Washington, Montana, North Dakota, Idaho, Alaska, and New York. Some changes were made to the program for the current shipping season. The following table outlines the number of restricted feeders exported from each state during the 1999/2000 shipping season. In addition, the numbers of exports from the current season which
started in October 2000 are an increase over the same time frame last year. A total of 31,933 were exported between October 1 and October 14, 2000, as compared to a total of 17,958 for the equivalent time frame in 1999.

**Restricted Feeder Cattle exports to Canada, 1999/2000**

<table>
<thead>
<tr>
<th></th>
<th>AK</th>
<th>ND</th>
<th>MT</th>
<th>ID</th>
<th>WA</th>
<th>HI</th>
</tr>
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<tr>
<td>B.C.</td>
<td>623</td>
<td>0</td>
<td>0</td>
<td>6,480</td>
<td>2,946</td>
<td>10,049</td>
</tr>
<tr>
<td>Alberta</td>
<td>239</td>
<td>3,647</td>
<td>119,079</td>
<td>16,755</td>
<td>14,429</td>
<td>3,200</td>
</tr>
<tr>
<td>Sask.</td>
<td>0</td>
<td>2,003</td>
<td>8,564</td>
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<tr>
<td>Manitoba</td>
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<td>2,349</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>862</td>
<td>7,999</td>
<td>127,643</td>
<td>16,755</td>
<td>20,909</td>
<td>6,146</td>
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</table>

Canada published a proposal in the Canada Gazette in December 1999 which outlined draft changes to their import health requirements. These proposed changes would allow Canada to recognize zones or regions in other countries, including the United States. This will provide an opportunity for recognition of the different animal health status of States for such diseases as tuberculosis, brucellosis, bluetongue and pseudorabies. The CFIA is anticipating having a final regulatory change in place by April 2001. APHIS-VS will be working with both the States and CFIA to request recognition of various States as this regulatory change is finalized.

The table below entitled Livestock and Poultry Exports shows the number of livestock, poultry, germplasm and other animals exported during fiscal years 1998, 1999, and 2000. This data is obtained from APHIS-VS Export Health Certificate database. Data is entered into this database from each Area Office based on health certificates which are endorsed in that office. Most of our livestock is primarily exported to Canada and Mexico.


<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Bovine</td>
<td>165,022</td>
<td>148,269</td>
<td>110,228*</td>
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<td>Equine</td>
<td>33,803</td>
<td>53,510</td>
<td>50, 118</td>
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<tr>
<td>Ovine</td>
<td>319,370</td>
<td>359,781</td>
<td>371,507</td>
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<tr>
<td>Caprine</td>
<td>112,499</td>
<td>91,726</td>
<td>58,096</td>
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<tr>
<td>Porcine</td>
<td>141,798</td>
<td>390,069</td>
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<td><strong>Total livestock</strong></td>
<td>772,492</td>
<td>1,043,355</td>
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POULTRY EXPORTS:

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<th>Product</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
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<tbody>
<tr>
<td>Day-old chicks</td>
<td>32,217,388</td>
<td>40,643,722</td>
<td>38,643,599</td>
</tr>
<tr>
<td>Hatching eggs (dot)</td>
<td>81,769,832</td>
<td>74,929,827</td>
<td>65,521,644</td>
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<tr>
<td>Other live poultry/birds</td>
<td>56,305,836</td>
<td>56,624,321</td>
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<tr>
<td>Ostrich</td>
<td>9,412</td>
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GERMPLASM EXPORTS:

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<th>2023</th>
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</thead>
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<td>6,297</td>
<td>7,448</td>
<td>7,419</td>
</tr>
<tr>
<td>Caprine/Ovine semen</td>
<td>1,802</td>
<td>1,022</td>
<td>1,980</td>
</tr>
<tr>
<td>Cervine semen</td>
<td>1,318</td>
<td>2,765</td>
<td>3,712</td>
</tr>
<tr>
<td>Bovine embryos</td>
<td>18,370</td>
<td>16,383</td>
<td>22,846</td>
</tr>
<tr>
<td>Other animals (cervids, camelids, zoo, etc)</td>
<td>214,688</td>
<td>15,164,710</td>
<td>776,676</td>
</tr>
</tbody>
</table>

*Note - the number for live cattle exports does NOT include restricted feeder cattle exports to Canada, which totaled 180,314 in FY 2000.

(IV) REGIONALIZATION

NCIE is responsible for evaluating the animal health status of countries or regions requesting approval to export animals and animal products to the United States. Such requests usually call for recognition of the region’s freedom from a specific animal disease, but may relate to conditions for the importation of a specific commodity. The evaluation process includes a risk analysis and, in many cases, a site visit. If, after completing the evaluation,APHIS believes the request can be approved and a regulatory change is required, a proposed rule is published in the Federal Register for public comment.

Over the past year, NCIE completed its evaluation of requests from the Republic of South Africa for recognition as free of scrapie, Baja California Norte as having regions free of cattle fever ticks, and regions in Australia as free of bluetongue. Currently, NCIE is involved in the evaluation of requests from Argentina, Brazil, Chile, the European Union, Japan, Korea, Estonia, Panama, Mexico, Paraguay, the Republic of South Africa, and Poland.

(VI) VETERINARY MEDICAL OFFICE, PLANT PROTECTION AND QUARANTINE

The Veterinary Medical Office, Plant Protection and Quarantine (PPQ), is responsible for ensuring the appropriate and consistent application of regulations, policies, and procedures for the handling of animal products, byproducts, and related materials and the handling of international garbage. Activities in other areas of PPQ result in disease exclusion activities as well. To summarize:
REPORT OF THE COMMITTEE

Pre-clearance activities
PPQ will continue to pilot a pre-clearance program in Canada that is patterned after a Vancouver program where PPQ officers are working in cooperation with Customs and Immigration and Naturalization Service (INS) personnel in order to preclear passengers for their return to the United States. At the conclusion of this program an evaluation will be made as to whether this program will be continued based on the level of risk of receiving prohibited materials (fruits, animal products, animal byproducts) from a country other than Canada from these passengers.

Baggage inspection
PPQ currently has 59 teams at 23 locations. Approximately 50 teams will be added over the next 18 months with emphasis on adding teams at the larger ports and land border locations in Texas. Breeds other than beagles are being used when activities are based outside of airports.
Tomographic X-ray inspection of baggage will be field tested in Puerto Rico in the fall of 2001.

REPORT OF ANIMAL PRODUCTS IMPORTED/EXPORTED
September 1999-July 31, 2000

Vessels and Aircraft Arrivals

<table>
<thead>
<tr>
<th>Vessels and Aircraft Arrivals</th>
<th>51,515</th>
<th>32,166</th>
<th>6,133</th>
<th>9,142</th>
<th>505,822</th>
<th>32,672,115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessels arrived</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vessels boarded</td>
<td></td>
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<td></td>
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<tr>
<td>Vessels monitored for garbage violations</td>
<td></td>
<td></td>
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<tr>
<td>Lots consisting of 6,162,795 kilograms of garbage were removed from these vessels</td>
<td></td>
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<tr>
<td>Aircraft arrived from foreign locations</td>
<td></td>
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<tr>
<td>Kilograms of garbage removed from these aircraft</td>
<td></td>
<td></td>
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</tbody>
</table>

Meat and Other Animal Products confiscated/Refused Entry

<table>
<thead>
<tr>
<th>Meat and Other Animal Products confiscated/Refused Entry</th>
<th>1,801</th>
<th>1,946</th>
<th>144,758</th>
<th>265,000</th>
<th>39,532</th>
<th>64,849</th>
<th>4,128</th>
<th>5,936</th>
<th>8,905</th>
<th>51</th>
<th>$21,550</th>
<th>63</th>
<th>$6,850</th>
</tr>
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<tr>
<td>Ship passenger baggage</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Aircraft passenger baggage</td>
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<tr>
<td>Border crossing</td>
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<td>Post offices</td>
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<tr>
<td>Footwear Cleaned and Disinfected</td>
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<tr>
<td>Maritime Garbage Civil Penalties</td>
<td>51</td>
<td>$21,550</td>
<td></td>
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<td></td>
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<tr>
<td>Notification Violations</td>
<td>63</td>
<td>$6,850</td>
<td></td>
<td></td>
<td></td>
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</table>
PHYSICAL AND CHEMICAL RESTRAINT OF HORSES HELD IN U. S. DEPARTMENT OF AGRICULTURE ANIMAL IMPORT CENTERS

Ralph C. Knowles, DVM

The inspection of horses offered for entry into the United States is a mandatory action required by the U.S. Department of Agriculture, Title 9, Code of Federal Regulations, Part 92. These inspections are performed in USDA's Animal Import Centers, which are located in Miami, FL, Newburgh, NY, and Los Angeles, CA.

Horses being handled for inspection in these Animal Import Centers are exposed to strange handlers, noises, and odors.

Horses in nature, historically have been "plains dwellers" and thus, when they become excited, are given to flight, and attempt to escape their present "setting" as opposed to equids of jackass/burro lineage or their crossbreeds - mules; when alarmed or excited, having origins in the mountains of The Middle East, stop to evaluate their setting before making a move to exit their perceived danger (in a mule this is often interpreted as stubbornness).

In the workplace, it is the supervisor's and organization's (in this case USDA's) obligation to train personnel to carry out their duties in a safe manner. While USDA's, Veterinary Services supervisors are trained in the proper restraint methods for horses, the livestock inspectors may not have been trained in the proper physical restraint methods appropriate for use on horses.

Historically, when chemical restraint of horses held in quarantine has been indicated, private veterinary practitioners have been "called in" to apply such chemical agents. The entry of private practitioners into a USDA quarantine station, dilutes the biosecurity of the station.

This author believes it is indicated and practical for USDA to initiate training sessions to update the animal import centers veterinary supervisors and animal health technicians, in the latest, cutting edge, techniques of physical and chemical restraint of horses. The implementation of restraint methods by USDA employees would preclude the need for a private veterinary practitioner to enter a quarantine station in these instances.

In the litigious society that prevails in the United States, I believe the USDA can successfully defend, as state of the art, any challenge or claim that a "client" may make against the U.S. Government should an untoward situation occur following the application of "modern", cutting edge, restraint methods.

The author reiterated the history of a horse from Argentine origin, who entered the United States through the USDA Miami Animal Import Center, Miami, Florida, and was subsequently found to be infested with screw-worm (Cochliomyia hominivorax) in Wellington, Florida.

(The author showed several 35mm transparencies related to the subject).
REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES OF CATTLE, BISON AND LAMA

Chairman: Dr. John A. Schmitz, Lincoln, NE
Vice Chairman: Dr. Donald E. Mattson, Corvallis, OR

Dr. Helen M. Acland, PA; Dr. Bob H. Bokma, MD; Dr. Carole A. Bolin, MI; Dr. Steven R. Bolin, MI; Dr. Bruce L. Branscomb, NV; Dr. H. Michael Chaddock, MI; Dr. Wilber W. Clark, MT; Dr. Thomas F. Conner, IN; Dr. George L. Crenshaw, CA; Dr. A. A. Cuthbertson, NV; Dr. Allan L. Dewald, SD; Dr. James J. England, ID; Dr. Murray E. Fowler, CA; Mr. Bob Frost, CA; Dr. John E. George, TX; Dr. Michael J. Gilsdorf, MD; Dr. Rube Harrington, TX; Dr. Lenn R. Harrison, KY; Dr. Robert L. Hartin, OK; Mr. Del E. Hensel, CO; Dr. John W. Hunt, Jr., MO; Dr. Julie Ann Jarvinen, IA; Dr. Arthur J. Kennel, MN; Dr. William W. Laegreid, NE; Dr. Howard D. Lehmkuhl, IA; Dr. Donald H. Lein, NY; Ms. Janet Maass, CO; Dr. Patrick L. McDonough, NY; Dr. Janice M. Miller, IA; Dr. Michael W. Miller, CO; Dr. Donald R. Monke, OH; Dr. Raymond L. Morter, IN; Dr. Robert M. Nervig, NC; Dr. Louis E. Newman, NC; Dr. James E. Novy, TX; Dr. Phillip A. O'Berry, IA; Dr. Bennie I. Osburn, CA; Mr. C. Marbury Seaman, Jr., VA; Dr. Lynne M. Siegfried, PA; Dr. Clarence J. Siroky, WL; Mr. George Teagarden, KS; Ms. Susan W. Tellez, TX; Dr. Robert M. S. Temple, OH; Dr. Charles O. Thoen, IA; Dr. John U. Thomson, MS; Dr. Cheryll B. Tillman, OR.

Minutes of Committee on Infectious Diseases of Cattle, Bison and Lama
Birmingham, Alabama
John A. Schmitz, Chair
Donald Mattson, Vice-Chair

The meeting was called to order by the Dr. Jack Schmitz, Committee Chair, at 12:30 PM, Monday, October 23, 2000 with 11 Committee members and 17 non-committee members present. The speakers and their presentations were as follows:

Dr. Julie Jarvenen, Iowa State University. Bacterial Isolates from the Preputial cavity of Lamas.

Preputial swabs of 17 llamas and 13 alpacas were cultured aerobically and anaerobically. The population included intact and gelded adults and immature males. All were positive for a range of common commensals and environmental contaminants, which included 21 genera. The five most common bacterial isolates in descending order included Staphlococcus spp., Streptococcus spp., Bacillus spp., Bacteroides spp., and Actinomyces spp. All swabs were negative for Campylobacter and fungi.
INFECTIOUS DISEASES OF CATTLE, BISON AND LAMA

Dr. Lora Ballweber, Mississippi State University. Cryptosporidium parvum and Giardia duodenalis in Lamas.

Both parasites cause severe diarrheal disease in animals and humans and are considered to be a global public health threat. Morphologically, isolates of each parasite recovered from humans are indistinguishable from those recovered from a variety of domestic and wild animals leading to the presumption that each is zoonotic. Transmission experiments, however, have had mixed results leading to arguments disputing the zoonotic potential of each. Recent advances in molecular biology have allowed for the characterization of a variety of isolates at the genetic level and have confirmed that isolates of each parasite infecting humans also occur in many other species. However, isolates of each parasite have been identified that are adapted to a particular host or group of hosts and are not present in humans. Consequently, a variety of genetic types exist for both parasites, some of which have public health significance. Current research focuses on identification of the genetic types exist in Lama and whether these have zoonotic potential.


The purpose of this study was to determine the physiological changes associated with chronic heat stress in sheared versus nonsheared alpacas. Fourteen intact male, adult alpacas were randomly assigned to one of two groups: Group S alpacas were sheared to within 2 cm of their skin; Group NS alpacas were not sheared. These animals were maintained in the same paddock, with adequate artificial shade from June through August in east central Alabama. Data collected in the morning, every two weeks, included vital signs, body weight, body condition score, complete blood counts, serum chemistries and electrolytes, whole blood selenium, and plasma cortisol. S and NS groups were contrasted using the repeated measures analysis of variance. All pertinent correlations with weather parameters (daily maximum and minimum ambient temperatures, maximum relative humidity, the livestock heat stress index and calculated heat stress index) were calculated. This study indicated that there are differences between sheared and nonsheared alpacas in physical examination and clinicopathologic parameters that can be correlated with changes in ambient conditions. These differences suggest that nonsheared alpacas are less heat tolerant than sheared alpacas. Therefore, shearing is recommended for animals exposed to similar conditions.

Dr. Robert Callan, Colorado State University. Ovine Herpesvirus 2 Infection and Malignant Catarrhal Fever in a Dairy Cattle Herd.

Sheep associated malignant catarrhal fever (MCF) is a highly fatal infectious disease of cattle and bison. Ovine herpesvirus 2 (OHV2) was
detected by polymerase chain reaction (PCR) test from 53 of 54 bison and 30 of 30 cattle with clinical and histopathological signs of MCF. Alternatively, 10 of 10 bison and 38 of 39 cattle diagnosed with other diseases at necropsy were PCR negative for OHV2. Peripheral blood samples from normal adult cattle in four dairy herds were tested for OHV2 by PCR. Three of the four dairies had a history of previous cases of MCF however only one of these herds has close contact (200 feet) with sheep. The herd with close proximity to sheep had a 21% prevalence of clinically normal OHV2 positive animals while the other three dairies had a 0% prevalence. A prospective study of peripheral blood OHV2 status was initiated in the dairy herd with sheep contact. Blood and milk samples were collected from thirty adult cattle at monthly intervals for 8 months. Eight of the animals were blood OHV2 PCR positive on at least 1 of 8 monthly samples. Two animals had OHV2 PCR positive milk samples during the study period. None of these animals developed signs of MCF during the study period. These data show that transmission of OHV2 from sheep to dairy cattle can occur over a distance of at least 200 feet. In addition, cattle may become latently infected with OHV2 without showing clinical signs of MCF.

A.W. Layton, Montana State University. *Mycoplasma bovis* Pleuropneumonia and Lymphadenitis in Bison

A respiratory disease outbreak a herd of 600 bison in Montana in the fall and winter of 1999 was described. The animals ranged from 8 months to three years and all animals had originated from a closed parent herd. All groups except calves were affected with two-year-old animals having the greatest incidence. Clinical signs included dyspneic posture, stridor, coughing and "smacking of lips". Clinical signs occurred after early fall vaccination against BVD, P13, IBR and BRSV with modified-live vaccine, and clostridial diseases with seven-way toxoid. The number of clinical cases abated when animals were fed pelleted feed medicated with tetracycline and tylosin, but additional deaths occurred after discontinuation of medicated feed. A total of 24 bison died or were killed during the outbreak.

Common gross necropsy findings included variable amounts of serosanguinous pleural and pericardial effusion; severe fibrinous pleuritis and epicarditis; severe pulmonary congestion and edema; swollen lymph nodes containing multiple depressed encapsulated foci of green/gray caseous necrosis in pulmonary, thoracic and head regions. Histologically, there was extensive fibrinopurulent inflammation with multiple pyonecroganulomas in the lungs and lymph nodes that resembled lesions characteristic of tuberculosis. *Mycoplasma bovis* was isolated from lungs and lymph nodes and judged to be the etiologic agent.

Mr. Robert Frost, Lincoln, California

In the last decade there has evolved some understanding of certain diseases, prevalence, and diagnostics in regards to South American
Camelids (SACs). Just last year the first ever "Prevalence of Selected Diseases of Llamas and Alpacas" was completed and included in the report of the Committee on Infectious Diseases of Cattle, Bison, and Lama. (The 1999 Report of the 103rd Annual Meeting of the USAHA, Proceedings pages 268-276.)

Also during the last decade research projects on FMD, bovine tuberculosis, brucellosis, and rabies have allowed industry and regulators some confidence in understanding those diseases in regards to SACs. There is, however, a great deal of research still to be undertaken with SACs and the various diseases that effect their involvement with human and animal health, intra and interstate movement, and international travel and trade.

Last March an historic meeting of Canadian and United States animal disease officials took place at the National Centre for Foreign Animal Disease in Winnipeg, Manitoba. The purpose of the meeting was to initiate dialog between the two countries and establish collaboration between various agencies in Canada and the United States concerning animal health research.

Camelids, both New World and Old World were the focus of this meeting. A need was recognized to establish protocols for the study of certain diseases in camelids. The group determined that further understanding of disease conditions in camelids is needed for appropriate disease management and eradication purposes. Valid diagnostics are required by world trade agreements to ensure rapid and safe movement of livestock. The task of understanding South American Camelid (SAC) diseases and providing validated diagnostics for these species quickly mushroomed into an immense project. Many years of study and hundreds of thousands of dollars for each earmarked disease could be required. The need to evaluate 15 to 30 animals per disease as requested by statisticians for number validation may put diagnostic research for non-traditional livestock at a loss for dollars, facilities, and manpower in the not too distant future.

All studies conducted to date on infectious diseases of SACs indicate that all four New World camelids (llama, alpaca, vicuna, and guanaco) respond to agents in the same way (diagnostic test validity, sensitivity, specificity). Therefore, the group stipulated that it is not necessary to duplicate studies on each species.

Old World camels were also considered. Camel numbers in North America are estimated to be only about 4000. Small numbers, to be sure, but as members of the family Camelidae, they share similar anatomy and possibly resistance or susceptibility to infectious and parasitic diseases with llamas and alpacas. Perhaps the most pressing need for non-zoo camel owners and breeders is that camels be recognized as a unique domestic animal, that is not a ruminant, by state, provincial and federal regulatory officials. They need to be classified with llamas and alpacas for regulatory purposes. Camels, like llamas and alpacas, have become more important, and economically valued animals in their native countries.
wise, they have become an alternative livestock species in the United States. Serologic-laboratory tests need to be validated for use in camels just as is being done presently for llamas and alpacas.

In regards to llamas and alpacas a decision was made to make the study of bovine brucellosis, vesicular stomatitis (VS), bluetongue (BT) and epizootic hemorrhagic diseases (EHD) the first priorities. Although *Brucella abortus* has never been reported to occur naturally in SACs anywhere in the world, validation of additional brucella diagnostic tests is needed. Other diseases were discussed, especially those that had been mentioned in a survey of prevalence reported to the annual USAHA meeting in 1999. The list included anaplasmosis, leptospirosis, bovine tuberculosis, human tuberculosis, avian tuberculosis, Johne’s disease, foot and mouth disease, rinderpest, trypanosomiasis (*Trypanosoma evansi*), bovine virus diarrhea, retinal degeneration (equine herpesvirus type I), rabies, caseous lymphadenitis (*Actinomyces pseudotuberculosis*), and ovine brucellosis (*Brucella melitensis*).

There has not been a definitive diagnosis of either Bluetongue Virus (BTV) or Epizootic Hemorrhagic Disease Virus (EHDV) in South American Camelids (SACs). Simply stated there has been no isolation of either virus in llamas or alpacas. However, there have been positive serologic diagnostic test results for these diseases in SACs in the Americas. The animals that have tested positive have not had clinical signs of the diseases nor has there been an isolation of either virus in any of the test positive animals. There is evidence that antibodies are found in SACs, but there is no evidence to suggest that they are reservoirs for the disease. The fact remains that there is research to be done in regards to BTV and EHDV diseases in SACs.

Presently there are six U.S. states and all of Canada that require BTV testing in SACs. Are the BTV tests that are utilized valid for llamas and alpacas? Is it appropriate to regulate animals that react positively to cattle and sheep tests without having knowledge of their validity in regards to SACs? The need to know the disease status of BTV and EHDV disease is necessary not only in our domestic trade and movement, but also in the international marketplace. Clinical signs of BTV and EHDV disease must be differentiated from vesicular disease and rinderpest. The viremia of BTV and EHDV must be established in SACs and the validation of diagnostic tests specifically for llamas and alpacas must be undertaken.

Vesicular stomatitis virus has been isolated in only one SAC case (llama, New Mexico, 1997). Understanding this vesicular disease in SACs and developing valid diagnostic tests is again a most important research project in order to be able to differentiate VS from the other vesicular diseases and rinderpest.

TB (bovine tuberculosis) in SACs is a concern for regulatory officials, but sufficient research has been conducted to date to indicate that the tuberculin skin test is valid. Canada has published the results of their TB
project that has been completed at their laboratory facilities in Nepean, and the United States TB project data is complete and ready for publication.

The motivation by Canada and the United States to evaluate diagnostic testing for non-traditional livestock for the purpose of compliance with international standard setting organizations is commendable. The question looms how to establish support for facilities, manpower, animals, and money. Proactive projects prove difficult to establish adequate funding from government and industry. Crisis management traditionally makes the headlines and receives any funds that are available. The ultimate goal to improve non-traditional livestock diagnostics for disease control and eradication of disease will take dedication from government and industry.

Dr. Donal O’Toole, University of Wyoming. A Prospective Study of OHV2-Associated Malignant Catarrhal Fever in a Large Bison Feedlot.

A report was presented about losses in a large bison feedlot where a fatal enteric syndrome was recognized recently. Approximately 150 bison died of the syndrome, which was diagnosed as malignant catarrhal fever (MCF). Affected bison died 1-3 days after clinical onset. Consistent features were vasculitis, cystitis and ulcerative typhlocolitis. DNA of ovine herpesvirus-2 (OHV-2) was detected in tissues from all animals with typical clinical signs and lesions. A prospective study assessed the importance of MCF relative to other diseases at the feedlot. Three hundred healthy male bison were followed for up to 10 months at the yard. At entry, 23% (71/300) of bison were seropositive for MCF viruses, including OHV-2. Eight had detectable OHV-2 DNA in peripheral blood. The prevalence of seropositive bison was essentially the same (23.9%) six months later. Twenty-two of the 300 bison (7.0 %) died (9/99 - 8/00). Fifteen had acute MCF, 4 had pneumonia, and 3 were not examined post-mortem. Persistent infection with OHV-2 of healthy bison at the start of the study did not predict increased likelihood of animals developing MCF. MCF is probably the most important fatal viral disease of commercial bison.

Dr. Vern Anderson, North Dakota State University. Nutritional Future of Bison.

Research activities on bison at the Carrington, North Dakota Research Center, primarily targeted toward defining the nutritional requirements of bison, were described.

The meeting recessed at 4:40 PM.

The Committee on Infectious Diseases of Cattle, Bison and Lama reconvened its meeting at 7:15 AM on Tuesday, October 23, 2000 with 15 Committee and over 30 guests in attendance. The speakers and their topics were as follows:

Dr. Linda Detwiler, USDA, APHIS. Bovine Spongiform Encephalopathy
Update.

Dr. Detwiler reported on the situation involving the sheep flocks in Vermont that were imported from Europe in the mid-1990's and later diagnosed with a TSE. The situation is still undergoing action. Dr. Detwiler also provided an update on the BSE situation in Europe including the declining prevalence of the disease in Great Britain and the surveillance program focusing on downer cattle in the European nations.

Drs. Amir Hamir and Janice Miller, USDA, ARS, NADC. Experimental Transmission of Chronic Wasting Disease to Cattle.

To determine the clinical signs, nature of lesions, and compare natural bovine spongiform encephalopathy (BSE) with experimental scrapie in cattle, calves were inoculated with brain suspension from mule deer naturally affected with CWD. Between 24 and 27 months post inoculation, 3 animals became recumbent and were euthanatized. Gross necropsies revealed emaciation in 2 animals and presence of a large chronic pulmonary abscess in the third. Brains were examined for protease-resistant prion protein (PrPres) by immunohistochemistry and Western blotting, and for scrapie associated fibrils (SAF) by negative stain electron microscopy. Microscopic lesions in the brain were subtle in 2 animals and absent in the third case. However, all 3 animals were positive for PrPres by immunohistochemistry and Western blot, and SAF were detected in 2 of the animals. A non-inoculated control animal euthanatized during the same time-period did not have PrPres in its brain. These are preliminary observations from a currently in-progress experiment. Three years after the CWD challenge, the 10 remaining inoculated cattle are alive and apparently healthy. These preliminary findings demonstrate that diagnostic techniques currently used for BSE surveillance would also detect CWD in cattle should it occur naturally.


CWD is a transmissible spongiform encephalopathy (TSE) that affects free-roaming deer in areas of northeast Colorado and southeast Wyoming. In the fall of 1998, a survey of adult cattle, in defined CWD endemic areas was initiated to evaluate possible transmission of CWD from deer to cattle. The areas included 22 ranches whose cattle co-mingled with free-roaming deer. The survey population included older cows that were being eliminated from the herds due to age-related problems or not being pregnant. All cows in the project, were at least four years old and had spent a minimum of four years in the herd. Cows were identified by unique ear tags prior to leaving the ranch and the intact heads, including the attached ears and ear tags, were delivered to the Colorado State University Diagnostic Laboratory following humane slaughter.

The brains were removed and examined microscopically for tissue al-
terations indicative of a TSE. Immunostaining with anti-PrP antibody was conducted on sections of the commonly affected neuroanatomic sites in the medulla oblongata.

Analysis of 262 brains failed to reveal any indications of CWD or any other TSE. Incidental findings in some brains included mild non-suppurative meningoencephalitis, neuronal lipofuscin accumulation, and occasional neuronal perikaryonic vacuoles in the red nucleus. Prion deposition was not evident immunohistochemically using a method with formic acid and proteinase K treatment prior to application of monoclonal antibody to the bovine prion protein F99/97.6.1. Thus, evidence of transmission of CWD from deer to cattle under free-roaming conditions could not be demonstrated in this group of cattle known to have lived in CWD endemic areas of northeast Colorado.

Dr. E.R. Atwill, Epidemiology and Potential Management Practices for Bovine Cryptosporidiosis.

Dr. Atwill presented an overview of his bovine cryptosporidiosis research and discussed possible management approaches to help reduce contamination of watersheds. Since calves account for shedding the largest number of oocysts over the early days of their lives, this is the primary population to focus on. Wet weather, rain or snow melt, contribute to moving oocysts into water supplies, thus shortening calving season and moving it as far from the wet weather season is helpful in reducing potential contamination of water with oocysts. Vegetation has been shown to effectively reduce the movement of oocysts on the ground, again reducing movement into water sources. Cow pats "baked" in the sun in hot weather release few oocysts.

Dr. Johnnes Storz, Louisiana State University. Analysis of Viruses in Shipping Fever Pneumonia of Cattle - Emergence of Respiratory Coronavirus.

Dr. Storz's presentation is summarized in a manuscript published elsewhere in the Proceedings.

Dr. William Laegreid, USDA, ARS, MARC. Bovine Respiratory Vaccination Study.

Dr. Laegreid described a three year vaccination trial in which low morbidity rates precluded generation of adequate data to test the efficacy of the modified live virus vaccines in reducing morbidity, but gave indications that it did reduce mortality due to respiratory disease.

Dr. James Keen, USDA, ARS, MARC. Slaughter Plant Surveillance for \textit{E. coli} 0157:H7.

Feces and hides of cattle were collected at slaughter plants and cultured for \textit{E. coli} 0157:H7. Swabs collected from the carcasses of these animals during and after processing were also cultured for \textit{E. coli} 0157:H7. There was a positive correlation between prevalence of \textit{E. coli} 0157:H7 in
live cattle and carcass contamination.

Dr. Bob Briggs, USDA, ARS, NADC reported on mucosal vaccination against respiratory diseases of ruminants.

His research has focused on the construction and testing of modified-live vaccine strains of Pasteurella (Mannheimia) haemolytica, P. multocida, and Haemophilus somnus. Genetic deletions are introduced into target genes in a manner which leaves no residual foreign DNA and which reassembles the target gene(s) to yield immunogenic but non-functional product(s). As reported last year to this committee, a modified-live Pasteurella haemolytica vaccine has proved efficacious when administered either parenterally or orally, and appears to protect cattle as soon as three days after eating hay top-dressed with the vaccine. An intranasal formulation was tested last fall in low-risk calves at their point of first assembly. A good antibody response was elicited; however, the group experienced no mortality and low morbidity, thus data were insufficient to test efficacy of the vaccine. An ovine serotype 2 intranasal vaccine was administered to big-horn sheep with some animals being directly vaccinated and others being commingled with vaccinates. Both direct and indirect vaccinates seroconverted and resisted virulent challenge better than a single unvaccinated control. Though again inadequate, the data are encouraging considering the high susceptibility of this species to pneumonic pasteurellosis.

Dr. Keith Murray, USDA, ARS, NADC. Plans for Major New USDA Animal Health Facilities at Ames, Iowa.

Dr. Murray, Director of the National Animal Disease Center briefly described the plan for new buildings needed to consolidate and house the USDAAPHIS (National Veterinary Services Laboratory and Biologics Division) and ARS (NADC) programs at Ames, Iowa. Current facilities are worn out and inadequate to accommodate future workloads. The workload associated with a national animal disease emergency would create a crisis, unmanageable situation in the present NVSL facilities.

A Resolution titled “USDA’s APHIS-ARS Master Plan” which calls for Congressional funding for construction of new facilities for the USDAAPHIS and ARS programs at Ames, Iowa was passed by the Committee.

A Resolution titled “Sheep-Associated Malignant Catarrhal Fever” which called for the USDA to initiate a research program directed toward isolation of the sheep-associated MCF virus was passed by the Committee.

A Resolution titled “Transmissible Spongiform Encephalopathy Surveillance” which called for the USDA to specific funds for surveillance of bovine spongiform encephalopathy and other transmissible encephalopathies was passed by the Committee.

The meeting adjourned at 12:00 PM.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
ANALYSIS OF VIRUS INFECTIONS IN SHIPPING FEVER PNEUMONIA OF CATTLE: EMERGENCE OF RESPIRATORY CORONAVIRUSES

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Shipping fever pneumonia (SFP) is an acute respiratory tract disease, and remains a serious problem in beef cattle recently transported to feedlots. This form of pneumonia is characterized by fever, dyspnea and exudative inflammatory and necrotizing lung lesions (Hoerlein, 1980; Yates, 1982), and affected 64% of fatal cases in a study of feedlot cattle in Colorado (Jensen et al., 1976). A multifactorial etiological concept for SFP is widely accepted in scientific circles, which implies that crowding and other stressful conditions favor virus spread and infections of respiratory tracts that, in some instances, become further complicated with Pasteurella and other bacterial infections, often leading to fatal pneumonia (Hoerlein, 1980; Yates, 1982). Losses from SFP continue to occur in spite of widespread use of modern management and vaccination programs derived from decades of intensive research on physiological factors, infectious agents and pathogenesis of respiratory tract diseases, defense mechanisms and immune responses of cattle, modern vaccines, metaphylactic and therapeutic antibiotic treatments, and improved diagnostic tools.

Viruses traditionally associated with SFP include bovine herpesvirus-1 (BHV-1) of infectious bovine rhinotracheitis, bovine parainfluenza type-3 virus (PI-3), bovine respiratory syncytial virus (BRSV), and bovine viral diarrhea virus (BVDV) (Yates, 1982). Respiratory tract samples yielded BHV-1 and no other viruses in 18% of 354 fatal cases of SFP in an investigation reported by Jensen and coworkers (Jensen et al., 1976). Isolations of BHV-1 were made from nasal or eye secretions and tracheal samples, but rarely from affected lungs. Infections with PI-3 were detected sporadically in lungs of field cases of SFP (Yates, 1982). The direct involvement of BRSV or BVDV in naturally occurring epizootics of SFP has not been documented in published reports (Yates, 1982). Experimental exposure of calves to BRSV induced respiratory distress, but this virus was reisolated only from nasal swab samples, and bacterial infections were detected in the lungs of 8 of 12 experimental animals (Woolums et al., 1999). Sequential inoculations of cattle with BHV-1, PI-3, or BVDV and Pasteurella haemolytica induced more severe signs of clinical disease than the single infections (Yates, 1982). Bacterial insults in SFP are P. haemolytica or Pasteurella multocida as well as Haemophilus somnus infections.

In 1993, one investigation was conducted in the U.S. to assess prevail-
CORONAVIRUS INFECTIONS IN SFP

Coronavirus infections of cattle (Storz et al., 1996). This experiment involved 100 cattle in Kansas and Arizona feedlots. A high percentage of cattle arriving at feedlots yielded isolates of an "emerging" virus. These virus strains were recovered from nasal swab samples collected from cattle experienced SFP, and were identified as respiratory bovine coronaviruses (RBCV). A refined virus isolation scheme was employed, which included the G clone of human rectal tumor-18 (HRT-18) cells, Georgia bovine kidney (GBK) and bovine turbinate (BT) cells with specific ranges of permissiveness for all known respiratory viruses of cattle including RBCV. This approach resulted in the first successful isolation of wild-type RBCV at high rates from nasal swab samples of cattle arriving at feedlots with respiratory distress, and provided the initial evidence of potential etiological role of RBCV in SFP. Infections with RBCV had not been recognized to be associated with SFP of cattle in the past (Yates, 1982).

Respiratory tract infections with viruses and Pasteurella spp. were determined sequentially among 225 cattle during two severe epizootics of SFP which were naturally evolving and experimentally monitored in 1997 and 1998 (Storz et al., 2000a and b). Ninety-three of 105 cattle and 106 of 120 cattle developed signs of SFP during the 1997 and 1998 epizootics, respectively, and RBCV was isolated in nasal swab samples collected from 81 and 89 sick cattle in the virtual absence of other respiratory bovine viruses during the early phase of the epizootics. Twenty-six cattle developed severe pneumonia and died during the pathogenesis of SFP. RBCV were isolated from nasal secretions of 21 and 25 of the 26 dead cattle, while 2 and 17 of them nasally shed Pasteurella spp. before and after transport, respectively. RBCV were detected at titers of 1.0 x 10^3 to 1.2 x 10^7 PFU per g of lung tissue from 18 cattle that died within 7 days of the epizootics, but not from the lungs of the remaining cattle that died on days 9 to 36. Twenty-five of the 26 lung samples were positive for Pasteurella spp., and their CFU ranged between 4.0 x 10^5 to 2.3 x 10^9 per g. Acute and subacute exudative, necrotizing lobar pneumonia characterized the lung lesions of these cattle with a majority of pneumonic lung lobes exhibiting fibronecrotic and exudative changes typical of pneumonic pasteurellosis, but other lung lobules had histological changes consisting of bronchiolitis and alveolitis typical of virus-induced changes. These cattle were immunologically naïve to both infectious agents with only minimal hemagglutinin inhibiting (HAI) antibody and immunoglobulin M (IgM) responses to RBCV infections at the onset of the epizootics, and hemagglutinin-esterase (HE)- and spike (S)-specific virus-neutralizing antibodies against RBCV could not be detected with a sensitive immunoblotting assay (Lin et al., 2000b). However, RBCV were not detected from the lungs of cattle dying between days 7 to 36, most of which had significant HAI antibody titers against RBCV when they died. In contrast, the 18 clinically normal and RBCV isolation-negative cattle had high HAI antibody titers against RBCV from the beginning, while their antibody responses to P. haemolytica antigens were delayed. These cattle
had the highest levels of total and IgG2 antibodies against RBCV for the entire period of the epizootics, and antigens recognized were HE, S and nucleocapsid (N) viral proteins. Cattle, which nasally shed RBCV at the beginning of the epizootics and survived from the SFP, developed characteristic primary immune responses to RBCV infections with antibodies specific for HE and S glycoproteins.

Our refined virus isolation tests permitted the exclusion of other respiratory bovine viruses that could have infected the cattle during the initial stages of these two SFP epizootics (Storz et al., 2000a and b). Bovine herpesvirus-1 was isolated sporadically from nasal swab samples of cattle at the beginning of the epizootics, but apparently did not spread among cattle. Similarly, PI-3 was isolated from four cattle in the 1997 epizootic and from 13 cattle in the 1998 epizootic on day 19. The BHV-1 and PI-3 were detected only in three lung samples of calves, all of which had initial respiratory tract infections with RBCV during the first week of the epizootic, and died on days 14, 31, and 36 of the 1998 epizootic. Cytopathogenic or noncytocidal BVDV and BRSV were not detected in nasal secretions or lungs through virus isolation attempts with GBK and BT cell cultures and by immunofluorescence tests.

The following phenotypic and genotypic properties differentiated recently-isolated RBCV from previously-studied enteropathogenic bovine coronavirus (EBCV) (Chouljenko et al., 1998; Lin et al., 2000a; Storz et al., 1996; Storz, 1999; Storz et al., 2000a and b): (1) RBCV were isolated in the first G clone cell passage without the use of trypsin enhancement. Trypsin activation was required for the isolation of wild-type EBCV. (2) RBCV have high cell-fusing activity for the G clone cells in the neutral pH ranges. (3) RBCV have a restricted hemagglutination pattern, and agglutinate only mouse and rat, but not chicken red blood cells (RBC). The prototype EBCV agglutinate both rodent and chicken RBC. (4) RBCV have high acetyesterase (AE) activity at 37°C, whereas the AE function of EBCV is much more active at 39°C. Most of RBCV and EBCV isolates have receptor-destroying enzyme activities for rat RBC. (5) Comparative analysis of wild-type RBCV and EBCV at the 3' genomic region (9.5 kb) revealed that RBCV-specific nucleotide and amino-acid changes are disproportionally concentrated within the HE gene, S gene and the genomic region between the S and envelope (E) genes.

The etiological roles of infectious agents and their mechanisms of pathogenesis in SFP have been researched in numerous past investigations, but they must still be further defined. The original Henle-Koch's postulates have not been proven for a disease as complex as SFP (Thomson, 1980; Yates, 1982). Evans analyzed similar challenges involving the roles of viruses in the genesis of chronic diseases, several forms of cancer, or other complex human disease conditions (Evans, 1976). He formulated a unified concept of criteria for causation in order to identify specific etiological factors in the genesis of complex and chronic diseases. Thomson first related these cri-
Criteria for causation to infections leading to SFP (Thomson, 1980).

Criteria for the involvement of different infectious factors in SFP were evaluated by us according to Thomson's ideas about Evans' criteria (Evans, 1976; Thomson, 1980). The potential etiological roles of RBCV or other respiratory bovine viruses as causative factors in the pathogenesis of the 1997 and 1998 epizootics of SFP were applied to the following criteria. (1) The virus infects the mucosa of respiratory tract passages and lungs of affected cattle. (2) The virus can be isolated in cell cultures at high rates from respiratory secretions and lung samples during the pathogenesis of SFP. Both of these criteria were proven by the results of our recent investigations (Storz et al., 1996, 2000a and b). (3) Virus-specific immune responses are observed in cattle recover from SFP. Rising titers of HA1 antibodies against RBCV were detected in all surviving calves which had RBCV infections at the early stage of the epizootics. They developed typical primary antibody responses to RBCV infections characterized by increases in IgM appearing first, followed by rises in IgG1 and IgG2 (Lin et al., 2000b). (4) Viruses isolated from cattle with SFP are not isolated from clinically normal cattle, but they may be detected in the pathogenesis of other respiratory tract diseases (Storz, 1999). Besides the 18 normal control cattle involved in the 1997 and 1998 epizootics of SFP, 20 normal cattle and 32 cattle with chronic lungworm infections did not shed RBCV in nasal secretions in related investigations (Storz, 1999; Storz et al., 2000b). (5) Cattle with significant antibody titers against the candidate virus do not develop SFP, which occurs in cattle without such immune protection. Eighteen normal control cattle, which remained clinically healthy and RBCV isolation-negative during the 1997 and 1998 epizootics of SFP, had significant titers of HA1 antibodies against RBCV at the beginning of the epizootics (Storz et al., 2000a). These cattle had the highest level of total and IgG2 antibodies against RBCV (Lin et al., 2000b). In contrast, calves without such immune protections developed acute respiratory tract diseases, including the fatal cases (Lin et al., 2000b; Storz et al., 2000a and b). (6) Elimination of the virus factor prevents or decreases the severity of SFP. This criterion awaits the development of an effective vaccine. (7) "The whole thing should make biologic and epidemiologic sense". The virological, bacteriological, immunological, epidemiological, pathological and histological findings on cattle of the experimentally monitored 1997 and 1998 epizootics of SFP satisfy this criterion to a full measure (Storz et al., 2000a and b).

Application of these criteria to virus infections of the 1997 and 1998 epizootics identifies RBCV as an initiating and significant infection in SFP that were previously not considered. Our studies reported for the first time initial high rates of respiratory tract infections with a virus and the evolving secondary infections with Pasteurella spp. among cattle developing fatal SFP under experimentally controlled conditions in natural settings of two severe epizootics. The initial high rates of nasal RBCV shedding followed by lung infections with RBCV and P. haemolytica or P. multocida were proven.
through cultivation and quantification of these infectious agents in nasal secretions and affected lungs. The fatal outcomes of the combined infections of lungs with RBCV and Pasteurella spp. probably were influenced by the bacterial component which induced necrotizing lesions in the lungs.

Selected References
REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES OF HORSES

Chairman: Dr. Lee M. Myers, Atlanta, GA
Vice Chairman: Dr. Peter J. Timoney, Lexington, KY

Dr. J. B. Anderson, TN; Dr. C. Carter Black, GA; Dr. Jones W. Bryan, SC; Dr. C. L. Campbell, FL; Dr. Leroy Coggins, NC; Dr. James J. Corbett, CA; Dr. Tim Cordes, MD; Mr. Edward C. Corrigan, WI; Dr. E. Paul J. Gibbs, FL; Dr. Mary H. Giddens, OR; Dr. Chester A. Gipson, VA; Dr. Lynn T. Hagood, FL; Dr. Steven L. Halstead, MI; Dr. Robert M. Harbison, AR; Dr. G. Reed Holyoak, OK; Dr. Ralph C. Knowles, FL; Dr. Donald P. Knowles, Jr., WA; Dr. Donald H. Lein, NY; Dr. Thomas R. Lenz, KS; Ms. Amy W. Mann, VA; Dr. Patrick L. McDonough, NY; Dr. Clifford W. McGinnis, NH; Dr. Robert W. Mead, WA; Dr. Andrea M. Morgan, MD; Dr. Don L. Notter, KY; Dr. Roger E. Olson, MD; Dr. Eileen Ostlund, IA; Dr. William E. Pace, FL; Mr. Bruce A. Shelfer, FL; Dr. Manuel A. Thomas, Jr., TX; Dr. H. Wesley Towers, DE; Dr. Susan C. Trock, NY; Dr. Charles D. Vall, CO; Dr. Thomas E. Walton, CO; Dr. James A. Watson, MS; Dr. Ernest W. Zirkle, NJ.

Committee Summary

The Infectious Diseases of Horses Committee convened on Sunday, October 22, 2000 from 12:30 - 5:30 p.m. in the Medical Forum B Room of the Sheraton Hotel, Birmingham, Alabama. Seventy-two attendees were recorded on roll. A variety of pertinent topics were presented, including a 1½ hour program on West Nile Virus in the United States.

A short business meeting followed the scientific session which resulted in the following actions:

(1) The Committee endorsed the resolution calling upon Congress to fund the facilities in Ames, Iowa as described in the USDA Master Plan.
(2) The Committee expressed significant concern over the risk of the inadvertent introduction of a foreign animal disease into the U.S. equine population through an infected equid and recommended that the Deputy Administrator of USDA, APHIS, VS take the appropriate steps to insure the adequacy of surveillance and efficiency of sampling of all equines in post-import federal quarantine.
(3) The Committee expressed concern over the lack of effective communication between USDA, APHIS, VS and USAHA members with regard to the development, notice, and adoption of proposed rules and recommended that USDA, APHIS, VS extend greater efforts to alert and network with USAHA at the time (or preferably in advance) of proposed rulemaking.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
INFECTIOUS DISEASES OF HORSES

Following are reports from the scientific session.

Efficacy of Competitive ELISAs for Serological Detection of Infection with *Babesia equi* and *Babesia caballi*

By Dr. Don Knowles,
Animal Disease Research Unit, ARS/USDA, Pullman, WA

Competitive ELISAs (1) have been developed for the serologic detection of horses infected with *Babesia equi* and *Babesia caballi* (6,7,8,9, 10,14). The development of these ELISAs was initiated due to problems associated with the use of the complement fixation test (CFT) (2-4) for the detection of anti-equine babesial antibodies. The problems with the CFT are anti-complement activity in sera; anti-erythrocyte activity in sera, and the presence of specific immunoglobulin IgG(T) in equine sera. Immunoglobulin IgG(T) doesn't fix complement via the classical pathway and therefore may lead to false negatives in the CFT (13).

These assays are based on monoclonal antibodies, which bind to recombinant merozoite surface antigens produced in *E. coli*. These antigens are equi merozoite antigen 1 (EMA-1) of *B. equi* and rhoptry-associated protein 1 (RAP-1) of *B. caballi* (5,6,8,11). Monoclonal antibody 36/133.97 used in the cELISA for the detection of anti-*B. equi* antibody binds an EMA-1 epitope conserved in *B. equi* isolates worldwide (8). An initial study showed that the *B. equi* cELISA correctly identified infected horses from 19 countries (8), and subsequent data which test 154 sera from these countries showed a 94% concordance between the CFT and cELISA (9). The discordant sera were retested by immunoprecipitation of 35S-methionine labeled *B. equi* antigen. The CFT(-), cELISA(+) sera were shown to be true positives. Although the precise amino acid sequence of the epitope bound by mAb 36/133.97 isn't known, a comparison of the deduced amino acid sequences from 19 independent *ema1* genes showed a mean identity of 95%. The lack of significant variation of EMA-1 suggests this merozoite surface protein is not under immune selective pressure and supports its utility as a diagnostic reagent.

In an initial study 302 sera previously tested for equine anti-*B. caballi* antibody by the CFT were also tested by cELISA (6). The results of cELISA and CFT were 73% concordant. The majority of the discordant sera (72/ 77) were CFT(-), cELISA(+) (6). The discordant sera were tested by indirect immunofluorescence assay (IFA) (12). Sera tested by IFA were diluted 1:200 to ensure specificity. The need to dilute these sera leads to the potential of decreased sensitivity. Testing by IFA revealed that 48 of the CFT(-), eELISA(+) sera were true positives (6).

A recent study comparing the CFT and the cELISAs for serodiagnosis of *B. equi* and *B. caballi* found concordances of 76% and 89% respectively (7). In this study 22 sera were found to be CFT(-) and cELISA(+). When
tested by IFA 17 of these sera were shown to be true positives (7). Furthermore, each cELISA was utilized to test 1,000 sera from horses of U. S. origin, considered to be true negatives. The resulting specificities for the B. equi and B. caballi cELISAs were 98% and 99% respectively (7).

These collective data indicate that the cELISAs for the serodiagnosis of B. equi and B. caballi provide enhanced test performance compared to the CFT.

Literature Cited:
a family of highly conserved proteins of Babesia equi and Theileria species. Molecular and Biochemical Parasitology 90, 69-70.


West Nile Virus in Horses in the United States, 1999-2000

By Dr. Randall L. Crom, Veterinary Services, Emergency Programs, APHIS, USDA

Background
In New York in early September 1999, an outbreak of human encephalitis and multiple deaths of wild birds, including exotic specimens at a New York City zoo, were suspected by the zoo's veterinary pathologist of being related to each other. Due in large part to her observations and efforts, it was confirmed in late September that a single pathogen was responsible. Although the cause of human disease was initially thought to be St. Louis encephalitis (SLE) virus, the causative organism of both the human and avian outbreaks was determined to be West Nile virus (WNV), an arthropod-borne flavivirus related to SLE virus but never before detected in the Western Hemisphere.

Named for the province in Uganda where it was discovered in 1937, the normal geographic distribution of WNV is Africa, the Middle East, and Western Asia. Periodic introductions into Europe have occurred, causing illness in humans and horses. Transmission of WNV is primarily through a mosquito-bird cycle, with other vertebrates infected as incidental ("dead-end") hosts only. Mosquitoes responsible for WNV transmission are principally Culex species, but the virus can also be transmitted by Aedes, Anopheles, and other species.

The origin of the WNV introduced into the northeast United States is believed to be the Middle East. Genomic sequences of the New York virus were found to be closely related to a WNV strain isolated from geese in Israel in 1998. How WNV was actually introduced into the United States is unknown, but some speculation has centered on infected immune-compromised humans, mosquitoes, or birds being transported by aircraft. Migratory birds coming from Africa are suspected of being the source of past WNV introductions into temperate areas of Europe.
The 1999 Outbreak

A virus isolated on 14 September at the National Veterinary Services Laboratories (NVSL) in Ames, Iowa, from tissues of a New York crow, was later confirmed to be WNV. Soon after, the disease outbreaks among humans and wild birds were confirmed as being caused by identical strains of that virus.

The outbreak eventually affected Connecticut and New Jersey, in addition to New York, and a single WNV-positive crow was found in Maryland. A total of 62 human cases, including 7 deaths, were detected. All human cases occurred in New York from early August to late September. Hundreds or thousands of wild birds, especially corvids such as crows, were killed by WNV. Deaths were identified in at least eight different orders of birds. The number of WNV-positive *Culex pipiens* mosquitoes trapped in New York during the 1999 outbreak suggested an important role for that mosquito species in the transmission of WNV.

By mid-September of 1999, a private veterinary practitioner in eastern Suffolk County on Long Island, New York, recognized a cluster of cases of equine encephalitis. Affected horses had acute hindlimb ataxia among other neurologic signs and almost half of them died. After exhausting other plausible explanations for the cluster of disease he was seeing, the practitioner contacted the State Veterinarian in New York and requested assistance in reaching a definitive diagnosis. With WNV near the top of the list of differential diagnoses, Veterinary Services (VS) of the Animal and Plant Health Inspection Service (APHIS) was contacted to discuss the possibility of an exotic zoonotic disease being present in New York equine.

After an initial investigation by an APHIS-VS Foreign Animal Disease Diagnostician (FADD), it was agreed that further investigation of the situation was warranted. An Early Response Team (ERT) composed of State and Federal personnel was sent to Long Island on 10 October. The cause of the outbreak was definitively confirmed as WNV on 18 October. Eventually, a total of 25 cases of horse infected with WNV were found, all on Long Island and all with clinical onset between 26 August and 18 October, 1999. Nine of the 25 horses died or had to be euthanatized. At least 38 other horses on Long Island were also found to have been infected with WNV but did not develop clinical signs of illness.

Preparation for 2000

Even before the detection of WNV in overwintering mosquitoes in New York City in March 2000, planning for the detection and control of WNV activity in the year 2000 had begun at the local, State, and Federal levels. As a result of funding by the Centers for Disease Control and Prevention (CDC), a comprehensive surveillance system called the National West Nile Virus Surveillance System was put in place in 19 jurisdictions along the Atlantic and Gulf Coasts from Massachusetts to Texas. This surveillance consists of testing wild birds, veterinary case finding and investigation, hu-
man case finding and investigation, plus the seasonal collection and testing of mosquitoes and testing of sentinel chickens. The U.S. Geological Survey's National Wildlife Health Center and APHIS participate in the system, especially by providing laboratory services. Both positive and negative results are reported weekly and posted to a public web page (http://nationalatlas.gov/virusmap.html).

APHIS-VS prepared for 2000 by developing a strategy for dealing with WNV. A single coordinator was named to improve communications and liaise with other local, State, and Federal agencies working on WNV issues. In addition to surveillance issues, another important area of preparation was diagnostic testing. NVSL developed reagents to improve diagnostic capabilities, including an equine and avian IgM-capture enzyme-linked immunosorbent assay (ELISA), a nested reverse transcriptase polymerase chain reaction (RT-PCR) test, and a plaque-reduction neutralization test (PRNT). Reagents were supplied to numerous State veterinary diagnostic laboratories.

2000 Outbreak

WNV activity did indeed return in 2000. Through 17 October, over 3,600 birds in 10 States, from New Hampshire to Virginia, including the District of Columbia, have had confirmed findings of WNV. Most of these have been crows of other corvids such as blue jays. Corvids are apparently particularly sensitive to WNV as a very high mortality rate has been observed, thus they are a good sentinel of WNV activity in an area. Almost 400 mosquito pools in 5 States, with at least 11 different species of mosquitoes, have been found WNV-positive. Most are *Culex* species (*C. pipiens*), but several *Aedes* species (* vexans, japonicus, triseriatus*) have also been found positive. There have been only 18 human cases to date (in Connecticut, New Jersey, and New York), including one death in a New Jersey man. An interesting finding this year has been that 26 other mammals of 7 types were found WNV-positive (bats, domestic rabbits, cats, raccoons, squirrels, chipmunk, skunk). Only 6 sentinel birds (all chickens) have shown WNV antibody seroconversion this year, all of which were well after other WNV activity was recognized in the area.

Horses have been affected again this year, more severely than 1999 in terms of numbers and range of distribution. The first equine case had clinical onset on 17 August in Staten Island, New York. Since then there have been 30 more cases (31 total) in 6 States (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island). Of the 31 horses, 17 (55 percent) have died or been euthanatized. Due to the lack of clustering of equine cases so far this year, no ERT has been called out to investigate, but an epidemiologic (case-control) study is being initiated for most of the clinical cases through the cooperation of State veterinary authorities in each of the States.
Infection in Horses

Clinical illness in horses has commonly involved ataxia and falling down with an inability to rise, but has also included signs such as muscle fasciculation, proprioceptive deficits, head shaking, lower lip paralysis, teeth grinding, apprehension, or hyperexcitability. Thus both central nervous system and cranial nerve signs have been observed. Fever is variably recognized but is likely present at some stage of infection. Treatment of clinical infection is supportive and palliative.

The incubation period for WNV in horses is probably between 5 and 15 days, but most infections are subclinical. On Long Island in 1999, there were 3 subclinical infections found for every 2 clinical infections. Undoubtedly this ratio would have been greater had more testing been targeted at finding subclinical infections rather than clinical cases. Based on experimental studies, it appears that IgM antibody to WNV appears about 10-12 days after inoculation (mosquito bite) and may last from a few days to a few weeks, or possibly slightly longer. Neutralizing antibody to WNV appears at about 3 weeks post inoculation and may last for several months or longer (years?).

There is no evidence of WNV-infected horses serving as a source of infection for other animals nor as a source of virus for mosquitoes. Based on the scientific literature, and on three experimental equine inoculation or transmission studies done since last year, horses are only incidental ("dead-end") hosts and do not develop viremias high enough to allow transmission of WNV to mosquitoes. In the studies, the maximum level of viremia observed in 16 horses experimentally-infected with WNV was 3 log 10 per milliliter of serum, while most had viremias of less than 2 log 10. The largest study showed that eight horses infected with WNV via mosquito bite (Aedes albopictus) did not transmit WNV back to virgin mosquitoes. Over 600 mosquitoes were fed on the 8 horses during the viremic phase of their infections. Although one horse developed clinical illness, none of the mosquitoes acquired WNV infection.

For 1999 and 2000 so far, the case fatality rate in horses is 46 percent (26/56). There appears to be no gender or nor breed predilection related to infection or to developing clinical illness. The age of a horse does appear to be related to the outcome of infection. While all ages of horses are infected, those that become clinically ill are older (mean 15.5 years) than those that don’t (mean 11.2 years). Of those that become ill, those that die are older (mean 16.8 years) than those that recover (mean 14.6 years).

Most of the horses infected with WNV so far in the United States have been pleasure horses. On most premises with a clinical infection, the infection rate of other horses has been low. Although the majority of cases observed in 1999 were clustered in one area of eastern Long Island, most cases in 2000 have not been clustered. When clustering of infections has been seen, usually they are within a radius of less than 10 miles of each other.
Prevention and Control

The best prevention and control of WNV is related to mosquito control. Breeding source reduction, larviciding, and adulticiding all have a role. While we know that Culex species are most often found infected, it is perhaps likely that the most commonly found infected species are not the ones responsible for transmission to equine. WNV-positive Aedes vexans mosquitoes were recovered from the premises of this year's equine index case, albeit probably 2 to 3 weeks after infection of that horse occurred. Knowing which species infect horses is critical for knowing what time of day horses are likely to be bitten and relates directly to how best protect horses from biting mosquitoes. Regardless of when they are likely to be bitten, the best protection for horses is vector-protected housing. As providing such housing may often not be possible, the use of topically applied (wipe-on or spray-on) pyrethroid-based repellents may also be helpful.

In hopes of developing better prevention and control recommendations for WNV, epidemiologic investigations are ongoing for equine cases detected in 2000, as mentioned previously. Questionnaire data are being collected on case premises and putative control premises in the immediate area of a case, and sera are being collected from equidae on those premises for WNV testing. It is hoped that risk factors for equine infection with WNV (subclinical or clinical) can be elucidated from a case-control analysis of the data.

Because horses appear to be dead-end hosts, no restrictions have been placed by any States on the movement of healthy horses from WNV-affected areas. However, import restrictions have been placed by the European Union (EU) on horses originating in Connecticut, Massachusetts, New Jersey, New York, or Rhode Island. Effective 15 September 2000, a supplementary certificate must be completed stating that the equid to be imported comes from a premises at least 50 km from any equine case of WNV that has occurred in the last 15 days. Horses can still be transported to an airport within those five States for export to the EU as long as they do not stop during transit and suitable measures are taken to protect them from insect vectors. No other countries have yet imposed restrictions on U.S. equine due to WNV.

Both an equine and an avian isolate of WNV has been provided by APHIS-VS to at least one approved animal biologics manufacturer. No application for licensure of a vaccine has yet been filed, but if and when that happens, APHIS-VS would consider the product for a "conditional" license. Approval of a conditional license could potentially be carried out in a few months. Granting of such a license would mean that the product is safe, pure, and shows a reasonable expectation of efficacy, but full efficacy testing would not have been carried out.

References
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Risk of Foreign Equine Diseases in the United States

By Dr. Ashby Green, Florida Department of Agriculture

In a world of rapidly crisscrossing flights and a steady expansion of international air travel it has become nearly impossible to police the pathways of disease transmission. Florida is in a unique “high risk” location because of the large volume of international trade with Central and South America and the Caribbean. Because of this, the state has the distinction of having the greatest risk of foreign animal diseases imported into its borders. Other states, in addition to Florida, are also at risk because of the
relative ease of interstate transport. For example, between 1997 and July 2000, approximately 23,000 horses were imported into Florida, and approximately 27,000 horses were exported to other states each year (Department of Agriculture and Consumer Services, Division of Animal Industry, Report of Equine Activities).

Historically, the State of Florida and the USDA/APHIS have done a good job of controlling disease outbreaks in Florida, however emerging animal diseases around the world combined with the expansion of international travel have lead researchers to focus on new strategies to control infectious diseases in both people and animals. Globalization presents new challenges and opportunities in combating imported diseases and pests. Effective preventive and control strategies to exclude exotic diseases requires a long-term, large-scale strategy, rather than a tactical approach to control invaders. We must focus on outcomes and start thinking “outside the box”. Exclusion and control strategies must be based on implementation of sound and scientifically based methodology. The economic consequences of failure to exclude the invaders include:

- The threat to human and animal health
- The direct cost to combat the exotic disease
- The loss of potential economic output which results in loss of revenue

**Equine Piroplasmosis**

Equine Piroplasmosis (EP) is an example of how difficult it remains to successfully implement and maintain an effective disease prevention and control program.

**Brief EP History:**

- First detected in Miami, FL 8/61
- Principal vector, Tropical Horse Tick
- 1962-1978 joint state-federal eradication program
- EP rule; Chapter 5C-14, December 20, 1962
- 1962-1971: 1150 EP positive horse found in Florida; 40 in other states
- It took 15 to 20 years to eradicate EP from Florida. This was a joint state and federal program.
- All cases from other states originated from Florida and/or Puerto Rico (PR) and the U.S. Virgin Islands (USVI).
- Cost of controlling the outbreak: $7-8 million.
- 1978-1988 tick surveillance and treatment program
- 1974-1984 only 15 new cases of EP
- November 1984: 293 Paso Fino horses tested under court order in Florida
- 35 or 12% were EP positive
- All but 1 were imported from PR and South America and processed
REPORT OF THE COMMITTEE

through the USDA Import Center in Miami

March, 1994, rule amended to require horses from EP endemic US possessions to test negative prior to shipment to the US and quarantined for retest between 30 to 60 days after arrival in Florida.

**Horses Imported into Florida from Puerto Rico**

<table>
<thead>
<tr>
<th>Year</th>
<th># imported to other states</th>
<th># transported post-entry pre-test</th>
<th># positive on</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>59</td>
<td>1</td>
<td>2, 1 B. equi, 1 B. caballi</td>
</tr>
<tr>
<td>1995</td>
<td>115</td>
<td>3</td>
<td>11, 10 B. caballi, 1 B. equi</td>
</tr>
<tr>
<td>1996</td>
<td>79</td>
<td>9</td>
<td>7, B. caballi</td>
</tr>
<tr>
<td>1997</td>
<td>70</td>
<td>14</td>
<td>1, B. caballi</td>
</tr>
<tr>
<td>1998</td>
<td>97</td>
<td>20</td>
<td>2, B. caballi</td>
</tr>
<tr>
<td>1999</td>
<td>125</td>
<td>16</td>
<td>4, B. caballi</td>
</tr>
<tr>
<td>2000 thru 9/7</td>
<td>38</td>
<td>1</td>
<td>1, B. equi</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>583</strong></td>
<td><strong>64</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

The results of Florida's post-entry test requirements show that 0.05% or 28/583 horses imported from Puerto Rico had positive CF titers for EP. Of this number only 4 horses were found to be infected with EP. These horses were treated successfully and released from quarantine. The remaining 24 horses were negative for EP on follow-up retests. All of these horses had negative CF tests for EP prior to departing Puerto Rico.

**Horses Imported through MAIC (60% originated in SA and the Caribbean Excluding horses imported from PR**

<table>
<thead>
<tr>
<th>Year</th>
<th># imported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>1,019</td>
</tr>
<tr>
<td>1997</td>
<td>1,233</td>
</tr>
<tr>
<td>1998</td>
<td>1,347</td>
</tr>
<tr>
<td>1999</td>
<td>1,777</td>
</tr>
<tr>
<td>2000</td>
<td>1,824</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,200</strong></td>
</tr>
</tbody>
</table>

**EP Summary:**
Future efforts to control EP in the U.S. should include:
INFECTIOUS DISEASES OF HORSES

- Develop a more accurate test for EP; one with less false negative reactions.
- Determine the vector potential of ticks now present in the U.S. to assess the degree of danger the disease truly poses to the nation’s equine industry.
- Finding a more effective drug for treating horses with EP.
- Institute changes at the federal level to prevent exotic disease vectors from entering this country.

**Contagious Equine Metritis**

Contagious Equine Metritis (CEM) is another example of the risk of foreign equine disease entering the U.S.

CEM Imports - Florida

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>3</td>
</tr>
<tr>
<td>1996</td>
<td>13</td>
</tr>
<tr>
<td>1997</td>
<td>101</td>
</tr>
<tr>
<td>1998</td>
<td>90</td>
</tr>
<tr>
<td>1999</td>
<td>186*</td>
</tr>
<tr>
<td>2000 (through Sept.)</td>
<td>112</td>
</tr>
</tbody>
</table>

Number of CEM approved Quarantine Facilities: 12

The CEM Case of King:

*King, a seven year old German Warmblood stallion was imported from the Netherlands in December, 1999. The horse arrived at the MAIC on December 14th and was released on December 16th and entered a state CEM Approved Quarantine Facility at Wellington, Florida. The stallion and two test mares immediately began the CEM protocol for qualification of the stallion to be released from CEM Quarantine. Prebreeding tests and cultures were negative on both the stallion and mares. The mares were test bred on January 9, 2000. The following information is given as a time line for better understanding of the problem that developed:

<table>
<thead>
<tr>
<th>King</th>
<th>Test Mares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-breeding Culture -</td>
<td>Pre-breeding CF Test: negative (12/21/99)</td>
</tr>
<tr>
<td>Negative (12/17/99)</td>
<td>Pre-breeding Cultures: 12/21, 12/24, &amp; 12/27 – negative</td>
</tr>
<tr>
<td>Bred Mares - 1/9/00</td>
<td>Test Breeding: 1/9/00</td>
</tr>
<tr>
<td>Post Breeding Treatment - (1/9, 1/10, 1/11,1/12, &amp; 1/13)</td>
<td>Post Breeding Cultures: 1/12/00, 1/15, 1/18 – negative</td>
</tr>
<tr>
<td></td>
<td>Post Breeding CF Test: 1/24/00**</td>
</tr>
</tbody>
</table>

** The bacteriological test results received from NVSL were listed as negative for CEM. However, there was a note at the bottom of the test chart that indicated one of the mares had a titer of 3+ at the 1:4 dilution, but there was no other explanation given. Rather than reporting the sample as “suspicious,” the report was sent out as negative. The stallion was re-
leased from quarantine based on the reported negative laboratory results. The two test mares were to be used to test breed another stallion in the facility. Another CF test was done on the mare on 1/31/00 and the test results were positive at a titer of 4+ at the 1:16 dilution. The mare was culture positive for Taylorella equigenitalis from a uterine culture on 2/20/00, while cultures from the clitoral sinuses and fossa were negative. The stallion was returned to the facility and placed under quarantine until a decision on its disposition could be made.

There was a lot of discussion as to what to do with the stallion. Attempts were made to return it to Germany, but Germany refused to allow the horse to return. The stallion was finally moved under permit to Cornell University for treatment. The mare was treated successfully at the CEM Quarantine Facility in Wellington in accordance with the treatment protocol for imported mares. The mare was culture negative and CF test negative on 4/6/00.

Because of this unfortunate situation and concerns about the post breeding CF test dates needing to be extended, the Department is in the process of revising its CEM rule to lengthen the time for the post breeding CF test to be conducted on test mares from 15 days to not less than 20 days post breeding. Other proposed changes include: (1) Adding an additional culture site (i.e., deep cervical or uterine) for imported mares, (2) Requiring a negative CF test for CEM on all imported mares, and (3) Require a negative CF test for CEM of the first three mares bred to stallions after release from quarantine.

The Ever-Constant Threat of Screwworm

History of the U.S. Eradication Program:
- 1825: Infestation in the U.S. western states
- 1930’s: Spread to the southeast; Livestock producers lost $400 million annually
- Early 1950’s: USDA Research Service develops eradication program based on biological control. Gamma radiation during the pupae stage leaves the fly sexually sterile. Used operationally in Florida in 1957
- 1959, screwworm successfully eradicated from SE
- 1962, southwest targeted with eradication
- 1966, eliminated from the U.S.
- Constant reinfestation from Mexico
- 1972: Joint Commission for the Eradication of Screwworm formed between Mexico and the U.S.
  - Goal: To push the sterile fly barrier to Guatemala
  - New plant formed in Chiapas, Mexico and the old plant in Mission, Texas was closed
- 1991: Mexico declared free of the pest
- 2003: New sterile-fly rearing facility in Panama
INFECTIOUS DISEASES OF HORSES

Eradication includes:
- regulation of cattle movement
- treatment of wounds
- release of sterile-flies

Recent Outbreaks in the U.S.:
- 1997: San Antonio, Texas: larva was detected on a dog shipped from Panama
- 2/9/98: MAIC; Thoroughbred shipped from Venezuela. Screwworms found between the bulbs of the heel.
- 7/14/99: MAIC, Paso Fino foal shipped from Venezuela. Screwworms found in naval area.
- 2/16/00: MAIC, Thoroughbred shipped from Venezuela. Screwworms found at the base of the penis.
- February 27, 2000:
  - 17 horses shipped from Argentina to the United States (MAIC)
  - Passed USDA quarantine inspection
  - 2 shipped to Georgia
  - 5 to California
  - 1 to Pennsylvania
  - 1 to Texas
  - 8 to Florida
- March 2, 2000
  - Private Practitioner found screw worm larvae in one of the Florida horses, Wellington area.
  - Confirmed by the NVSL on March 4, 2000
  - March 3; horse and premise treated
  - March 6th; horse received a second treatment
  - NVSL reports that the larvae was 24 hours from maturity when they were collected and it is unlikely that any larvae dropped off.
  - Sentinel animals set out for surveillance purposes
  - Sterile flies not released
  - All 17 horses quarantined until March 15th except for the horse with screwworms. The infested horse was not released until the wound healed.

Focus on Wellington incident:
- Voluntary inspection of animals in the focus area
- Treatment of all cuts and abrasions
- Use of sentinel animals, and
- Education of veterinarians, animal owners and the public

Concerns:
- Are efforts of the USDA sufficiently effective to stop the import of horses with screwworms to allay public fears?
- Are policy changes needed to allow USDA inspectors to perform a thorough
physical exam e.g. sedate animals, prior to their release from quarantine?

- Should USDA pressure South American countries to re-evaluate their current animal health program prior to exportation of these animals to the United States?

**West Nile Virus Response Plan**

The Florida Department of Agriculture and Consumer Services, recently developed a *West Nile Virus* (WNV) *Response Plan* and added it to the state's current and highly successful Arboviral Surveillance, Control and Eradication Plan developed by the Department of Health (DOH). The WNV Response Plan differs from the standard arboviral response plan since it calls for use of the Emergency Operations Center (EOC) in event the detections of human and animal cases become widespread.

The Department of Agriculture and Consumer Services is concerned about WNV movement and transmission to other states, including Florida, and has taken additional steps to monitor the possible introduction of the virus into the state. These “steps” include:

- an active “real time” WNV Surveillance Plan for horses, livestock and pets imported into the state from WNV affected northeastern states. Agricultural Law Enforcement Inspection Station's shall check and verify the health status of these animals as they enter the state.

- Establish “fixed” sentinel horse herds in heavily populated equine areas of the state. Initially 15 sites containing a minimum of 5 horses per site will be used. The horses will be blood tested every 30 days for evidence of WNV as well as other arboviral infections.

This information is forwarded to the Division of Animal Industry for monitoring, tracking and follow up on-farm inspections if necessary.

**Eastern Equine Encephalomyelitis in Virginia, North Carolina, South Carolina and New Jersey - 2000**

By Dr. Eileen N. Ostlund, National Veterinary Services Laboratories

From mid-July through October 15, 2000, twenty-eight cases of eastern equine encephalomyelitis (EEE) were identified through diagnostic testing at the National Veterinary Services Laboratories (NVSL), Ames, IA. The EEE positive submissions originated from equids in New Jersey, North Carolina, South Carolina and Virginia. Sixteen additional cases of EEE, including 6 avian cases were identified in North Carolina, South Carolina, and Virginia through testing at state veterinary diagnostic or public health laboratories. This represents unusually high activity of EEE virus in the affected states.

All the horse brain submissions to NVSL tested negative for rabies
virus antigen in the state of origin. Additionally, the brain samples from all 14 horses that yielded EEE isolates were negative for West Nile virus RNA by nested RT-PCR testing. EEE virus isolates were confirmed by complement fixation assay using eastern, western and Venezuelan virus reference serum. Serologic identifications of EEE cases were based on results of hemagglutination inhibition, plaque reduction neutralization, and IgM capture ELISA tests along with consideration of reported clinical signs and vaccination history. Table 1 shows the results of testing at NVSL.

Table 1.
EEE positive submissions to NVSL
July 15-October 15, 2000

<table>
<thead>
<tr>
<th>State</th>
<th>EEE isolates</th>
<th>EEE compatible serology</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>NC</td>
<td>1</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>SC</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>VA</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>14</td>
<td>28</td>
</tr>
</tbody>
</table>

Twenty three of twenty eight EEE positive submissions provided clinical history or histopathologic information. Clinical antemortem signs reported among the EEE infected horses included sudden onset of depression, ataxia, fever (up to 107°F), wandering circling, trembling, staggering, blindness, head pressing, seizures, convulsions, recumbency and loss of consciousness. Histopathologic lesions consisted of lymphopurulent encephalitis. With the exception of high fever, the clinical observations seen in EEE cases overlap those seen in severe cases of West Nile encephalitis in horses. The histopathologic lesions of EEE are generally more severe than those observed in cases of West Nile encephalitis. Interestingly all 3 EEE cases in NJ occurred in a county in which West Nile virus infection of horses had also been observed during 2000.

Of the 28 EEE positive submissions, the horse's age was reported for 20 submissions. Four of 20 horses were less than a year of age with the youngest horse 4 weeks old. Ten horses were 1-3 years of age and 6 horses were older than three years. The oldest horse in this group was 14 years old. Vaccination status was unknown or not reported for 18 of the 28 cases. Ten cases were from horses that were known to be unvaccinated against EEE. Of these 10 cases, the age of the horse was reported for 7 cases and all 7 were horses 3 years old or younger.

The EEE virus activity observed in NJ, NC, SC, and VA in 2000 illus-
REPORT OF THE COMMITTEE

trates the importance of consideration of EEE infection in encephalitic cases in horses in the eastern United States. Young horses lacking the protection afforded by vaccination are particularly susceptible to infection.

Report of Contagious Equine Metritis Focus Group

By Dr. Don Lein, Cornell University

Dr. Don Lein reported on behalf of the Contagious Equine Metritis (CEM) Focus Group. Other members of the Group include Amy Mann and Drs. Mark Dulin, Ernie Zirkle, Peter Timoney, and Roger Olson. The Group offers the following recommendations:

Importation of Mares - Lower Risk Group
1. Protocol should apply to imported mares 2 years of age or older originating from CEM positive countries.
2. Exempt European Thoroughbred passported mares that have not been on a breeding farm; Imported animals to be restricted to racing/performance activities.
3. All mares, including exempt Thoroughbred mares, should be CEM CF negative in country of origin before export.
4. All mares should be CEM CF tested at port of entry upon arrival in U.S.
5. Three sets of cultures should be collected at days 1, 3, and 7.
6. Cultures must be held for at least 7 days before being reported negative.
7. All cultures will be collected, shipped in proper transport medium (Amies Transport Medium with charcoal) and plated out and incubated within 48 hours of collection.
8. Each set of cultures will include samples/specimens from the endometrium (open mares) or cervix, in addition to the clitoral fossa and clitoral sinuses.

Importation of Stallions - High Risk Group
1. One set of cultures from 4 sites: Distal urethra, fossa, diverticulum or sinuses, and deep preputial folds.
2. Test mares (2)
   a. Obtain 2 sets of negative cultures 7 days apart and a negative CEM CF test prior to breeding.
   b. Post breeding - 3 sets of negative cultures 7 days apart; All sets include swabs from the endometrium (open mares) or cervix, clitoral fossa and sinuses.
   c. CEM CF test 21 days postbreeding.
   d. Reuse test mares not less than 50 days from last breeding date:
28 days – from breeding to release from breeding to previous stallion
14 days – prebreeding tests for new stallion
8 days – rest – may be required for another CEM CF test (28 days post breeding)

**Country of Origin Laboratory Procedures**
Official test papers must indicate period of holding cultures (at least 7 days) and final test results – neither pre-mature release nor inadequate incubation times will be acceptable.

**U. S. Laboratory Procedures**
Review of laboratory testing, only approved laboratories to be used for testing imported stallions/mares, training of personnel required, Standard Operating Procedures, proper QA/QC, proficiency testing provided at least annually (similar to EIA official laboratories).

**Disclaimer**
Repeat testing, if required, may prolong release of an animal. Several reasons may be responsible:
- Overgrown, contaminated plates
- Sample unsuitable—over 48 hours in transit, swabs dry, tubes broken, ID problem
- Decision on need for repeat cultures, treatment of contaminants, etc. left up to Laboratory Director, AVIC and State Veterinarian
- Anti-complementary test – CEM CF

**NAHMS Equine 98 Study – Report Summary**

By Dr. Josie Traub-Dargatz, Colorado State University

A summary of the reports and info sheets available thus far based on the National Animal Health Monitoring System Equine '98 study was presented by Dr. Traub-Dargatz the commodity specialist for the study. The outcome of the Internal Parasite and Equine Viral Arteritis (EVA) aspects of the study were emphasized. The info sheets (2 on parasites) and the descriptive report on EVA were highlighted in particular as they were released since the last USAHA Infectious Diseases of Horses committee meeting e.g. April 2000. Other info sheets released in April 2000 included those on Fumonisin B1 Mycotoxin in Horse Grain/Concentrate on U.S. Horse Operations, Endophytes in U.S. Horse Pastures and an interpretative report on Lameness and Laminitis in U.S. Horses.

A total of 985 operations with 3 or more horses on 1/1/98 participated in the parasite portion of the study. A total of 8,516 horses had feces tested at the National Veterinary Services Laboratories Parasitology Laboratory for
the presence of parasite ova using modified Stoll's technique using Sheather's solution. The results of the NAHMS Equine '98 study represent analysis of weighted estimates to generate the prevalence of parasite ova shedding in feces for the 28 states included in the study. The number of horses sampled per farm was based on a sliding scale based on the inventory of horses on the operation. All horses were sampled only once during the study and all were sampled on an operation on the same day. In order to evaluate for a season effect within each state approximately half the operations had horses sampled in the summer and the other half in the winter. Highlights include an estimated 51% of horses shed strongyle ova in their feces while only 3.5% of horses shed ascarid ova. However the majority of horses shed either low or no strongyle eggs in the feces e.g. 82.8%. There was no effect of season or age of the horse on strongyle egg shedding. Factors found to increase the risk of an operation of having a moderate to high level of shedding among sampled horses included having dewormed the majority of horses greater than 18 months of age less than 6 times per year, having the overall cleanliness of the equine area assessed as poor by the interviewer, never requiring new resident equids dewormed within the 12 months before adding them to the operation, and having an operation located in the central region of the U.S. For more information see the NAHMS Info sheets entitled Internal Parasites and U.S. Horses: Ascarids #N327.0400 and Internal Parasites and the U.S. Horses: Stronglyes #N326.0400.

For the Equine Viral Arteritis (EVA) and the U.S. Horse Industry interpretative report 1,136 operations in 28 states contributed to the questionnaire data while 837 operations in 25 states contributed to the serology estimates with a total of 7027 horses tested for antibodies to EAV. For more detail on the study design and sampling see the NAHMS Equine '98 EVA interpretative report #N315.0400. All results represent analysis of weighted data to develop prevalence estimates for the horses in the states included in the study. All serology was performed at the National Veterinary Services Laboratories Virology Laboratory and a serum neutralization titer of 1:4 or greater was considered positive. Highlights from this report the 59.4% of operators had never heard of EVA. The familiarity with EVA was higher for operations with 20 or more horses and for operations where the primary use of horses on the operation was for racing or breeding. The overall estimate of seroprevalence to EAV was 2% in unvaccinated horses with 8.3% of operations with one or more horses seropositive to EAV. Unvaccinated Standardbred horses were estimated to have the highest seroprevalence (23.9%) compared to any other breed category estimated (Thoroughbred, Quarter Horse, Warmblood, all other breeds). The percent of unvaccinated horses seropositive was lowest in the Western region. The estimated seroprevalence was highest for horses 5 years of age or more and for horses less than 6 months of age when compared to horses 6 months of age to 5 years of age. The seropositivity of the horses less than
6 months of age could be seropositive due to passive transfer of antibodies to EAV.

For further information or copies of the reports or information sheets contact The Centers for Epidemiology and Animal Health (CEAH) USDA: APHIS: VS attn NAHMS; 555 Howes Fort Collins, CO 80521; 970-490-8000; NAHMSweb@usda.gov; www.aphis.usda.gov/vs/ceah/cahm.

**Equine Infectious Anemia and EIA Brochure 2000**

By Dr. Tim Cordes, National Animal Health Programs, APHIS, USDA

**Introduction**

Equine infectious anemia (EIA) has been recognized as a major infectious disease of equines for over 150 years. Since 1970, tools have been available to identify persistently infected carriers of EIA virus (EIAV). Testing of serum for antibodies to EIAV has made it possible to accurately monitor equines for the infection. The tests commonly used are the agar gel immunodiffusion (AGID or Coggins) test and now also several ELISA tests. Testing and removal of carriers from many areas of the world have become routine and/or required and has provided a measure of protection against exposure to the virus, as equines are the only known reservoir of infection. In 1996, we published and distributed over 3000 copies of a video-brochure package entitled *Equine infectious anemia: how to protect your horse*. The brochure in that package, *EIA: a status report on its control* (1996), contained much basic information on the lentivirus that causes EIA and on its transmission and control. The brochure is now available on the Internet at: [http://www.aphis.usda.gov/vs/eia/eia.html](http://www.aphis.usda.gov/vs/eia/eia.html) and is entitled *Equine Infectious Anemia - The Infection and the Disease*.

In this brochure we discuss what has been learned about EIA since 1996, what effect that information has had on our approaches to controlling EIA in the field, and what additional actions are needed to further the control of EIA nationally. We also reiterate and debunk some of the popular myths about EIA that have led to confusion and overreaction by those faced with EIA for the first time.

Title 9, Code of Federal Regulations (9 CFR) section 75.4 concerns the requirements for testing horses for interstate movement. In addition, 9 CFR 75.4 outlines the procedures for the recognition of laboratories and personnel as qualified to conduct EIA testing. The physical facilities of the laboratory must be inspected, and personnel who conduct EIA tests must complete an approved training course and demonstrate individual proficiency in conducting EIA tests.

EIA remains one of the most feared diseases of equines. Within-State regulations concerning EIA are the jurisdiction of each State, and control of its spread remains a high priority for most State regulatory agencies. Control is predicated on finding the persistently infected equine carriers of EIAV.
REPORT OF THE COMMITTEE

and controlling their movement. In many jurisdictions, destruction of the carrier is recommended or mandated. As the majority of these carriers are without clinical signs compatible with EIA at the time they are tested, many owners have difficulty acting on this recommendation.

Here we attempt to put these issues in perspective and offer several proposals to better control the spread of EIA.

Why We Should Test For and Control EIA
1. Equine species (horses, donkeys, mules, etc.) are the only ones in which EIAV replicates.
2. Once infected with EIAV, equines remain infected for life.
3. Some strains of EIAV kill rapidly and some induce severe chronic disease, but many field strains present today appear to induce few or no overt clinical signs of disease in equines.
4. EIAV is a lentivirus and mutates at a high rate.
5. We assume that all strains of EIAV have the genetic potential to induce disease in equines.
6. EIAV is a blood-borne infection; transmission occurs by transfer of blood between equines.
7. Blood-feeding insects (especially horse flies and deer flies) are important natural vectors of EIAV.
8. Separating infected from uninfected horses by 200 yards is an effective way to break mechanical transmission of EIAV by insects.
9. Serological testing to identify EIAV carriers is an important tool in controlling EIA.

Popular Myths and Facts about EIA

Myth #1. EIA is a contagious disease.

Facts: EIA is an infectious disease (it is caused by the invasion and multiplication of the EIAV in tissues of the equine), but it is not contagious (it is not directly transmitted from one equine to another; it requires the intervention of vectors, e.g., insects or humans). Many publications incorrectly refer to EIA as a contagious disease. Perpetuation of this myth, or imprecise use of the terms contagious and infectious, undoubtedly leads to unsubstantiated and increased fear of the infection and disease. EIA is best thought of as a blood-borne infection.

Myth #2. EIAV induces disease and death in a high percentage of infected equines.

Facts: Although EIAV has the potential to induce severe disease with a high mortality rate, most field strains of EIAV found today are not associated with overt clinical disease when the test-positive carrier is found. In part,
the current low rate of severe clinical EIA is related to the testing and removal of reactors with clinical disease over the past 25 years. The EIAV strains with the greatest potential to induce severe disease have been selected against over the years.

Myth #3. EIAV spreads rapidly through a population.

Facts: Transmission of EIAV is predictable only in the sense that infected equines persistently carry virus in their blood; if enough blood is transferred to a second equine, the virus will initiate an infection. In the absence of humans, transmission of EIAV requires the transfer of blood (or possibly other virus-rich secretions) between equines in close proximity, generally by blood-feeding insects. The probability and rate of transmission of EIAV in equine populations are multifactorial; they are highest when these three conditions are present: (1) the level of EIAV in the blood is high (i.e., during clinical disease), (2) blood-feeding vectors are abundant, and (3) equines are crowded. In some cases, the spread of EIAV from carrier horses has been explosive. In others, there has been no transmission over periods of years. Transmission of EIAV is a chance phenomenon. As EIAV mutates at a high rate, for purposes of disease control every virus strain is assumed to have the potential to initiate explosive epidemics. Why take chances if we can test and avoid reservoirs of the infection?

Myth #4. Quarantine farms for EIA reactors are dangerous and should not be permitted.

Facts: There is no scientific basis for the fear of acquiring EIA from known test-positive equines in safe quarantine (200 yards from other equine). The chance of acquiring the virus by commingling with untested equines in an area where only 1 in 10,000 equines is infected is significantly greater than from the quarantined equine, maybe more than a million fold greater. When fear subsides and logic prevails, quarantine farms might become acceptable alternatives to mandated destruction.

The challenges of EIA continue to face us, in part, because we can’t tell if the equines we encounter have ever been tested for EIA, or, if they have been tested, with whom they have commingled since the test. If they are infected and they commingle with our equines, what is the chance that ours will become infected?

The following are suggestions on how to reduce significantly the risk of acquiring EIA in the United States. The remainder of this brochure is devoted mainly to discussing these actions.
1. Promote and implement the adoption of effective permanent individual equine identification methods.
2. Encourage State programs to enhance the public understanding of EIA.
3. Develop novel cooperative programs that promote area-wide testing of
4. Consider regular reviews of official tests that give rapid results for on-site applications.

5. Consider quarantine farms to permit the safe containment of EIAV-infected equines.

6. Obtain a better understanding of the biological risks of EIAV transmission, and then apply this knowledge to develop quantitative risk assessment models on which to base regulatory decisions.

Such actions will help us find solutions to problems such as:

- How can we modify our EIA control to maintain/increase our surveillance for EIA and give a higher benefit-to-cost ratio to the industry? Can we do a better job of finding reservoirs of EIAV that have not been tested?
- How can we better serve the equine community in relation to EIA?

**EIA Literature**

The vast majority of articles published on EIA and EIAV during the past 5 years (found by searching the Internet Grateful Med at http://igm.nlm.nih.gov/) focus on understanding the basic molecular aspects and control of viral replication, generally in cell cultures in the laboratory. Much of the research was conducted because EIAV is genetically related to the human immunodeficiency virus (HIV), not because it causes infections in horses.

There still are modestly funded efforts to define how the EIAV causes disease in horses, to identify the immune effectors that help horses control viral replication, and to produce safe vaccines that would protect horses against EIAV infection, if exposed. Developing a vaccine is tricky because some of the disease signs in infected horses are related to immune responses (immunopathology) shown to be stimulated by some experimental vaccines.

In the past 5 years, several groups have demonstrated that the genetic material of EIAV can be found persistently and sometimes in relatively high levels in test-positive horses without clinical signs of EIA, i.e., in apparent carriers. These data provide clear evidence that these carriers should be isolated/quarantined once they are detected.

**EIAV as a virus is better known today, and the genesis of some of the clinical signs are better understood, but control strategies are essentially unchanged since 1972.**

**Realities and Surprises**

Since 1980, an average of one million equine samples have been tested for EIA each year in an overwhelming surveillance effort by industry, veterinarians, and regulatory agencies. In spite of this, the NAHMS survey of the equine industry reports that 58 percent of owners in the Midwestern States have never heard of EIA, and only 12 percent of equines in the West are tested for EIA. The NAHMS survey also reports that EIA is perceived
INFECTIOUS DISEASES OF HORSES

as the most important viral infectious disease of equines nationally.

EIA appears to be of greatest concern in areas of the country where the infection has occurred historically at highest frequency (States in the Southeast) or where regulations have helped to inculcate a sense of urgency about EIA control (States in the Northeast). A review of the surveillance statistics reported for fiscal year 1998 reveals the significance of State regulations. In that period, over 179,000 equine samples were tested in the Northeastern States, and only 3 test-positive horses were found. Extensive testing, comprehensive regulations, and aggressive follow up on new infections for the past 25 years have reduced significantly the risk of contacting a test-positive equine in this region. State regulations are available at the website http://www.aphis.usda.gov/vs/sregs.

Despite our collective efforts over 25 years, EIA is still an unknown or an enigma to many owners. To most, it only represents a problem when it knocks at their door; when it does, overreaction is the norm.

Regulations/Laws and Challenges

Once an accurate test to identify carriers of EIAV was available, the Infectious Diseases of Horses Committee (IDOHC) of the United States Animal Health Association (USAHA) formulated recommendations for the control of EIA; these recommendations have been used by most authorities interested in promulgating regulations/laws. In 1997, a set of guidelines for EIA control were drawn up by a working group from the IDOHC. These guidelines were adopted by the USDA as Equine Infectious Anemia, Uniform Methods and Rules, Effective January 1, 1998 to help standardize control recommendations in different jurisdictions.

During the past 5 years, Arkansas and Texas have enacted dramatic changes in State regulations. Both of these States followed the lead of Louisiana, which in 1993 promulgated regulations that required permanent identification of every equine and an annual test for EIA. Louisiana, in addition, required the destruction of test-positive equines and the quarantine and testing of equines that had been within 200 yards of the reactor.

The legislation passed in Arkansas in 1997 requires that every equine have an EIA test annually and whenever there is a change of ownership; it also mandates destruction of each reactor and requires State authorities to quarantine and test all contacts within 440 yards of the reactor. In 1999 after appropriate public debate, the legislation was modified further to broaden a good neighbor provision. In Arkansas, any horse owner can now request that the State authorities verify that any other owner had tested their equines during the past year. If no evidence of a current test is produced, then the State is mandated to test them. This good neighbor provision is novel, and time will tell if it increases compliance and goodwill among owners or has the opposite effect.

The regulations in Texas are similar in that they require testing for congregation and for change of ownership, as well as requiring State authori-
ties to perform trace back testing on all equines within 200 yards of reactors. The number of samples tested for EIA increased dramatically after regulations were adopted.

In 1993, Louisiana took the bold step of requiring permanent identification and annual EIA testing of equines. Although Louisiana authorities estimate that less than 40 percent of equines are tested annually, the public has responded favorably to the increased emphasis on EIA control. Methods to increase compliance beyond 40 percent remains a formidable challenge.

Three States where EIA has occurred frequently in the past have instituted comprehensive regulations/laws that require testing each year and when there is a change of ownership. Regulations for EIA and other equine diseases change frequently, so we advise a careful review of individual State requirements before moving equines to another State.

Distribution of EIA

Since testing for EIA was initiated, the vast majority of new cases have been found each year in the area we have designated The Hotzone. In the past 5 years, some anomalous case distributions have been noted, mostly in groups of horses on specific premises or in specific regions being tested for EIA for the first time. For example, the increased rate of positive tests in 1998 in Indiana were traced to 32 new cases on one farm; in Arizona to 15 new cases on one premises; and in Utah to 127 new cases found in free-roaming horses in the Uintah Basin in northeastern Utah on lands belonging to the Ute Indian Nation or on contiguous lands administered by the Bureau of Land Management (BLM).

Results from two free-roaming populations of horses in diverse geographic areas deserve further discussion. In North Carolina in 1996, EIA was discovered in horses on Shackleford Banks, a barrier island in the Cape Lookout National Seashore, managed by the National Park Service. On the first testing of this isolated, insular, free-roaming population, 41 percent (76/184) of the horses were reactors, 38 percent if the 10 test-positive foals of reactor mares are subtracted.

Interestingly, the rate of EIA in BLM horses in the one hot area in Utah in 1998 (immediately adjacent to Ute Tribal land where EIA reactors were found) was similar to that seen in North Carolina. There the rate was 49.5 percent (53/107), 44 percent if the test-positive foals of reactor mares are subtracted. In both of these cases, it appears that EIA had been present in the population for years and had stabilized, as the rate of infection increased with age. In both cases, the EIA test-positive rate was exceptionally high in mature stallions: 88 percent (16 of the 18 dominant herd stallions) on Shackleford Banks and 89 percent (17 of 19 stallions 3 years of age) in the index area in Utah.

These data suggest that stallion behavior plays a role in increasing the risk of EIAV transmission between horses. The most obvious behavior to
be investigated is the combative behavior between stallions associated with establishing and defending harems. Unfortunately, this natural field experiment was not possible because both groups of test-positive horses were destroyed once test-positive results were obtained and/or confirmed.

In both of these populations, the majority of test-positive horses were in apparent carriers when found. In Utah, however, two stallions appeared to have signs of the chronic form of EIA and one died during its first day of captivity. Also, EIA appeared to decrease reproductive success in the Utah group. The rate of foaling in the test-positive group of mature mares was 52 percent (12/23) compared to 87 percent (13 of 15) in test-negative mares from the same area.

In order to find EIA, you have to test for it; under tested areas may have carriers, and transmission may be slow or epidemic. Two free-roaming populations were each found to be about 40 percent test-positive.

Public Education, Awareness Weekends, and Testing Clinics

Control of EIA is most effective when industry decides to participate actively. Good examples occurred over the past 2 years in southeastern Oklahoma and in the Uintah Basin in northeastern Utah. With the support of State veterinarians, local veterinarians, and veterinarians and students from Oklahoma State University and Louisiana State University, a series of educational talks were presented and over 1,500 equines were sampled at veterinary clinics and on farms; only one positive found. In one of the clinics, owners could have their equines tested for EIA and immunized for Eastern and Western encephalitis, tetanus, and influenza at a reduced fee. At a specially approved site, samples were tested within hours of sample collection using sensitive ELISA tests; test-kit manufacturers donated the kits for these demonstration projects.

Analyses of the response to these field exercises suggest that during the first year, the majority of individuals who availed themselves of the service were already testing the equines on a regular basis. During the second year, the trend was for these same individuals to test all the equines under their charge, including a number not tested previously. The real challenge for EIA control is to reach the owners who have not tested their equines previously and who attempt to participate in congregation events without testing. These untested animals then pose threats to other equines because of their close proximity. Control of EIA becomes most effective when industry representatives insist on enforcing regulations, or else establish more stringent rules than mandated by the State.

Awareness of EIA is the first step; agreeing to test is doesn’t necessarily follow. The good neighbor provision in the Arkansas law will be a good proving ground for State mandated testing. Can we expect better than the 30-40 percent compliance now considered good?
Foals and EIA: The Possibilities and the Realities

In many jurisdictions, young foals are exempted from testing if the mare is test-negative. If mares are test-positive, their foals will generally be test-positive as well. In these cases, the foals could be infected or merely carrying passive antibodies to EIAV obtained in colostrum. The risk of transmission to the foal is assumed to be higher if the mare has recently experienced clinical signs of EIA. When the mare is a stable in apparent carrier of EIAV, field studies have shown that a high percentage (>90 percent) of foals can be raised uninfected, even when weaned at 5-8 months of age in areas with high insect vector populations. Recent studies in Oklahoma have extended our knowledge in this area. Over 3 years, more than 97 percent of the foals of test-positive Choctaw/Cherokee bloodlines have been raised free of the infection.

When free-roaming horses in Utah were found infected and ordered destroyed (see above), the 12 foals of test-positive mares were placed in a prospective study by the BLM. They were safely quarantined and repeatedly tested for EIA. All 12 foals had antibody levels that decreased with time, and none of the 12 had evidence for the genetic material of EIAV in their circulation. Within 8 months, after having tested negative on the AGID test, all 12 foals were released from quarantine and adopted.

In foals of test-positive mares, declining levels of antibody to EIAV and sensitive PCR tests showing no viral RNA are good indicators that the foals are not infected. These foals should be in isolation/quarantine from all sources of EIAV for at least 60 days before release.

Accuracy of Testing

In order for us to control EIA effectively, we must use the most accurate tests available. The AGID or Coggins test has been approved since 1972. Are better tests available today?

The answer is a qualified no. It is true that the AGID assay requires more antibody than an ELISA test to give a positive result. The AGID test for EIA, though, is the only serologic test whose results correlate positively with results of the horse inoculation test, which tests for the virus itself. Together, the AGID and ELISA tests for EIA give us options and increase our accuracy. By having more than one type of test, we can essentially maximize the advantages and minimize the disadvantages of each individual test, and have the extra advantage of testing for antibodies against more than one antigen. The advantages and disadvantages of the AGID test and the ELISA tests are as follows:

Advantages of the AGID Test:
1. The AGID test is specific; nonspecific reactions can be distinguished from EIAV-specific reactions.
2. The AGID test correlates with the virus content measured by the horse inoculation test.
3. The AGID test has international acceptance.
4. There has been nearly 30 years of experience with the AGID test.

Disadvantages of the AGID Test:
1. The AGID test requires skilled subjective interpretation of results.
2. Results not available for at least 24 hours.
3. The end-user must make up plates with agar; errors can lead to decreased sensitivity.

Advantages of ELISA Tests:
1. All ELISA test kits available today incorporate the same virus specific antigen; and test results are easier to interpret. False positives may occur.
2. One ELISA test kit incorporates the same EIAV antigen as the AGID test, and some also include and additional virus-specific antigen.
3. ELISA tests are easier to interpret.
4. Results can be calculated objectively if assay color development is measured with a spectrophotometer.
5. ELISA tests are more rapid than the AGID test; results are available within minutes.

Disadvantages of ELISA Tests:
1. The ELISA method can be less specific than the AGID test; false positive results may occur. Positive ELISA results MUST be confirmed with an AGID test.
2. ELISA tests are more expensive per sample.
3. ELISA results are not accepted in some States or for international travel.

Advantages of Having More Than one Type of Test for Diagnosis of EIA:
1. Increased accuracy and power is obtained by using several antigens (similar to the confirmatory tests for HIV).
2. The impact of the majority of human errors is minimized.

   The AGID test remains the test of choice for EIA, and because it has been correlated with viral presence, it will remain the standard against which all other tests are compared. Thus, if a positive reaction is noted in an ELISA assay, it must be confirmed by an AGID test before a positive result is released and acted upon. In the vast majority of cases there is agreement between test results from all available kits.

   Sometimes discordant test results occur. Discordants are results that differ from test to test, e.g., between ELISA and AGID, from laboratory to laboratory, from test run to test run with the same test method in the same laboratory, or between two samples from the same animal. When discordant results are seen, which test or tests should be used as the definitive test? And most importantly, are differences in test results related to biological phenomena or to differences in human performance.
All licensed kits are standardized to an equivalent sensitivity, but when comparing any two tests, occasional samples will yield different test results. These occur most often when samples have reactions that are near the cutoff point in ELISA or at the limit of detection in AGID.

The most frequent biological reason for divergent test results is that the horse in question has very low levels of antibody against EIAV. The horse may have recently been exposed and is just beginning to produce antibodies. Rarely, in apparent carriers have consistently low antibody levels against EIAV, suggesting a low level of viral replication and low stimulation. In both cases the end result is the same: the antibody level is so low that it escapes detection in some routine tests. The next most common reason for divergent test results is that the horse has been exposed to a related agent that cross-reacts with antigens of EIAV. Low levels of specific antibodies would result primarily in false-negative AGID reactions, while nonspecific antibodies would result primarily in false-positive ELISA results. Fortunately these types of reactions have been observed at a very low rate.

In order to minimize human errors in testing, the USDA-APHIS-VS mandates that prior to receiving approval to conduct EIA tests, a technician must have specific training and must demonstrate individual competence. This governmental oversight is outlined in 9 CFR. 75.4. In addition, the USDA monitors laboratory performance through annual proficiency tests which must be completed with accuracy by all approved laboratories. Nonetheless, human errors in testing for EIA and reporting the results can occur at multiple points. First, a technical error could have been made in testing the sample. For example, errors in preparing agar for the AGID test or in washing ELISA test wells may lead to incorrect results. Second, the technician may be uncomfortable or unwilling to interpret and report as positive a sample with a very weak AGID test reaction. Third, loss of sample integrity could occur by cross contamination or mislabeling. When laboratories are testing large numbers of samples, consistent attention to detail is required to ensure that all tests are properly conducted and reported.

For samples with positive reactions, many laboratories confirm the initial reaction by testing the sample a second time as originally run and also in other approved types of tests before issuing the positive test report. We recommend collecting a second sample from each reactor to confirm the accuracy and reproducibility of test results. This is important to ensure the integrity of the first report, especially to minimize the impact of human error.

Biologically false reactions in EIA testing are extremely rare. The number of EIAV-infected horses estimated to be reported falsely as negative is less than 1 percent of the number of reactor horses found each year. The number of false reactions can be decreased if diagnosticians capitalize on the strengths of the available tests for EIA. The impact of these false-negative equines is thought to be significantly lower than that of the millions of equines that remain untested.
Checks and cross-checks are used to minimize the impact of inaccurate reports. Repeat confirmation testing of positives should be mandatory. Continued education of diagnosticians should be required; this should include the submission of blind tests as routine samples to ensure accuracy.

**Final Word: Federal involvement in EIA control:**

This brochure has discussed some of the things we have learned about EIA since 1996. The authors have suggested what might be done to further control EIA at the State level. However, involvement at the Federal level needs discussion. USDA-APHIS-Veterinary Services remains committed to the national EIA control program and proposes to improve the program as follows:

1. Provide the most current EIA educational materials, including:
   - A regularly updated version of this EIA brochure
   - A regularly updated version of the EIA Uniform Methods and Rules (UM &R)
   - A current edition of the EIA video
   - A soon-to-be produced EIA laboratory guide.
2. Improve national EIA surveillance by
   - Accounting for quarantined EIA reactors
   - Increasing the frequency and accuracy of laboratory reporting
   - Improving tracking system(s) for out-of-State testing.

We are open to suggestions from the horse industry, State regulatory officials, and other interested parties concerning what more the USDA can do to control EIA in the United States.
EIA Positive Tests per 10,000 Samples
FY 2000

Source: USDA APHIS V&I National Animal Health Program
Trends in EIA Reactor Rates
FY 2000 Compared with FY 91-99

Index of Change

-1 - 0
0 - 1
1 - 5
No Reactors Reported

Source: USDA APHIS National Veterinary Health Information System

Trends in Numbers of EIA Tests
FY 2000 Compared with FY 91-99

Source: USDA APHIS VS National Animal Health Program

REPORT OF THE COMMITTEE

Investigations on Equine Infectious Anemia in Equids from the Uintah Basin in Utah, 1999-2000

Presented by Dr. Chuck Issel, Gluck Equine Research Center


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Summary

In 1998, equine infectious anemia (EIA) was diagnosed in the Uintah Basin in NE Utah in a substantial number of free roaming horses on Ute Tribal lands and on federal lands administered by the Bureau of Land Management (Issel et al, Proc US An Health Assn 102:376-384, 1998). The horses gathered in the Bonanza herd area were tested for EIA and released in June of 1998; the test-negative horses from the area with the highest rate of EIA were held in quarantine for 45 days, retested, branded and released in July into the Bonanza herd area. In both cases, they were released after being in contact with an EIA test-positive horse, and with the understanding that gathering and testing of each group would occur in 1999. From November 1999 through March 2000 a total of 216 horses were gathered in the Bonanza herd area. In initial tests for EIA, 32 of the 216 horses (15%) were positive for EIA and were destroyed. Of the 46 foals of 1999, 2 were test-positive and both were out of test-positive dams. Both proved to have passive immunity, as their antibodies decayed, and they became test-negative during the quarantine period. During the first 60-day quarantine, 1 additional horse, a 2 year-old stallion, became test-positive for EIA and was destroyed. No further transmission was found during additional quarantine periods.

In 1999 the rate of EIA was highest in the group of horses with BLM brands (from the index area in 1998): 15 of the 52 (29%) were test-positive, compared with 17/164 (10%) of those without brands. This suggests the possibility that some of these infections occurred during the quarantine period in 1998 and that the horses were released before serologic evidence of infection was present.
An attempt was made to gather all horses in this area in 1998. In 1999, at least 21 horses were gathered in the Bonanza HA that had not been previously gathered/released there. This represents another possible source for maintenance of EIA in this area. EIA could also be introduced into the free roaming bands through entry or release of EIA virus-infected domesticated horses onto the open range country. To further document the risk posed by this source, domestic equids were sampled during an intense “testing clinic” for EIA in the Uintah Basin in April of 2000. During the 2-day exercise, 558 equids were sampled and 1 was positive. The horse had been recently purchased from a neighbor without a test for EIA, further documenting the importance of pre-purchase health exams and negative tests for changes of ownership.

A surprisingly high rate of infection with EIA virus (19% in 3-year-olds; 0% in foals of 1999) was found in horses gathered in the Bonanza herd area in 1999-2000. Although it is not possible to determine why the infection persisted in this herd, it is probable that one or more horses were incubating EIA at the time of their release in 1998. Another factor that could have contributed to the spread of EIA was the reshuffling of horses that occurred after their releases in June and July of 1998. The increased level of interaction to establish and maintain a social hierarchy and stallion dominance behavior to establish and maintain harems could have contributed to an increased risk of transmission of EIA. Effective control of EIA in open range country and with free-roaming populations will require a high level of cooperation and continuous surveillance.

Introduction and Materials and Methods

Equine infectious anemia (EIA) has been controlled in the United States since the early 1970s by application of serologic testing for detection of carriers of this persistent lentivirus infection. Generally the agar gel immunodiffusion (AGID or Coggins) test has been the test of choice, has received wide international acceptance, and is recognized as the gold standard serologic test for EIA. Testing for EIA has occurred at a relatively low rate in the western United States, partly in response to the low number of test-positive equids found in routine testing. In 1998, a focus of EIA infections was detected in wild and free-roaming horses in the open range country in the Uintah Basin in NE Utah. Gather and testing of these horses was complicated by the fact that some were owned by Ute Tribal authorities, some were privately owned, and some were the property of the US government, under the jurisdiction of the Bureau of Land Management. Unfortunately, few of the horses had positive permanent individual identification, so proof of ownership of most of the horses could be questioned. When EIA was found in this area in 1998, a substantial number of Tribal and privately owned horses were gathered and sent to slaughter without being tested; all horses kept were found negative for EIA. An attempt was made to gather all horses under the aegis of
the BLM for EIA testing. In the Bonanza herd area (HA), 1 of the 101 horses was test-positive and destroyed. After returning privately owned horses to their owners, the remaining 97 were released back onto the Bonanza HA without quarantine, with an understanding that they would be gathered and tested again in 1999.

In 1998, a high rate of AGID test-positive BLM-managed horses (53/107) were found near the confluence of the Green and White Rivers. The test-positive adults were destroyed; the 12 foals of test-positive dams were studied and placed for adoption after they proved not to be carriers of EIA virus. The other horses were held in quarantine for 45 days, during which 2 foals were born. Testing after the 45-day quarantine defined 1 additional case, a 2 year-old stallion; this stallion was destroyed. The decision to brand and release the remaining horses without further quarantine was made with the proviso that all the released horses would be gathered and tested for EIA, requested to occur during the spring of 1999. As these horses from the index area were not in an officially designated BLM herd area when gathered, and as fencing to separate Ute Tribal horses and the BLM horses was not in good repair, a decision was made to release the quarantined horses at the site of the quarantine pens in the Bonanza HA. Thus the release was made realizing that the band would disperse and probably commingle with the 97 horses released there earlier. This paper documents the follow-up testing of these horses and efforts to help define the rate of EIA in this area in NE Utah.

The Bonanza HA is located about 15 miles south and east of Vernal, in northeastern Utah. The Herd Area includes habitat that may be characterized as gently rolling benches in the northern half, to eroded and incised drainages in the south and southwest. The White River Corridor forms the southern boundary of the HA. Native vegetative communities consist of mixed "cool desert, mixed shrub and bunchgrass", and sagebrush with scattered juniper. Soils range from silty sands to sandy loams. Average precipitation ranges from 8 inches in the desert areas to about 12 inches in the more northern areas.

In 1999, horses in the Bonanza HA were gathered by helicopter (assisted by horseback if needed) following standard BLM protocols. Once gathered, the horses were transported to central penning facilities where the groups were sorted by sex; foals were placed in a separate pen. Then individuals were run through chutes, assigned a unique tag number, blood samples were collected by jugular venipuncture, and age was estimated by tooth eruption and wear. Blood samples were collected in evacuated glass tubes with the aid of multi-sample needles to minimize the contamination of personnel and equipment with potentially infective blood. Once sampled, the blood was allowed to clot and serum was tested in ELISA tests. Serums were aliquoted and stored at -20°C for future uses. Horses with repeatedly positive ELISA test results were sorted and segregated, awaiting confirmatory AGID test results from the Utah state laboratory. The
test-negative horses were further separated into manageable groups, organized to provide at least 400 sq ft per animal and to minimize combative contact between individuals in adjacent pens. Additional consideration was given for near-term gravid mares, which were separated into smaller groups to permit adequate space for foaling. Individuals at higher risk for EIA, e.g., pen-mates of the test-positive 2 year-old stallion discovered after the first 60 day quarantine, were kept in the same pen but separated from adjacent pens with a double panel corridor, to create a spatial barrier of about 5 feet between pens.

Testing for EIA utilized all official test kit formats, namely AGID (IDEXX Laboratories, Westbrook, ME), competitive ELISA (CELISA from IDEXX), synthetic antigen ELISA (SA-ELISA and SA-ELISA II from Centaur Inc., Overland Park, KS), Vira-CHEK ELISA (from Synbiotics Inc., San Diego, CA) as well as research immunoblot tests. In field testing protocols, ELISA tests were used to obtain rapid results and segregate repeatedly positive ELISA reactors; disposition of these reactors awaited confirmatory AGID test results. Under special arrangements during an intense survey of privately owned horses in the Uintah Basin, negative field ELISA tests were conducted in an approved laboratory setting to issue official EIA test certificates. In cases when test reactions were equivocal or not in agreement, the immunoblot test was used.

Results and Discussion

Gathering of horses in the Bonanza HA was postponed until November of 1999, in part to avoid the stress of the gather on near-term mares and neonates, to permit congregation of the horses during the non-vector season, and because of budgetary considerations. Over the first week of the gather, 205 individuals were captured. An additional 5 free-roaming horses were noted in a group shortly after the initial effort was completed and were gathered in late November. By March of 2000 intense surveillance and reports of additional sightings ultimately revealed that a small group of horses was still free; these 6 were gathered with difficulty by helicopter and horseback on March 7, 2000.

The initial sampling indicated that 32 horses, none of which were foals, were positive on all official tests for EIA. An additional 2 foals of test-positive dams had evidence of antibody against EIA virus (EIAV). The 11 horses gathered later were negative by AGID tests. All 32 reactor horses were positive on all official tests for EIA, were euthanatized by barbiturate overdosage, and buried in a deep pit. The remaining horses were kept in pens at the remote quarantine site through late June of 2000, and maintained on high quality, weed-free hay, and provided with non-mineralized salt blocks ad lib. During confinement all horses were immunized for eastern and western encephalitis, rhinopneumonitis, and dewormed. One additional reactor, a 2 year-old stallion, was discovered in tests conducted after an initial 60 day quarantine period and was destroyed in February. No addi-
tional transmission/seroconversion was noted in tests conducted through May of 2000.

Two foals of test-positive mares were found with low levels of antibodies against EIAV in official tests for EIA in November of 1998. As these types of reactions were seen previously in 12 uninfected foals from test-positive mares, it was decided to quarantine these foals in a separate pen and monitor their reactions through time. One of these, foal #124, was negative on all official tests for EIA, but was slightly reactive on CELISA tests and positive on immunoblot tests for antibodies to gp90, gp45 and p26. This foal continued to have lower levels of anti-EIAV antibodies during the quarantine period and ultimately tested negative in immunoblot tests 135 days later. The other foal, #115, was initially a weak positive reactor by AGID and positive by CELISA and Vira-CHEK, but negative by SA-ELISA. Foal #115 continued to show declining antibody levels against EIAV proteins and by 135 days in quarantine it was negative on all official tests for EIA.

In 1998, the rate of infection with EIA in the index area increased dramatically by age, e.g., 89% of mature stallions were reactors. The suggestion from these data was that the infection had been present in this localized population for years. By contrast, the distribution of EIA in the Bonanza herd area in 1999 was evenly distributed by age, consistent with recent exposure (data not shown). The only exception was the uniform lack of infection in the 46 foals born in 1999. The lack of serologic evidence of infection in the foals suggests that most transmission occurred in 1998, that foals are at lower risk of acquiring EIAV than older horses, or both. This latter point was noted first in prospective studies on EIAV transmission where sentinel mares became infected but foals of test-positive mares were statistically at lower risk of acquiring the infection than adults in the same environment.

The rate of EIA reactors in the group with BLM brands, i.e., those that had been gathered in the index area in 1998 and released after a single 45-day quarantine, was 29% (15 of 52) compared to 10% (17 of 164) in all the other horses (14% if the 1999 foal crop is not considered). This difference suggests the strong possibility that some of the horses released in 1998 with negative AGID test results had been infected with EIAV before their release but had insufficient time to produce antibodies against EIAV. They had been held at a quarantine site in June-July of 1998, and 1 new case of EIA was defined in the quarantine group at the termination of a 45 day quarantine indicating active virus replication and seroconversion to EIA during the vector season at the quarantine site. Thus, these horses had been at risk for EIA. Retrospective serology was performed on their serum samples, collected at the time of their release in 1998 that had been confirmed test-negative by AGID. None of the samples had reactivity in the CELISA, Vira-CHEK or SA-ELISA test, the 3 official ELISA test formats for EIA that occasionally have proven to be more sensitive indicators of EIA.
than the AGID test. Three of the samples, however, were repeatedly reactive against the surface unit protein of EIAV in immunoblot assays at the time of their release. As antibodies against the gp90 surface unit protein are usually the first to be detected in an active infection, the data suggest that these 3 individuals had been exposed to/infected with EIAV at the time of their release. The presence of low levels of antibodies against EIAV in these horses, however, could also occur if the horses had been repeatedly exposed to inactivated virus in blood through insect feeding. As these low levels of anti-gp90 antibodies were not evident in samples collected in June but present in samples collected 45 days later, they most likely represent responses to recent exposure. All the approved diagnostic test formats available today (AGID, CELISA, Vira-CHEK and SA-ELISA II) include reagents that detect antibody against the major core p26 antigen of EIAV; none can detect anti-gp90 activity. Data from experimental infections suggest that anti-gp90 antibodies can be found in immunoblot tests for 3-5 days before anti-p26 activity can be detected in official tests (Issel et al, unpublished observations).

It is of interest to note that the average band size before/during the gather in 1999 appeared to increase substantially over that observed in 1998. In 1998, most bands were composed of 3-6 adults. After July of 1998, several abnormally large family groupings were observed in the Bonanza HA with 20-30 adults each (Dan Gardner, personal communication). These family groupings were established after the horses were released in June and July of 1998 and their formation had to include a number of unfriendly/combative contacts to establish a social hierarchy and to establish/maintain harems. Many of these encounters would result in trauma and lead to the transfer of bodily fluids including blood. If we assume that these interactions and contacts occurred during the vector season and after several horses had been recently infected with EIAV, conditions leading to the transmission of EIAV were near optimal. Our interpretation of the data includes release of several recently infected adults and the transmission of EIAV by vectors and through direct contact with blood resulting from traumatic interpersonal relations, especially shortly after their release during the summer and fall of 1998.

Analysis of most "outbreaks" of EIA can yield bits of data that could ultimately lead to a better understanding of the rates of morbidity and mortality associated with EIAV infections. To gain a better appreciation for the impact of EIAV, we calculated gross statistics on the population. We know with certainty that at least 50 of the 52 branded horses originating from the index area in 1998 were recaptured, indicating no more than a 4% mortality rate (3% per year) in this group with the highest rate of active infections with EIAV. Other firm statistics are: (1) in 1998, 151 horses were released here, and (2) and in 1999, 46 foals of 1999 were gathered from the Bonanza HA. Thus, at least 21 of the 216 horses gathered here in 1999 were not present or had not been gathered/released here in 1998. These 321
horses could have been present in the area and eluded the gather in 1998 (thought by us to be the most likely explanation), or they could have been privately owned horses that were released here intentionally (no evidence for this possibility was found), or they could represent in-migration from contiguous BLM lands or from Ute Tribal lands (also deemed to be a viable explanation). Thus an overall population increase of from 17-45% was evident from July 1998 through November 1999 (14-36% per 12 months). This population increase is consistent with expected population changes on BLM ranges nationwide (25% natality and 5% mortality on an annual basis) and suggests that the transmission of EIAV in this population did not have a dramatic effect on reproduction, foaling rates, foal survival or mortality rates overall. These estimates are in contrast with those from the index area in 1998 where the number of foals from test-positive mares was significantly lower ($c^2 p<0.01$) than that in test-negative mares from the same area.4

The fate of the 2 branded horses from the index area not recaptured in 1999 will remain in question. Did they die on the range and our estimate of 3% annual mortality is accurate? Or did they elude the gather and intense surveillance for 5 months? Did they migrate to another area? Were they infected with EIAV and have they initiated new foci of infection in Utah or in Colorado? The BLM is planning for complete herd gathers in this area of Utah and in contiguous BLM lands in Colorado over the next 3 years. We await the identification of these 2 individuals and the discovery of their EIA test-status. We are aware of restrictions on the placing of visible marks on wild free-roaming horses, but the adoption of permanent individual identification methods would be invaluable tools in the monitoring and management of these populations.

Another possible source of infection for the free-roaming populations is the release of infected horses owned by individuals onto the open range. To gain a better appreciation of the risk posed from this source and to help the community understand and manage the risks of EIA, an intensive public awareness effort was initiated in the Uintah Basin in March of 2000, culminating in a community-wide “EIA testing clinic” in April. Over a 2 day period a team of local veterinarians and volunteer assistants coordinated by the Utah state veterinarian (Marshall) and the Uintah County Chairman of the Public Lands Committee (Lekas) sampled 558 horses at 5 prescribed sites and by making calls at individual premises. Testing revealed that only 1 of these 558 horses had serologic evidence of infection with EIAV; the recently purchased 10 year-old mare was positive on all 3 ELISA test formats and was confirmed by AGID testing. Follow-up testing and epidemiologic investigations failed to reveal a confirmed source for the infection but indicated exposure to a privately owned stallion about a year earlier, which on anamnesis suggest it may have been showing clinical signs of EIA at the time, that died within 2 months of the exposure.

Management decisions on the wild horses during the gather operation
in 1998 may have contributed to the spread of EIAV. Bands from diverse locations within the BLM lands were gathered, grouped together and released with no priority given to maintain family groupings or to return individuals to their initial range. By admixing and releasing the horses after their known exposure to an infected horse during the vector season in 1998, conditions were near optimal for the transmission of EIAV. Data from testing in 1999 reported here indicate that 19% of the non-foals were positive for EIA when gathered.

One is tempted to speculate on the fate of the horses on the BLM lands under discussion if no intervention had occurred, if additional quarantines had been imposed in 1998, or if retesting had occurred prior to the 1999 vector season as requested. We assume that with no intervention EIAV would have continued to spread between free-roaming bands. Data suggest that infected bachelor stallions would have been important players in moving EIAV between bands. Once in a given band, EIAV would be mechanically transmitted between horses within the band by blood-feeding vectors. Under these conditions one would expect that EIAV would continue to be spread at a low rate and only to individuals/bands in close proximity.

If we assume that EIAV-infected test-negative horses were released from either or both groups in 1998, what would have happened if they had been kept in quarantine another 45 days in close proximity and during the vector season? Our best guess is that vector populations could not have been reduced significantly without serious environmental impacts (and that would not have been permitted), that vector transmission of EIAV would have occurred at a high rate, and that transmission would have exceeded that observed. Although speculation can help one gain an appreciation for the relative risks and a valuable perspective, the scenarios presented above are moot if the infection was introduced from the 21 horses not accounted for in 1998, or from other sources.

When working with equids, we need to take all precautions to eliminate EIAV transmission by man. This must include an education program as most "horsepersons" have not had experience with EIA and have not developed standard operating procedures to deal with EIAV-infected horses. This experience with EIA in the Uintah Basin has reminded us to consider and institute routine measures to reduce the likelihood that personnel and contractors for the BLM will transfer EIAV between horses under their management. This includes all aspects of gathering, sampling, and includes the adoption process. This should include testing of each individual placed for adoption at least two times under most conditions, and for the following reasons. Most gathers do not result in the gathering of all horses in the areas in question; thus, we must assume that each horse gathered and with a negative test may have been recently exposed to an EIAV-infected horse that was not gathered; thus a retest after a 45-60 day quarantine may be needed to insure that they were not recently infected, especially in...
areas with a history of EIA. This is the only foolproof way to assure freedom from EIA and is consistent with good medical practice.

During these exercises in 1998 and those reported here, only 2 new cases of EIA were found in the quarantined horses in the initial 45-60 days after their gather. Both of these cases occurred in 2 year-old stallions, and each could have been acquired before or during the sorting process, before they were sampled for their EIA status. The risk of acquiring EIA from these exposures could probably have been reduced by maintaining the integrity of bands, from their initial spotting through gathering and testing. The greatest risk of exposure to these populations comes when they must be gathered and held as a group in close proximity during the vector season. To reduce these risks, collection of samples at the point of gather and use of ELISA tests to obtain results quickly could prove invaluable in the management of populations at high risk for EIA. Additionally, gathers could be scheduled for the fall/winter (after the first killing frost but before the foaling season) to reduce the potential of vector transmission and to reduce stress to the near-term mares and/or neonates.

The control of EIA in the western United States is complicated by considerations of open range laws and a tradition of not testing for EIA. In the Uintah Basin, that tradition has changed in a relatively short time in response to the discovery of the infection in free-roaming equids and the realization of potential economic impact. Eradication of EIA under such conditions seems at best improbable. Effective control requires vigilance, knowledge, cooperation between all parties with an interest in equid health, and intense surveillance. This exercise has documented the potential for rapid spread of EIAV in a population of free-roaming horses, and has confirmed the relative "resistance" of foals to infection. The continued persistence of EIAV in the free-roaming horses on Ute Tribal lands or on contiguous federal lands managed by the BLM seems probable if the source of the infections reported here was from horses that had not been gathered earlier. Time and patience will permit the accumulation of data from future gathers in this area to help illuminate these points.

In the Bonanza HA in 2000, 71 adults of the initial 216 were released back onto the range. Based on expression of local interest and support of Bonanza wild horses, a local adoption was held that resulted in 28 successful adoptions. The remaining horses were removed for placement in either the BLM's adoption program or long-term holding facility (sanctuary).

Acknowledgements:

The assistance of Dr. Rebecca McConnico from Louisiana State University in helping to organize veterinarians and students who volunteered for these exercises is appreciated; specifically, Dr. Belinda Barnickle and students from the Oklahoma State University College of Veterinary Medicine (Gena Guerriero, Matt Lampe, Seletha Sanders and Anne Karn) assisted during the gathers. A tremendous team was organized for the EIA
Testing Clinic and included the following persons and institutions: Dr. Carey Floyd, Oklahoma Department of Agriculture; Dr. Mike Davis, Oklahoma State University; Dr. Kathy Williamson, private practitioner from Oklahoma; Eddie Cramer and Kerry Pride, students at the LSU School of Veterinary Medicine, Baton Rouge; Matt Lampe and Desi Kelleher, students at the Oklahoma State University College of Veterinary Medicine; Dr. Bill Day and the Horse Program students from Utah State University; Ms. Dru Bower from Uintah Basin chapter of People for the USA, co-sponsors of the Clinic with Uintah County; personnel from the Western Park facility in Vernal for making space available for the testing laboratory; and the veterinarians in private practice in the Uintah Basin area, from the Utah State Department of Agriculture and Food (Drs. Wyatt Frampton and Bruce King), and the USDA (Dr. Fred Halls) who contributed their efforts during the Clinic to help raise public awareness about EIA. Issel is supported by proceeds from an endowment from the Lucille P. Markey Charitable Trust and by the Kentucky Agricultural Experiment Station. We gratefully acknowledge the continued generosity and collective interest in accuracy in testing for EIA from IDEXX Laboratories (Westbrook, ME), Centaur, Inc (Overland Park, KS) and Synbiotics Inc. (San Diego, CA).

References cited:
REPORT OF THE COMMITTEE


NATIONAL EQUINE VIRAL ARTERITIS VIDEO CONFERENCE FOLLOW-UP

By Dr. Tim Cordes, National Animal Health Programs, APHIS, USDA

On August 22 and 23, 2000, USDA, APHIS sponsored an interactive, informational teleconference for Area Veterinarians In Charge and State Veterinarians about Equine Viral Arteritis (EVA). A three-question questionnaire was sent to the Area Veterinarians In Charge and State Veterinarians who participated and the following is a summary of the results of that questionnaire.

Q #1: “Was the program informative?”

23 of the 26 people who responded answered this question. Everyone who answered this question (23 of 23) said that the program was informative. In addition, 11 people commented on the program:

- Good overall program - There were four positive comments including the assertion that the program was pertinent and current
- Effective use of technology - There were five positive comments received including one participant who said it was “very effective” and an “excellent tool”
- Good review of the disease - There were three positive comments about the content of the program including specific praise for the presenters

Q #2: “What additional concerns or questions do you have about EVA and the efforts to control it?”

- Industry involvement - There were nine comments that fit this category. The main concern of those who answered this question is whether Industry cares enough about EVA to do something about it or that it is mainly a concern of the racing industry in the East.
- Nothing additional - There were five comments that fit this category. All five said that the video conference answered the questions they had prior to the conference and they have no additional concerns.
- Next Steps - There were four comments that fit this category. For
example, one respondent wanted to know “what’s next?” while another is concerned that there is no money for the next steps.

Restricting movement - There were four comments that fit this category. Most are concerned about the continued movement of horses without restriction.

Q #3: “Now that you have attended the EVA teleconference, what, if anything, are you planning to do now?”
23 of the 26 people who responded answered this question. The majority of the comments fit into these 3 categories. Respondents who answered this question are planning to:

Educate and Inform the Industry - There were ten comments that fit this category; many said that for any EVA program to be successful, the equine industry needs to be more aware of the disease and how to control it.

Wait/Do Nothing Now or Discuss Next Steps - There were nine comments that fit this category. Most who responded this way will wait to see what happens in their state or begin some discussions within the animal health regulatory community about EVA and its control.

Take Specific Action - There were two comments that fit this category. One respondent is going to “work on making EVA a reportable disease” while the other said they would “push for vaccination” in the state.

Kentucky’s Equine Viral Arteritis (EVA) Program

By Dr. Don L. Notter, Kentucky State Veterinarian

In May of 1984, an Equine Viral Arteritis (EVA) event affected the entire Thoroughbred industry in Kentucky. The event became so widespread throughout Kentucky’s Thoroughbred breeding population that a mandatory order was issued closing all Kentucky Thoroughbred breeding sheds. The epidemiological investigation identified 14 breeding stallions with EVA infected semen, all of which were then classified as EVA shedders.

With support from Kentucky’s Thoroughbred industry and the scientific community, the Kentucky Department of Agriculture promulgated 302 KAR 20.180, an Administrative Regulation titled; Restriction Equine Viral Arteritis; Necessity and function to identify, prevent/control and eradicate EVA within Kentucky’s Thoroughbred breeding population.

The Administrative Regulation established an EVA test and vaccination protocol for all Thoroughbred males standing at stud in Kentucky. An EVA test is now required to determine the stallion’s EVA antibody status prior to being vaccinated with an EVA vaccine.

The Administrative Regulation also set guidelines for a mare that is booked to a shedding stallion, including nurse mares and teasers. Mares shall be reported as either (1) EVA sero-negative, or (2) officially vaccinated.
nated against EVA or (3) isolated from other equine on the premises. Teasers must be officially vaccinated against EVA annually.

In February of 2000 an isolated EVA event occurred on a Kentucky Thoroughbred farm. In view of the event, I can justifiably document that Kentucky’s EVA Program prevented spread within or from the premises, since the event was totally confined to horses on a premise with four barns populated with pregnant, open mares and mares with foals by their side.

The Kentucky Office of the State Veterinarian sends annual notification to all Thoroughbred owners and breeding shed managers that Thoroughbred breeding stallions shall meet Kentucky’s testing and vaccination requirements prior to standing at stud. The Department documents all testing (blood and semen testing), and EVA vaccinations are reported via a health certificate.

The Department supports educational and informational programs especially for nurse mare providers and other breeds that are not addressed under Kentucky’s EVA Administrative Regulation. We encourage all breeds to implement the American Horse Council Publication; Guidelines for Breeding a Mare to an Equine Arteritis Virus Shedding Stallion. We support veterinarians and owners when implementing this program.

Physical and Chemical Restraint of Horses Held in USDA Animal Import Centers

By Dr. Ralph C. Knowles

The inspection of horses offered for entry into the United States is a mandatory action required by the U.S. Department of Agriculture, Title 9, Code of Federal Regulations, Part 92. These inspections are performed in USDA’s Animal Import Centers, which are located in Miami, FL, Newburgh, NY, and Los Angeles, CA.

Horses being handled for inspection in these Animal Import Centers are exposed to strange handlers, noises, and odors. Horses in nature, historically have been plains dwellers and thus, when they become excited, are given to flight, and attempt to escape their present setting as opposed to equids of jackass/burro lineage or their crossbreeds - mules; when alarmed or excited, having origins in the mountains of The Middle East, stop to evaluate their setting before making a move to exit their perceived danger (in a mule this is often interpreted as stubbornness).

In the workplace, it is the supervisor’s and organization’s (in this case USDA’s) obligation to train personnel to carry out their duties in a safe manner. While USDA’s, Veterinary Services supervisors are trained in the proper restraint methods for horses, the livestock inspectors may not have been trained in the proper physical restraint methods appropriate for use on horses.
Historically, when chemical restraint of horses held in quarantine has been indicated, private veterinary practitioners have been called in to apply such chemical agents. The entry of private practitioners into a USDA quarantine station, may compromise the biosecurity of the station.

This author believes it is indicated and practical for USDA to initiate training sessions to update the animal import centers veterinary supervisors and animal health technicians, in the latest, cutting edge, techniques of physical and chemical restraint of horses. The implementation of restraint methods by USDA employees would preclude the need for a private veterinary practitioner to enter a quarantine station in these instances.

In the litigious society that prevails in the United States, I believe the USDA can successfully defend, as state of the art, any challenge or claim that a client may make against the U.S. Government should be untoward situation occur following the application of modern, cutting edge, restraint methods.

The author, reiterated the history of a horse from Argentine origin, who entered the United States through the USDA Miami Animal Import Center, Miami, Florida, and was subsequently found to be infested with screw-worm (*Cochliomyia hominivorax*) in Wellington, Florida.
REPORT OF THE COMMITTEE ON JOHNE’S DISEASE

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Introduction

The Johne’s Disease Committee met on Monday October 23, 2000, from 12:30 to 7:00 p.m. 99 people attended including 38 committee members. Fifteen presentations were made and seventeen resolutions were proposed. Abstracts and papers are included in the body of the report.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.

National Johne’s Working Group (NJWG):
Five Year Review with Path Forward

This report in its entirety follows the committee report.

Reports from the NJWG,
Subcommittee of the USAHA Johne’s Disease Committee

State Program Committee –
Draft Program Standards discussed at the NJWG

386
APHIS regards Johne's disease as a program disease, however it is not an eradication program at this time. The purposes of APHIS are to safeguard the U.S. from the occurrence of adverse animals health events, monitor the health and productivity of animal populations and health related attributes of animal products, enhance the health status of animal populations by anticipating and responding to new or emerging threats, and to expand the domestic and international marketability of U.S. animals, and products. With this in mind, the role to the national Johne's disease program coordinator is to provide program assistance and coordination, serve as a liaison with Industry, State and other Federal agencies, program evaluation, recommend relevant policy changes, and provide long term planning for the program.

In April, APHIS published the final rule to amend requirements for moving positive animals. They must only be moved interstate to slaughter only. Animals that are moved are required to have an owner-shipper paper and an official tamper resistant eartag. The changes removed the requirements for sealed container or APHIS escort, branding, and reactor tag. The changes also identifies an official test for Johne's disease as an organism detection test approved by the Administrator and conducted in a laboratory approved by the Administrator. Currently this includes just fecal culture.

APHIS has also started working on developing program standards for the Johne's disease program. The draft standards have been reviewed by Johne's Working Group. The draft document will be revised and presented to the working group again in the spring. APHIS has also been working with the dairy industry on an indemnity program the dairy cattle. An indemnity program would provide incentives to dairy producers with participants in the voluntary program must meet standards set within program (ID, biosecurity, testing).

APHIS has also been working on a USDA Web site development which would include a listing of herds enrolled in status programs by states, comparison of State Johne's programs, and a listing of State Updates.

APHIS approved $174,000 to fund the National Research Council Study to study the issue of Johne's disease. $100,000 have been approved for a review of current knowledge of diagnosis and control of Johne's disease. July 1, 2000 - June 30, 2001. Additional funds ($74,000) for following year.

Research Subcommittee

J. R Stabel, USDA-ARS-NADC

Summary of UK study on *M. paratuberculosis* in retail milk
A brief summary of the work performed in the UK on sampling of retail milk for *M. paratuberculosis* (MAP), the causative agent of Johne's disease in cattle, is discussed along with current and future studies proposed to examine the heat inactivation of MAP in milk. The MAFF study surveyed 258 dairies in the UK and sampled each at least once for one raw and a number of heat treated milk samples (pasteurized whole/semi-skimmed/skimmed or UHT). Wherever possible, the raw and pasteurized milk samples originated from the same batch of milk. A total of 830 samples of raw or pasteurized milk were tested for the presence of MAP. Due to the very slow growth rate of this bacterium, some results are still pending but as of July 31, 2000, confirmed results are available for 679 (81.8%) of the samples tested. Based on the available results, viable MAP has been found in 1.9% of raw milk samples and 2.1% of pasteurized milk samples. Conclusions are not available yet since the study is not complete. Acting on the advice of the Advisory Committee on the Microbiological Safety of Food, Chairman of the Food Standards Agency, Sir John Krebs, said: "We have received advice from the ACMSF. On the basis that the risk to human health has not been proven, the Committee did not recommend any change in the current advice regarding the consumption of milk. But, we note their concern that ways of reducing exposure to MAP should be actively explored. We, therefore, intend to convene a conference to review possible controls at all stages of the food chain. The Food Standards Agency was set up to represent consumers and it is our job to ensure that while research into any possible link continues, we should do all that we can to reduce human exposure to the bacterium." The entire report and press release are in the National Johne's Working Group, research subcommittee report.

Current and proposed studies to further evaluate the effect of heat treatment on survival of MAP in milk are being conducted in the US and other countries. A predominant theme of these studies is to conduct experiments using pilot-scale pasteurizer units to more closely simulate continuous-flow systems used in dairy processing plants today. In a study recently completed in New Zealand using a pilot-scale pasteurizer unit, no viable MAP were recovered after pasteurization treatment. In contrast, results from a study conducted in Germany suggests that MAP does survive treatment at 71.7°C for 15 sec. These researchers incorporated a resuscitation medium step in their culture protocol to ensure more successful recovery of sub lethally injured bacteria. A study recently initiated in the US by the IDFA with collaborators, Charles Sizer, Moffett Center; Judy Stabel, ARS-NADC; Mike Collins, Univ. Wisconsin; Allen Sayler, IDFA; will incorporate the resuscitation step in their experimental protocol to achieve the highest level of sensitivity for recovery of potential survivors. Input on the design of the study was received from Catherine Donnelly, Joe Frank and Mike Doyle, food microbiologists involved in Listeria and E. coli research.
JOHNE’S DISEASE

A proposal for sampling of retail milk for MAP by culture and PCR has been funded. The work will be conducted by Marshfield Clinic, Marshfield, WI. The sampling will be performed in Wisconsin, Minnesota and California at retail markets.

Small Ruminant Subcommittee

S. M. Stehman, Co-Chair Small Ruminant Subcommittee, Cornell University Diagnostic Lab

Options for a Johne’s Test Negative Status Program for Elk

Interest has been expressed by elk breeders and requested by states for a test negative status program for Johne’s Disease. The goal of the program would be to identify elk herds with a low risk of being infected with Mycobacterium avium subsp paratuberculosis. Issues were identified that limit options. These include unknown prevalence of infection in the elk, potential for an unknown level of strain variation of Map in elk with different growth patterns in culture, lack of standardized methodology for diagnosis of Johne’s in elk and a need to proficiency check laboratories participating in a national program. Other issues reviewed include the need for education and the need for options for disease control in those herds found to be infected. The Elk Johne’s Test Negative Status Program proposes that all elk one year or older in the herd be tested annually with fecal culture. Annual testing for three years is recommended with recertification every two years thereafter using whole herd fecal culture of eligible animals. In addition, clinical suspects and other deaths should also be monitored with histopathology as described in the model Chronic Wasting Disease Model Program. Histopathology is needed to monitor for variant strains not detected by current agent detection methods.

J.B. Katz, presented by S. G. Hennager, USDA-APHIS-NVSL

Ovine Johne’s Disease serologic comparison between two commercial bovine enzyme-linked immunosorbent assays, complement fixation test, and an agar gel immunodiffusion test.

It was noted at the committee the importance of emphasizing that the ELISA tests were used off-license and are not validated for use in sheep. They were evaluated on a well characterized panel of sheep serum as a preliminary assessment of the performance and potential usefulness of these tests in sheep.

Ovine Johne’s Disease (OJD) was diagnosed by serologic methods for 36 negative, naturally infected, and experimentally infected sheep. Five negative animals from a university monitored flock, 2 animals diagnosed
with caseous lymphadenitis (CL), 9 naturally infected animals from 2 Johne's disease confirmed flocks, and 20 experimentally challenged animals were used in the comparison. Experimentally challenged sheep were given *Mycobacterium avium* spp. Paratuberculosis type strain purified protein derivative (PPD), Johnin OT PPD, Johnin PPD, live and killed cells of *Mycobacterium avium* spp. Paratuberculosis strain 18, a live identified field strain, and a *Corynebacterium pseudotuberculosis* bacterin (CPB). The serum was tested by two commercial bovine enzyme-linked immunosorbent assays (ELISA), complement fixation (CF) tests, and an agar gel immunodiffusion test (AGID). The histopathologic evaluation of animals naturally infected or experimentally challenged with live bacteria demonstrated lesions and acid-fast organisms consistent with OJD. All serologic tests had negative test results for the negative animals. One ELISA kit yielded positive results for most of the naturally and experimentally infected animals but was also positive for animals diagnosed as CL and challenged with the CPB. The other ELISA kit and the CF results were negative for the animals diagnosed with CL or challenged with CPB but had fewer positive results on the naturally infected or experimentally infected animals. The AGID test results were positive for the naturally infected and experimentally challenged animals but negative for the animals diagnosed with CL or challenged with CPB. Although the small sample size did not allow for sensitivity and specificity calculations, the AGID appeared to have the best combination of positive results for the positive animals and negative results for the negative and nonspecific CL animals. These results should be confirmed using an interlaboratory serologic comparison. Additional serologic testing of uninfected and infected animals will be needed to determine the sensitivity and specificity of these tests and to evaluate if the bovine ELISA kits can be adapted for diagnosis of OJD.

**Other Reports**

B. J. McClusky, USDA-APHIS-CEAH

**NAHMS: Dairy 2002**

The 2002 NAHMS study will focus on dairy. CEAH is doing the needs assessment through early 2001 and distributed a survey form for providing input to the process. The survey will follow-up on Johne's information collected in Dairy 1996.

K. V. Brock, et. al., Auburn University, College of Veterinary Medicine

Dr. Brock reported on a study to determine the prevalence of Johne's disease in a subpopulation of Alabama beef cattle. This was determined using an IDEXX ELISA for the detection of *Mycobacterium paratuberculosis*.
JOHNE'S DISEASE

sis-specific antibodies in serum. Serum was collected from 79 herds that were participating in the Alabama Brucellosis Certification program. A total of 2,073 beef cattle were tested by randomly selecting 30 animals per herd in herds greater than 30 and selecting all animals in herds 30 and less. It has been estimated that the IDEXX ELISA test has a 60% sensitivity and a 97% specificity. Of the 79 herds tested, 29 herds were seronegative, 24 herds had 1 to 2 positive animals, and 26 herds had 3 or more seropositive animals. The average number of infected animals per positive herd was 3.3. In addition, a calculated minimum of 53.5% of the herds were identified as Johne's positive herds with 95% confidence level. Of the total number of animals tested 8.0% (166/2073) were positive by the ELISA for antibody. After adjustments for test sensitivity and specificity and the proportion of animals sampled per herd, the true prevalence was calculated to be 8.75%. These data suggest that approximately 50% of the herds are infected with Mycobacterium paratuberculosis and the overall prevalence of infection in Alabama beef cattle is approximately 8% which correlates with other previously published regional estimates.

M. T. Collins, University of Wisconsin

Activities of the International Dairy Federation M. paratuberculosis Task Force

The International Dairy Federation (IDF) held a brainstorming session concerning M. paratuberculosis May 6, 1999 in Brussels. It was decided, as a product of that meeting that a task force was needed to gather the latest scientific information on this organism. The M. paratuberculosis Task Force, comprised of 30 members representing 17 countries met for the first time in Brussels December 6, 1999. M.T. Collins was elected to chair the Task Force.

The program of work was to prepare a report to the IDF on five subject areas. These became chapters of the final report.

1. Diagnostic techniques for paratuberculosis.
2. Recommendations for on-farm control of paratuberculosis.
3. Ecological characteristics of M. paratuberculosis.
5. Destruction of M. paratuberculosis in milk and milk products by heat.

Action teams were formed to draft a report on each of the five topics. Working by e-mail, the groups produced a first draft that was circulated to the full Task Force for comment in May. The Task Force next met in June 6-8, 2000 in Aarhus, Denmark. Over the two and one-half day meeting each action team presented their respective reports. Comments were received, discussed, and the lead author was told to have the revised chap-
REPORT OF THE COMMITTEE

ters of the report back to the chairman by July 5. After receipt of the revised chapters they were compiled into a single document and a covering Executive Summary was added. The full report was then submitted to the Task Force for one final review.

September 19, 2000 the Task Force met during the IDF Dairy Summit in Dresden. Editorial changes were suggested to the Executive Summary and Chapters 1 through 4. These components were approved as edited by unanimous vote. The Task Force recommended extensive revision of Chapter 5 before approval. Prof. O. Cerf (France) took charge of the revision. After 2 weeks of editorial work and exchange of ideas and data the final version of chapter was submitted to the Task Force. It was approved unanimously.

The full report with Executive Summary was submitted to the IDF Program Coordination Committee October 13 with the recommendation that the report be published as a monograph. If approved by the PCC the report will be forwarded to each member country’s national committee for approval. If approved the report should be available by Christmas.

The Task Force also recommended that an international symposium concerning diagnosis and control of paratuberculosis be held. It has been scheduled for January 27, 2001 in Brussels. For additional information and updates about publication of the report and the paratuberculosis symposium visit the IDF web-site: http://www.fil-idf.org

K. Meyer, C. Miller, PARA Organisation

Activities of the Paratuberculosis Awareness and Research Association

Cheryl Miller and Karen Meyer from the Paratuberculosis Awareness and Research Association provided an update on their organizations activities. The report included a description of Crohn’s disease, a discussion of Mycobacterium paratuberculosis as a potential human pathogen and a review of evidence that Mycobacterium paratuberculosis might be in our food. The report also included recommendations on critical elements for a Johne’s disease control program.

S. J. Shin, et al., Cornell University Diagnostic Lab

A new liquid culture method, the TREK ESP Culture System II, for Rapid Detection of Mycobacterium avium subsp. paratuberculosis in bovine fecal samples.

Solid medium culture has been the standard procedure for detection of M. avium subsp. paratuberculosis in bovine fecal samples. However, because of the long generation time of the bacterium, it is a slow and labor
JOHNE'S DISEASE

intensive procedure requiring up to 12 weeks of incubation. The purpose of this study was to develop a rapid detection procedure for \textit{M. avium} subsp. \textit{paratuberculosis} in bovine fecal samples using a liquid culture method, the Trek ESP Culture System II (ESP), in conjunction with the Cornell double incubation decontamination process.

Bovine fecal samples, a total of 85 including 30 known positive samples and 55 unknown samples, were decontaminated by the Cornell double incubation process prior to culture in ESP MYCO bottles and on Herrold's egg yolk (HEY) agar slants. Of 30 known bovine fecal samples, 10 heavy shedders (>300 CFU/g), 10 medium shedders (31-300 CFU/g) and 10 low shedders (1-30 CFU/g) were included. Of 55 unknown samples, 25 were NVSL were check samples and 30 were field samples. All bottles flagged as positive in ESP and all suspect colonies on HEY agar slants were confirmed as \textit{M. avium} subsp. \textit{paratuberculosis} by acid fast staining and PCR.

Of 85 bovine fecal samples, 59 (69.4%) were positive for \textit{M. avium} subsp. \textit{paratuberculosis} by the ESP method while 51 (60%) were positive by the standard solid medium culture method (HEY). Both systems were able to detect 100% of heavy and medium shedders; however, the ESP detected 8 more low shedders than the standard HEY agar method.

\textit{Mycobacterium avium} subsp. \textit{paratuberculosis} was detected by the ESP with a mean time to detection of 14.97 days for heavy shedders, 22.79 days for medium shedders, and 34.5 days for low shedders. In contrast, by the standard solid medium culture on HEY agar, \textit{M. avium} subsp. \textit{paratuberculosis} was isolated with a mean time to detection of 39.71 days for heavy shedders, 41.9 days for medium shedders, and 48 days for low shedders. Two samples (2.4%) from each method were contaminated with fungus and other microorganisms.

In conclusion, the ESP, a liquid medium based detection system, was able to detect \textit{M. avium} subsp. \textit{paratuberculosis} in bovine feces 2 to 3 weeks earlier than the standard HEY culture method with greater sensitivity and identical contamination rate.

S. G. Kim, et. al., Cornell University Diagnostic Lab

Development of Quantitative PCR-based on the ABI 7700 System (TaqMan) for \textit{Mycobacterium avium} subsp. \textit{paratuberculosis}

There have been numerous reports for PCR-based diagnostic methods to detect \textit{Mycobacterium avium} subsp. \textit{paratuberculosis}, the causative agent of Johne's disease. The result of conventional PCR tests has been only qualitative, either positive or negative; therefore, the result foes not present any quantitative information about the number of agents in the specimen. We have developed a quantitative PCR method using the ABI system (TaqMan) to measure the number of \textit{M. avium} subsp. \textit{paratuberculosis} present in test samples. The sensitivity of the method was 10 CFU
for *M. avium* subsp. *paratuberculosis* ATCC 19698. The specificity of the method was tested for 14 Mycobacterial species (*M. abscessus, M. asiaticum, M. avium subsp. avium, M. bovis, M. fortuitum subsp. fortuitum, M. intracellulare, M. kansasii, M. marinum, M. phlei, M. scrofulaceum, M. simiae, M. smegatis, M. terrae, M. ulcerans*) and 9 non-Mycobacterial species (*Borrelia borgdorferi, Chlamydia psittaci, Ehrlichia canis, E. equi, E. risticii, Escherichia coli, E. coli O157:H7, Streptococcus equi, S. zooepidemicus*). Even at high level of cell numbers (10^5 CFU), most of the organisms tested negative except *M. marinum* and *M. scrofulaceum*. The finding with *M. scrofulaceum* was consistent with a recent report by Austrian investigators who found some isolate closely related to *M. paratuberculosis* carry 70% to 79% hemology with *M. paratuberculosis* in the region of IS900.

Using this TaqMan-based quantitative PCR method with the Trek ESP System II for bovine clinical fecal samples, we were able to confirm that most of the positive samples contained 10^5 to 10^6 CFU/ml of *M. avium* subsp. *paratuberculosis* strains classified by shedding levels, heavy, medium, and low based on CFUs on HEY slants.

D. C. Sockett, Wisconsin Veterinary Diagnostic Lab-UWI

**Johne’s Disease ELISA assay in Cattle**

Dr. Sockett, microbiologist at the WVDL, presented the results of two small studies that evaluated the repeatability of the ELISA assay in sets of serum samples from the WVDL. The reported CV’s were greater than would be desired and illustrated the need to be cautious in interpreting ELISA results in individuals and the value of running internal QC serum samples.

Veterinarians have questioned why some ELISA positive cows are negative when they are retested approximately 30 days later. Reports of cattle failing to remain test positive have started to erode confidence in the assay by veterinarians and livestock producers. The Johne’s disease ELISA assay is approved and licensed by USDA Veterinary Biologics and marketed as a diagnostic kit by a private company. Serum samples with a sample/positive (S/P) ratio of 0.25 are classified as positive for *M. paratuberculosis* antibodies and less than 0.25 as negative.

WVDL examined the variability of this assay. In one trial, the WVDL tested serum samples from twenty-two ELISA positive cows. The cows were bled approximately 30 days after the first ELISA test. Six cows tested negative and 16-tested positive for *M. paratuberculosis* antibodies. Next, 286 serum samples from one Wisconsin dairy herd (frozen at -75 °C) were thawed and retested. Thirty-two of the original thirty-three ELISA positives remained positive but there 12 new ELISA positive cows. Examination of the data made it clear the change in ELISA classification could not be explained simply by a small shift in test results around the
JOHNE'S DISEASE

arbitrary cut-off of 0.25. The possibility of laboratory error was rigorously investigated and ruled out.

A second trial examined the variability of the assay. Six serum samples from cows with different S/P ratios for Johne's disease were tested multiple times for 5 consecutive days. A total of 36 plates or 72 replicates were tested. The sample mean, standard deviation (SD), coefficient of variation (CV), as well as 95% and 99% confidence intervals were calculated for the 6 serum samples as well as for the positive and negative controls provided by the manufacturer. The coefficient of variation is a measure of assay variation or repeatability. Robust assays have CV's of 10% or less when the same serum sample is tested on different days with different ELISA plates. The six serum samples had an average CV of 19%. Samples with low S/P values tended to have higher CV's than samples with higher S/P values. However, all 6 diagnostic samples had relatively large confidence intervals around the sample mean. The data is summarized in Table #1. For example, sample number four has a mean S/P ratio of 0.30 but has a 99% confidence interval ranging from 0.18 to 0.42. This means that if the same serum sample is retested, 99% of the time the values obtained will be between 0.18 and 0.42. Taking the results for sample number 4 as an example, 12/72 or 16.7% of the S/P ratio test values below the 0.25 cutoff and would have been classified as negative for Johne's disease.

Discussion

The foundation of every serological test is defined by two parameters known as precision and accuracy. Precision is a measure of the amount of dispersion or variation that occurs when the same serum sample is tested multiple times. Assays with a very small amount of dispersion are very precise and therefore repeatable. Accuracy is determined by how close the assay results are to the real or correct values, which was not evaluated here. However, assays that lack precision are by definition inaccurate. The Johne's disease ELISA assay is imprecise thus making sample classification (positive or negative) problematic. The problem is worse for samples that are near the arbitrary cut-off 0.25. For example, serum samples with an S/P ratio of 0.27 can be expected to retest negative approximately 35% of the time and concurrently serum samples with an S/P ratio of 0.21 will test positive approximately 25% of the time.

The arbitrary cutoff for the Johne's disease ELISA assay was established using a method known as receiver-operating curve (ROC) analysis. ROC analysis involves plotting the rate of correct and incorrect positive test results, using different cutoffs for the assay. A ROC curve is plotted for the different ELISA cutoffs and a cutoff is chosen that gives the best balance between sensitivity and specificity for the assay. However, inherent in ROC analysis is the assumption the test is precise. Since the Johne's disease ELISA assay is imprecise, sensitivity and specificity estimates
should be interpreted with caution.

*IDEXX Laboratories Inc., One IDEXX Drive, Westbrook, Maine 04092.

### Table 1:
ELISA Variability Analysis – Wisconsin Veterinary Diagnostic Lab

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Mean S/P Ratio</th>
<th>SD</th>
<th>CV</th>
<th>95% C.I.</th>
<th>99% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.04</td>
<td>.017</td>
<td>38.4%</td>
<td>.04 ± .03</td>
<td>.04 ± .04</td>
</tr>
<tr>
<td>2</td>
<td>.18</td>
<td>.039</td>
<td>22.1%</td>
<td>.18 ± .08</td>
<td>.18 ± .10</td>
</tr>
<tr>
<td>3</td>
<td>.21</td>
<td>.028</td>
<td>13.8%</td>
<td>.21 ± .06</td>
<td>.21 ± .07</td>
</tr>
<tr>
<td>4</td>
<td>.30</td>
<td>.046</td>
<td>15.4%</td>
<td>.30 ± .09</td>
<td>.30 ± .12</td>
</tr>
<tr>
<td>5</td>
<td>.47</td>
<td>.071</td>
<td>15.1%</td>
<td>.47 ± .14</td>
<td>.47 ± .18</td>
</tr>
<tr>
<td>6</td>
<td>1.3</td>
<td>.143</td>
<td>10.7%</td>
<td>1.3 ± .28</td>
<td>1.3 ± .37</td>
</tr>
<tr>
<td>IDEXX Neg. Control</td>
<td>.095</td>
<td>.008</td>
<td>8.4%</td>
<td>.095 ± .016</td>
<td>.095 ± .02</td>
</tr>
<tr>
<td>IDEXX Pos. Control</td>
<td>.574</td>
<td>.035</td>
<td>6.2%</td>
<td>.574 ± .07</td>
<td>.574 ± .09</td>
</tr>
</tbody>
</table>

O.D. = Optical density units.
S/P Ratio = Serum/positive ratio
SD = Standard deviation
CV = Coefficient of variation
CI = Confidence interval

Summarized data is based on 72 replicates per serum sample

### IDEXX Johnne's ELISA — Validation and Variation

John C. Lawrence, Director of Marketing,
IDEXX Production Animal Services

Manufacturers of USDA-licensed ELISA kits are required under 9CFR to produce test kits according to Outlines of Production. This document is written by each manufacturer and is submitted to and filed by USDA during the licensing process. The document describes exactly how the products are manufactured, identifying specific procedures for propagation and purification of organisms, preparation of biological and non-biological components, including sources for critical raw materials. Consistency in manufacture will help standardize performance and variability of manufactured test kits. Any changes in manufacturing must be supported by data.

An R&D data package is also submitted to USDA, showing the utility of the ELISA. Supporting data includes comparison to standard methods.
or other ELISAs using animal populations of known status, exposure/challenge studies, international reference sera as well as some assessment of cross-reactivity or interference. Cutoffs are determined by comparing positive and negative populations to obtain the best possible combination of sensitivity and specificity, usually including a ROC analysis. Other parts of the data package include an assessment of reproducibility by CV analysis within plate or by comparison of serum panels on multiple batches. Field trials are conducted by submitting 3 batches of test kits to 3 relevant laboratory sites to evaluate variation and robustness.

Variation in ELISA tests can be looked at and controlled a number of ways. The variation within plates can be controlled during the manufacturing process by adequate process control and evaluated during QC with relevant samples. A plate CV of less than 10% is desirable and can approach 3%, depending upon the complexity of the manufacturing process. IDEXX's Johne's ELISA plates typically have plate CV's of around 7%, which compare favorably to other IDEXX manufactured plates (PRRS, BLV, PRV). These products include plates based upon and manufactured by different processes (recombinant, culture, viral, bacterial, capture, direct coating), ultimately influencing overall performance. Variation between batches becomes more difficult due the nature of certain biological components, the interaction of antigens used in manufacturing and the availability of critical samples used in testing. The absolute magnitude of sample values batch to batch may vary between 5% to 50%, depending on the sample used and its reactivity to any particular antigen present in the test system. Ongoing QC typically emphasizes consistency in overall sensitivity and specificity characteristics, rather than variation in OD or S/P values since, once a product license is received, manufacturers are obligated to produce ongoing test kits consistent with the performance identified in the original licensing package.

S. Jones, et. al., CSL Animal Health, Parkville, Victoria
(Biocor Animal Health Inc, Omaha, NE)

Practical Aspects of the Use of PARACHEK™ - CSL's JD Absorbed ELISA Test

Stephen Jones,* Ralph Slaughter,+ Tom Kellner+ 1

The Mycobacterium paratuberculosis Antibody Test Kit (PARACHEK™), commercialised by CSL Animal Health, Australia, was licensed by USDA APHIS in March, 2000, for distribution in USA through CSL's subsidiary company Biocor Animal Health Inc. CSL was the first company to develop and market an absorbed EIA for the specific detection of antibodies to M. paratuberculosis in bovine serum. The test is performed in less than 2 hours.
PARACHEK™ was developed with several technical features designed for high reproducibility and good performance:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of conjugate and chromogen concentrates</td>
<td>Ensures better stability, flexibility and reduces potential for invalid tests through inadvertent contamination of working strength reagents</td>
</tr>
<tr>
<td>The Kit Negative Control</td>
<td>Serves to control for inadequate absorption during the first phase of the assay</td>
</tr>
<tr>
<td>Monitored endpoint reading</td>
<td>This feature effectively reduces plate-to-plate variability and reduces the likelihood of invalid assays being run where the reactivity of conjugate may be lower than expected</td>
</tr>
<tr>
<td>Assay cut-off algorithms</td>
<td>Selected to ensure very high test specificity</td>
</tr>
</tbody>
</table>

PARACHEK™, based on this original development, has been evaluated in cattle herds from Johne's disease-endemic and Johne's disease-free regions of Australia and the USA. Test sensitivity was 87% or greater for cattle with clinical paratuberculosis, as well as approximately 60% of those cattle with sub-clinical disease and shedding organisms in their faeces. For overall diagnosis of paratuberculosis, irrespective of disease stage, the PARACHEK™ test kit will detect approximately 50% of cattle infected with *M. paratuberculosis*. This absorbed ELISA has also been shown to be more sensitive than the agar gel immunodiffusion (AGID) test as well as the complement-fixation test (CFT), particularly in sub-clinically affected cattle. The reported test specificity estimates for PARACHEK™ are 99% in USA and 99.7% and 99.8% (±0.3%) in Australia. PARACHEK™ is currently being used in more than 20 countries. In Australia, the use of the absorbed ELISA is central to the National Johne's Disease Market Assurance Program for cattle.

The conjugate used in the PARACHEK™ kit is also reactive against IgG from sheep, goats, deer/elk, alpaca, and several other species. The specificity of PARACHEK™ for diagnosis of Johne's disease in sheep and goats has been determined as 99.3±0.5% and 99.8±0.3%, respectively, by modifying the cut-off algorithm used for cattle to Negative Control OD plus 0.200 (cf. NC+0.1 for cattle). In one study, PARACHEK™ detected 44.2% (53/120) of infected sheep and was not significantly different from AGID (46.7%, 56/120); both tests combined detected 59.2% (71/120). PARACHEK™ detected infected animals from all of five properties tested whereas AGID failed to detect any infected sheep from the property with the lowest prevalence of disease. Hence, PARACHEK™ may be more sensitive at detecting infected sheep in flocks with a relatively low preva-
JOHNE'S DISEASE

lence of disease. PARACHEK™ is approved in Australia for use in sheep and goats. Recent studies have also shown that cross-reactivity from in-
fecion with Corynebacterium pseudotuberculosis was not detected using PARACHEK™.

CSL and Biocor are actively researching the use of their BOVIGAM™ IFN-α assay for the early detection of Johne's disease infected animals.

* CSL Animal Health, 45 Poplar Road, Parkville 3052, Victoria, Australia
+ Biocor Animal Health Inc., 2720 North 84th Street, Omaha, NE 68134.

J. Smith, Antel Biosystems, Inc (Antelbio), Lansing, MI

Jerry Smith reported on efforts by AntelBio to integrate Johne's dis-
ease testing with DHIA records as a management tool. AntelBio is a sub-
sidiary of Northstar Cooperative of Lansing, MI. It is owned by dairy and beef producers in Michigan, Wisconsin and Indiana. The company's first priority is better methods to detect and manage Johne's disease. They currently offer serum ELISA, fecal culture and PCR testing.
NATIONAL JOHNE'S WORKING GROUP (NJWG):
FIVE YEAR REVIEW WITH PATH FORWARD

Robert Whitlock*, John Adams**, Gary Weber***, Co-Chairs NJWG

*School Veterinary Medicine, New Bolton Center, University of Pennsylvania, Kennett Square, PA 19348
**National Milk Producers Federation, 2101 Wilson Blvd, Suite 400, Arlington, VA 22201
***National Cattlemans Beef Association, 1301 Pennsylvania Ave, NW Suite 300, Washington, DC 20004

The Co-Chairs of the National Johne's Working Group (NJWG) were asked to conduct a five year review and to outline a path forward by the United States Animal Health Association (USAHA) president (Ernest W. Zirkle) and officers at the conclusion of the 1999 USAHA meeting in San Diego. The charge included a review of the efforts and accomplishments of the NJWG and to assess the relationship of the NJWG to our parent, the Johne's Committee of the USAHA.

In an effort to provide a time line perspective, we need to outline some of the major milestones for Johne's Disease. The original description of the disease was made by Dr. Heinrick Johne and Dr. Frothingham in 1895. Along with the movement of cattle from Europe to North America, Johne's Disease was also imported and first described by Leonard Pearson in Pennsylvania in 1906, ten years after its description in Europe. The causative organism was first isolated by Twort in 1910.

Johne's Committee

Originally, the Johne's committee of the USAHA was a subcommittee of the Tuberculosis committee until 1986. At the 1986 USAHA meeting in Louisville, KY, Morrie Craig, chair of the Johne's subcommittee recommended the formation of a Johne's committee. This action was approved by the USAHA Executive committee. In October 1987, the first meeting of the Johne's committee as a standing committee of the USAHA was held in Salt Lake City, UT, October 1987, chaired by Sarah Hurley. With recognition of Johne's disease as an important disease affecting livestock, several states including New York, Pennsylvania and Wisconsin began to develop their own Johne's programs. In 1988, the Johne's committee outlined 8 goals, which included the development of uniform diagnostic techniques and the need for a national control and certification program. Subcommittees of the Johne's committee, first formed in 1990, included: standardized fecal culture method, serological test standardization, management recommendations, herd certification and quality control for fecal cultures. The original Johne's herd certification program was developed under the
leadership of Diana Whipple while she was Co-Chair of the Johne’s Committee from 1990 to 1993. Bill Rottenberger and Chris Rossiter served as chair and Co-chair of the Johne’s committee respectively from 1996 to 1999.

**National Johne’s Working Group Is Established**

In October 1994, the formation of the NJWG was approved by the Johne’s Committee of the USAHA in October 1994. During a meeting of the USAHA executive committee in Washington, DC on February 28, 1995 the Co-chairs were appointed by the USAHA President, Wes Towers. The Co-Chairs were John B. Adams, representing the National Milk Producers Federation, Gary Weber, representing the National Cattleman’s Beef Association and Robert H. Whitlock representing the Johne’s Committee of the USAHA. The initial task force membership included 26 individuals representing a broad range of perspectives and constituent groups; including the USDA, breed organizations, Universities, extension services, the AVMA and commodity groups. The 40 constituent groups, associations and corporations represented are listed in Table 1. Currently, 60 individuals are listed as voting members of the NJWG with 24 corresponding members including the officers of the USAHA. Membership in the NJWG requires membership in the USAHA and submission of a letter of intent to participate in the activities of the NJWG to Robert Whitlock, Co-chair of the working group.

On April 4, 1995, the first meeting of the NJWG was held in conjunction with the annual meeting of the National Livestock Conservation Institute in Kansas City, Missouri. Since that first meeting, the NJWG has held additional meetings, all in association with other organizations. The NJWG meets annually, each October at the time of the USAHA meeting and annually at the National Institute of Animal Agriculture, formerly the Livestock Conservation Institute. Additional meetings have been held with the American Veterinary Medical Association (3), The National Cattlemans Beef Association (1) and the International Association of Paratuberculosis in Madison, WI in 1996. Since the initial meeting in St Louis, attendance has grown from 30 to 125 persons attending the latest meeting in Birmingham, AL.

At the annual meeting of the USAHA held in Reno, NV, October 1995 objectives for the NJWG were approved by the Johne’s Committee and are listed along with the mission statement for the NJWG in Table 2. In an effort to successfully reach the objectives listed subcommittees were formed. Initially, subcommittees for research, laboratory diagnostics, state Johne’s programs and economics were formed as they were perceived as being fundamental to making progress with Johne’s Disease. Additional subcommittees were formed later to address specific issues concerning the Johne’s Disease effort. A complete listing of all subcommittees with their chairpersons are listed in Table 3.
Education Subcommittee

Lack of a full understanding about Johne's Disease by producers, veterinarians, and agricultural leaders necessitated the formation of an Educational Subcommittee to develop new informational materials about Johne's Disease and implement an educational effort. Although many individuals have contributed significantly to this effort, three individuals need to be recognized for their leadership in this area. Gary Weber of the National Cattlemen's Beef Association facilitated the development of an excellent review about Johne's Disease. This was directed to the beef producer, but appropriate for others that desire more information about Johne's Disease. In April, 1998, 50,000 copies were printed and distributed with a second printing of 50,000 copies in October, 1999. This excellent brochure entitled "Johne's Disease, Should you be concerned?" is available at www.beef.org or 303-694-0305.

Chris Rossiter and Don Hansen, Co-Chairs of the Education Subcommittee for several years, have given an enormous amount of energy and talent to organize and produce many informational pamphlets on Johne's Disease. Two booklets that stand out are: "Johne's Disease: A Plan for Pathogen Reduction", one for dairy and another for beef herds. Additionally, they have written a series of over ten articles discussing specific aspects of Johne's Disease for 5,932 plus members of the American Association of Bovine Practitioners. These articles are available at the AABP web site: aabp.org. Many other individuals, organizations and writers have and continue to contribute articles about Johne's Disease.

Economics Subcommittee

The objectives for the Economics Subcommittee were clearly outlined at the time the committee was formed. Ken Olson, chair of the Economics Subcommittee, has consistently updated the NJWG about economic issues at each meeting. Members of the NJWG, especially the Economics Subcommittee worked closely with Scott Wells (coordinator for the '96 Dairy NAMHS survey) and the Center for Epidemiology & Animal Health staff to help design the Dairy '96 NAHMS study with emphasis on Johne's Disease. This study report provided new information about the prevalence, economics, management practices, and general awareness about Johne's disease in dairy cattle. In herds where 10% of the cull cows had clinical evidence of Johne's Disease, the economic loss was estimated at $245 per cow. The total loss to the dairy industry attributable to Johne's Disease was estimated to exceed $200 million per year.

The quantitative data gathered about Johne's Disease from the '96 NAHMS study helped raise awareness within both the dairy industry and the veterinary profession recognize a serious problem exists. There was an ongoing awareness among stakeholders that additional resources needed to be directed toward better diagnostic testing and a greater emphasis placed on controlling the disease at the farm level.
The Research Subcommittee has focused on establishing priorities for research. Judy Stabel, as chair of the Research Subcommittee, has kept the NJWG abreast of new diagnostic developments including the "Tip-Test" and new antigens being developed for the ELISA test such as the a362 and the p35 antigens. Updates from ongoing Johne's research included the results of milk pasteurization studies done in four different sites; USDA/ARS University of Wisconsin, University of Georgia and Rhode Island were reviewed. A critical review of pasteurization studies resulted in a letter from Joseph Smucker of the FDA dated Feb 9, 1998. The letter stated "After a review of the available literature on this subject, it is the position of FDA that the latest research shows conclusively that commercial pasteurization does indeed eliminate this hazard." Recently, the International Dairy Federation has formed a task force to consult and collaborate on the issue of \textit{M. paratuberculosis} and pasteurization. That report is due to be released in January, 2001.

During the AVMA meeting of the NJWG in July 1996, Dr. Herbert Van Kruiningen, of the University of CT and Dr. David Graham, of Baylor Medical School provided a detailed discussion about the issues surrounding a possible relationship between paratuberculosis and Crohn's Disease. Dr. Graham, a leading human gastroenterologist, strongly advocates a causal relationship between the two diseases and has conducted therapeutic trials in people with Crohn's Disease. Dr. Van Kruiningen, with both a veterinary degree and the MD degree, served as major professor for Rod Chiodini. Dr. Chiodini provided several of the first publications implicating a causal relationship between Crohn's and Johne's Disease. One major benefit of the debate between Graham and Van Kruiningen was a published manuscript outlining the lack of support for a common etiology for both diseases by Van Kruiningen.

On December 14, 1998, the National Institute of Allergy and Infectious Diseases held an International workshop in Bethesda, MD on "Crohn's Disease-Is there an Infectious Etiology?". The conference reviewed the current state of knowledge relevant to a microbial etiology of Crohn's Disease with specific reference to \textit{M. paratuberculosis}. A 33 page report was prepared which is available from the NIAA website.

The name of the Research committee will be changed to "Research Advisory committee for the NJWG and the Johne's committee" to reflect the added responsibilities expected of the group. The committee will be asked to provide their expert opinion about a variety of issues including the development of guidelines for use of Johne's vaccine in cattle herds.

\textbf{Certification Program leads to a Johne's Status Program}

In 1993, a task force of the Johne's Disease committee of the USAHA developed guidelines for a National Johne's Herd Certification program for cattle. These guidelines were proffered in response to several states that
had developed both control and herd certification programs and in response to resolutions passed by agricultural industry leaders such as the Livestock Conservation Institute, 1990\textsuperscript{10}. Several states including: New York, Ohio, Pennsylvania, Maryland, New Jersey and Wisconsin had implemented some type of Johne’s Certification program. The National program was based on alternative year testing by either ELISA or fecal culture\textsuperscript{23}. This replaced several earlier state programs based entirely on annual fecal culture. Although the new certification program was scientifically sound, it attracted less than an estimated 600 herds in total to participate from all states over a period of four years. Consequently in 1997, the NJWG appointed a committee to develop a more affordable and flexible, yet scientifically sound Johne’s herd certification program. The program must be voluntary, provide for flexibility for the owners to remain at any level, and cost less than the 1993 certification program.

This committee, chaired by Leslie Bulaga, USDA, APHIS and Mike Collins, of the University of Wisconsin, held two major meetings in Riverdale, MD to develop the new Johne’s program, called the "U. S. Voluntary Johne’s Disease Herd Status Program for Cattle" (VJDHSP\textsuperscript{1}). The Status program is based on herd level diagnostics, not individual animal diagnostic criteria. With Mike Collin’s previous experience in Holland and the Dutch Johne’s program along with the collective wisdom of the committee members, a scientifically sound step-wise program with increasing likelihood of freedom from Johne’s disease was designed and accepted by the Johne’s Committee. This program was endorsed by the USAHA in 1998 in Minneapolis, MN and now serves as the foundation program for Johne’s disease in the United States\textsuperscript{1}.

Program for Infected Herds

The VJDHSP program focused entirely on Johne’s test negative herds with no consideration given for infected herds. To assist states, herd veterinarians, and producers dealing with Johne’s Disease, a new committee was charged to develop a program for Johne’s infected herds. This committee, also chaired by Leslie Bulaga, developed recommendations for cattle herds with Johne’s Disease that were approved by the USAHA in 1999. This document, entitled “Minimum Recommendations for Administering and Instituting State Voluntary Johne’s Disease Programs for Cattle” is found in the 1999 Johne’s Committee report\textsuperscript{27}. The report outlines the responsibilities of the State Johne’s Advisory Committee. These State Committee are playing an important role in developing and promoting a Johne’s control program in their respective states.

State Programs Subcommittee

One function of the State Programs Subcommittee is to collate information from the states concerning progress being made to implement various Johne’s programs. This included states that have implemented the
original certification program now called the Status Program, established Johne's Advisory Committees, and review Johne's vaccination guidelines among other parameters². Monthly conference calls inviting each state veterinarian to discuss Johne's issues important to them and their staff was initiated on Monday, November 16, 1998 by Bill Buisch and continue under the leadership of Mike Carter, the USDA National Johne's Coordinator. Typically these conference phone calls involve 30 to 60 persons and last an hour. Discussion covers such topics as educational materials, confidentiality issues, status of herd testing, funding for Johne's programs and the VJDHSPC. Currently more than 21 states have implemented the VJDHSPC and other states are in the process. Some of the issues that are impeding progress with Johne's Disease programs at the state level include: lack of funds, testing accuracy, lack of interest, confidentiality issues for the positive herd, and fear of a "blacklist" being developed.

Laboratory Subcommittee
The necessity to have laboratories approved to conduct both Johne's ELISA and Johne's fecal cultures was recognized early by the Johne's Committee. This was supported by repeated USAHA resolutions (1985, 1992, 1993, 1994) to encourage the USDA/APHIS to conduct annual check tests. The first national Johne's check tests were conducted in 1996 when 23 laboratories participated in the fecal culture and 16 labs in the ELISA check tests. Each year those laboratories that pass the check tests are listed in the proceedings of the USAHA Johne's Committee report and on the USAHA web site: www.usaha.org

As states continue to implement a Johne's control program, the importance of a test negative herd status should increase as herd owners purchase test negative heifer replacements. The credibility of the negative herd status will by necessity rest with the laboratory conducting the testing, usually the state diagnostic laboratory. Therefore, the national check tests will be critical to the final success of the program. A tabulated summary of the check tests are shown in Table 4.

Johne's Symposium October 1998 in Minneapolis, MN.
On October 6, 1998 in Minneapolis, MN, a Johne's Disease Symposium, sponsored by BD-BIOSCIENCES and CSL Limited was held in place of the regularly scheduled Johne's Committee meeting. During the Symposium more than 23 speakers presented material concerning all aspects of Johne's Disease, including the position of various industry groups to the proposed Status Program and the legal aspects of Johne's Disease. Most presenters prepared a written contribution which was included in the Symposium notebook distributed to each person in attendance. A short synopsis is listed in the Johne's Committee report for 1998¹⁷.
Council for Agriculture, Science & Technology (CAST)

CAST is a non-profit organization composed of 38 scientific societies in addition to many individual, student, company, nonprofit and associate society members. CAST was established in 1972 as a result of a 1970 meeting sponsored by the National Academy of Sciences, National Research Council. The mission of CAST is to identify food and fiber, environmental, and other agricultural issues and to interpret related scientific research information for legislators, regulators, and the media for use in public policy decision making. Johne’s Disease has recently been identified by CAST as an important disease for which an issue paper is being developed and should be available in early 2001. The paper will discuss diagnostic inadequacies, lack of an effective vaccine, regulatory deficiencies and the potential link to Crohn’s Disease.

National Research Council (NRC) of the National Academy of Sciences (NAS)

Over the past two years, the NRC has sought and received partial funding for the $233,000 study of Johne’s Disease. This study will require an estimated two years according to David Meeker, who will serve as the coordinator for this project. The identified objectives include: (1) Review of diagnostic techniques, mode of transmission, clinical expression, global prevalence, and potential animal and human health implications. (2) Evaluate programs to control and prevent Johne’s Disease. (3) Provide policy recommendations on identification, monitoring, and management strategies. (4) Conduct an objective critical assessment and summarize the state of knowledge regarding the relationship of Johne’s Disease in ruminants and Crohn’s disease in humans. (5) Provide recommendations of future research priorities and potential mechanisms to facilitate the prevention and control of the disease.

Western States Dairymen Proposal for Johne’s Disease

At the April meeting of the NJWG with NIAA in Corpus Christi, TX, a spokesman for the Western States Dairymen Trade Association shared their concerns about Johne’s Disease and their interest in developing an aggressive program to reduce the prevalence of Johne’s Disease in dairy cattle. This group had recognized Johne’s Disease as a serious threat to their industry for a variety of reasons, including the direct economic losses but also the possible public relations issues. Members of the Western States Dairymen group first met with members of the NJWG in Chicago on July 9-10, 2000 to discuss an indemnification program for Johne’s Disease in dairy cattle. During this meeting a draft dairy indemnity program for Johne’s infected cattle was outlined. Several elements of the program included: (1) the herd owner must have a written bio-security plan in place to reduce transmission of infectious diseases, specifically Johne’s Disease. (2) In order for the herd veterinarian to design and develop a Johne’s herd plan,
the veterinarian must have additional special training as approved by the state Johne's Epidemiologist. (3) The herd owner would be required to pay for the Johne's herd biosecurity plan. (4) Costs of Johne's testing and sample acquisition would be paid for by the US government. (5) Cattle confirmed as test positive by an organism based test would be eligible for a government indemnity payment (estimated $950) when sent to slaughter.

In October 2000, the Western States Dairyman met again with the NJWG during the USAHA meeting in Birmingham, AL. Although not able to incorporate the indemnity plan into ongoing legislation during the fall of 2000, the dairymen and the NJWG continue to refine the proposed program with the intent to include an indemnity plan in the next US five year farm bill.

Overall Accomplishments of the NJWG:
1. Greater awareness of Johne's Disease by producers, regulatory officials, veterinarians and the general public. The increased level of awareness and knowledge about Johne's Disease is due in large part to the massive educational efforts by many members of the NJWG, especially the Education Subcommittee.

2. Development and implementation of the VJDHSPC "Status" program for cattle. This voluntary, user friendly, flexible program now serves as a national model for states to follow. To date more than 21 states have adopted the Status program with many others planning adoption in the near future.

3. Annual check tests for Johne's ELISA and fecal culture by the USDA/NVSL have been conducted annually since 1996. This past year 41 laboratories participated in the fecal culture check test and 63 in the Johne's ELISA check test. See table 4 for annual participation in the check tests.

4. Established guideline recommendations for states to develop programs for cattle herds with Johne's Disease. This document outlines functions for the state Johne's Advisory committees, optional programs for Johne's infected herds, educational programs, and testing issues.

5. National Johne's Coordinator position established and filled by Michael Carter, DVM, MS in April, 2000. His office is in Riverdale, MD. Resolutions from the NJWG supporting this position had been passed in 1997 (#14) and 1999 (#38). The NJWG anticipates that Michael Carter will significantly facilitate implementation of both the Status and the State programs.

6. Increased funding for Johne's Disease programs at both the National and state levels has resulted from increased awareness about the economic importance of Johne's disease and the potential public health concerns. Several states legislatures, including Ohio, Minnesota, New York, Pennsylvania, New Jersey, North Carolina, Wisconsin, and Iowa have approved increased funding for Johne's Disease. At the National level, the US Congress has approved nearly $2.5 million for Johne's Diseases programs at USDA/APHIS over the past two years. One individual who stands out for his efforts to "facilitate" this increased funding is John Adams, Co-
NATIONAL JOHNE'S WORKING GROUP (NJWG): FIVE YEAR REVIEW WITH PATH FORWARD

chair of the NJWG. Recently, three additional competitive grants on Johne’s Disease totalling nearly $1 million were approved and funded by NRI. NJWG members at all levels helped make this possible by their educational efforts to help producers and veterinarians become more aware of the importance of this disease for which there is no cure, no treatment and only a poor vaccine which does not prevent infection.

7. Representatives of more than 40 organizations serve as dedicated volunteer members of the National Johne’s Working Group. They who have given of their time and talents to facilitate the progress to where the NJWG is today deserve enormous credit. Each organization they represent has provided funds for travel and per diem to attend many of the 17 NJWG meetings held since April 1995. If we estimate the average meeting attendance as 40 persons (an underestimate) multiply 17 meetings equals a total of 680 person-meetings times with an estimated cost to attend one meeting of $1,000, yields $680,000. This represents a significant contribution by the volunteers and the organizations each person represents.

NJWG Path Forward—Short Term Objectives (7)

To discern NJWG members about establishing priorities for the Working Group, a questionnaire was sent out to nearly 85 persons on the NJWG mailing list including officers of the USAHA in mid-September 2000. The responses received from 35 persons when tabulated resulted in the prioritized list shown in Table 5. Educational issues remained the highest priority with determination of economic value for herds participating in the herd status program. Concerns about serological issues, especially false positives and quality control issues ranked # 3 with the necessity to re-establish research (both applied and basic) priorities as fourth.

The short term objectives include:

1. A CD disk that contains many reference materials, slide sets, and educational materials on Johne’s Disease. Funds have been identified to support this effort and Charlie Elrod has agreed to coordinate the project to make this happen within the next year.

2. Johne’s ELISA quality control sera provided by NVSL will be required on each Johne’s ELISA plate run in every check test “approved” laboratory. Producers, veterinarians and regulatory officials need to have confidence in both the ELISA and fecal test results. Some producers and veterinarians question the Johne’s ELISA results when several positives occur in herds with a low probability for infection. A greater level of confidence would result if standard quality control sera that was monitored regularly from all Johne’s testing laboratories across the country. Richard Jacobson of Cornell University, chairs the Quality Control committee to facilitate implementation of this plan.

3. Quality control specimens for Johne’s fecal cultures need to be part of the check test approval. The QC samples would be used to monitor both
media quality and sample processing technique. These samples would be provided by NVSL and included with herd samples to serve as QC samples for the culture technique. This would be require as one component of being an approved laboratory.

4. Certificates of Veterinary Inspection (CVI, also known as Health Certificates) continue to cause concern among practicing veterinarians. Requests to sign CVI's for cattle coming from a herd known to have Johne's infection, when the individual cattle may be Johne's test negative are particularly troublesome. What type of risk associated with signing CVI's? Fortunately, Larry Williams, State Veterinarian from Nebraska has agreed to work with Michael Carter and other members of the CVI subcommittee to address these issues.

5. Vaccination for Johne's Disease has not received much emphasis in the past 15 years with few scientists recommending it's use only in heavily infected herds. Clearly the vaccine does not prevent infection, nor does it eliminate shedding of *M. paratuberculosis* in the digestive tract. However, most people do accept the fact that Johne's vaccination does markedly reduce the occurrence of clinical signs of weight loss and diarrhea in infected cattle. Since one of the major economic losses attributable to Johne's Disease is reduced lifetime milk production due to premature culling, vaccination may be warranted in more herds than currently recommended. Clearly the usage Johne's vaccine for infected herds requires further evaluation with the development of guidelines for its recommended use.

6. Despite the increased visibility and awareness of Johne's Disease nationally, very USDA competitive funding has been awarded to research projects on Johne's Disease. For several years only one funded grant on Johne's disease was awarded nationally by CREES. Precious little funding has been made available that is directed toward applied or field research. Questions such as "How many years are required to eradicate Johne's from an infected herd?" or "What are the economic benefits to a producer to have a status level 4 herd?" or "What factors determine when an infected cow will shed detectable organisms?" are unknown, yet cry out for answers.

7. National "Program Standards" are needed for states to work with infected herds in a coordinated manner. Currently the NJWG has developed guidelines for state Johne's advisory committees, but no clear guidelines exist about the optimum recommendations for infected herds.

**Mid-Term Objectives for the NJWG**

1. Indemnity program for dairy cattle. The Western States Dairymen and National Milk Producers Federation have come together to encourage development of an indemnity plan for dairy herds, but at this time no single plan has been developed. Many questions exist: "Will producers enroll in a voluntary indemnity program?" "On the basis of what test will indemnity be paid to the producer?" "How should test positive cattle be identified? How
should test positive cattle be disposed?"

2. "Approved" Johne's serologic tests for small ruminants. Some small ruminant groups have already encouraged State Johne's Advisory committees, such as Ohio, to develop “Status" or certification programs for goats. NVSL has indicated a willingness to assist with this effort, but at this time no ELISA test has been developed specifically for sheep or goats.

3. Funding for Diagnostic Laboratory infrastructure. As the requests for more organism based testing increases, state laboratory capacity for culturing and or PCR testing will require significant new funding for centrifuges, incubators, thermal cyclers and automated equipment for liquid media systems. These costs are significant and will reach millions of dollars.

4. National web site (APHIS) listing all status herds in the United States. At this point in time, APHIS has indicated they will provide a web site for this purpose and will hire staff to facilitate its development. The challenge here will be for the individual states to provide the data concerning herd identification, status level, etc. to the central site where it will be made available to the general public. The web site would serve as a significant resource for producers seeking to purchase cattle as herd replacements or for herd expansion purposes that are at low risk for Johne's Disease.

5. Defined Training Program for State Johne's Disease Epidemiologist. The necessity for a well defined comprehensive training program for each State Johne's Disease Epidemiologist is seen as a prerequisite for training herd veterinarians in the techniques of developing a herd biosecurity plan for producers. In order to be reputable and effective it will be incumbent on USDA/APHIS-CEAH to develop a credible training program. The Education Subcommittee has been charged with developing these guidelines which will require a significant effort. Training must be of high caliber to convince practicing veterinarians and producers that the state Epidemiologists have the expertise and background to give the guidance necessary for building truly effective herd biosecurity plans.

6. Funds for applied research in Johne's Disease have been lacking for many years. Both state and national governments with producer groups will need to respond to the many practical questions facing the producer and local veterinarian on a daily basis.

7. A coordinated approach to Johne's Research is needed, since what precious resources exist should not be expended on the same type of research efforts by several groups. One example is the continued use of serologic surveys to estimate the prevalence of Johne's disease in various groups of cattle in different regions of the country. Is this the best use of limited funds?

Longer Term Objectives for the NJWG

1. Perhaps an indemnity program for beef cattle will need to be developed when and if a dairy indemnity plan for Johne's Disease is developed. As more producers become comfortable with voluntary incentive programs
that emphasize risk assessment and biosecurity as the basis for Johne's herd plans, eventually producers may decide that greater incentives should accompany an eradication program. More than two decades will likely elapse before a comprehensive eradication effort is initiated.

2. An "Approved" Johne's serologic test for camelids is currently of interest to camelid owners since the individual value of alpacas or llamas is high. However, the cost of the development of an ELISA test for the relatively small market is unlikely to warrant a commercial company expense.

3. "Status" or "Test Negative" programs for other ruminants, such as cervidae and camels, is most likely several years away and of lower priority for funding from the government. However, if the respective breed organizations develop an interest in test negative programs for certification, then funding may become available from the producers themselves. With the estimated low prevalence of JD in camels, a test negative status may be possible in the near future. In the case of cervidae which are very susceptible and perceived to have a significance occurrence of the disease, a test negative program may be more challenging.

4. Although a distant goal, increased premiums for milk and meat from animals at low risk for Johne's disease (Status herds) needs to be addressed at some point. Achieving this objective will depend on the results of investigations focused on the role of *M. paratuberculosis* and Crohn's disease in humans.

5. An eradication program for Johne's Disease from the national herd seems several decades away. However, if a definitive relationship between MAP and Crohn's is proven in the near future, an eradication program could begin much sooner.

References:
21. Van Kruiningen HJ. (1999): Lack of support for a common etiology in Johne’s Disease of animals and Crohn’s Disease in humans. Inflammatory Bowel Diseases 5:183-191
Mission Statement:

The National Johne’s Working Group (NJWG) will serve as a resource for animal agriculture in assessing any potential association between Johne’s and human health. Recognizing that Johne’s disease has major economic implications for producers, the NJWG will develop and coordinate implementation of a National Johne’s program. This program will be designed to protect the public and animal health, reduce the economic burden upon producers and bring about a uniform approach for control, herd certification, and eventual eradication of this insidious and costly disease in the United States. Approved by the NJWG meeting on April 9, 1996, in Colorado Springs, CO.

Objectives:

1. NJWG will evaluate information suggesting *M. paratuberculosis* is a zoonotic pathogen and assess the likelihood that animals serve as a reservoir of infection.
2. NJWG will evaluate the potential for the organism to contaminate foods of animal origin.
3. NJWG will identify and encourage research needed develop a strategy for a control and herd certification program.
4. NJWG will evaluate the domestic and international economic impacts of Johne’s disease and develop recommendations for updating currently suggested good management practices which can be employed by producers to prevent entry and spread of the infection in livestock populations.
5. NJWG will develop a set of policy objectives and goals to enhance development and implementation of the strategy for a Johne’s disease control and herd certification program.

Passed by Johne’s Committee USAHA, 1995

Table 2.

Sub-committees of the National Johne’s Working Group.

Initially four sub-committees of the NJWG were formed which included:

1. Economic Impact of Paratuberculosis, chaired by Ken Olson
2. State Control Programs for Johne’s Disease, chaired by Mitch Essey, then by Bill Buisch & Mike Carter
NATIONAL JOHNE’S WORKING GROUP (NJWG):
FIVE YEAR REVIEW WITH PATH FORWARD

4. Laboratory Diagnostic Issues, chaired by Joan Arnold, followed by Janet Payeur.

Subsequently, the subcommittees were expanded to include other areas:
5. Education, chaired by Gary Weber, followed by Don Hansen,
6. Small Ruminants, co-chaired by Sue Stehman and Bill Shulaw.
7. Certification, co-chaired by Leslie Bulaga and Mike Collins
8. Strategic Planning Committee, chaired by John Adams
9. Serology QC, chaired by Richard Jacobson
10. Validation of Check Tests, chaired by Ray Sweeney
11. Certificate of Veterinary Inspection (Health Certificate), chaired by Larry Williams
12. Treasurer, Ken Olson

Table 3. National Johne's Working Group Constituent Groups.

Agencies and Associations represented by Membership in the NJWG:
(40 Allied groups, organizations and corporations)

- American Association of Bovine Practitioners
- American Association on Veterinary Laboratory Diagnosticians
- American Sheep Industry
- American Veterinary Medical Association
- American Farm Bureau
- California Dept of Food & Agriculture
- Holstein Association
- National Cattlemen’s Beef Association
- National Institute of Animal Agriculture
- National Milk Producers Federation
- North American Elk Association
- Small Ruminants Association
- State Veterinarians
- USDA-National Programs Staff
- USDA/APHIS/NVSL
- USDA/APHIS/VS/NAHMS
- USDA/ARS
- United States Animal Health Association
- Universities: Colorado State, Connecticut, Cornell, Iowa State, Minnesota, Missouri, Oregon State, Ohio, Pennsylvania, Rutgers, Texas A & M, Wisconsin
- Extension Service

414
WHITLOCK, ADAMS, WEBER

Companies/Corporations:
Allied Monitor
BD BIOSCIENCES
BIOCOR Animal Health
Bio-Star Research
IDEXX Corp
ImmunCell
Trek Diagnostics
Pharmacea-Upjohn

Table 4.
National Johne's Check Tests, Laboratory Participation*

<table>
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<th>Year</th>
<th>Fecal Culture Test</th>
<th>ELISA Test</th>
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<td>5</td>
</tr>
<tr>
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<tr>
<td>2000</td>
<td>41</td>
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*Data obtained from Committee on Johne's Disease reports in USAHA proceedings.

Table 5.
Listing of issues prioritized by the National Johne's Working Group, information obtained by mail ballot in September 2000.

Rank score, lowest number, greatest concern
1-89 Educational issues for producers
2-103 Economic incentives for testing and determination of value added benefit for Status herds
3-110 Serology issues, false positive ELISA and QC issues
4-129 Research Priorities identified, basic and applied
5-133 APHIS priorities for Johne's Disease identified
6-167 Paratuberculosis related to Crohn's disease issues
7-173 Replacement heifers, sources, web site, etc
8-175 Health Certificate Issues for the herd veterinarian
9-194 Beef herd issues, epidemiology, risk factors, control issues
10-199 Vaccine usage in heavily infected herds
11-201 Strategies for state legislature to obtain funding
12-202 NAHMS study for next Beef and Dairy survey
13-218 State confidentiality laws
REPORT OF THE COMMITTEE ON LIVESTOCK IDENTIFICATION

Chairman: Dr. John Hunt, MO
Vice-Chair: Kevin Maher, IA

Dr. David T. Bechtol, TX; Dr. Jerry J. Bohlender, CO; Dr. Robert L. Brewer, VA; Dr. Donald R. Bridgewater, CO; Dr. Mitchell A. Essey, CO; Ms. J. Amelita Facchiano-Donald, TX; Mr. Jim Fraley, IL; Dr. Steven L. Halstead, MI; Mr. Neil Hammerschmidt, VT; Dr. E. Ray Hinshaw, AZ; Mr. Joe N. Huff, CO; Mr. Ralph D. Jones, SD; Dr. Susan Keller, ND; Dr. Maxwell A. Lea, Jr., LA; Mr. James W. Leafstedt, SD; Dr. Jim Logan, WY; Dr. Harless A. McDaniel, MD; Mr. Terry R. Menlove, UT; Mr. Richard E. Nelson, VT; Dr. Kenneth E. Olson, IL; Dr. Thomas W. Riley, IN; Ms. Nancy J. Robinson, MO; Dr. E. C. Roukema, VA; Dr. Gary L. Seawright, NM; Mr. J. Malcolm Shelton, IV, TX; Mr. J. Gary Shoun, CO; Mr. Gary Simpson, CO; Mr. Daniel J. Vitiello, VA; Mr. John F. Wortman, Jr., NM.

Agenda:

1999 Report Summary
Neil Hammerschmidt, Holstein Association-FAIR
Dr. John Weimers, USDA/APHIS/VS-Identification Issues
(Canadian Update was not presented)
Dr. Paul Sunberg, NPPC, Port Industry Update
Diane Sutton, USDA/PAHIS/VS
John Todd-Rollins Ranches
Mike John –MFA
Van Neidig-APIES Corp.
Terry Menlove-International Livestock Identification Association
O.I.E. Technical Bulletin
New Business

National Farm Animal Identification (F.A.I.R)
By Neil Hammerschmidt, F.A.I.R. Coordinator

The National Farm Animal Identification and Records pilot project is in its third year of development. The collaborative project of members of the Council on Dairy Cattle Breeding is funded in part through a cooperative agreement with USDA, APHIS, VS and is coordinated by the Holstein Association.

Objectives:

Develop a model for a National Animal ID program that unifies animal identification programs and links animal recording systems that meets needs of the various segments of the industry. In addition to identification sys-
tems and methods, issues of electronic data flow, database administration and accessibility will be established. The project will design and test methods to track animals from farm to farm, farm to market, and market to slaughter.

The pilot demonstration has primarily been established in several of the key dairy states, including New York, Pennsylvania, Wisconsin and California.

The model has been built upon three key components of a national program; those being numbering systems for both animals and premises, identification methods and the information system.

The project has evolved into two phases, each with its benefit to a national system.

Phase 1: provides a system to provide immediate determination of an animal's origin

Phase 2: provides for the tracking of animals from various production points

**Numbering Systems**

**Premises (Location) Numbers**

The premises numbers that are associated with the location of a production unit are provided by the state departments of agriculture. For example, NY 31046. These numbers are used in F.A.I.R. to provide the origin of an animal as well as the potential of tracking of animal movement.

**American ID Number**

The American ID numbering system, or social security-like numbering system for cattle, is being used in the F.A.I.R. project. Unlike previous numbering system in the United States, this number does not reflect any meaning. That is, the number does not reflect vaccinations administered to the animal, its registry status, sex, etc.

American ID, similar to national number systems throughout the world, is defined as:

- **Country Code** : alpha 3 characters
- **ID Number** : alphanumeric 12 characters

This number, which is printed on the ID Tags provides a unique number for the animal throughout the entire world.

**Identification Methods**

**Visible ID Tags**

Providing identification tags that meet the needs of day-to-day herd management has been given priority. This is accomplished by allowing the herd owner to select the size, color and most importantly, their herd management numbers they need for future newborn calves. One-time use,
often referred to as "tamperproof" tags are used in the F.A.I.R. project.

When a producer orders tags the next available American ID numbers are allocated to each herd management number. The F.A.I.R. system then allocates the next available American ID numbers to each tag. The database maintains a record of what premises each American ID number was allocated to. This provides the mechanism to establish an animal point of origin.

**Electronic ID**

- **Radio Frequency Identification (RFID)**

  RFID technology is the primary form of electronic identification used in the National F.A.I.R. project. RFID Tags when used, are used in combination with visible ID Tags. In such cases, the tags are "packaged" together to provide a cross reference of the EID code with the animal's American ID number. Ear Tag RFID transponders are attached to the animal with a similar tagger used with conventional ear tags.

**Information System**

The National F.A.I.R. relational database consists of 51 National F.A.I.R. tables with 89 support tables. The Informix relational database running on an HP-UX server is accessed via Java JDBC.

The relational database model is being developed to meet the requirements of the system, both short and long-term. This model is being tested and converted to a full-fledged physical database that will capture premises identification, animal identification and animal movement. With this data design, we can track a participating animal from the moment it was tagged to the moment it was slaughtered. All participating animals that come into contact with one or more animals within a specified time period can readily be determined.

The data will be updateable real time, using internal applications or Internet applications. The data will also be retrievable real-time on www.nationalfair.com.

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Dr. John Weimers, USDA/APHIS/VS – **Identification issues**

**Reason for ID system:**

Key traceback method in cattle is ID and is now half of what it was in 1990.

Blood testing is also going away in cows due to Brucellosis clean up. Rollover system of ID assignment within a herd is not adequate. Unique ID# is needed. Untraceable reactors = 80 in 1997 and 30 in 1999. This does not include suspects that are not found.

The rate of unfound animals in traceback cases of Brucellosis remains at 3%.
LIVESTOCK IDENTIFICATION

50% of submissions for Brucellosis are without ID.
Time and dollars required for tracebacks drags out disease control programs.
Of 1,062 residue cases, 165 untraceable due to inaccurate ID.
USDA – wants to be a partner in animal ID enable a system that is industry driven.
USDA will set standards for a national, recognizable numbering system for unique animal ID. Goal is to complete this task by summer of 2001.
They are looking at American ID # for the system. Advanced notice of proposed rule may occur before spring 2001.
For Federal rule making was
Three part –
First:
• American ID number allocator (keeper of the numbers via APHIS)
• Review process for applications from allocator.
• Issuance of ID blocks
• Breed assoc., AI companies, state departments of Ag., or anyone needing to allocate IDs can be administrator to their customers.
• They would submit application, receive approval and code, initial status is probationary, oversight board works with them for accuracy of the program administration, allocate block of #s, Identify each tag to the premises.
• Provide tags and educate users, make records of tags issued available to government.
Second:
Establish an oversight board, which receives application and recommendations for AIN Allocator, monitor AIN allocation, administer and recommend compliance action.
Third:
Premises ID-
States vary in their interpretation and implementation of a premise ID systems and APHIS wants to standardize the system. They are considering using FSA offices to administer ID program for states.
Fourth:
A list of basic information is needed to adequately trace the movement of animals.
Fifth:
Standards for the official use of EID devices in livestock.
Sixth:
Standards for electronic data messaging and data retrieval
REPORT OF THE COMMITTEE

Anticipate that after 3-4 years, many animal ID systems will be in place. USDA wants a mandatory system to be in place in the next few years.

Diane Sutton, USDA/APHIS/VS

Interstate movement requirements were proposed for interstate movement of sheep and goats. In January or February the final rule will be issued.

Recommend use of metal tags with serial alphanumeric number.
Premise based individual ID
Serial no. on front, country and state info. On the back.
Official premise tag will have government shield-approved by USDA for program.
Only require ID on goats for breeding purposes or those that are at risk due to commingling with scrapie-infected animals.

John Todd-Rollins Ranches

Owned by Rollins family
GA, FL, TX
8th largest cow/calf producer in US.
They have an arrangement with Excel and feed in TX panhandle
They use EID systems at the ranch and the feedlot.
5 years ago they started an intensive ID program.
All cattle have EID and are in computer program.
Cost of all components of their ID system is <$6/hd. They recouped cost in 1st year.

Training of personnel is most important-understanding why they should use EID.
Tag loss is <1/5 from calf to market and <2% in cows.
Now 95% of the data are collected within their cow calf system and 99% at the feedlot.
Herd assessment is done at pregcheck.
They have 3 registered breeding herds.
Rollins ranch has scoring system for carcass data for bull scoring and match it up to cow herd to evaluate bulls for carcass impact on the offspring.
They assess calves branding time and feedlot time and they project out weights of feedyard.
Weaning to slaughter is<1% of death rate.
Wean in June thru October
Cattle are scheduled to kill on specific day and time in Excel.
LIVESTOCK IDENTIFICATION

schedule is 6 months in advance. They are paid and receive carcass by 3rd day from plant.
  Carcass data is 99% accurate.
  Individual data is managed back to the herd.
  They maintain a 90-day breeding and calving window—they have 7-month marketing interval.
  Begin to iron out weak marketing times and delivery dates to retailer.
  Average $35-40 per head premium on the current grid.
  They will AI 10,000 cows next year to build similar genetic pool for the retail market.
  Yield grade goal 80% 1s and 2s.
  13.5% of calf crop were in the loss category (made <$30 profit/hd.)

Mike John—MFA

  MFA Health Track—Preconditioning Program.
  Statewide MFA has 250 Retail Outlets that represents half of Missouri’s 2mm cows.
  New Beef Industry—Choice/Select Spread is the highest it has been in history (Was $21 difference this year).
  Beef demand has improved for the first time in 20 years.
  He thinks we need to get away from live cattle price base.

  Consolidation/cooperation – source verification is important.

  Process verification—description—animal welfare, quality assurance, program integrity, cost reduction, better health and easier to feed are important.
  Added value—improved carcass quality, cost efficient pre-conditioning, reduce shrink, and known genetics.
  9,500 cattle have been marketed thru their program.
  15,000 tags were sent out thus far and only 200 red tags given out (for visual ID only).
  The have a specified feeding and vaccination program.
  “Mark of Quality” brand is the plan for the MFA program for beef qualify assurance and source verification.
  Dec. 5th 2000, they will have 2000 source verified calves at a sale in MO.
  They will manage sale results, utilize EID, create follow up analysis for customers and prove the value of participation.
  Strategy—Dr. Hunt’s Dept. is providing funding for tags, AAPIES Corp.
REPORT OF THE COMMITTEE

provides the database, chute side data entry, performance and carcass data retrieval, buyer demand, national ID system, provide record keeping service, eliminate keyed entry of data.

Dr. Paul Sunberg, NPPC, pork industry update

In July within the Federal Register a proposed rule was published for interstate movement within a swine production system. Comments are due by November 20th. This is not a replacement for the certificate of veterinary inspection – rather it is an alternative. It would be voluntary – it is an agreement between export, import state, veterinarian and producer.

ID-similar to now with addition of lot ID acceptable for pigs that are being shipped.

They would have to be part of this and certified by Vet that provides regular health maintenance for those pigs. Traceback is the requirement.

The number references producer shipper and state of destination contract.

Integrity of lot is up to the producer’s signature, verified by paper trail and up to scrutiny of import and export state.

Notifications may be transferred electronically.

Van Neidig-APIES Corp.

“There must be a system for EID to work.”

Traceability, accountability, and source verification is needed.

Components of a system include-EID transponder, reader and data repository (national and international with appropriate levels of security).

Temperature level sensing.

Cattle Trax is one program and they now have another-Cow Sense-which is on line

(3000 license copies with 250 active cows representing 5.3 progeny/cow).

Examples of successful use of central data repository:

MO electronic animal tracking (MEAT)
Cow Sense on line
MO 4-H carcass data project.
TN Cattleman
SEMEX US/Canada
Grand Labs

Terry Menlove-International Livestock ID Association

15 years in Utah Department of Agriculture focused on cattle ID and brands (28,000 registered brands).

Hot iron brands are not useful when it comes to integration.
ILID encourages and supports the EID for animals when practical and cost effective and on a voluntary basis.

The job is how to interface electronic ID with hot iron brand.

Dr. Harless McDaniel:

Working on technical bulletin as an editor for an OIE document for tracing animals and animal products. Purpose—to show information is available for the most remote to the most sophisticated countries.

Business meeting:

Harless McDaniel suggested the ID committee form a working group to allow government to help industry toward a system of animal identification.

Dr. Larry Williams discussed that there are two camps: regulatory and herd management. He is worried about the voluntary program being turned into a mandatory government program, as NE has been promoting a voluntary program.

Neil expressed the fact that the American ID system is simply a numbering system and can be shared among elements of the industry and should not be confused with a mandatory system.

Dr. Healey stated that NCBA does not support mandatory animal identification.

A resolution discussing hosting a meeting with the USAHA Food Safety Committee and the USAHA Information Systems Committee was passed for Executive Committee consideration.

Meeting adjourned at 12:28 p.m.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON NOMINATIONS AND RESOLUTIONS

Chairman: Dr. Richard H. McCapes

Dr. J. Lee Alley, AL; Dr. Jones W. Bryan, SC; Dr. Andrew A. Clark, OR; Mr. Joe B. Finley, TX; Dr. R. David Glauser, OH; Dr. Burke Healey, OK; Dr. Jeffry J. Huse, NY; Ms. Amy W. Mann, VA; Dr. Michael R. Marshall, UT; Dr. H. Wesley Towers, DE; Dr. Larry L. Williams, NE.

PRESIDENT ............................................................. B. R. Hillman, Idaho
PRESIDENT-ELECT ........................................... H. M. Chaddock, Michigan
FIRST VICE-PRESIDENT ......................................... M. Lea, Louisiana
SECOND VICE-PRESIDENT ................................. R. E. Frost, California
THIRD VICE-PRESIDENT ...................................... D. H. Lein, New York
TREASURER ...................................................... H. W. Towers, Delaware

REGIONAL DELEGATES

NORTHEAST ............................................. R. J. Eckroade, Pennsylvania
............................................................... V. P. LaBranche, Massachusetts
NORTHCENTRAL .............................................. C. W. Geary, Wisconsin
.................................................................. J. W. Leafstedt, South Dakota
SOUTH .............................................................. R. E. Good, Arkansas
........................................................................ M. S. Silberman, Georgia
WEST .................................................................... Pono Von Holt, Hawaii
........................................................................ C. W. Lum, Hawaii

RESOLUTION NUMBER: 1
SOURCE: Committee On Animal Health Information Systems
Committee On Bluetongue And Bovine Retroviruses
Committee On Brucellosis
Committee On Captive Wildlife And Alternative Livestock
Committee On Food Safety
Committee On Foreign Animal Diseases
Committee On Import/Export
Committee On Infectious Diseases Of Cattle, Bison And Lama
Committee On Infectious Diseases Of Horses
Committee On Johne's Diseases
Committee On Parasitic Diseases
Committee On Pharmaceuticals
Committee On Pseudorabies
Committee On Transmissible Diseases Of Poultry
Committee On Transmissible Diseases Of Swine
Committee On Tuberculosis
Committee On Wildlife Diseases
The United States Animal Health Association strongly supports the United States Department of Agriculture's Animal Plant Health Inspection Service (APHIS)-Agriculture Research Service (ARS) Master Plan for Facility Consolidation and Modernization of the APHIS National Veterinary Services Laboratories, the APHIS Center for Veterinary Biologics, and the ARS National Animal Disease Center and recommends the construction, equipping, operation and maintenance of the Ames, Iowa National Animal Health facilities depicted in the United States Department of Agriculture Master Plan. These facilities are essential to protect and ensure our nation's food safety and supply and its 120 billion dollar animal industries. A copy of this resolution shall be delivered to the Secretary of Agriculture, Congress, and the President of the United States of America.

RESOLUTION NUMBER: 2
SOURCE: Committee on Salmonella
SUBJECT MATTER: Phage Typing and Fingerprinting Isolates

The United States Animal Health Association requests that the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service phage type, as well as provide support for pulsed field gel fingerprinting of all isolates of S. typhimurium and S. enteritidis submitted to National Veterinary Services Laboratory.

RESOLUTION NUMBER: 3
SOURCE: Committee on Salmonella
SUBJECT MATTER: Take Steps to Relieve Shortage of Salmonella Serogrouping Sera
DATES: Birmingham, Alabama, October 19-26, 2000

The United States Animal Health Association recommends that the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service take steps to ensure that high quality Salmonella serogrouping sera are available to the animal health diagnostic laboratories in the United States.

RESOLUTION NUMBER: 4
SOURCE: Committee on Salmonella
SUBJECT MATTER: Development of Salmonella Monitoring and Response System

The United States Animal Health Association recommends that the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service provide at least a quarterly summary of serotyped Salmonella isolates to the respective submitting state agency.
REPORT OF THE COMMITTEE

which oversees animal health. This could allow states to monitor and detect clusters of animal salmonellosis cases and take appropriate actions to control disease spread if necessary. Currently, the sources of such information are inadequate to provide quarterly reports of Salmonella serotypes.

RESOLUTION NUMBER: 5
SOURCE: Committee on Salmonella Enteritidis In Eggs

The United States Animal Health Association urges the Food and Drug Administration (FDA) to recognize existing state egg quality assurance programs that meet the minimum requirements of the Egg Safety Action Plan, and establish an agreement with the cooperating state agency to administer the program. Under this agreement, FDA would recognize producers enrolled in an approved state program as meeting the requirements of federal regulations.

RESOLUTION NUMBER: 6
SOURCE: Committee on Infectious Diseases of Cattle, Bison and Lama
SUBJECT MATTER: Transmissible Spongiform Encephalopathy Surveillance

The United States Animal Health Association requests that the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service allocate specific funds for surveillance of bovine spongiform encephalopathy and other transmissible encephalopathies of animals.

RESOLUTION NUMBER: 7
SOURCE: Committee on Infectious Diseases of Cattle, Bison and Lama
SUBJECT MATTER: Sheep-Associated Malignant Catarrhal Fever

The United States Animal Health Association urges the United States Department of Agriculture, Agriculture Research Service to initiate a research program directed toward isolation of the sheep-associated MCF virus and eventual control of the disease.

RESOLUTION NUMBER: 8
SOURCE: Committee on Tuberculosis
SUBJECT MATTER: Conditional approval of the Bovigam™ as a supplemental test for diagnosis of bovine tuberculosis

The United States Animal Health Association requests that the United States Department of Agriculture, Animal Plant Health Inspection Service, Center for Veterinary Biologics should grant conditional approval for a pe-
period of 2 years of the Bovigam™ for use as an ancillary/supplemental test for diagnosis of bovine tuberculosis. The assay should be used for detection of interferon gamma in blood samples collected from cattle 3-30 days after injection of PPD for skin testing and should be used in conjunction with the CCT. Designated tuberculosis epidemiologists should be given the authority to use test results at their discretion to make decisions on the final classification and disposition of cattle. The method for interpretation of the assay should be the same as that used in New Zealand. Laboratories conducting the assay should include an antigen, such as pokeweed mitogen, as a positive sample control during the evaluation period. The approval period should be used to gather additional data on the performance of the test under field conditions in the United States.

RESOLUTION NUMBER: 9
SOURCE: Committee on Food Safety
SUBJECT MATTER: Animal Production Food Safety Training For Food Animal Veterinarians

The United States Animal Health Association urges the United States Department of Agriculture and the State Animal Health Authorities, in cooperation with livestock and poultry industries, develop appropriate systems and guidelines for training food animal practitioners in animal production food safety audit and certification processes and encourage their participation in animal production food safety and quality assurance programs.

RESOLUTION NUMBER: 10
SOURCE: Committee on Brucellosis
SUBJECT MATTER: USDA Support to the Wyoming Game and Fish Department

The United States Animal Health Association urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to support financially and with personnel the efforts of the Wyoming Game and Fish Department to improve the elk winter habitat so that the cycle of transmission of brucella among the elk in Wyoming will be interrupted.

RESOLUTION NUMBER: 11
SOURCE: Committee on Animal Health Information Systems
SUBJECT MATTER: Integration of USDA, APHIS, VS Surveillance Systems

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to work with the Animal Health Information Systems Committee and utilize the expertise of other appropriate USAHA committees to evaluate, streamline and integrate all existing national animal health
REPORT OF THE COMMITTEE

information surveillance systems and provide support at the State level for the surveillance system infrastructure necessary to enhance national and international trade.

RESOLUTION NUMBER: 12 (NOT APPROVED)
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Assessment of ground beef contamination with *Mycobacterium avium* subsp. *paratuberculosis*, both before and after cooking.

RESOLUTION NUMBER: 13 (NOT APPROVED)
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Testing of retail milk for presence of live *Mycobacterium avium* subsp. *paratuberculosis* (MAP)

RESOLUTION NUMBER: 14 (NOT APPROVED)
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Quantitative Risk Assessment of Human Exposure to *Mycobacterium avium* subsp. *Paratuberculosis* (MAP)

RESOLUTION NUMBER: 15
SOURCE: Committee on Johne's Diseases
SUBJECT MATTER: Quality Assurance of Johne's Diagnostic Procedures

United States Animal Health Association (USAHA) requests the United States Department of Agriculture (USDA), Animal Plant Health Inspection Service, Veterinary Service and Agricultural Research Service to work with American Association of Veterinary Laboratory Diagnosticians and the USAHA Johne's committee and Johne's disease certified laboratories to design and implement national guidelines to include certification, recertification, quality control, standardization of tests and agent identification for feces and serum in ruminants.

USDA should provide funds to support the development of these protocols and report the status of these guidelines at the next USAHA meeting in Hershey, Pennsylvania.

RESOLUTION NUMBER: 16 Consolidated into Resolution 15
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Laboratory Recertification Following a Johne's Disease Check

RESOLUTION NUMBER: 17
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: USDA, APHIS Johne's Disease Budget
The United States Animal Health Association request that the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service implement a specific line item in the budget for Johne's Disease as prioritized by the Committee on Johne's Disease and the National Johne's Working Group (NJWG).

RESOLUTION NUMBER: 18
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Check Test Panel of Bovine Sera for Evaluation of Serological Test Kits for Johne's Disease

RESOLUTION NUMBER: 19
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Voluntary Johne's Disease Program Standards for Cattle

The United States Animal Health Association requests the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to develop Program Standards and the necessary infrastructure to implement a national voluntary Johne’s disease program for cattle.

RESOLUTION NUMBER: 20
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Johne's Disease Funding for Laboratories

RESOLUTION NUMBER: 21
SOURCE: Committee on Johne’s Disease
SUBJECT MATTER: National Johne’s Disease Pilot Project

The United States Animal Health Association requests the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service convene a panel of Johne's disease experts to design and implement a multifaceted national Johne’s disease pilot project to validate the current sampling scheme of the National Voluntary Johne’s Disease Herd Status Program for cattle and the use of pooled fecal samples for an organism-based test to detect Mycobacterium avium subsp. paratuberculosis (MAP). Funds for this project should come from funds allocated for Johne’s disease in this year’s budget.

RESOLUTION NUMBER: 22
SOURCE: Committee on Johne’s Disease
SUBJECT MATTER: Johne’s Disease Elisa Guide to Interpretation

RESOLUTION NUMBER: 23
SOURCE: Committee on Johne’s Disease
SUBJECT MATTER: Johne’s Disease Fecal Culture Quality Control
REPORT OF THE COMMITTEE

RESOLUTION NUMBER: 24 Consolidated into Resolution 15
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Johne's Disease Fecal Culture Check Test

RESOLUTION NUMBER: 25 Consolidated into Resolution 15
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Quality Assurance for Commercial Licensed Johne's Disease

RESOLUTION NUMBER: 26 Consolidated into Resolution 15
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Johne's Disease Testing in Ruminants Other Than Cattle

RESOLUTION NUMBER: 27 Consolidated into Resolution 15
SOURCE: Committee on Johne's Disease
SUBJECT MATTER: Johne's Disease Testing in Ruminants Other Than Cattle

RESOLUTION NUMBER: 28
SOURCE: Committee on Livestock Identification
SUBJECT MATTER: National Mid-Year Meeting

The United States Animal Health Association should facilitate the participation of the Committee on Food Safety, Committee on Livestock Identification and the Committee on Animal Health Information in organizing a national meeting on the applications of animal identification systems.

RESOLUTION NUMBER: 29
SOURCE: Committee on Transmissible Diseases Of Poultry
SUBJECT MATTER: Congressional Feasibility Study on Avian Viral Disease Research

The United States Animal Health Association encourages the United States Department of Agriculture, Agriculture Research Service to complete the congressionally mandated feasibility study to consolidate avian viral disease research in Athens, Georgia and the initiation of planning to construct physical facilities for this national institute or center for poultry health research.

RESOLUTION NUMBER: 30
SOURCE: Committee on Transmissible Diseases of Poultry
SUBJECT MATTER: Live Bird Markets

The United States Animal Health Association urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to make emergency funds available to support a USDA-state-industry cooperative program to eliminate H5 and H7 LPAI virus infections.
from the live bird marketing system in the northeastern United States. This program should include temporary closure, depopulation with indemnification, and cleaning/disinfection of the New York and New Jersey urban retail live bird markets.

RESOLUTION NUMBER: 31
SOURCE: Committee on Brucellosis
SUBJECT MATTER: Pseudorabies and Brucellosis Cull Sow and Boar Slaughter Surveillance

The United States Animal Health Association urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service and cooperators to conduct a review of cull sow and boar slaughter surveillance for brucellosis and pseudorabies. As suggested in the 1998 Swine Brucellosis Subcommittee report, this review could be patterned after a recent review of the cattle slaughter surveillance program.

RESOLUTION NUMBER: 32
SOURCE: Committee on Pseudorabies
SUBJECT MATTER: National Plan for Pseudorabies (PRV) Post-Eradication

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to work with state, industry and academic stakeholders to ensure the action items of the National Plan for PRV Post-Eradication, including emergency response, surveillance, regulations and feral/wild swine are appropriately addressed in a timely manner and that progress be reported on each of the four topics at the 2001 USAHA Committee on Pseudorabies meeting.

RESOLUTION NUMBER: 33
SOURCE: Committee on Brucellosis and Committee on Pseudorabies
SUBJECT MATTER: Feral-Wild Swine

The United States Animal Health Association urges the United States Secretary of Agriculture to recognize the feral-wild swine threat as a high priority for funding for research through Agriculture Research Service and Cooperative Research Extension and Education Service and field studies through United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service and/or Wildlife Services.

In particular, funding is necessary to:
1. Conduct population studies needed to support the development of threat management strategies.
2. Define the role of Brucella strain RB51 for use as a dual vaccine and conduct field trials to determine its efficacy.
3. Conduct further study and field trials in relation to swine brucellosis and pseudorabies infection in feral swine and their transmission to domestic swine.

RESOLUTION NUMBER: 34
SOURCE: Committee on Pseudorabies
SUBJECT MATTER: Electronic Transfer of Permits and Certificates for Swine

United States Animal Health Association urges the United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Service to expedite the adoption of the use of electronic signature and electronic transfer of official documents for swine movements.

RESOLUTION NUMBER: 35
SOURCE: Committee on Foreign Animal Diseases
SUBJECT MATTER: Education – Foreign And Emerging Diseases

A. The United States Animal Health Association recommends to the American Veterinary Medical Association Council on Education that the essential curriculum requirements of an accredited or approved college of veterinary medicine (AVMA Directory, 2000, p 190) be modified to include foreign and emerging animal diseases. The suggested change (in bold) would read (page 191, 9) Curriculum:

"The curriculum shall require students to attain an understanding of the central biological principles and mechanisms that underlie animal health and disease from the molecular and cellular level to organ, organismal, and population manifestations. This shall include:

1. _______
2. an understanding of the principles of maintenance of health, of diagnosis and prevention of disease, including foreign and emerging animal diseases, ______.".

B. The United States Animal Health Association supports the timely development of a system assuring that accredited veterinarians demonstrate proficiency in recognizing signs and lesions of foreign and emerging animal diseases.

RESOLUTION NUMBER: 36
SOURCE: Committee on Foreign Animal Diseases
SUBJECT MATTER: Plan For Plum Island Animal Disease Center (PIADC)

The United States Animal Health Association urges the United States Secretary of Agriculture to revise and finalize the comprehensive plan and accelerate the modernization of the Plum Island Animal Disease Center, a vital component of foreign animal disease diagnosis and prevention.
RESOLUTION NUMBER: 37
SOURCE: Committee on Transmissible Diseases of Poultry
SUBJECT MATTER: Avian Health Research Funding

The United States Animal Health Association supports increased funding for research programs on poultry health at the National Animal Disease Center, Avian Disease and Oncology Laboratory, and the Southeast Poultry Disease Research Laboratory.

RESOLUTION NUMBER: 38
SOURCE: Committee on Rabies
SUBJECT MATTER: A National Plan for Rabies Control in Wildlife

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS), Wildlife Services to seek new funding for terrestrial wildlife rabies vaccination programs, and further encourages state and local governments and regional alliances to support this activity through appropriate funding channels. USAHA also strongly encourages USDA, APHIS Wildlife Services, United States Public Health Service and Centers for Disease Control, to assist states and local agencies in the development, maintenance and expansion of coordinated wildlife rabies control and vaccination programs.

RESOLUTION NUMBER: 39
SOURCE: Committee on Sheep and Goats
SUBJECT MATTER: Support for NAHMS Sheep Study


RESOLUTION NUMBER: 40
SOURCE: Committee on Sheep and Goats
SUBJECT MATTER: Support for Depopulation of TSE Sheep

The United States Animal Health Association supports the United States Department of Agriculture efforts to expeditiously depopulate the two Vermont sheep flocks under quarantine for a transmissible spongiform encephalopathy of foreign origin.

RESOLUTION NUMBER: 41
SOURCE: Committee on Wildlife Diseases
SUBJECT MATTER: Chronic Wasting Disease (CWD)

The United States Animal Health Association strongly urges the United States Department of Agriculture, Animal and Plant Health Inspection Ser-
vice, Veterinary Service to continue to develop and implement a federal program for the eradication of CWD in domestic elk with provision of indemnity.

RESOLUTION NUMBER: 42
SOURCE: Committee on Tuberculosis
SUBJECT MATTER: Railing out Cost in Slaughter Plants

The United States Animal Health Association urges the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Service to consult with slaughter plants for the purpose of gathering information to determine an equitable rail out fee, and that a system be established to pay such plants when a carcass is railed out, a granulomatous lesion is detected, and sufficient identification is collected to enable tracing.

RESOLUTION NUMBER: 43
SOURCE: Committee on Sheep and Goats
SUBJECT MATTER: Johne's Disease Testing in Ruminants other than Cattle

The United States Animal Health Association urges the United States Department of Agriculture, Agricultural Research Service to develop and evaluate new and/or improved serological and agent detection methods for diagnosis of *Mycobacterium avium subspecies paratuberculosis* infection in sheep and goats.
The meeting of the Parasitic Diseases Committee used the 2000 meeting to conduct a symposium on ticks and tick-borne diseases. The meeting opened with a brief review of the 1999 meeting, specifically the results of the voting of the membership to adopt a new name for the committee, Parasitic Diseases. The 1999 decision to organize a symposium highlighting the threat to U.S. livestock from ticks and tick-borne diseases, and whether we have an adequate database for risk assessment.

The symposium "Ticks and Tick-Borne Diseases: A Critical Priority" was opened with brief descriptions of the organization of the symposium (invited presentations followed by a roundtable discussion), and the objectives of the symposium, to promote a science-based framework for more accurate risk assessment of ticks and tick-borne diseases that are important to regulatory agencies, to animal and food importation industries, to individual animal owners, and for susceptible animal populations in the U.S. and other countries.

Thirty minutes into the session, there were 38 people in attendance. The list of attendees indicated that nine current members (out of 28) of the committee attended the meeting. There were twenty-nine visitors, several of whom expressed an interest in joining the committee.

The following papers were presented:

Risks of Introduction of Heartwater into the U.S. Associated with Importations of Reptiles and of Wild Game Animals from Africa

Michael J. Burridge, UF/USAID/SADC Heartwater Research Project, College of Veterinary Medicine, University of Florida
Gainesville, Florida 32611-0880
REPORT OF THE COMMITTEE

The Threat of Heartwater to the United States

Burridge (1997) described the threat posed to the livestock and deer populations of the United States by heartwater, an acute disease of domestic and wild ruminants in sub-Saharan Africa and the eastern Caribbean, caused by the rickettsia *Cowdria ruminantium* and transmitted by ticks of the genus *Amblyomma*. He listed four reasons why the threat posed by heartwater should be considered serious, and they were that (1) the risk of introduction of infected ticks from the Caribbean is ever-present; (2) the risk of introduction of infected ticks on imported reptiles is very real; (3) the risk of introduction of infected wild game animals from Africa is also very real; and (4) two tick species indigenous to the United States have been shown to be experimental vectors of heartwater. In this presentation, new information on the risks associated with importation of reptiles and of wild game animals since 1997 will be summarized, and recommendations will be made on measures to minimize these risks.

Risks Associated with International Trade in Live Reptiles

The international trade in live reptiles has been active for many years, but it has grown dramatically in the last decade, with the United States responsible for more than 80% of the total world trade in live reptiles (Hoover, 1998). By 1995, both the volume of live reptiles imported and the variety of species involved had increased markedly to reach over 2.5 million animals a year.

In 1997, the exotic African tortoise tick (*Amblyomma marmoreum*) was identified in Florida outside importation facilities on a reptile-breeding operation where it had become established (Allan *et al.*, 1998). This African tick had been introduced to the premises presumably on imported leopard tortoises (*Geochelone pardalis*) and had spread within the premises to Aldabra giant tortoises (*Aldabrachelys elephantina*), yellow-footed tortoises (*Geochelone denticulata*), a Galapagos giant tortoise (*Geochelone nigra*) and domestic dogs. This discovery was a cause for concern since the tick *A. marmoreum* had been reported to be an experimental vector of heartwater (Bezuidenhout, 1987), a finding later confirmed by Peter *et al.* (2000a).

The identification of a colony of *A. marmoreum* ticks in Florida raised the question of the frequency with which potential vectors of heartwater were being introduced into the United States and, consequently, a study was undertaken to determine the extent of the dissemination of exotic ticks within reptile facilities in Florida. This study found that at least 11 exotic tick species were being imported into Florida on reptiles, with their spread to reptile-breeding facilities, zoos, wildlife theme parks, pet stores, wildlife care centers and collections of private hobbyists (Burridge *et al.*, 2000a; Simmons & Burridge, 2000). In addition to *A. marmoreum*, the exotic species included two others, the large reptile tick (*Amblyomma sparsum*) and the tropical bont tick (*Amblyomma variegatum*), that were proven vectors of heartwater (Norval & Mackenzie, 1981; Walker & Olwage, 1987).
PARASITIC DISEASES

This discovery that two reptilian tick vectors of heartwater were infesting tortoises imported into Florida raised another question, namely their ability to introduce *C. ruminantium* infection into the United States. Consequently, all *A. marmoreum* and *A. sparsum* ticks identified on imported tortoises were collected, and a sample of each collection was processed for testing for *C. ruminantium* infection using a PCR assay (Peter et al., 2000b). In one shipment imported into central Florida from Zambia, 15 of the 38 *A. sparsum* ticks collected from leopard tortoises were found to be positive for infection with *C. ruminantium* (Burridge et al., 2000b). This finding demonstrated clearly that importation of tick-infested tortoises from Africa posed a very real threat of introduction of heartwater into the United States.

**Risks Associated with International Trade in Wild Game Animals**

Wild African ungulates continue to be imported into the United States even though many species are known to be susceptible to *C. ruminantium* infection. Studies have shown that eight of these wild animal species are subclinical carriers of heartwater, capable of infecting ticks with *C. ruminantium* that produces fatal infections in domestic livestock. They are the blesbok (*Damaliscus pygargus*) and black wildebeest (*Connochaetes gnu*) (Neitz, 1933, 1935), the Cape buffalo (*Syncerus caffer*) (Andrew & Norval, 1989), the common eland (*Taurotragus oryx*), the giraffe (*Giraffa camelopardalis*), the greater kudu (*Tragelaphus strepsiceros*) and the blue wildebeest (*Connochaetes taurinus*) (Peter et al., 1998), and the sable antelope (*Hippotragus niger*) (Peter et al., 1999). It is clear, therefore, that at least some species of wild ruminants from heartwater-endemic regions of Africa are capable, if imported, of introducing heartwater into the United States.

**Measures to Minimize Risks Associated with Importation of Reptiles**

In the absence of measures to control introduction of exotic ticks on imported reptiles, two consequences seem certain for the United States, namely that exotic ticks will develop breeding colonies and become established as indigenous species in states such as Florida which have suitable environments, and that heartwater will eventually be introduced into susceptible native mammalian populations causing high case fatality rates in cattle, sheep, goats and deer. Efforts to minimize these risks will involve not only regulatory measures but also development of methods to control ticks on reptiles and to eradicate exotic tick infestations.

In response to the findings that several exotic vectors of heartwater had been introduced into Florida on multiple occasions on imported reptiles (Burridge et al., 2000a), the U.S. Department of Agriculture (USDA) requested and received in 1999 a crisis exemption from the U.S. Environmental Protection Agency to use certain permethrin and cyfluthrin products registered for use on mammals for tick control on reptiles and in rep-
tile facilities. This crisis exemption provided state and federal authorities with acaricides to treat reptile tick infestations until studies could be completed to identify safe and effective acaricides for registration for use on reptiles. Later, in response to the report providing evidence of *C. ruminantium* infection in ticks found on tortoises imported into Florida (Burridge *et al.*, 2000b), the USDA passed an interim rule in March 2000 prohibiting the importation into the United States of leopard tortoises, African spurred tortoises (*Geochelone sulcata*) and Bell’s hingebacked tortoises (*Kinixys belliana*) (Anon, 2000). This rule provided regulatory authority to prohibit the importation into the United States of three of the chelonian species most commonly found to be infested with tick vectors of heartwater (Burridge, in press).

Treatment of imported reptiles, either at the port of entry or at the premises of the importer, is another measure that will assist in the control of exotic ticks, including those that are potential vectors for heartwater. Unfortunately little information is available on the safety and efficacy of acaricides for control of ticks on reptiles, in part because the demand has been too small to interest manufacturers and in part because testing of reptiles is not a requirement for pesticide registration (Hall & Henry, 1992). Consequently studies are on-going in the author’s laboratory to identify an acaricide formulation that is safe for reptiles, that can be administered easily either to reptiles or to their bedding and that will predictably kill reptilian ticks. Initial results have identified one permethrin product (Provent-a-Mite™, Pro Products, Mahopac, NY) that meets these criteria.

The regulations and treatment measures mentioned above should greatly reduce the risk of introduction of tick vectors of heartwater into the United States. However, it is evident that numerous shipments of infested reptiles have already been imported, at least into Florida, and have become established on premises housing reptiles. There is an urgent need to eradicate these infestations in order to minimize the risk that exotic vectors of heartwater will spread to native fauna and thus become established as indigenous tick species, as happened in past years in Florida with the iguana tick (*Amblyomma dissimile*) (Bequaert, 1932) and the rotund toad tick (*Amblyomma rotundatum*) (Oliver *et al.*, 1993). The author and his colleagues, in conjunction with field staff from the Florida Department of Agriculture and Consumer Services, are testing protocols for exotic tick eradication on infested reptilian premises in Florida, and initial trials using a permethrin product (Provent-a-Mite™) for treatment of infested reptiles and a cyfluthrin product (Tempo®, Bayer Corp., Kansas City, MO) for treatment of the premises have produced promising results.
Measures to Minimize Risks Associated with Importation of Wild African Ungulates

In light of the ability of at least some wild African ungulates to harbor subclinical C. ruminantium infections, it is imperative that any ungulates intended for importation into the United States be tested for heartwater before entry is permitted. Diagnosis of C. ruminantium infection in ruminants has relied until recently on examination of brain crush smears (Synge, 1978). However, it is impossible to use brain biopsy techniques routinely to screen wild animals for heartwater and, therefore, alternative screening tests have been used.

The USDA continues to utilize serological tests to screen animals for C. ruminantium infection, using the indirect fluorescent antibody test and, more recently, also a competitive ELISA. It is well known that Ehrlichia spp. cross-react with C. ruminantium in the indirect fluorescent antibody test (Logan et al., 1986; du Plessis et al., 1987, 1993; Holland et al., 1987; Jongejan et al., 1989; Kelly et al., 1994; Matthewman et al., 1994), and concerns over use of this test for screening animals for importation into the United States have already been expressed (Logan et al., 1986; Dilbeck et al., 1990). The indirect fluorescent antibody test was compared with the competitive ELISA utilizing C. ruminantium antigens, and in both tests extensive cross-reactions were recorded with antibodies to ehrlichial infections (du Plessis et al., 1993). It is evident, therefore, that positive serological responses are uninterpretable in a screening test for heartwater since it is impossible currently to determine whether they are due to exposure to C. ruminantium or exposure to some cross-reacting agent such as an Ehrlichia sp. Furthermore, recent studies in Zimbabwe have shown that some cattle known to be carriers of C. ruminantium can be seronegative (S.M. Mahan, personal communication), demonstrating that even a negative serological response does not always indicate absence of C. ruminantium infection.

One of the major questions to be asked in considering a wild ungulate for importation into the United States from heartwater-endemic regions of Africa must be its C. ruminantium carrier status. Until recently, there was no test sensitive or specific enough to detect subclinical C. ruminantium infections. Now such a test is available, and it is the PCR assay developed at the University of Florida (Peter et al., 1995, 2000b; Mahan et al., 1998). It is recommended that all wild ungulates being considered for importation from heartwater-endemic regions of Africa be tested for C. ruminantium infection by the PCR assay, with those testing positive refused entry into the United States. The author requested in 1997 validation by the USDA of the PCR assay for diagnosis of C. ruminantium infection, but a decision is still pending. The more sensitive and specific PCR assay that detects C. ruminantium infection should be used to screen animals for heartwater prior to importation rather than use of non-specific serological tests that can only detect antibodies of uncertain origin. Such
REPORT OF THE COMMITTEE

a change in the method of screening of animals for heartwater is necessary if subclinically infected wildlife are to be prevented from introducing heartwater into the United States.

References
PARASITIC DISEASES


Diagnosis and Management of Heartwater

Basil Allsopp, Onderstepoort Veterinary Institute, South Africa

Summary

The diagnostic serology of heartwater has long been known to be unsatisfactory, since all tests give both false positive and false negative reactions (Du Plessis et al. 1993). Molecular genetic diagnostics, based on PCR amplification of parasite DNA followed by probing for parasite-specific sequences, is much more sensitive and specific. The new tests have revealed the presence, in the field in Africa, of numerous organisms more or less closely related to Cowdria ruminantium, and these cause the difficulties with the serological diagnostic tests. Some of the newly identified organisms appear to be pathogenic in ruminants, and others of them have been detected in dogs and, possibly, in a human. Further research is required to determine the extent of the risk which these newly identified organisms would pose if they were accidentally introduced into the US. Until this risk has been clarified it is recommended that all animals from areas where heartwater may exist should be screened before importation. The screening should be based on the new DNA-based PCR tests, and three negative samples from each animal should be required. These should be taken at monthly intervals to improve the chances of detecting ‘carriers’.

Background

Heartwater is an economically important tick-borne disease of livestock and some wild ruminants, caused by the obligate intracellular rickettsial parasite Cowdria ruminantium. The disease is prevalent in sub-Saharan Africa within the distribution areas of a number species of Amblyomma ticks, in particular Amblyomma hebraeum and A. variegatum. The disease also occurs in the French Antilles to which A. variegatum was introduced from West Africa, possibly as early as the eighteenth century (Maillard et al. 1993). It has been demonstrated experimentally that sev-
PARASITIC DISEASES

Several native American Amblyomma species are capable of transmitting the heartwater organism, so there are justifiable fears that the disease could spread to the mainlands of both the Americas (Barré et al. 1987).

Diagnostic options

Traditionally this relied on post mortem findings; the classical pathological lesions were said not to be exclusively diagnostic but the microscopical demonstration of ehrlichial bodies in brain endothelial cells was regarded as the ultimate deciding factor. Antemortem diagnosis requires the use of one of three different basic technologies. Animal sub-inoculation or cell culture isolation to demonstrate the presence of the parasite, serological detection of antibodies to Cowdria, or PCR and probing for Cowdria-specific DNA sequences. Live parasite isolation is too slow and impractical for large scale routine use so serology or DNA-based tests are the only practical options.

Standard serological tests

Two tests are approved by the OIE for international trade, the mIFA test and the cIFA test, and the protocols can be found in the 1996 manual, which is currently under revision. As antigen target cells the mIFA test uses mouse macrophages infected in vivo with the Kümml isolate, while the cIFA test uses tissue cultured endothelial cells infected with 'a C. ruminantium strain' (sic). This latter is distressingly vague.

IFA test problems

False positive reactions are common with sera from areas free from heartwater and heartwater vector ticks, and cross reactions have been demonstrated with various Ehrlichia antisera (E. phagocytophila, E. equi, E. bovis, E. chafeensis, and E. canis). False negative reactions also occur, especially with cattle, which has especially serious implications for animal movement control (Du Plessis et al. 1993).

ELISA tests for Cowdria

These all test for antibody against Cowdria MAP1 protein, which is a polymorphic, immunodominant, antigen having homologues in all other Ehrlichia spp. There are three ELISA formats, the indirect ELISA (iELISA), the competitive ELISA (cELISA), and the MAP1B ELISA. The last named is the latest and best serological test for Cowdria and it has been tested in 17 African countries, the Caribbean and the USA (van Vliet et al. 1996).

MAP1B ELISA test results

Only 80% of the sheep sera, and 20% of the cattle sera, collected in an endemic area of South Africa, were positive, even though all the animals must have been exposed to the parasite. In the Caribbean only 15% of sera (all animals) from some heartwater-endemic islands were positive. In Burkina Faso calves become seropositive at >8 months old, while sheep
and goats become +ve at <1 month of age, and in Guadeloupe seropositive calves became negative within 5 months. These results indicate that false negatives occur, especially in cattle. On the other hand, 20% of all goat sera from a heartwater-free areas in South Africa were positive, so false positives occur also.

**The reasons for the unreliability of heartwater serology**

We postulated that there are previously unrecognized ehrlichias in the field, closely related to *Cowdria ruminantium*, and that while some cause disease others do not. To test this we ‘fished’ by PCR for rickettsial and ehrlichial 16S rRNA genes in field samples of blood and ticks and we detected two new *Ehrlichia* species and five different *Cowdria* genotypes, of which two were previously known and three were new (Allsopp et al. 1996). Further research has developed protocols for PCR amplification of parasite DNA followed by probing for parasite-specific sequences, targeting three different genes, selected to provide discrimination at three different levels. These are the genus level (*Cowdria*), the species level (for individual *Cowdria* and *Ehrlichia* spp.), and at the isolate level (for different isolates or strains of *Cowdria*). This procedure had been found to provide more sensitive and specific diagnosis of *Cowdria* and *Ehrlichia* spp. than any serological test (Allsopp et al. 1999).

**DNA probes for Cowdria and Ehrlichia species**

The probe designated pCS20 is the most sensitive, and it has been found empirically to be specific for the genus *Cowdria*. To date this probe has not been found to cross-react with any *Ehrlichia* spp. which we have tested. The 16S rRNA gene probes will identify *Cowdria* and *Ehrlichia* at, or near, the species level and provide phylogenetic comparisons with other bacteria. This enables the recognition, and classification, of any previously undescribed species which are found. The third probe is based upon the *map1* gene probe. As noted above, this cross reacts with other *Ehrlichia* spp., but the value of this gene is that, because of its polymorphism, it distinguishes between different isolates of *Cowdria ruminantium*.

**Phylogeny from 16S sequences**

Figure 1, which is based upon 16S rRNA gene sequences, shows how the species classically known as *Cowdria* form a part of the Genogroup III *Ehrlichia* species. Note that *Cowdria* is particularly closely related to *E. canis* and *E. chafeensis*.

**Cowdria sp. (Omatjenne)**

This is one of the three previously undescribed *Cowdria* organisms which was discovered during our ‘fishing’ expedition. When the original mlFA test was being validated in the field it was found that 81% of cattle sera from the farm ‘Omatjenne’, in a heartwater and *Amblyomma* free area in Namibia, were found to be IFA positive. *Hyalomma truncatum* ticks were collected from the cattle and the ground-up ticks were inoculated...
individually into mice. One mouse developed clinical symptoms and *Ehrlichia*-like organisms were seen microscopically. DNA sequence data of both 16S rRNA and *map1* genes show that the organism is, phylogenetically, a *Cowdria* and subsequently identical sequences have been found in completely healthy goats in heartwater-free areas of South Africa. This organism appears to be apathogenic in ruminants, and cannot therefore be the same as the organism which is classically known as *Cowdria ruminantium*. There is no doubt, however, that on a molecular genetic basis it is very closely related to other *Cowdria* species (Figure 1).

**Canine ehrlichiosis**

Domestic dogs frequently present at veterinary clinics in Pretoria with clinical symptoms of ehrlichioses. It is rare for any ehrlichial morulae to be visible under the microscope, and to confirm the diagnosis an *E. canis* PCR test is performed. In about 60% of these cases the test is negative,
and we then perform a pCS20 test for Cowdria. About 80% of them are positive. It appears then that nearly 50% of these suspected 'ehrlichiosis' cases are carrying an unknown species of Cowdria, although we cannot (yet) say it causes the clinical symptoms. In one particular case we examined DNA from a sick dog where morulae had not been seen in macrophages. This sample was E. canis PCR negative, we could find no Ehrlichia species 16S sequences, but the sample was Cowdria (pCS20) positive, and yielded a known Cowdria 16S sequence and a typical Cowdria map1 sequence. This dog was definitely carrying a Cowdria, although we have no way of saying that this was the cause of the clinical symptoms. At this point the classical parasitologist will say "you must satisfy Koch's postulates".

**Koch's first postulate**

This is classically stated as "The agent must be present in every case of the disease but should not be found in healthy animals." but this needs a little updating if it is to be relevant to the current situation. The second part of this postulate, the easiest part to deal with, says "The agent should not be found in healthy animals". This is no longer generally regarded as a requirement, since it is well known that many organisms cause disease in only a proportion of their hosts (*Neisseria meningitidis*, *Mycobacterium tuberculosis*) and subclinical infection (carrier state) after recovery is common (*Cowdria ruminantium*, *Theileria parva*).

As far as the first part of the postulate is concerned, what Koch meant by "disease" was a collection of measurable observations or symptoms. We could therefore say "syndrome" (a group of concurrent symptoms of a disease), instead of "disease", without doing any violence to Koch's original idea. In this case the syndrome was that the animals had clinical symptoms of canine ehrlichiosis and were negative by *E. canis* PCR. So 80% of the dogs with this syndrome were Cowdria positive, and while this does not satisfy the "every case" requirement it is getting close, and it seems likely that the Cowdria was indeed the cause of the "ehrlichioses".

**Koch's postulates 2, 3 and 4**

"The agent must be isolated from the host and cultured in vitro" is currently underway. When this has been achieved the last two postulates can be addressed. "The disease must be reproduced when the culture is inoculated into a healthy susceptible host" and "The agent must be re-isolated from the experimental infection".

**What next for canine Cowdria?**

We need to check for infectivity to cattle, sheep and goats, because it is vital to see whether this is *Cowdria ruminantium*. We must also find the tick vector. *Amblyomma* ticks do not normally feed on dogs, although it is not impossible for this Cowdria to be carried by an *Amblyomma* species
which bites dogs if no other hosts are available. However it is also possible that the vector is one of the ticks which prefer dogs, such as *Haemaphysalis leachii* or *Rhipicephalus sanguineus*.

**Can Cowdria infect humans?**

A 56 year old woman died with severe jaundice in a Johannesburg hospital, and a blood sample was sent to the OVI to check for *Ehrlichia*. There is no record of why this was done, but there is a record that the woman's dog had died of 'biliary' 2 weeks previously. 'Biliary' normally refers to *Babesia canis* infection, but someone may have thought that an ehrlichiosis had been responsible for the animal's death. The woman's blood sample was tested and no *Ehrlichia* species sequences could be found, however the sample was *Cowdria* (pCS20) positive and yielded a known *Cowdria* 16S sequence.

A *Cowdria* was definitely present in this sample, but the significance of the finding cannot now be confirmed. The blood sample could have become contaminated, although there is no specific reason to believe that it did, and we will never be sure that in this particular case the *Cowdria* was the cause of death. However, given the variety of closely related organisms which we have found it is not unreasonable that *Cowdria* should occur in hosts other than ruminants and dogs, and we know that humans are infected by *E. chafeensis*, which is very closely related to *Cowdria* (Figure 1). We must look at other cases of suspected human ehrlichioses, and such cases should receive appropriate treatment (doxycycline) without delay.

**Conclusions**

There are six important messages from these findings which are relevant to the importation into the US of animals from Africa and the Caribbean.

1. The variety of closely related *Cowdria* and *Ehrlichia* organisms in the field makes serological tests unreliable. Only DNA based diagnosis has been shown to be sufficiently specific as to be useful in this situation.

2. Subclinical (carrier-state) *Cowdria* infections are common and the parasite is present at very low levels. The sensitivity which derives from the high degree of target amplification achieved by PCR is essential in order to detect carriers.

3. Despite what is stated in 2 above, all tests have a lower limit of detection and sub-detectable *Cowdria* infections are common. It has been shown, for instance, that healthy carrier goats in Guadeloupe could infect ticks with *Cowdria* for up to 11 months, *but not at every time point during that period* (Camus 1992). We recommend at least three negative tests at one month intervals should be required prior to importing any animal from Africa or...
the Caribbean.

4 Dogs can carry *Cowdria* infections. No-one knows if this poses a threat to ruminants but until we do know it would be wise to require the same three negative *Cowdria* tests at one month intervals before importing dogs from Africa or the Caribbean.

5 *Cowdria* may be able to infect humans. No-one knows if this poses a threat to ruminants, or if the infection causes human disease, or if this is a common occurrence. More research is essential, and in the interim symptoms of “ehrlichiosis” in humans should always be treated promptly and appropriately.

6 Neither panic nor denial is ever an appropriate response to the unknown or the unexpected. If in doubt it is wise to take precautions while doing the appropriate research.

References
PARASITIC DISEASES

Eradication of the Tropical Bont Tick from the Caribbean: The Caribbean Amblyomma Programme

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A summary of progress in the Caribbean Amblyomma Program since its inception in 1995, a general overview of technical progress, and one case study, that of St Kitts, was presented. One concern emerging in 2000 is that the elimination of the small remaining Amblyomma variegatum (tropical bont tick, or TBT) “hot-spots” is remaining elusive. Why is this so? - Egrets? Alternative residual hosts? Or is it program management (technical and administrative) and “fatigue”? At the 1998 US AHA meeting, Bob Bokma referred to funding and administrative changes. After three years of negotiation, the CAP has now secured EURO 1.5m from the European Community. Changes in administration include the withdrawal of IICA and the gradual decentralization of administrative and financial management from FAO HQ and the Regional Office in Chile to the Caribbean. An overview of the program identifies one outstanding constraint – an appropriate management support function - and suggests a remedy in the form of a proposal for a revised management strategy. This is coupled with the identification of a future structure to succeed the CAP, namely the Caribbean Animal Resources Management (CARM) Program.


The USDA, the EU - CAFP (Caribbean Agriculture and Fisheries Program), and IFAD, as the primary donors to CAP all provide technical inputs and approve work and travel plans on an annual and quarterly basis. FAO is the lead technical implementing agency and a Regional Co-ordination Unit manages day-to-day operations at the field level. The countries involved include Anguilla, Antigua & Barbuda, Barbados, Dominica, Montserrat, St Kitts & Nevis, and St Lucia, St Maarten for eradication activities, and Haiti, Dominican Republic, British Virgin Islands, Netherlands Antilles, St Vincent, Grenada, Trinidad & Tobago for surveillance. Representatives from each agency, organization and country are members of the Amblyomma Program Council, the overall governing body. Field operations started in late 1995 on northern islands. In 1998 – 1999, TBT-eradication was almost completed on four islands – Dominica, Montserrat, St Kitts and St Lucia, but the elimination of remaining “hot-
spots", although small, is remaining elusive. Why is this so?
* Egrets? This seems unlikely epidemiologically as a primary cause but we are also now faced with totally unexpected new foci in St Croix (north), Dominica (central), and St Vincent (south). Where are these ticks coming from? The French West Indies?
* Alternative residual hosts? – Dogs, donkeys, etc., or small populations of untreated feral ruminants.
* Program management (technical and administrative) and "fatigue".

It may well be a combination of factors, but the last one is of major concern, and later in this presentation we propose a remedy in the form of a strategy and management review. Since the mid-term review in September 1997, some of the management constraints have continued during the past three years. At the regional (RCU) level, the most important constraint is related to a lack of an internal, independent, but unified management support structure. At the national level, a parallel observation can be made: the two countries that have performed most consistently and effectively are St Lucia and St Kitts. Both were managed by dedicated Animal Health Officers with minimal other duties or private interests.

During the past 12 months, the project refocused technical activities on the seven main TBT-eradication islands (Anguilla, Antigua, Barbados, St Kitts & Nevis, St Lucia and St Marten). It deferred the important surveillance activities in adjacent islands (BAI, Dominican Republic, Haiti, Netherlands Antilles in the north and Grenada, St Vincent and Trinidad and Tobago in the south) for a further year, pending EU inputs and additional staff. Even under the restricted field program, the Program Manager spends over 80% of his time on administrative and financial management (budget issues, contracts, purchase and control, and donor (EU) negotiations) and supervising relatively inexperienced technical and support staff. Technical delivery has, therefore, been a disappointment, but at the last A.C., the USDA agreed in principle that the RAU required at least one additional senior staff member.

The St Kitts Case: the Current Situation:
Mandatory treatment of all livestock ended in August 1998. In 1999 - 2000, eradication activities continued in the TBT foci (hotshot). Four (4) locations were treated including the Dale, Under, Greenville areas of the St. Peter/ St. Georges, St. Mary’s District interface, the Infield area of Trinity District and the Profit area of St. John’s district. Surveillance continued throughout the island. A summary of data is shown in Tables 1 and 2. On advice from the USDA chief Biometrician, the protocol was modified in the second half of 1999 to increase the number of properties inspected. This was deemed necessary in view of the very heterogeneous nature of the environment and of the animal husbandry systems prevalent in the islands. Consequently, the number of properties inspected in quarterly sur-
vey rounds 7 and 8 increased three to four fold, although the actual number of animals inspected decreased slightly. The efficacy of this revised strategy is clearly demonstrated in that the number of infested properties/animals detected increased in the second half of 1999. Whilst this increases the confidence of the data, it shows that the hot-spot areas remain potentially infested.

In total, some 799 properties were surveyed during the period under review. In the last six months of 1999, 447 (over 50%) properties were surveyed. The number of contacts (properties) at its highest point was 887. Overall, almost 40% (5,587) of the estimated livestock population (14,753) were examined. However, it must be noted that because properties and animals were selected at random, from the data base, for each survey cycle (SID), then some properties and animals may have been selected more than once. In fact, this was done purposely in instances where TBTs were found on a property in one cycle; thus, they were intentionally included in the next cycle.

Table 1:
Host Analysis

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<th>Host</th>
<th>Estimated Populat.</th>
<th>Number Examined</th>
<th>% TBT +ve</th>
<th>%</th>
<th>Number males</th>
<th>Number females</th>
<th>Dermato-philosis</th>
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<td>42</td>
<td>4</td>
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<td>8</td>
</tr>
<tr>
<td>Totals</td>
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<td>5587</td>
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<td>15</td>
<td>0.003</td>
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Table 2:
Chronological Analysis

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<th>Period</th>
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<th>Number males</th>
<th>Number females</th>
<th>Dermato-philosis</th>
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<td>27</td>
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* Since the protocol was modified in the second half of 1999, the number of properties inspected in SIDs 7 and 8 increased three to four fold. In total some 799 properties were surveyed during the period under review. The number of contacts (properties) at its highest point was 887.

Very low numbers of ticks have been reported during the first 6 months of this year at two remaining TBT hot-spots. Some forty egrets were examined from near these two sites, but no immature tick stages were found. We believe that the most important factor is staff fatigue, and loss of motivation. At the end of 1999, significant staff changes occurred in St. Kitts and further intervention and support are required from the Regional Coordination Unit.

Prior FAO/Trust Funds (TF) (1994-1998) originated from the SECNA Program (ODA, GTZ, and USA). From 1994 to 1998, annual USDA funds were managed via IICA. IFAD funds became available in 1996. At that time, the FAO/TF imprest accounts were "managed" by the FAO-R and later, the FAO-SRO. The CAP-RCU and USDA were mainly concerned over the difficulties associated with IICA management of project funds, especially post-1996. In 1998, however, USDA identified an additional $1.94m for the CAP via a USA/FAO TF and then decided to route their annual contribution also via FAO. At this time, their previous, existing and pledged commitments total about US$ 5.0 million.

In 1996-1997, the EU provided approximately EURO 0.75 million mainly for purchase of insecticide and two vehicles. A request was then made for an additional EURO 1.5-2.0m. This was approved in 1999, but thereafter, prolonged negotiations took place regarding contractual and disbursement procedures. Eventually, an agreement was reached under a MoU between FAO and the EU-CARIFORUM.

There are additional funds available under the current Caribbean Agriculture and Fisheries Program (CAFP) for livestock health and quarantine activities. During the CAFP review in 1999, the Caribbean Amblyomma Program proposed to the EU-CAFP consultant that the EU might also appropriate funds for CSF control. EURO 2.0m were approved and discussions between EU-CAFP and FAO-R’s in the Dominican Republic and Trinidad are now taking place. Finally, there is approximately another EURO 2.6m for an animal and plant quarantine program that is to be implemented by IICA. Collectively the various "components" could be technically packaged with attention mainly to TBT, CSF, and Screw-Worm, and marketed as a "Caribbean EMPRES Program".

There is a complexity of CAP management structure that thwarts efforts to synthesize a unified approach. The following proposal takes into account the immediate prospect of FAO being offered the opportunity to implement the CSF component of the EU-CAFP. Would it, therefore, complicate the issues if CAP diversified technically?

Major benefits and technical justification include the following:

* Cost-effectiveness especially of field operations in the Dominican
PARASITIC DISEASES

Republic and Haiti.
* Increased sustainability.
* Establishing a regional core database on livestock statistics and health.
* Strengthening veterinary quarantine and emergency preparedness.
* Marketing of a more favorable package to farmers.

The USDA proposed that future projects use the CAP model as it currently functions very cost-effectively. The fact that it already exists and operates in 18 island/countries could be presented as strong justification to implement a regional Caribbean Animal Resources Management (CARM) program (disease eradication, emergency preparedness and quarantine) under a unified management co-ordination unit. Moreover, USDA are co-funding complementary programs for CSF in the Dominican Republic and NWS in Jamaica. It is believed that USDA would endorse such a proposal on both logistical and economic grounds. Moreover, the wider program would fit conceptually into the joint FAO/USDA draft proposal prepared at the recent APC meeting for post-CAP activities. Implementation commonalities include:
* Same major donors (USDA and EU).
* Same 16 CARIFORUM countries, plus British & Dutch dependencies.
* Same national Agriculture Ministries and Livestock Departments.

One issue to be addressed (at the next APC) is further clarification of the respective roles of the RCU, the APC and the FAO. There is a need to re-emphasize the conclusions of earlier meetings that stated that the RCU is the focal point for all deliberations (correspondence, discussions, etc.) pertaining to the CAP. Equally important in this respect is the statement made by the feature address speaker, Dr. Lindquist (formerly the FAO-SECNA field director), at the FAO/IAEA conference on Area-wide insect pest eradication programs: “eradication programs should be independent of political and institutional bodies; that is managed by an autonomous body, ?.. some programs have failed, not because of inappropriate technologies, but because of conflicting political and institutional agendas. In summary, avoid ‘political control’.”

Thus, the main agencies should accept their respective roles of equal, strategic partners. No single agency or organization, or an individual representing them, should claim “seniority” status on administrative, technical or political grounds.

The FWI program has not made the same progress as the CAP. They have a much less focussed program, much of it based on European/French law. Moreover, their technical approach, based on spraying, has been the subject of considerable debate. More recently, however, it has been proposed by senior Government officials in Martinique of the desirability that the APC and the RCU should play a leading role in the coordination of the French Caribbean’s TBT program. This should improve coordination and technical direction of the French program that has been of concern during...
the past few years.

The CAP-RCU has invariably been inadequately staffed, particularly at the middle/senior management level, and particularly in respect of financial management and computer support. With the pending increased responsibility for EU funds, and for the proposed overall expanded program, there is a strong justification for a Senior Management Officer (SMO) (Administration, Finance & Information Technology). The new SMO, although under the Program Manager, would assume overall responsibility for administrative and financial management and information technology/computer network management. The current level of imprest management under the FAO TF ranges from US$ 300,000 - $350,000 annually. The new EU funds, some US$ 500,000 annually, will be managed in a separate account under EDF rules operated directly by the project. The SMO could also supervise the EURO 2.0m allocated for CSF assuming that FAO secures the executing role. Thus, the magnitude of total financial responsibility would then be about 1.5m annually.

The SMO will supervise the establishment and maintenance of an effective computer network in the 18 countries/islands now involved in the CAP. The network will support a regional database on livestock statistics including animal disease sanitation. Once all administrative and finance matters are handled effectively by an administrative and management officer, professional staff could allocate more time to technical issues.

With goodwill, appropriate direction and coordination, the sun can set on the CAP and rise on CARM for the benefit of agricultural development in the Caribbean.

Justification for a Senior Management Officer

The Caribbean Amblyomma Program started field operations in early 1995. The RCU was based in the FAO office. At senior management level, the then IICA Director of Agricultural Health program provided strong support to project activities. Notably, at that time, the project was operational in the field in only 4 of the 8 TBT-infested islands or countries. In mid-1996, in anticipation of the RCU being relocated to St Kitts, two APOs were assigned there. In addition, there was a USDA veterinarian seconded to St Kitts.

During the April 1998 APC, it was proposed to relocate the whole RCU to Antigua. The IICA/sub RCU office in St Kitts was destroyed by Hurricane Georges and the hurricane also created havoc in Antigua. Towards the end of 1998, it was decided to stay in Barbados and establish the RCU in an old Government Office. In consequence, throughout much of 1998 and early 1999, at a time when the project had extended its operational area, the RCU was partially paralyzed.

The relocation and consolidation of the RCU progressed satisfactorily in early 1999. However, two key staff left the project after three years of service. Unfortunately, the Senior Administrative Assistant, who had over
PARASITIC DISEASES

15 years experience in FAO, failed to provide effective services and resigned in February 2000. For the past year, the RCU technical support staff consists of two inexperienced UNVs (one field veterinarian and one "computer specialist"). A new Administrative Assistant joined the RCU in June after some in-service training via the Administrative Officer at FAO-SLAC.

The Program Manager discussed various alternative scenarios for additional staff inputs - technical or management - with FAO and USDA but deferred the decision pending analysis and finalization of impending inputs via the EU. The EU inputs will include a senior secretary and an animal health officer. A critical analysis is now complete and it is quite obvious that the most urgent and important need is for a full-time, senior Management Officer to take on the overall administrative and financial management issues.

The Potential Role of *Amblyomma maculatum*, the Gulf Coast tick, in the Transmission and Dissemination of Heartwater (*Cowdria ruminantium* infection) in the U.S

Pete Teel, College of Agriculture and Life Sciences, Texas A&M University, College Station, TX

Work in the 1980's by Uilenberg and colleagues in the Netherlands, and confirmed by Mahan and colleagues in Zimbabwe in the 1990's, established *Amblyomma maculatum*, the Gulf Coast tick, as a competent transtadial vector of *Cowdria ruminantium*, the agent of heartwater. The findings are of concern due to the presence and proximity of both the heartwater agent and the African vector, *Amblyomma variegatum*, the tropical bont tick, in the Caribbean. The recent reintroduction of the tropical bont tick on cattle on the island of St. Croix, a U.S. Territory, has increased the concern.

The Gulf Coast tick is a three-host tick. Adult ticks readily attack large animals including cattle, sheep, goats, swine, equine, and canines, as well as white-tailed deer and exotic cervids. The adults are well known to many cattle producers as an “ear tick” because of the affinity for feeding in the external portions of the outer ear, however adult ticks will also feed on other areas of the body. The immature forms (larvae and nymphs) are known to readily feed on ground dwelling birds, such as meadowlarks and quail, as well as rodents. Little is known of the immature ticks feeding on cattle under field conditions, however, in preliminary experiments we have recovered more than 80% fed nymphs after being freely released on the legs and muzzle of cattle (1000 unfed nymphs/animal) and maintained outdoors in small paddocks, suggesting that nymphs may readily feed on cattle under field conditions.

The original distribution of the Gulf Coast tick was described to be within 100 to 150 miles of the Gulf Coast from Texas and up the Atlantic
Coast to Georgia. Through the 1960’s this tick became established in north-central Oklahoma and southeastern Kansas, causing economic losses in cattle as early as 1968. Surveys in 1999 indicate that the Gulf Coast tick has expanded its range in these states. In Oklahoma more than twice the number of counties are infested and in Kansas more than three-times the number of counties are infested. Significant differences in seasonal activity have emerged between the Coastal and inland populations. In Texas adults become active in May and reach peak abundance on cattle in August and September, with immatures being found on birds from October to March. In contrast, the ticks in Kansas and Oklahoma are becoming active as adults in March and reaching peak abundance in April and May, with adult activity on birds/rodents during summer months. Were Gulf Coast ticks to become involved in the transmission of heartwater on the US mainland, the role of this tick as a vector might be as different as its geographic populations.

Issues related to Gulf Coast tick involvement in the field transmission and maintenance of *Cowdria ruminantium* in North America include:

- Are all geographic populations of *Amblyomma maculatum* equally competent as a vector of the heartwater agent?
- Would the seasonal activity of *A. maculatum* support its possible role as a vector since it is known that cattle that do not succumb to the disease remain carriers for about 200-250 days?
- If *A. variegatum* became established along the U.S. Gulf Coast, what potential effects would both *Amblyomma* ticks have on the spread, transmission, and maintenance of the heartwater agent in this region?

Clearly, the Gulf Coast tick has been established as a vector of the heartwater agent. Therefore, heartwater emergency preparedness should include the Gulf Coast tick as a potential vector. And, the biology and ecology of the tick should be clarified throughout its geographic range.

**Changing Factors That Influence the Prevalence of Infestations of *Boophilus* spp. Ticks in the Quarantine Zone, and the Implementation of the Cattle Fever Tick Eradication Program**

Phillip A. Pickerill, Area Veterinarian in Charge, USDA, APHIS, VS, Austin, TX

The cattle fever tick eradication effort began over a century ago. The USDA initiated the national program in 1906. Following the eradication of cattle fever ticks, *Boophilus annulatus* and *B. microplus*, from the United States in 1943, a buffer zone, the Tick Eradication Quarantine Area (TEQA), was established along the U.S. side of the Rio Grande River, in the eight counties from the Gulf of Mexico to Amistad Dam near Del Rio, Texas. Depending on natural boundaries, fences or roads that could stop stray
livestock, the zone ranges from a few hundred yards to six miles wide and extends along 900 miles of riverbank. The current Cattle Fever Tick Eradication Program (CFTEP) is the responsibility of Veterinary Services, Animal and Plant Health Inspection Service, U. S. Department of Agriculture.

The development of the buffer zone concept and the program to protect the U.S. from tick reinfestation has been in operation for over 55 years. Many of the basic activities have been carried out with little change during this period such as horseback patrol, dip vat treatment, dipping schedules, and quarantine schedules. However, in recent years, there have been changes in many of the important factors that impact the program and the manner by which it is managed. The factors which have experienced noticeable change during the last 20-25 years will be categorized as (1) changing factors that influence the prevalence of infestations in the quarantine zone; and, (2) changing factors that influence the implementation of the CFTEP.

The TEQA is managed as if it were part of Mexico. The requirements for legal movement of livestock out of the quarantine zone are identical to the tick requirements to export livestock into the U.S. from Mexico. Prior to movement cattle must be inspected and found free of ticks, be dipped in an approved pesticide, and be accompanied by a permit issued at time of treatment.

Although we usually refer to the tick program as the Cattle Fever Tick Eradication Program, it is essentially a tick surveillance program. The difficult problems encountered by the CFTEP are those associated with finding ticks, and finding them early—when they are still in the TEQA. Once ticks are found, the eradication procedures are well-established and have proven to be highly successful. We have excellent, time-tested tools and regulations that allow the program to quickly eliminate the risk of spread of the ticks to other livestock.

Obviously, the prevalence of infestations of Boophilus spp. ticks in the TEQA is directly related to the prevalence of ticks in the areas of Mexico adjacent to the Rio Grande River. Associated determinants are those factors which enhance the livestock movements from Mexico and conditions which affect or prevent early detection of ticks in the TEQA.

Changes that have affected the tick status in Mexico: The most significant factor that influences tick infestations in the TEQA is the status of the effort in Mexico to control ticks. Although 15-20 years ago there was noticeable progress made in their tick program, in recent years the program has received no funding to maintain these activities. Evidence of the decline of the program in Mexico is reflected in the infestation rates of Mexican cattle apprehended in the TEQA. Apprehended Mexico cattle had a 10% infestation rate in the 1970's; 20% in the '80's; 70% in the '90's; and, 80% in FY 2000. An ominous product of the lack of a regulatory program in Mexico is the move to more owner-treated livestock. Improper
tick control practices have resulted in the development of pesticide resistant strains of ticks.

Other changes affecting the tick status of Mexico include:

- Just as in this country, improved range management in Mexico permits heavier stocking of pastures.
- There are more game ranches; many are located on the river.
- The extended drought conditions in recent years which have resulted in livestock being concentrated along the river.
- The recent practice of "staging" or "shaping" cattle from southern Mexico near the river prior to exporting into the U.S.; and
- Ten years without freezing weather has permitted an unabated tick buildup on both sides of the river.

Several changes in recent years have increase the risk of ticks entering the U.S. from Mexico. Examples of changes within the quarantine zone that could enhance the opportunity for tick incursions are:

- A once formidable barrier to ticks has reduced effectiveness as Falcon Lake has decreased to approximately 10% of its designed capacity.
- Drought conditions in recent years have resulted in more livestock on the river and the low water levels allow more straying and smuggling.
- The increase of "brush country" habitat and restricted access to the large areas of the developing "wildlife corridor" have obscured the visibility of livestock smuggling.
- With the increased numbers of ticks across the river there is a greater risk of vector or mechanical transfer of ticks.

The ability to detect ticks in the TEQA as soon as possible is critical to averting multi-premise outbreaks. Even a small outbreak has a drastic effect on surveillance activities due to inadequate staffing levels. The staffing level has decreased from as high as 149 inspectors and county supervisors in 1973, to 102 in 1980, and 77 after a "reduction in force" in 1983. Since 1988 the number of inspectors and county supervisors has been at or near 65.

Other factors that impede early detection of ticks in the TEQA are:

- The producers and their level of knowledge of ticks has changed.
- There are more premises and people to deal with—most of the ranches have been divided to settle estates; there is more emphasis on hunting leases; and many colonias (subdivisions) have developed.
- Many residents of the colonias have come from Mexico with no knowledge of the CFTEP; and some have smuggled livestock and pesticides in the process.

A major change within the TEQA is the "wildlife corridor" project. Several wildlife preservation groups and the U. S. Fish and Wildlife Service (USFWS) are cooperating to develop a wildlife corridor along the north
river bank of the Rio Grande River from Falcon Dam to the Gulf of Mexico. The many parcels added each year are placed in the care of USFWS. These areas are fenced and allowed to revert back to "brush country", the native habitat of South Texas. The regulations and restrictions that accompany the development of refuge areas and the endangered species regulations, limit the ability of program personnel to perform the critical surveillance activity of river patrol. Trail maintenance has been restricted and the resulting habitat provides perfect cover for illegal activities of drug, alien and livestock smugglers. These same conditions make it difficult to impossible to detect sign of livestock movements.

Finally, during the last 20 years, all activities carried out within the TEQA for the purpose of detecting the presence of ticks have become more complicated by the extremely hazardous conditions present in this area. The presence of the tick riders is often perceived as a threat by those who are involved in very profitable, but illegal, activities that occur along the border.

Several changes have occurred during the last 20-25 years that have impacted the implementation of the CFTEP. One group of factors that can be considered together are land use, ranching practices, and the makeup of the livestock producers. Other influences on the CFTEP that will be discussed have resulted from changes in program procedures and changes involving CFTEP personnel. Some of these changes are:

**Land use, ranching practices, and producers.** There have been many changes in the use of the land in the quarantine zone and the adjacent country. In general, ranches are smaller than 25 years ago as many have been divided to settle estates. Those ranches that have not changed hands, are very much changed. Improved pastures enable ranchers to stock cattle and wildlife heavier than in the past. Twenty-five years ago the Catarina Ranch had 30 cowboys, no horse trailers—they rode everywhere horseback—and pastures were gathered every three years. Today they have 6 cowboys and gather cattle annually, with the help of helicopters. Most of the large ranches that remain are involved with hunting leases and consequently are stocking and managing the land to enhance wildlife numbers and variety. High game fences are more common which results in restricted animal movement; however, where fences are not game fences or not maintained in good condition, the roaming livestock and wildlife can expose large amounts of land.

Because of water and labor problems, many of the large ranching and farming operations have moved to Mexico. In the lower valley, land near the river has been converted to industrial or residential uses. Many parcels have been purchased as investment property with no apparent use in mind. In some areas, oil or gas income allows owners to lease the land; lessors are not able or interested in maintaining fences, and not informed regarding the tick program. These changes have resulted in smaller, but
far more numerous, premises with which the CFTEP must interact.

There have been noticeable changes in not only the number of producers but the type of producers that are involved in CFTEP activities. There are more absentee owners and owners holding full-time jobs elsewhere then in the past. There are would-be cowboys who buy or lease enough land to have livestock, but are unable to build and maintain good fences to keep the livestock confined. It is difficult to determine owners of livestock and difficult to contact them when they are known. A few producers are knowledgeable, know the value of a successful tick program and are interested in helping to continue the success—but most are not. The significance of the CFTEP to, not only south Texas but to, the nation’s entire cattle industry, is not fully appreciated by most of today’s livestock owners.

**Changes in CFTEP procedures.** Although there has been little change in many of the important procedures of the CFTEP such as dipping schedules, pasture vacation option, quarantine release schedules and the pesticide used, there have been important changes in program procedures. Most of the changes either affect vat management, or are improvements in technology.

The vat management procedures currently used are more complex and time consuming. However, the procedures have greatly reduced the pesticide risks to employees, the public, livestock and the environment. Examples of the standard precautions are;

> Employees handling pesticides, dipping, or spraying livestock are required to use personal safety equipment;

> Cholinesterase levels of all employees are monitored at 60 day intervals;

> Spent dip vat contents must be processed through one the biofilter systems;

> The pH of the dip is closely monitored, and adjusted, to prevent potasan formation, reducing death loss in livestock; and,

> The physical security of the public access vats is vastly improved.

One of the important changes in the area of technology has been a stronger partnership with the Tick Research Unit, of Knipling-Bushland U.S. Livestock Insects Research Laboratory, Agricultural Research Service. The support of the Tick Research Unit with development of alternative pesticide options and pesticide delivery methods has not only been invaluable, but is our hope for future treatment options. We have proven the efficacy of ivermectin treatment of cervidae in vacated pastures to eliminate tick carryover. We are exploring other methods to deliver ivermectin, not only to wildlife, but to domestic livestock in the event we encounter ticks resistant to organophosphate pesticides. ARS developed the coumaphos biodegradation process that is now standard procedure for disposing of spent vat contents. This research group also provides accessible and timely
"troubleshooting" for almost any tick or pesticide related problem the CFTEP encounters.

The communication technology available to the CFTEP is vastly improved. In addition to mobile and walkie-talkie" radio equipment, cellular phones for supervisors, and computer network to all county offices have improved the communication capability of the program.

Persistent monitoring of "excess government property" resources has enable to CFTEP to procure equipment, tools, construction material. Trail maintenance has progressed from the "machete and shovel" to bulldozers, backhoes, tractors and shredders. Tractor-trailers are available to transport the heavy equipment along the quarantine zone. County offices have shop facilities and sizable tool inventories. The program has procured construction materials from steel plate to epoxy paint. All of these materials have been obtained at no cost to the program.

There are other changes that have also impacted the implementation of the program:

- The Texas Animal Health Commission eliminated their tick force several years ago. The primary activity of the group was tick surveillance outside of the quarantine zone. The CFTEP has tried to assume this responsibility in the more critical areas of the State; but, we are hampered by inadequate funding.

- Surveillance has been enhanced by inspections of wildlife at hunting camps near the quarantine zone.

- Owners have the option to claim their livestock only the first time they are apprehended. On subsequent apprehensions the animals are forfeited and not returned. Mexican owners must pay feed bills and boarding charges incurred by the apprehension of their livestock. The owners must stand the expense of legally exporting their livestock back to Mexico. These costly and punitive measures have resulted in a decrease in the numbers of stray Mexican stock.

- Tick inspectors are approved to carry government issued firearms for personnel protection when patrolling the hazardous river areas.

Changes involving CFTEP personnel. The decrease in personnel has been previously mentioned. Insufficient staffing is the most important change involving CFTEP personnel in the past 20-25 years. The most important program function is surveillance. An overview of the staff-years expended on the critical surveillance activities of river patrol, premises patrol, and vacated premises patrol for the last ten years, clearly demonstrates the impact of inadequate staffing during "outbreaks". From FY1991 through FY1998 the total staff-years performing these combined activities averaged 37.9 years. The effect of recent outbreaks, which began with the outbreak in Starr County in May, 1999, was reflected in the FY1999 accomplishments with only 29.5 staff-years in the combined patrols. The effect of additional outbreaks in Cameron and Hidalgo Counties was fully
felt in last year's accomplishments with only 16.7 staff-years in patrols — a 56% decrease from the FY91-98 average. This lack of surveillance significantly increases the risk of ticks going undetected in the quarantine zone for extended time periods.

There are greater demands on the time the inspectors have to carry out program activities:

- Limited resources require inspectors to be involved in construction and maintenance of equipment and facilities.
- In addition to meetings, required training also occupies considerable time.
- The Partnership Council has provided a organized forum for inspector input. The Council has improved safety and morale.
- Attitudes of personnel have also changed. They are much more conscientious about the risks of pesticides; probably as the result of "in-house" training for pesticide recertification.
- Despite the "cowboy" image that tick inspectors often try to project, they are becoming more receptive to new methods of operation—biofilters, ivermectin, pesticide injections and boluses, computers, fax machines, and cellular phones.

The CFTEP has encountered many changes in the last 20-25 years. In many respects the program remains unchanged; but in other areas it is quite different. Procedures have been modified, new techniques have been initiated, skills have been added in response to these changes. Today, because of the competence, flexibility, and commitment of the Veterinary Services and ARS personnel involved, the successful record of this important program has not changed.

**Risk of Babesiosis (Babesia spp. infection) in Cattle, Horses, and Native and Exotic Wildlife in the U.S**

G. Gale Wagner, College of Veterinary Medicine, Texas A&M University, College Station, TX

A summary of current information about the various species of Babesia spp. affecting cattle, horses and native and exotic wildlife in the U.S., and the vectors, prevalence and pathogenicity of each of those hemoparasites, was reviewed. Basically, the importance of the problem can be considered as either the transmission of exotic tick-borne disease agents (such as Babesia equi to horses) by native ticks (such as Dermacentor variabilis), or the transmission of native tick-borne disease agents (such as Babesia odocoilei to exotic wildlife) by some exotic tick species.

The reinfeestation of Cattle Fever Ticks (Boophilus spp.), especially acaricide resistant ticks, would almost certainly lead to a reoccurrence of Texas Cattle Fever (babesiosis) in the southern U.S. Babesiosis, like heartwater, is one of the greatest threats to the long-term development of food
animal health, production and diversity in rural areas of the U.S.

Babesiosis ceased to be a problem after the USDA Cattle Fever Tick Eradication Program (CFTEP), started in the early 1900s, was completed. By 1943 ticks were contained within a buffer zone established along the Rio Grande. For nearly 60 years, the CFTEP has stopped the reintroduction of fever ticks and babesiosis in Texas, New Mexico, Arizona and California. Since the late 1990s, however, about 80% of Mexican cattle that wandered or were smuggled into Texas and then apprehended, were infested with fever ticks. The number of outbreaks of *Boophilus* ticks outside the quarantine zone have also increased, from 4 in FY1998 and 8 in FY1999, to 32 in FY2000. No ticks were checked for *Babesia*, but four cattle died of babesiosis associated with one of the outbreaks in FY1999, the first reported cases of Texas fever in nearly 40 years. And, since the late 1990s, the USDA has been concerned that these outbreaks might include ticks that are resistant to the chemical compounds that we are permitted to use to kill *Boophilus* ticks.

Environmental and ecological concerns and awareness have changed since the days of the eradication program. Deer and elk, both alternate hosts for fever ticks, are far more numerous. Improved grasses and range conditions provide a better habitat for ticks thus ensuring their survival during adverse weather conditions. Increased stocking rates on these improved pastures and increased transportation of cattle on better roads can spread potentially *Babesia*-infected ticks from pasture to pasture. With few exceptions, U.S. cattle have no immunity to babesiosis, and if infected, about 50% or more would die. The they were to survive, however, they, like many of the cattle imported annually from Mexico, would become asymptomatic carriers of *Babesia* and reservoirs of infection for the spread of the disease by the recurring populations of fever ticks. All these factors are important in determining the livestock population at risk.

The USDA recently supported a study that considered, among other things, a benefit-cost analysis of the current CFTEP. The study also estimated the costs of controlling a hypothetical fever tick outbreak that might spread throughout the central region of Texas, and lead to a mandatory dipping program for cattle. Many things were considered, including the costs of acaricide, water, labor building dipping vats, cattle lost in the process of dipping, etc. Using 1998 dollars, the first-year cost for a mandatory dipping program would be $1.3 billion. If horses, which are alternate hosts for fever ticks, and dairy cattle are added to the program, the estimated costs for the first year increase to $1.47 billion. The study did not consider the costs of controlling ticks on wildlife (deer, elk and nilgai are also alternate hosts for *Boophilus* ticks), or the economic impact of the loss of U.S. and foreign markets for Texas cattle and horses, and the cost of remediation whenever those acaricides are used. *Boophilus* ticks could also transmit *Anaplasma* and perhaps several zoonotic disease agents.

The risk is also the cost of standing still while:
REPORT OF THE COMMITTEE

- We change the opportunities for exposure (wildlife translocation, habitat modification, mixed production systems, travel, bioterrorism);
- We increase the opportunities for exposure (world trade, strain on the regulatory systems, alternate hosts, vector diversity); and
- We stay comfortable in the box, ignoring the web of relationships when pathogens and vectors emerge and adapt to changing environmental and migratory patterns, changing perceptions of emerging and exotic diseases, changing animal use, care and handling, and changing opportunities for introduction and dispersion.

Acaricides, Resistance of *Boophilus microplus* Ticks to Acaricides, and the Cattle Fever Tick Eradication Program

John E. George, Knipping-Bushland U.S. Livestock Insects Research Laboratory, USDA, ARS, Kerrville, TX

Coumaphos has been the technological cornerstone of the Cattle Fever Tick Eradication Program of the Veterinary Services (VS) of APHIS for almost 30 years, and for over a decade has been the only approved acaricide available. In recent years its availability has been threatened by regulatory actions intended to remove all organophosphate pesticides from the marketplace and by the widespread occurrence in Mexico of populations of *B. microplus* resistant to products in this group of acaricides. The dearth of alternatives to coumaphos and the prospect of a progressively expanding spectrum of resistance to different chemical groups of acaricides by populations of *B. microplus* in Mexico, defines the greatest technological challenge to the continuing success of the campaign to protect the U.S. cattle industry from cattle fever ticks and babesiosis.

Coumaphos is used in the dipping vats at the import facilities of VS in Mexico to treat all cattle that are presented for export to the U.S. and which pass inspection. Coumaphos is a choice product for insuring that if ticks are overlooked during the inspection process they will be killed by the treatment, because exposure of replete females, the most difficult parasitic life stage to kill, results in almost 100% mortality of *B. microplus* susceptible to this chemical. Unfortunately, not all engorging female ticks from an OP resistant strain from Mexico were killed in an experiment when their hosts were dipped in a vat containing the 3,000 ppm concentration of coumaphos used in the import vats. Therefore, if adult *B. microplus* are overlooked on cattle presented at an Import Inspection Facility and the cattle are given a final dip in coumaphos and imported, there is a risk that OP resistant adult ticks could survive the dip and be introduced into the U.S. on the cattle. Also, evolution of a more highly OP resistant strain of *B. microplus* may occur in Mexico as a result of continuing selection pressure and such an event would invalidate further use of coumaphos at Import Stations.
Only amitraz, a formamidine acaricide, and permethrin, a pyrethroid, have acaricidal properties similar to coumaphos and exist in formulations that can be used to charge dipping vats. Potent, widespread resistance in Mexico of *B. microplus* to pyrethroid (P) products eliminates permethrin and related chemicals as possible replacements for coumaphos in dipping vats at import facilities. Amitraz has excellent acaricidal activity against ticks on cattle, but it cannot be used to treat equids.

The laws and regulations that form the legal foundation for eradicating infestations of cattle fever ticks within the boundaries of the State of Texas and the confines of the official Quarantine Zone are based, in part, on the use of an acaricide that has the attributes of coumaphos. Except for the problem of having to exclude horses from treatment with amitraz, amitraz and permethrin could both be used in the CFTEP within the framework of existing regulations, if target populations of cattle fever ticks were susceptible to the acaricides. Some chemicals that are efficacious acaricides, but which do not cause the rapid mortality of all developmental stages of *Boophilus* ticks on cattle could be used to treat cattle in the quarantine zone if regulations and treatment strategies were adapted to compliment the treatment methods and modes of action of products based on these acaricides. For example, experimental results with pour-on formulations of the macrocyclic lactones ivermectin and eprinomectin, indicate that a regime of two treatments with the second application four days after the initial one are efficacious for controlling *B. microplus* on cattle infested with all three parasitic stages at the time of treatment. Spinosad, an experimental product, applied as a whole body spray to cattle infested with *B. microplus*, was efficacious against all life stages except a few females that were fully engorged when the hosts were treated and which survived the treatment and oviposited some viable eggs. The remarkable persistent efficacy of >99.9% control of new infestations of larvae for two weeks post-treatment is evidence of the potential value of a product with spinosad as the active ingredient in systematic treatment programs to eradicate infestations of cattle fever ticks.

Informed choices of which acaricides to use in the campaign to keep cattle fever ticks out of the U.S. and cognizance of the risks acaricide resistant ticks pose for the program depend on our ability to diagnose resistance in a tick population. Dose-mortality bioassay methods such as the larval packet test (LPT) and the diagnostic dose assays based on dose-mortality data will continue to be essential tools for assessing the susceptibility of ticks to acaricides and helping to determine the mechanisms of resistance. The LPT and bioassays based on treatments of engorged females with acaricides have been standardized for OP and P acaricides and research to develop standardized bioassays for amitraz, macrocyclic lactones, and other products is underway. Problems that limit the usefulness of bioassay methods are a lack of precision and the length of time required to obtain results. Biochemical or molecular genetic techniques
for the diagnosis of resistance could provide data on the frequencies of resistance genes in a tick population within a few hours to 48 hours after a sample of ticks is received. Limitations of these kinds of assays are that they are relatively challenging scientifically to perform and could be too specific in some situations. A PCR assay for target site resistance of *B. microplus* to P acaricides has been created, and development of biochemical and/or molecular genetic assays for metabolic resistance to Ps, and target site and metabolic resistance to OPs will be completed soon. The next step will create biochemical and molecular genetic assays for amitraz and macrocyclic lactones.

Knowledge of the status in Mexico of problems with populations of *B. microplus* resistant to acaricides is crucial to efforts in the U.S. to protect against the ingress of this parasite and the disease agents it transmits. We know that resistance to OPs is widespread. While we have been informed that the Tuxpan strain that we used to determine the efficacy of our high concentration coumaphos treatments is as resistant as any known strains, we need to be engaged in a continuing cooperative effort with our colleagues in Mexico to evaluate OP resistant strains to enhance the probability that if a more highly OP resistant tick strain evolves we will detect it before it is introduced and becomes a problem in the U.S. Resistance to OP and pyrethroid acaricides will be followed by the evolution of resistance to amitraz and other acaricides that are used intensively. Amitraz has been used in Mexico for seven years and scientists there have already expressed concern that resistance to this acaricide is emerging.

The optimistic view is that a more highly OP resistant strain of *B. microplus* does not exist or will not evolve in Mexico and that we will can continue to rely on coumaphos to protect the U.S. cattle industry. Even if we choose to accept the optimistic view, it will be prudent for us to develop contingency plans. The recent alarm precipitated by problems with the supply of coumaphos demonstrated the need to have alternative strategies and the information needed to implement them available in a current database. The problem is becoming increasingly complex and there is no reason to expect that the animal health industry is going to come to our rescue with new acaricides. If and when new products or formulations become available, ARS will test them, but we need to understand the best ways to use the tools that are available to us now.

What else should we do? We need to maintain our close cooperative ties with Mexico to keep ourselves informed about new developments in their effort to control cattle fever ticks on cattle. The intensity of the threat of cattle fever ticks and babesiosis to the U.S. cattle industry is directly related to the quality of programs ranchers in Mexico use to control cattle fever ticks. It is also important for us to assess the U.S. research program to examine its scope and priorities. As part of our national research program we should promote continued and expanded cooperative efforts with Mexico.
The Development of Recombinant Vaccines to Protect Livestock Against Tick-borne Hemoparasitic Diseases

Don P. Knowles, Hemoparasite Disease Research Unit, USDA, ARS, Pullman, Washington

The recent history of the development of recombinant vaccines for diseases such as babesiosis and anaplasmosis was presented. Multiple approaches have been used, including the role of the tick vector in influencing antigen presentation, the host immune response itself, the influence of parasite genetics in presenting putative immunogens, and the importance of vaccine delivery systems.

Most recombinant vaccines have tended to induce good homologous immunity, but relatively poor heterologous protection. One important factor that is now better understood, is the influence of the tick vector at the level of the midgut epithelium, the gut muscle cells and the cells of the salivary gland, and how the movement of the parasite disease agents are changed (selected?) by the process of moving through these tissues after the vector tick feeds on a reservoir host. Recombinant vaccine design then, must include an evaluation of antigenic epitopes that survive the process.

Recent studies, particularly with bovine babesiosis, have highlighted the importance of the CD4 T cell in immunity. Thus, recombinant products must be able to induce vigorous CD4 T cell proliferation in order to promote and effective immunoglobulin response.

Studies of parasite genome, and the control on expression of certain antigens and not others, is an active and fertile area of research. Several lines are being pursued, such as the *Anaplasma* genome project at the USDA, ARS, Hemoparasite Disease Research Unit, and the *Cowdria* genome project at the Veterinary Research Institute in Onderstepoort, South Africa.

Research on effective delivery systems of recombinant gene products, or, indeed, DNA itself, is also just beginning.

Roundtable discussion.

The discussion was lead by Corrie Brown (College of Veterinary Medicine, University of Georgia). John Fischer (Southeastern Cooperative Wildlife Disease Study, University of Georgia) took the position that heartwater would have the highest impact on white-tailed deer and exotics. Occurrence of the disease, and infestation of the vector, could lead to depopulation of large numbers of exposed animals, increased surveillance of imports, use of alternate delivery systems of acaricides, and vigorous testing of samples for disease agents. Susan Little (College of Veterinary Medicine, University of Georgia) discussed the paucity of information on any of the ehrlichias that might infect livestock. Linda Logan (Texas Animal Health Commission) discussed the impact of world
Lee Coffman (Florida Department of Agriculture and Consumer Services) reminded the audience that we will not be dealing with one disease in one state, but likely several diseases in possibly many states. He asked for focus and planning, both on the diseases we have now as well as the ones discussed today. A planned, coordinated program would be a requirement. Larry Moore, Osceola, Missouri reiterated the need for emergency preparedness, but cautioned that the industry stakeholders needed to know the economic impact of these diseases so that they could support emergency management. John Adams, National Milk Producers Federation reflected on the total lack of resources for maintaining the $100 billion national livestock industry. The common reaction for congress is that many millions are going to support the industry, but they ignore the fact that plant agriculture, not animal agriculture, takes the great majority of funding. He too reiterated several of the issues and problems facing the industry, and agreed on the need for discussion, planning and coordination. Corrie Brown (College of Veterinary Medicine, University of Georgia) re-emphasized the needs expressed by the speakers for good collaborative research and risk assessment, and for a focus for the collaborative efforts. "We need to stop shoveling fog," she said.
REPORT OF THE COMMITTEE ON PHARMACEUTICALS

Chairman: Dr. Roy A. Schultz, Avoca, Iowa
Vice Chair: Dr. Joe S. Gloyd, Wilmington, DE.

Dr. James Bradford, MI; Dr. Myron D. Brown, KS; Dr. Scott A. Brown, MI; Dr. Thomas J. Burkgren, IA; Dr. Eric J. Bush, CO; Mr. Jon D. Caspers, IA; Dr. Elizabeth A. Curry-Galvin, IL; Ms. Barb Determan, IA; Dr. William H. Fales, MO; Dr. James E. Fox, GA; Dr. R.A. Gessert, FL; Dr. Eric Gonder, NC; Dr. Carl Graham, MO; Dr. Richard E. Hill, IA; Dr. John P. Honstead, MN; Dr. G. Dean Lindsey, IN; Dr. Patrick I. McDonough, NY; Dr. David J.S. Miller, U.K.; Dr. Bert A. Mitchell, MD; Dr. Larry F. Moore, MO; Ms Valerie H. Patten, NY; Ms Tracy A. Raef, DC; Dr. Jane F. Robens, MD; Ms Sarah A. Salmon, MI; Dr. Jishu Shi, CT; Ms. Meryl C. Sosa, IL; Dr. Paul Sundberg, IA; Dr. Lyle P. Vogel, IL; Dr. Phillip W. Widel, Mo.

The Pharmaceutical Committee met at 12:30pm on Monday, October 23, 2000 in the East I Room of the Sheraton Hotel in Birmingham, Alabama.

Thirty-two participants were present with 18 committee members and 14 guests.

The committee has maintained a continuing emphasis on providing a forum to identify and address issues concerning the availability and the safe use of pharmaceutical products in animals. Continued education at all levels and including proper and effective use of pharmaceuticals has been encouraged as a means of achieving these goals.

Dr. Bert A. Mitchell led off the Pharmaceutical Committee meeting by announcing his intent to retire from the Center for Veterinary Medicine (CVM) within the next year. He reviewed the current approvals of new animal drugs which have been published in the Federal Register and compared the 2000 approvals to date with the number of approvals in 1998 and 1999. Three new chemical entities were approved, one in swine and two in canine. A total of 40 approvals for new indications, new dosage, new species, or new combinations were registered.

Dr. Mitchell reviewed the new budget for CVM for 2001. It increased the total FTE's by 39 people, and the total budget increased to 64.9 million dollars. The increases are budgeted for bioterriorism, drug approvals, antimicrobial resistance, biotechnology, import tolerances, and Codex on animal feeding. He discussed the antimicrobial resistance and risk assessment and resistance thresholds, including monitoring thresholds. Dr. Mitchell noted that his agency had concluded that the use of fluoroquinolones for treatment of chickens had led to a level of decreased campylobacter susceptibility which impacts human health. This linkage in risk assessment appears to be a basis for future regulation of the use of fluoroquinolones in
REPORT OF THE COMMITTEE

food animals.

Dr. Mitchell subsequently responded to audience questions regarding published accounts indicating that the approval of fluoroquinolones in chickens may be withdrawn. In a related issue, he summarized the CVM’s 12-page response to the USAHA resolution generated by the Pharmaceutical Committee in 1999(Appendix B). He stated that the crux of the response was that the CVM/FDA takes a regulatory approach for approving animal drugs that carefully balances the approval of safe and effective animal drugs and protection of human health.

Touching on other CVM activities, Dr. Mitchell spoke about pending legislation before Congress including the Minor Use—Minor Species Act, and the Animal Health Protection Act, both of which deserve strong support by USAHA, its members and others interested in animal agriculture. He also noted CVM’s intent to regulate transgenic animals and to cooperate with international efforts to protect the safety of animal feeds.

Dr. Paul Sundberg, Assistant Vice-president, National Pork Producers Council discusses the “Prudent Use Guidelines for Antibiotics and Antimicrobials”. He stated, “Animal agriculture shares the concerns of government agencies, physicians and veterinarians about changes in microbial susceptibility that could threaten the health of people and animals. Farmers and their veterinarians are also consumers. They eat what they produce. They don’t want to jeopardize the health of others, as they don’t want to jeopardize the health of their families. They also are very proud of their role in maintaining the health and productivity of their animals. They enjoy what they do and strive to be good stewards so following generations can also participate in animal agriculture.”

Also though, animal agriculture needs timely and economical availability and access to effective animal health products to keep their animals healthy. This is the right thing to do from the perspective of animal welfare, the environment, and doing all that can be done to provide meat, milk and eggs that are safe and wholesome.

Judicious use of antimicrobials as a tool to address the emergence of antimicrobial resistant bacteria has been the subject of multiple meetings in international and national venues. The World Health Organization and the Office International des Epizooties (OIE) are actively developing guidelines for judicious use to be available to the counties of the world. The American Veterinary Medical Association has convened an expert committee to develop judicious use guidelines for U.S. veterinarians. Species specialty groups such as the American Association of Swine Practitioners have used these general guidelines to develop similar models for their practitioner members. The National Pork Producers Council has taken these and provided pork producers with a basic checklist to evaluate their antimicrobial use.

In summary, the pork industry believes that the questions about antimicrobial resistance and its potential effects on public health are very com-
plex and the issue is not as simplistic as some, including some advocacy
groups, contend. It is imperative that politics or the precautionary principle
not overcome science, as has happened in some European Union coun-
tries. Decisions regarding antimicrobial use in these countries have been
made for political reasons without a scientific basis. Because of this, effi-
ciencies of pork production have suffered without demonstration of benefit
to human health.

It is also imperative that all the stakeholders in the issue are able to
provide input and reach consensus on a coordinated plan to address anti-
microbial resistance. This plan should include an objective assessment of
the relative risks attributable to all that prescribe or use antimicrobials.

FUTURE DEVELOPMENTS AND TRENDS WITH RESPECT
TO FOOD ANIMAL VETERINARY DRUGS

David J. S. Miller, BVMS (Glas) MRCVS
Demafarma Consultancy Limited, Surbiton, Surrey, UK

In order to develop the theme of the future directions of food animal
veterinary drug developments and trends I consider that it will be beneficial
to:

i) Review the current state of the biosciences companies and
markets

ii) Consider the political and regulatory events which closely impact
R and D

iii) Consider the R and D trends among the surviving 'players' in the
A/H industry.

i) A review of the current state of the biosciences companies and markets.
The world market for animal health products has grown slowly in re-
cent years and has been worth in the region of US $16B to US $18B.

<table>
<thead>
<tr>
<th>Year</th>
<th>US $ Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>15.9</td>
</tr>
<tr>
<td>1996</td>
<td>17.4</td>
</tr>
<tr>
<td>1997</td>
<td>17.7</td>
</tr>
<tr>
<td>1998</td>
<td>18.0</td>
</tr>
</tbody>
</table>

Table 1.
World market value for animal health and nutrition products.

Source: Vivash-Jones Consultants Ltd.
North America has continued to be the main driver of sales, with Western Europe following.

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>30.9%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>23.5%</td>
</tr>
<tr>
<td>Asia</td>
<td>19.7%</td>
</tr>
<tr>
<td>Latin America</td>
<td>10.1%</td>
</tr>
<tr>
<td>Others</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

The major sectors of the market by product class are pharmaceuticals, feed additives (medicinal and nutritional) and biologicals.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmaceuticals</td>
<td>51%</td>
</tr>
<tr>
<td>Feed additives</td>
<td>35%</td>
</tr>
<tr>
<td>Biologicals</td>
<td>14%</td>
</tr>
</tbody>
</table>

A particularly rapid pace of change in company structure of the animal health industry has occurred and this has been largely driven by the increasingly frantic scramble of the human pharmaceutical companies to merge.

At the time of writing the top 9 companies in the human pharmaceutical sector of prescription medicines included two large organisations of 'to be finalised' mergers and recent completed mergers. (See Table 4)

<table>
<thead>
<tr>
<th>Company</th>
<th>US $ Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Glaxo-Smith Kline</td>
<td>22.6</td>
</tr>
<tr>
<td>2. Pfizer Warner Lambert</td>
<td>21.54</td>
</tr>
<tr>
<td>3. Merck &amp; Co.</td>
<td>16.45</td>
</tr>
<tr>
<td>4. Astra – Zeneca</td>
<td>14.86</td>
</tr>
<tr>
<td>5. Aventis</td>
<td>14.47</td>
</tr>
<tr>
<td>6. Bristol Myers – Squibb</td>
<td>13.15</td>
</tr>
<tr>
<td>7. Novartis</td>
<td>11.11</td>
</tr>
<tr>
<td>8. Roche</td>
<td>10.78</td>
</tr>
<tr>
<td>9. Johnson &amp; Johnson</td>
<td>10.02</td>
</tr>
</tbody>
</table>

Source: Wall Street Journal Europe 18.01.00
PHARMACEUTICALS

Thus of the emerging top 2 companies, both individually, will have annual sales exceeding the total global market for animal health and nutrition products!

The top 9 companies in terms of global animal health sales are listed in Table 5.

Table 5.
Animal health companies total global sales rankings 1999.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>US $ Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Merial</td>
<td>1.56</td>
</tr>
<tr>
<td>2.</td>
<td>Pfizer</td>
<td>1.39</td>
</tr>
<tr>
<td>3.</td>
<td>Bayer</td>
<td>0.92</td>
</tr>
<tr>
<td>4.</td>
<td>Fort Dodge</td>
<td>0.70</td>
</tr>
<tr>
<td>5.</td>
<td>Schering – Plough</td>
<td>0.66</td>
</tr>
<tr>
<td>6.</td>
<td>Elanco</td>
<td>0.63</td>
</tr>
<tr>
<td>7.</td>
<td>Novartis</td>
<td>0.59</td>
</tr>
<tr>
<td>8.</td>
<td>Intervet</td>
<td>0.43</td>
</tr>
<tr>
<td>9.</td>
<td>Pharmacia – Upjohn</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Source: "Animal Pharm" Review of 1999

During 2000 Intervet completed the acquisition of Hoechst-Roussel Vet and thus move up the table to the no. 3 position.

Thus the prospective no. 1 human prescription medicine supplier will have total global sales 14.5 times bigger than those of the largest animal health company.

In the animal health sector the revenue ranges which exist rarely exceed $25M total annual sales and the suggested breakdown is as follows:

However during the 1990s several innovative new compounds have been introduced for food animals which have enjoyed gratifying global sales levels. e.g:

1998

<table>
<thead>
<tr>
<th>Estimated Sales</th>
<th>Product</th>
<th>Manufacturer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>$200-300M</td>
<td>Doramectin</td>
<td>Pfizer</td>
<td>Ectendocide</td>
</tr>
<tr>
<td>$100-200M</td>
<td>Moxidectin</td>
<td>Fort Dodge</td>
<td>Ectendocide</td>
</tr>
<tr>
<td>$100-200M</td>
<td>Tilmicosin</td>
<td>Elanco</td>
<td>Macrolid antibiotic</td>
</tr>
<tr>
<td>$50-100M</td>
<td>Florfenicol</td>
<td>Schering Plough</td>
<td>Phenicol antibiotic</td>
</tr>
<tr>
<td>$50-100M</td>
<td>Danofloxacin</td>
<td>Pfizer</td>
<td>Fluoroquinolone antibiotic</td>
</tr>
</tbody>
</table>
ii) Recent political and regulatory events which impact R&D.

The animal health industry operates in a global milieu which today presents a marked contrast to the environment which existed 20 years ago. The early 1980s were characterised by a high degree of scientific optimism, exemplified by biotechnological advances which appeared likely to deliver new approaches to disease control, in man and animals and also to products for the improvement of the productivity of food animal production. At that time R&D funding for animal health product projects was easier to justify. Today, however, we see a radically different scene.

The parent companies of animal health organisations suffer from increasing cost/profit pressures in their human pharmaceutical businesses and are reassessing their commitment to non-pharmaceutical businesses e.g. animal health, crop protection and seeds.

Novartis and Astra-Zeneca are both in the process of "spinning off" their agro-chemicals and seeds businesses into a new jointly owned entity to be called 'Syngenta'.

Consumer and political attitudes in developed countries tend to be increasingly negative towards new agricultural technologies and regulatory frameworks for them, which are driven by perceived political concerns, are becoming ever more restrictive.

The B.S.E. crisis in UK and other EU countries has undoubtedly hardened consumer and hence political attitudes towards 'food safety' issues. Consumers in the EU are now setting the agenda where food safety issues are concerned and the growth of Food Standards Agencies (at national and EU levels) will further concentrate political power in this area.

Political decisions in the EU, where scientific evaluations have regularly been overturned, using the so called 'precautionary principle' for some of them, include:

- The suspension of four in-feed antimicrobial growth promoters
- The banning of B.S.T. use in lactating cows
- The banning of anabolic hormones for lean beef production

Such activities inevitably make it increasingly difficult for animal health R&D managers to quantify the 'regulatory risk' or uncertainty attached to certain R&D projects. In relation to medicated feed premix projects in particular, it is perhaps of little surprise that two major players (Roche and Pfizer) have divested their activities in this area.

Good science is clearly no longer sufficient in itself to guarantee market entry for products which increase animal productivity, used in the EU.

The current regulatory system for veterinary medicines in the EU consists of a mix of centralised or decentralised procedures and is due for review in 2001. Research based companies are critical of the current system and believe that major changes are necessary. Key directions for desired changes are:

i) A single scientific assessment based solely on product safety, quality and efficacy, applicable to all European procedures.
PHARMACEUTICALS

ii) An effective rapid appeal capability and speedy arbitration between Member States, when there is a dispute in the "mutual recognition" process.

iii) Non automatic, proportional and harmonised application of new standards to currently authorised veterinary medicinal products based on risk-benefit assessment.

iv) Provision of uniform 10 year protection for all new data required.

v) Development of appropriate consumer protection procedures, based on realistic risk assessment and effective monitoring of risk, in order to ensure both the continued availability of veterinary medicines and the continued safeguard of public health.

vi) The development of a policy to facilitate the treatment of minor species with veterinary medicinal products for both food producing and companion animals.

Most striking contrasts exist between the USA and the EU. In the USA the productivity enhancers which have been removed from the market in the EU on political grounds, are still approved, e.g:

- Anabolic growth hormones
- BST
- In-feed growth promoters e.g. tylosin, carbadox, virginiamycin

A trend setting decision here, taken by FDA in USA in regard to a bagonist feed premix for pig feeds, based on ractopamine ("Paylean"-Elanco), has now been approved and will assist the production of the lean pork which US consumers demand.

However, one more controversial development in the USA has been the effort of the FDA to respond to the continuing criticisms, from medical microbiologists and public health experts in relation to potential, but scientifically debatable human health hazards, arising from the veterinary use of certain antibiotics, particularly fluoroquinolones.

Until now the basic safety components of an application in USA for the approval of a food animal antimicrobial medicine were:-

- Target animal efficacy studies
- Environmental safety studies
- Food safety (residue) studies
- Target animal safety studies

An issue of "microbial safety" has now been added to the list. The new "microbial safety" requirements for antimicrobials currently propose both pre-approval (resistance development and pathogen load) and post-approval (monitoring and resistance thresholds) studies

Discussions with stakeholders are on-going to further refine these requirements but it is already clear that no new veterinary antimicrobials for food animals will be approved in the USA without consideration of the microbial safety issue. Clearances in future are likely to be more feasible if the proposed veterinary antimicrobials have little or no use in human medicine or they are not the antimicrobials of first choice (or a significant alter-
native) for treating human infections, including food borne infections. Existing antimicrobials in this category would include ionophores (such as lasalocid), polymyxins (such as colistin) and pleuromutilins (such as valnemulin).


The animal health industry will move into the 21st Century competing for shares in a market worth approximately US $14B (excluding nutritional feed premixes) in which many important segments are dominated by generic (out of patent) products e.g. ivermectin in the ectendocide sector and oxytetracycline/chlortetracycline in the broad spectrum antibiotics sector. There is thus intense competition and the traditional products are extremely difficult to improve upon on a cost/benefit basis.

It is important to realise also that low cost producers in Asia, e.g. China (PRC) and India, are increasingly important producers of generic medicines, including fermentation based products.

The research expenditures which are feasible within animal health companies are relatively modest – even the largest animal health companies command annual budgets of only US $100M or so per year, whilst most of the top twenty animal health companies can commit no more than $50-60M per year. By contrast the human pharmaceutical industry now spends US $300M or more over 10-12 years to develop one new antimicrobial².

In the food animal sector the three major product segments are:-

- Feed premixes
- Pharmaceuticals
- Biologicals

In the feed premix segment it is widely expected that in developed countries e.g. EU, there will be an intensifying of regulatory controls and that opportunities for innovative feed premixes may be few. On the other hand, outwith the EU, intensive production of livestock will be essential to feed the world’s burgeoning population, which is expected to reach 9 Billion within the next fifty years. This intensive livestock production will probably be impossible without antimicrobial premixes for both productivity enhancement and disease control.

The anticoccidial segment for poultry feeds has declined in importance as a target for animal health research but a small number of companies remain committed to the development of new and improved biologicals for coccidiosis control.

In the ‘pharmaceuticals’ sector the main segments are anti-infectives and anti-parasitics. The anti-infectives sector may benefit ultimately from the revolution in antimicrobial research methodology which has occurred in the human pharmaceutical industry. The emergence of antibiotic-resistant tuberculosis in the community and multi-resistant Gram-positive organisms e.g. vancomycin resistant enterococci (VRE) and methicillin-resistant sta-
phylococci (MRSA) in hospitals, has acted as a spur to major research efforts. The new techniques include high output screening, new combinatorial chemistry, bio-informatics and the emerging sciences of pharmaceutical genomics and pharmaceutical genetics. Arising from such programmes we can expect antibiotics of a completely novel structure and mode of action, in the long term.

In the short term we can expect new derivatives of existing classes such as 3rd generation tetracyclines (glycylcyclines), 3rd generation fluoroquinolones and ketolides (related to macrolids).

The European animal health industry federation (FEDESA) has recently indicated that globally there are no fewer than twenty-seven new antimicrobial compounds under development at present. However, with the emerging highly restrictive regulatory climate for veterinary antimicrobials it is highly debatable as to how many of these substances will be eventually marketed for food animal veterinary use.

If the availability of new antimicrobial products declines, alternatives could gain importance. Competitive exclusion products and probiotics may be used as well as more effective new vaccines.

In the area of parasiticides, research is likely to focus on novel tick treatments and there will be a need to provide alternatives, on account of the development of resistance, to existing compounds used for the control of liver flukes and gastrointestinal nematodes in sheep/cattle. In the past ectoparasiticides were sourced from the agro-chemical discovery programmes of such companies as Hoechst-Roussel and Elanco. In these companies the animal health businesses have now lost their connection to the previously related crop protection businesses.

Production enhancers (other than antimicrobials) have borne the brunt of opposition to intensive livestock production during the past decade. Anabolic hormonal implants for lean beef production were banned in the EU at the end of the 1980s following the lead set by Sweden. However, they are still used in the USA and several other key beef producing countries. Although the (WTO) has ruled against the validity of the EU's ban on anabolic beef hormone implants, the EU is most unlikely to reverse its current position.

Heavy investments were made by several companies during the 1980s and early 90s into somatotropins and so-called repartitioning agents. BST was approved here and has developed significant sales, believed to be running at around $190M per year.

The U.S. approval of "Paylean" (ractopamine), the β agonist repartitioning agent, is likely to encourage other companies in the USA to continue working in this area. One such compound is zilpaterol ("Zilmax") which is currently on sale for cattle in South Africa and Mexico and could be developed for use in pigs.

Interest in P.S.T (porcine somatotropin) may also be revived as a consequence of FDA's approval of ractopamine, since it also offers potential
human health benefits in terms of leaner meat.

The production characteristics of livestock could also be manipulated by non-chemical means by transgenic and cloning techniques. This area of research is however quite clearly a high risk investment, particularly in the EU, where new food production techniques are under such intense critical scrutiny.

In relation to biologicals, R&D activities will be perhaps the most pivotal area of animal health industry R&D.

Vaccine research will continue to target the three major market sectors, cattle, pigs and poultry and vectored vaccines, DNA vaccines and marker vaccines will become widely available. Broad spectrum anti-mastitis vaccines for dairy cattle, anti-coccidial vaccines for poultry and improved multi-valent vaccines for cattle, pigs, and poultry will be primary targets. Other major targets are the development of anti-parasite vaccines for ticks, nematodes and liver fluke. In 1994 the world's first commercially available cattle tick vaccine was launched in Australia.

Finally food safety vaccines are expected to emerge for use against organisms of public health significance such as Salmonellae, Campylobacter and Listeria.

In both the 'biologicals' and 'pharmaceuticals' market sectors, advances in delivery system technology will be highly significant. Sustained release antimicrobials and anti parasitics are likely to be offered and oral delivery systems could replace the injection of many vaccines.

"Take home messages"

i) There is a major restructuring on going in the biosciences industry involving:
   - Human pharmaceuticals
   - Crop protection/seeds
   - Animal health

ii) The research based animal health industry is fast consolidating into a handful of major players.

iii) The cumulative impact of non-science based regulatory actions in the EU in relation to productivity enhancers has caused, in certain companies, a crisis of confidence in the EU's regulatory processes.

iv) Significant differences between the regulatory processes in the EU and the US have emerged and these could impact the sites chosen for future R&D activities.

v) Future R&D spending will be heavily focused on immunological techniques.

**Selected references.**

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Source: Animal Health Institute, Washington, DC, USA

CHARACTERIZATION OF ANTIMICROBIAL RESISTANCE

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It has been proposed that the use of antimicrobials in animals may significantly contribute to the development of antimicrobial resistance in zoonotic pathogens and enterococci. While the etiologic fraction has not been determined, transmission of resistance factors [1, 2] as well as transmission of the bacteria through food consumption has been documented. Newer molecular analytic techniques, while improving our understanding of resistance mechanisms and resistance transfer, have further fueled this concern. The detection of human pathogens that are resistant to multiple antimicrobials is particularly worrisome. Current proposals call for limited use of antimicrobials in animal agriculture while other proposals suggest that the relative risk of resistance transfer to human pathogens through the food chain or environmental contamination is minimal and thus does not warrant concern. Additional arguments suggest that inappropriate antimicrobial use in human medicine is the major culprit causing increased resistance in human pathogens.

In the U.S., multiple reviews of the matter have been conducted by both government and private agencies [3-14]. Each suggests that there is
justification for concern though there is no concrete data which suggests that harm has resulted from antimicrobial use in animals. All studies agree that the matter needs further study. Until recently, these reports have resulted in little regulatory action to limit antimicrobial use in animals. Now the dialogue favors the proponents of access restriction.

In Europe, a very different scenario has unfolded. In the 1971, the British limited the use of antibiotics in animals, particularly feed additive antibiotics, to prescription use only based upon the conclusions in the Swann Report [15]. Sweden, in 1971 also limited the use of feed additive antimicrobials [16]. In 1999, the European Union banned the used of virginiamycin, spiramycin, tylan, and bacitracin as feed additives. Two recent World Health Organization plenary conferences on the subject call for greater monitoring and restricted use if warranted [17, 18]. In both the U.S. and foreign countries the greatest concern is the use of feed additive antimicrobials, particularly those used for growth promotion and feed efficiency.

In response to these concerns, the Food and Drug Administration / Center for Veterinary Medicine has proposed a new framework for drug approvals [19]. The framework calls for restricted use depending on 1) the antimicrobics perceived importance in human medicine; 2) post approval monitoring for resistance development and consequential withdrawal of approval if resistant is deemed to pose increased risks; 3) restricted use of mass treatments regimes i.e., feed additives and water medication; and 4) restricted use in cases where consequential pathogen load increases.

For guidance in this debate, there is a real need for improved understanding of antimicrobial resistance and how farm level factors influence the character of resistance as seen on farms. Without this characterization, there will likely be greater political pressure calling for restrictions based upon the "imminent hazard provision of the Food, Drug, and Cosmetic Act"[20]

Sources of Resistance

Identification of the source of resistant genes is crucial for understanding and managing this concern. There are two source options; mutation and environmental reservoirs. Generally, it is assumed that in nature, mutation is a rare occurrence. Further, the survival rate for mutant strains is thought to be low. However, because bacterial populations are infinite in size and their replication rate is so rapid, it is not unreasonable to expect resistance mutant strains to develop, particularly with prolonged exposure to antimicrobics.

Local environmental reservoirs, such as pets [21], soil, water, and feed are a second potential source of resistance [22]. Within human populations, community based transfer is well documented [23]. Further, within ecological systems, it is possible that native or innate resistance genes are persistent and not expressed within the bacterial population until challenged. It is also possible that resistance genes are persistent with commensal
bacterial populations. There is one school of thought which suggests that these genes have a propensity to be self sustainable, hidden within the genetic code of the bacteria and expressed only when placed under selective pressure. In this scenario, it likely that bacteria which are host to resistance genes will become dominant when challenged. Whether or not they become submissive to normal flora when selection pressure is removed is unknown, though limited studies would suggest that this only partially occurs [24].

Lastly, instead of local activity being the source of new resistance, it is suggested that horizontal spread is a major contributor to prevalence estimates. For example, vectors such as migratory birds have been demonstrated to spread resistant clones such as Salmonella typhimurium DT104. Further, foreign travel is also a well documented risk factor for resistance.

The Transfer of Resistant Genes

Molecular technology has also improved our understanding of resistance transfer. It is now recognized that resistant genetic material is not only mobile within the bacteria [25], but is also transferrable between bacteria [26]. It can be mobilized and transferred between bacteria by plasmids, by phage, through conjugation, and through the accumulation of unbound or free DNA. Because of the ease of gene transfer, it is postulated that resistance which is clinically significant is primarily acquired from other bacteria. Little is known about the presence of resistance genes in relatively innocuous bacteria such as commensals and Campylobacter jejuni, however, it is very possible that these organisms are significant and maybe even primary reservoirs of resistance.

There is considerable debate within the scientific community as to how frequently genetic acquiescence occurs. In fact, this is one of the key elements of the debate over agricultural antimicrobial use. It has been suggested that the odds of resistance transfer increases the more closely related the bacteria. It is the possibility of resistance transfer which is particularly alarming to public health officials. They are concerned that genes encoded for resistance may be transferred to multiple species of bacteria and result in a significant risk to human health.

Resistance Characterization

Antimicrobial resistance may be characterized phenotypically or genotypically. Phenotypic characterization reflects the susceptibility of bacteria to given levels of antimicrobics. At some breakpoint concentration of antimicrobial, bacteria are judged to be sensitive or resistant based upon their ability to grow in culture. Published reports describing phenotypic resistance have been inconsistent, however, in both methodology and interpretation. For example, not all researchers have used common breakpoints. To overcome this point of confusion, NCCLS has established standards which are now generally accepted. Further confusion occurred when some researchers characterized bacteria as "decreasingly susceptible" even when
breakpoints were not exceeded. They arrived at this conclusion when bacterial susceptibility decreased even with very low antimicrobic levels. Thus, it is understandable that reports of phenotypic resistance have met with scepticism.

Environmental and management factors further complicate the interpretation of phenotypic resistance outcomes. For example, phenotypic resistance can vary depending on pig age, and housing [27], as well as the occurrence of stress events such as moving and transportation [28]. It is not surprising that pigs on different antimicrobics exhibit varying phenotypic patterns [29, 30]. Dosage level [31] and duration of treatment may affect phenotypic expression [32]. Even the degree of multiple resistance can be affected by antimicrobial regime [30]. Because of these potential confounders, it is not surprising that interpretation of phenotypic data is imprecise.

New techniques allow researchers to examine the genetic fingerprint of bacteria, looking specifically at resistant genes. Genotypic descriptions of resistance reflect whether or not bacteria possess resistance genes regardless of their phenotypic character. These techniques have particular value in "molecular epidemiology" where bacterial clones can be traced throughout a given ecological environment. For example, detection of like bacterial clones in two or more populations (be that man or animals) provides strong evidence of possible cross-contamination between the groups.

A study by Lee [33] emphasizes the importance of both phenotypic and genotypic resistance evaluation. In this study bacterial isolates were collected from three farms with differing antimicrobial use strategies. The bacteria phenotypically demonstrating resistance to tetracycline were genotypically evaluated. Multiple tetracycline resistant genotypes were identified both within and across farms. This study demonstrates how common phenotypes may vary genotypically. This study also demonstrates how genetic diversity may affect susceptibility endpoints as demonstrated phenotypically.

Not only are phenotypic differences reflective of the genes present, they may also be associated with manner in which genes are stoichiometrically encoded within the bacterium. Early work on resistance suggested that resistance is primarily encoded on plasmids. More recent work demonstrates that resistance may also be encoded on the chromosome. Within the chromosome, there are specific islands of genes which direct resistance expression. Within these islands are operons, promoters, and repressors [34]. It is the operon which codes for resistance. The operon, when acted upon by the promoter, activates resistance genes. In the absence of antimicrobial exposure, it is the repressor which stops transcription of the gene, thus preventing its resistance expression.

Further, it is now recognized that resistance genes may be transposed. These "jumping genes" have the potential to move depending upon the bacteria's needs. Additionally, resistance genes located within cassettes.
known as integrons may be relocated within plasmids or chromosomes based again on the bacteria’s needs [25]. As these mechanisms of control are better understood, it is hoped that they can be managed so as to prolong clinical antimicrobial effectiveness.

Benefits of Antimicrobial Use in Livestock
There are three justifications put forth for the use of antimicrobics in livestock; for improved productivity, for improved human health, and for relief of animal pain and suffering. In pig production, antimicrobics are valuable tools [35, 36], thus use restrictions have significant implications for farm productivity. Beran [37] suggests that antimicrobial use in livestock benefits human health by decreasing the incidence of zoonotic diseases such as leptospirosis, anthrax, and ornithosis. The most obvious benefit of livestock antimicrobial use is relief of animal pain and suffering. Proponents of use restrictions suggest that with proper husbandry, similar productivity and health can be accomplished. Livestock groups agree that good husbandry is essential for health, but are concerned that good husbandry alone is insufficient, particularly when dealing with endemic diseases or acute outbreaks. Further, foregone feed efficiency and rate of gain in pig production are not likely to be recovered through good husbandry alone [38].

Summary
There are three contrasting perspectives on antimicrobial resistance. Agricultural interest suggest that even though antimicrobial use does increase the prevalence of resistant organisms within local environments, the relative rate of resistance transfer to humans, either environmentally or through the food chain, is very low. Further, this group suggests that the benefits of agricultural use justify continuation of current regulations. The second perspective is put forth by human health advocacy groups. They suggest that increasing resistance prevalence justifies restricted use in livestock, based upon the “imminent hazard” clause of the Food Drug and Cosmetic Act. The argument put forth by these groups has been challenged by the agricultural community because the conclusions are based primarily upon retrospective study data. Regardless, these human health advocacy groups are having a significant influence on the debate. The third perspective is put forth by classical microbiologists. They suggest that resistance is most likely innate within bacteria or is a function of normal cellular activity. This perspective has only just recently been put forth to the extent that it is being heard. Because the consequence of regulatory change is so far reaching, it is important that all perspectives be heard and that each group be challenged to present sound science.

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REPORT OF THE COMMITTEE


**Ractopamine—A New Class of Drug Approved in 2000, Action, Usage, Public Perceptions.**

Dr. William C. Weldon, Technical Consultant, Elanco Animal Health

**Introduction**

The United States Food and Drug Administration recently approved ractopamine for use in finishing swine, after a thorough review of it’s safety and efficacy. Ractopamine will be marketed as a swine feed ingredient sold under the trade name Paylean®. Paylean® is a feed ingredient that directs nutrients to increase the amount of quality meat in high value cuts and improves production efficiency. Paylean® is the product of a 21-year research effort by Elanco Animal Health, a Division of Eli Lilly and Company. Ractopamine has been extensively researched during the 1980’s and 1990’s. There are more than 300 research publications in the literature on ractopamine. This presentation will review the action, usage, and public perceptions of this new technology.

**Action**

Ractopamine is in the class of compounds known as phenethanolamines. Ractopamine increases lean accretion and reduces fat accretion in finishing swine. Ractopamine accomplishes these things by increasing the activity of the enzymes that direct nutrients toward lean growth while decreasing the activity of enzymes that direct nutrients to fat growth.

**Usage**

The approved label indication for Paylean® is: *For increased rate of weight gain, improved feed efficiency, and increased carcass leanness in finishing swine fed a complete diet containing at least 16% crude protein from 150 lb (68 kg) to 240 lb (109 kg) body weight.* The approved dose is a range from 4.5 to 18 g/ton (5 to 20 ppm). The feeding directions for Paylean® are as follows: *Feed continuously to finishing swine as the sole ration from 150 lb (68 kg) to 240 lb (109 kg) body weight.* Paylean® is not approved for use with any other feed additives.

Feeding Paylean® to finishing swine results in significant improvements in growth performance and carcass composition. The following table summarizes the effect of Paylean® on swine growth and carcass composition.
**Public perceptions**

An extensive plan is in place to proactively educate people on the nutritional, social and economic benefits of Paylean®, and to address any questions that arise with accurate information from Elanco Animal Health and third party experts.

**Summary**

The use of ractopamine provides benefits for the entire pork chain including consumers, producers, and packers. In experiments over the last 20 years, ractopamine has consistently improved the growth performance and carcass composition of finishing swine.

A motion to adopt the Resolution of the USDA, APHIS, ARS, Master Plan to urge Congress and the administration for appropriate adequate funds to develop and construct and operate the Ames, Iowa National Animal Health facilities was made. The motion was seconded, discussed and passed by unanimous vote.

The meeting adjourned at 5:30 p.m.
In this presentation I will consider the following topics:

i) O.I.E—prudent use initiative for antimicrobials

ii) EU issues
- availability of veterinary medicines
- review of existing legislative framework for veterinary medicines
- anabolic beef hormones
- “precautionary principle”

iii) UK issues
- dispensing review
- BVA prudent use guidelines for antibiotics.
- BVA Code of Practice on Medicines

i) O.I.E.
The O.I.E. Office International des Epizooties have drafted documents relating, inter alia, to prudent use of antimicrobials in veterinary medicine, the surveillance and monitoring of the quantities of antimicrobials used in animal production and the harmonisation of national antimicrobial resistance monitoring activities in animals and animal derived foods.

They are also developing risk analysis methodology to manage the potential impact on human and animal health of antimicrobial resistant bacteria arising from the use of antimicrobials in animals and technical guidelines on the standardisation of antimicrobial susceptibility testing methods.

A world-wide electronic consultation on draft documents on the above took place in summer 2000 and comments will be reviewed in Q4 2000.

ii) EU issues—availability of veterinary medicines
Serious concerns have been expressed by veterinary organisations at UK and EU levels about the difficulties of discharging veterinary obligations in the face of a declining number of licensed veterinary medicines, particularly for all food animals and especially for minor species. Proposals to address this major problem have been compiled by the European Medi-
MILLER

cines Evaluation Agency (EMEA) and transmitted to the European Commission. These proposals included, inter alia:-

- Adoption of an "orphan drug" policy
- Realignment of the legislative definition of a horse as a food producing species.
- Extrapolation of maximum residue limits (MRL's) for 'major' species to 'minor' species eg cattle-sheep.

The EMEA's important proposals are still under discussion.

2001 review of existing EU regulatory framework for medicines (human and veterinary)

The European Commission is required to publish by 1st January 2001 a general report on the operation of the legislative framework for medicinal products in the EU and to propose any amendments considered necessary to improve current procedures. Many stakeholders have been consulted, including veterinary organisations, which latter consider that:

1. the assessment system should be science based and involve quality, safety and efficacy only.
2. the decision making process should be quicker
3. a more equitable balance should be struck between consumer protection and animal welfare
4. there should be no automatic coupling of human quality standards to veterinary medicines.

Anabolic hormones for beef cattle

This long running saga rumbles on and the EU and UK Scientific Communities continue to be at odds over this contentious technical and trade issue.

A recent report of the EU Scientific Committee on Veterinary Measures Relating to Public Health (SCVPH) concluded that:

"risks associated with the consumption of meat from hormone treated cattle might be greater than previously thought."

However a UK Scientific Expert Sub-Group of the Veterinary Products Committee, which advises the Ministry of Agriculture, reviewed the EU Report and "were unable to support the EU Report's conclusions."

In short the UK Scientists provided the UK Government with a sound basis on which to oppose the EU policy on anabolic hormones. The UK however are only one of many voices in the EU and most other EU Member States support the existing EU policy on banning the import of hormone implanted beef.
"Precautionary principle"

There are great concerns in the EU in the agricultural community that the science base of regulatory decision making, particularly in the field of production enhancers, has been eroded. c.f.

- anabolic beef hormones
- B.S.T
- Suspension of 5 antibacterial growth promoters

The so-called "Precautionary principle" (P.p) has been used to provide a kind of umbrella under which arbitrary, non-science based regulatory decisions can be authorised. The suspension of the 5 antibiotic growth promoters was 'justified' by the P.p.

This EU trend is in sharp contrast to the World Health Organisation who have this year produced guidelines on the prudent use of antibiotics in food producing animals. In relation to the regulation of growth promoting in-feed antibiotics they have emphasised the important role of scientific risk based evaluations in safety assessment.

iii) UK issues

Dispensing review

In the UK the Government have initiated a Committee of Enquiry to assess whether or not the prices of prescription only veterinary medicines to UK farmers is presently too high. Certain interests have suggested that perhaps the Danish system, wherein all veterinarian medicines are dispensed by pharmacies would be preferable. UK veterinarians will be arguing, in a robust fashion, that the Danish system would be unsuitable in UK and that the current system, whereby vets both prescribe and dispense prescription only veterinary medicines should be continued.

BVA Prudent use guidelines for antibiotics in food animals

The BVA, published General and Species Specific (food animals and companion animals) Guidelines. These are not prescriptive, as advocated by certain Danish and Dutch bodies and reflect the belief that the clinical judgement and experience of the responsible clinician should determine the final choice of product to be used.

The BVA has also published a Code of Practice on medicines to promote "best practice" among its members in the use, handling and storage of medicines.

In May 2000 the Royal Society of Medicine (London) organised a medico-veterinary Conference on Antimicrobial Resistance in Washington, D.C. A distinguished group of Anglo-American medical and veterinary scientists discussed multiple aspects of the resistance issue in man and ani-
mals. A most welcome outcome of the Conference was a clearer acceptance by the medical contributors that a large part of the current problem of antimicrobial resistance in man lay in the habits and practices of the medical Profession.

There was a recognition that there was a veterinary component to this problem but this was a peripheral one.

"Take home" messages

O.I.E
- developing documents relating to prudent use of antibiotics, risk assessments and antimicrobial monitoring et al.

EU developments
- concerns re availability of veterinary medicines
- review of current regulatory structure for veterinary medicines
- lack of balance in veterinary medicines regulatory activity between public health and animal welfare perceived by vets
- the 4th hurdle alive and well (precautionary principle)—further erosion of the scientific base of decision making.

UK issues
- dispensing review
- new BVA guidelines on antibiotic use published
- new BVA Code of Practice on Medicines
- RSM Conference considered that antibiotic resistance in man is primarily a problem for the medical profession.
RISK FACTORS ASSOCIATED WITH ANTIMICROBIAL RESISTANCE PHENOTYPE CHARACTER AS SEEN WITHIN SWINE FARMS

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Phenotype prevalence estimates for antimicrobial resistance are inherently co-linked to genotype and to environmental risk factors. More figuratively, risk factor effects for phenotype survival are cumulatively referred to as selective pressure. It has been proposed that increasingly high prevalence of resistant bacteria within livestock poses a significant risk to human health. Further fueling this concern has been the widespread detection of multi-resistant enteric pathogens, such as Salmonella typhimurium DT104. A consequence of these prevalence studies has been a renewed call for limitation of antimicrobial use in agriculture, particularly in crop and livestock farming, and in those cases where specific antimicrobials are considered critical for human treatment. Proponents of these restrictions propose that agricultural overuse and mass treatment regimes are the cause of increasing antimicrobial resistance prevalence as detected by phenotypic analysis. Other studies, however, suggest that multiple factors are associated with phenotypic expression of resistance. While there are no reports which comprehensively model factors affecting resistance prevalence, several gene studies and several epidemiologic studies of swine herds suggest factors beyond antimicrobial use which influence phenotype.

Gene Effects on Resistance Prevalence

Diversity of resistance genes within bacteria affects phenotype outcomes. In a study by Lee [1] bacterial isolates were collected from three farms with differing antimicrobial use strategies. Bacteria, phenotypically demonstrating resistance to tetracycline, were genotypically evaluated. Within those isolates with tetracycline resistance, there was a great deal of genotype variation. Multiple tetracycline resistant genotype variants were identified both within and across farms. Further, this study demonstrates that genetic diversity affects the degree of resistance expression (i.e., phenotype or mic). Thus, singular or multiple genes expressing resistance to the same antimicrobial may be present within isolates, and this diversity profoundly affects bacterial resistance character.

Not only are phenotype differences reflective of the resistance genes present, they may also be associated with the manner in which genes are encoded within the bacterium. Early works on resistance suggest that resistance is encoded on plasmids [2, 3], however, more recent work demonstrates that resistance may also be encoded on the chromosome. Loca-
tion of the resistance genes (plasmid versus chromosome) impacts the
degree of variability within mic outcomes [1].

Further, it is now recognized that mobile gene element containing re-
sistance genes may be transposed within and between bacteria [4]. These
transposons or "jumping genes" have the potential to move depending
upon environmental pressures. Additionally, resistance genes located within
gene cassettes known as integrons [5] may be relocated within plasmids or
chromosomes based again on environmental pressures [5]. Integrons also
play a role in dissemination of genes between bacteria [4]. Even though
these mechanisms are not well understood, it is likely that they impact
phenotypic resistance variance and thus prevalence.

Environment Effects on Resistance Prevalence

Antimicrobial use on farms affects resistance phenotype. However,
phenotypic resistance may also be influenced by animal age, housing [6],
and transport [7]. Further, there appears to be a bacteria X drug X thera-
peutic regime interaction [8]. Dosage level [9] and duration of treatment
may affect phenotypic expression [8]. Even the degree of multiple resis-
tance can be affected by antimicrobial regime [10].

Even though resistance decreases upon withdrawal of antimicrobial
use, there is evidence that resistance is maintained within herds, albeit at
lower prevalence levels [8, 9, 11-13]. Further, over the long term, preva-
ience of resistant organisms is antimicrobial specific [12]. Samples from
soil, water, and feed suggest that resistance resides not only within enteric
flora, but also within environmental flora [12]. The degree that resistance
within environmental flora affects resistance within animal flora is not yet
determined, however, genetic sharing is suggested to be frequent between
bacteria.

Assay Effects on Phenotype Characterization

Published reports describing phenotypic resistance have been incon-
sistent in both methodology and interpretation. This has confused inter-
pretation of phenotype data. For example, not all researchers have used
common breakpoints. To overcome this point of confusion, NCCLS has
established standards which are now generally accepted. Further confu-
sion occurs when some researchers characterized bacteria as “decreas-
ingly susceptible” even when breakpoints were not exceeded. They arrive
at this conclusion when bacterial susceptibility decreased even with very
low antimicrobial levels. Thus, it is understandable that reports of pheno-
typic resistance have met with scepticism.

Summary

Significant public policy changes are pending as a result of increasing
antimicrobial resistance prevalence estimates within livestock isolates.
Thus, it is crucial that decision makers be fully aware of the risk factors
associated with prevalence changes, including genetic and environmental
pressures. Clearly, genetic diversity affects phenotypic diversity. Hope-
RISK FACTORS ASSOCIATED WITH ANTIMICROBIAL RESISTANCE
PHENOTYPE CHARACTER AS SEEN WITHIN SWINE FARMS

fully, new discoveries in gene stoichiometry and gene mobility will improve
our understanding about the relationship between genotype and pheno-
type. Likewise, there is a need to understand to better understand environ-
mental factors associated with phenotype prevalence.

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The Committee met on October 21, 2000 from 6:00 – 8:30 PM. A total of 31 members and guests were present. Chairman Hillman made opening remarks about the importance of the committee chairs, and the committees they serve, to the function of USAHA.

Francois Elvinger, Chair of the Subcommittee on Standard Operating Procedures for Chairs and Committees, distributed the finished draft of the Operating Procedures manual, which has been developed by the subcommittee. Dr. Elvinger presented the changes that had been made to the document resulting from review of the previous draft at the Government Relations Committee meeting in Washington, DC in February, and grammatical and sentence structure modifications suggested by the Chairman of the Program Committee. Dr. Elvinger also made format modifications so the finished document could be published as a booklet. The Committee approved two amendments to the draft, then the committee approved the amended document. These amendments are noted on the attached final draft of the document. In addition to development of the Operating Procedures manual as a booklet, the finished document will be placed on the Association web page. The Operating manual will be implemented for the 2001 annual meeting, contingent upon approval of the Committee report by the Executive Committee. Chairman Hillman stressed that the Operating Procedures manual is to be a dynamic document which must be regularly reviewed and updated by the Program Committee to meet changing needs of the committees and suggested that the manual be a topic of discussion at succeeding Program Committee meetings. He also noted that some modification to the document may become necessary when the re-
vised constitution and bylaws are approved by the Association.

Bret Marsh, Chair of the Committee Review Task Force gave an update on the status of efforts to reduce the number of standing committee-meeting sessions during the annual meeting. Dr. Marsh reported that there were 39 committee sessions in 1997, 37 in 1998, 35 in 1999 and 36 during the current session and noted that in order to implement Phase II of the Long Range Plan the Association would have to be down to 30 sessions during the annual meeting.

Richard McCapes discussed Phases I and II of the long range plan and reiterated that the number of committee sessions would have to be reduced to 30 in order to reduce the annual meeting by one more day. A maximum of 30, five-hour sessions would allow all committee meetings to be completed in three days (ten sessions per day). The long-range plan recommends scheduling no more than ten, five-hour sessions per day. With the current requirement of 36, five-hour sessions, a total of four days for committee meetings is necessary.

Committee members brought forth ideas that might reduce the length of the meeting by one day without further reduction in the number of committee sessions. For example, John Hunt and John Schmitz suggested that rather than reducing the number of five-hour committee sessions to 30, it may be possible to reduce the length of the sessions to something less than five hours, thereby permitting the scheduling of more sessions per day. Some committees may not require the full five hours of scheduled time. The Committee Review Task Force will evaluate these ideas during the next year.

Maxwell Lea discussed plans for the 2001 meeting of the Government Relations Committee in Washington and encouraged committee chairs to attend and participate in the meeting.

Larry Mark reported on his efforts to improve the Association Web Page, including several new links that should improve the usefulness of our Association web page. One of the new links is to the NAHEMS web page. The Chairman requested that committee chairs discuss major items of interest from each of their committee meetings with Mr. Mark, who will develop news releases about important activities that took place at our annual meeting.

The Committee reviewed operating procedures for conducting committee meetings; development and submission of committee reports, recommendations and resolutions; review of committee membership and appointment of committee members. The Chairman reported potential changes in committee membership and conduct of meetings relative to international members that would occur if the revised constitution and bylaws is approved by the association.
Chairman: Dr Tom Hagerty, St Paul, MN
Vice Chairman: Jim Leafstedt, Alcester, SD

Dr. Tom Hagerty opened the meeting at 12:30 pm on October 23, 2000. Approximately 46 people attended on October 23 and also on October 24. The meeting was adjourned on October 23, 2000, at 11:00 am.

USDA Report - Dr Arnold Taft reported that 35 states are in Stage V, seven are in Stage IV, nine are in Stage III and one is in Stage II. During fiscal 2000, twelve states advanced to a higher stage. These states include Arkansas, California, Illinois, Indiana, Massachusetts, Michigan, Minnesota, Nebraska, North Carolina, Oklahoma, Pennsylvania and Wisconsin. He also reported that new funds are now available for pseudorabies vaccine reimbursement. These funds were allocated, beginning October 1, 2000, to Iowa - $4,492,440, Minnesota - $1,310,295, Indiana - $436,765, and $400,000 for other states. In conclusion, he reported that $6,651,653 remain in the current APEP fund.

National Pseudorabies Control Board - Phil Bradshaw reported on Control Board actions. It was brought to the Board's attention that reporting of cases of pseudorabies in feral swine is inconsistent between states. A recommendation was approved by the Board to require reporting of pseudorabies cases in feral swine. The consensus of the Board was that states with feral swine populations should be encouraged to conduct surveillance programs to detect cases of pseudorabies both in domestic and feral swine. Detection of pseudorabies in feral swine should be reported, but should not interfere with state advancement to free status. The Board approved the following recommendation and forwarded it on to the full committee for approval. “When cases of pseudorabies are detected in feral swine with
REPORT OF THE COMMITTEE

no spread to domestic swine, such cases: (1) should be reported as an addendum to quarterly reports, and (2) should not be reported as cases in domestic swine, and (3) should not interfere with advancement to free status."

The following state applications for status were considered and approved. Alaska, Arizona, Illinois and Rhode Island renewed their current statuses.

Indiana – Advance 88 counties into Stage IV. Carroll, Clinton, Tippecanoe and White will remain in Stage III.

Michigan – Advance to Stage V.

Minnesota – Advance 17 additional counties into Stage IV. With this change, 52 counties in northern Minnesota will be in Stage IV. Thirty-five southern counties will remain in Stage III.

Nebraska – Advance to Stage IV.

Wisconsin – Advance to Stage V.

National Plan for Pseudorabies Post-Eradication – Mr. Jim Leafstedt presented the National Plan for Pseudorabies Post-Eradication. He explained that the plan is made up of four major parts. These are (1) Emergency Response, (2) Surveillance, (3) Regulations, and (4) Feral / Wild / Captive Swine. He further emphasized that the plan is dynamic and serves to identify areas which need to be addressed as eradication reaches completion.

There was a great deal of discussion surrounding the details of the plan. Concerns were voiced about surveillance requirements for high risk areas, especially in regard to how requirements would affect states with feral swine populations. A lengthy discussion was held regarding the pros and cons of mandatory animal identification. Protocols for emergency response were also discussed.

The committee agreed to support the Plan and forwarded a resolution for USAHA approval. The resolution is as follows:

"As the National PRV Eradication Program comes to a successful conclusion, continuing program activities will enable realization of PRV eradication benefits and protect the industry from re-infection. Federal, state and industry representatives have met to discuss emergency response, surveillance, regulatory and feral swine management needs during the post-PRV eradication period. The National Plan for PRV Post-Eradication that details these needs and their associated action items was drafted during that meeting.

USAHA urges USDA to work with state, industry and academic stakeholders to ensure the action items of the National Plan for PRV Post-Eradication, including Emergency Response, Surveillance, Regulations and Feral/Wild Swine are appropriately addressed in a timely manner and that progress be reported on each of the four topics at the 2001 USAHA Pseudorabies
Committee meeting."

Declaration of Emergency for Pseudorabies Outbreaks in Stage IV and V areas. Dr. Paul Anderson and Dr. Joe Annelli discussed the possibility of beginning to treat outbreaks of pseudorabies in Stage IV and V areas as foreign animal disease emergencies. Under the scenario presented, to qualify for inclusion in the emergency declaration, a state or area would have to be in Stage IV or V and would have to prohibit importation of swine from State II or III areas. Dr. Annelli explained that this stipulation would be required in order to secure help from USDA-APHIS-VS Emergency Programs Staff. Another stipulation would be that immediate depopulation of affected herds would be mandatory.

After a great deal of thoughtful discussion, the committee agreed to consider the details of this topic and discuss them again at the 2001 USAHA meeting. It was the opinion of the committee that the eradication program needed to be closer to completion in all states before such a proposal would be practical. Also, in order to require mandatory depopulation of affected herds, many states would have to change rules or statutes in order to establish such authority.

Report of the Feral Swine Subcommittee – Dr. Max Coats presented the committee report.

The subcommittee met on Saturday afternoon from 1:00 to 5:25 p.m. with 54 actively participating attendees present. There were representatives from industry, state and federal agencies and several international participants.

Dr. Arnold Taft gave a short chronology of events leading to the creation of the draft Outline for a National Action Plan on Feral/Wild Swine and the draft Proposed Uniform Methods and Rules for Feral/Wild Swine Pseudorabies and Swine Brucellosis Control/Eradication. Mr. Dave Bergman from USDA Wildlife Services made a presentation outlining some of the capabilities that his agency could bring to bear on the feral/wild swine situation.

Dr. Taft then introduced the draft Outline for a National Action Plan on Feral/Wild Swine and lead the discussion of the document. There was general agreement with the goals as stated in the outline. (1) The first goal is to reduce the risk of disease transmission between feral/wild and domestic swine populations caused by local production and marketing practices. (2) The second goal is to reduce the intrinsic risks posed by feral/wild swine populations. There was however, some difference of opinion on some of the action points. After considerable discussion, the committee agreed that those with additional comments should submit them to Dr. Taft who would review and assess the submitted comments. Based on his assessment, he would then proceed to finalize the document. The committee felt this approach might enhance the possibility of securing the funds detailed in the draft Outline for a National Action Plan on Feral/wild Swine.

The draft Proposed Uniform Methods and Rules for Feral/Wild Swine
Pseudorabies and Swine Brucellosis Control/Eradication was introduced by Dr. Lee Coffman. A lively and productive discussion of the document was moderated by the newly appointed co-chairman of the Feral Swine Committee, Dr. Ashby Green from Florida. The Feral Swine Committee held that the document was not acceptable as written, but recommended to the Pseudorabies Committee that a working group be appointed to continue work on developing an acceptable program document. In addition, the committee recommended that membership of such a working group include persons representing both the Brucellosis and Wildlife committees.

A brief discussion of the need for some uniformity in defining feral or feral/wild swine related disease episodes that do not affect program status followed. This item was not discussed to conclusion due to time constraints.

Last year's resolution #15 on Feral/Wild Swine was reviewed and discussed. The subcommittee supported forwarding the previously accepted resolution to the parent committee with the following modification.

"Background - Feral/Wild swine continue to pose an increasing threat of acquiring, harboring and transmitting diseases with significant animal and human health importance and trade impact. There is a crucial need for pertinent research and field studies that address threats related to feral/wild swine.

Resolution - The USAHA urges the Secretary of Agriculture to recognize the feral/wild swine threat as a high priority for funding for research through ARS and CREES and field studies through USDA-APHIS-VS and/or Wildlife Services. In particular, funding is necessary to:

1. Conduct population studies needed to support the development of threat management strategies.
2. Define the role of Brucella strain RB51 for use as a dual vaccine and conduct field trials to determine its efficacy.
3. Conduct further study and field trials in relation to swine brucellosis and pseudorabies infection in feral swine and their transmission to domestic swine."

Draft Uniform Methods and Rules for Feral/Wild Swine Pseudorabies and Swine Brucellosis Control/Eradication – Dr. Arnold Taft presented a first draft of a UM&R for Feral/Wild Swine Pseudorabies and Swine Brucellosis Control/Eradication. Members present from the Feral Swine Subcommittee held that the document was not acceptable as written. Their recommendation to the Pseudorabies Committee was that a working group be appointed to continue work on developing an acceptable program document. In addition, the committee recommended that membership of such a working group include persons representing both the Brucellosis and Wildlife committees.

PSEUDORABIES

From the Feral Swine Subcommittee, there was some difference of opinion on some of the action points. There was, however, general agreement with the goals as stated in the outline. (1) The first goal is to reduce the risk of disease transmission between feral/wild and domestic swine populations caused by local production and marketing practices. (2) The second goal is to reduce the intrinsic risks posed by feral/wild swine populations.

**Draft Revision of CFR 85** – Dr. Arnold Taft presented a draft revision of the Code of Federal Regulations (CFR) Part 85. Members of the Program Standards Subcommittee reviewed the document in detail during their meeting and made the following recommendations: (1) The proposed changes should not be made to CFR 85 at this time. (2) Prior to changing CFR 85, OIE standards and effects on international trade need to be considered. (3) The working group established by committee resolution in 1999 should continue working on proposed language. (4) A second draft of proposed changes to CFR 85 should be prepared and presented at the USAHA Pseudorabies Committee meeting in 2001.

**Interstate Movement of Swine within a Production System** – Proposed rules for Interstate Movement of Swine within a Production System appeared in the Federal Register on September 21, 2000 (Docket No. 98-023-1). Although the pseudorabies committee has fully supported adoption of such rules for at least four years, concerns surrounding reference to Executive Order 12988 (refers to preemption of state and local laws) were discussed. Many of the state veterinarians present were concerned about inclusion of this language.

**Program Standards Subcommittee Report** – Dr. Tom Hagerty gave the Program Standards Subcommittee report. The committee recommended no changes to Program Standards.

Regarding proposed changes to CFR 85, the subcommittee recommended that: (1) The proposed changes should not be made to CFR 85 at this time. (2) Prior to revising CFR 85, OIE standards and effects on international trade need to be considered. (3) The working group established by committee resolution in 1999 should continue working on proposed language. (4) A second draft of proposed changes to CFR 85 should be prepared and presented at the USAHA Pseudorabies Committee meeting in 2001.

**Electronic Transfer of Certificates and Permits for Swine** – The committee renewed its support for the recommendation made in 1999 to expedite approval for the use of electronic techniques to transfer certificates, permits, and other swine documents. To emphasize this point, last year’s recommendation will be submitted as a resolution for 2000 as follows:

“Background: The swine industry has changed significantly. Swine herds are now often located on multiple premises located in a wide geographic distribution, even in multiple states. This change has complicated protocols for issuing certificates of veterinary
REPORT OF THE COMMITTEE

inspection. Using electronic transfer of information could expedite these protocols and enhance our ability to move animals interstate without jeopardizing disease control programs.

Resolution: USAHA urges USDA-APHIS-VS to expedite the adoption of the use of electronic signature and electronic transfer of official documents for swine movements.”

State Reports - The following states gave reports on eradication progress.

Indiana – Dr. John Johnston reported that there are no quarantined herds left in Indiana. He also reported that 88 counties have been granted Stage IV status. Four counties, Carroll, Clinton, Tippecanoe and White remain in Stage III. He reported that programs are in place to maintain high levels of biosecurity, vaccination pressure and surveillance.

Illinois – Dr. Dick Hull reported that there are no quarantined herds left in Illinois. Henry county remains in Stage III. The remainder of the state is in Stage IV. He reported that feeder pigs imported from Stage II areas must come from premises tested within 30 days prior to entry, must be vaccinated and must have a retest between 21 and 60 days post entry.

Nebraska – Nebraska has no remaining quarantines and has been granted Stage IV status.

Minnesota – Dr. Paul Anderson reported that there are no known infected pigs left in Minnesota. Four premises remain under quarantine. These premises have been depopulated or have been tested negative and will be released after a second negative test. Seventeen counties were added to the Stage IV part of the state. Currently, 52 counties are in Stage IV and 35 counties remain in Stage III. He reported that programs are in place to maintain high levels of biosecurity, vaccination pressure and surveillance. After November 1, 2000, feeder pigs imported from Stage II areas must come from premises tested within 30 days prior to entry, must be vaccinated and must have a retest between 15 and 45 days post entry.

Iowa – Dr. John Schiltz reported that Iowa has made significant progress toward eradication. There are currently 365 quarantined premises in the state. He reported that new laws were enacted during the year which have helped to drive the program forward. Herds in Stage II counties must be monitored every six months. All swine in Stage II counties must be vaccinated. Movement of pigs from quarantined premises has been severely restricted. They cannot be moved into counties which have no quarantined sites and they cannot be moved to sites in other counties if a monitored premises is located within 1.5 miles.

Master Plan for NVSL, CVB and NADC in Ames, Iowa. The committee approved a resolution supporting development, construction and operation of the USDA, APHIS, ARS facilities in Ames, Iowa. The proposed facility will replace outdated and inefficient facilities currently used by the APHIS National Veterinary Services Laboratories (NVSL), the APHIS Center for Veterinary Biologics (CVB) and the ARS National Animal Dis-
Recommendations – The following recommendation to USDA-APHIS-VS was approved by the committee.

Case Reporting for Pseudorabies in Feral Swine
Background: States with feral swine populations are encouraged to conduct surveillance programs to detect cases of pseudorabies both in domestic and feral swine. Detection of pseudorabies in feral swine should be reported, but should not interfere with state advancement to free status.

Recommendation: When cases of pseudorabies are detected in feral swine with no spread to domestic swine, such cases:
1. should be reported as an addendum to quarterly reports, and
2. should not be reported as cases in domestic swine, and
3. should not interfere with advancement to free status.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON PUBLIC HEALTH AND ENVIRONMENTAL QUALITY

Chairperson: Dr. Lyle P. Vogel, Streamwood, IL
Vice Chairperson: Dr. Lee M. Myers, Atlanta, GA

Dr. George W. Beran, IA; Dr. Thomas G. Blaha, MN; Dr. Dale D. Boyle, DC; Dr. Stanley L. Diesch, MN; Dr. Don A. Franco, VA; Dr. John P. Honstead, MD; Dr. William O. James, DC; Dr. William E. Jennings, TX; Dr. Tari P. Kindred, CA; Dr. J. C. Leightly, MD; Dr. Harry E. Moore, TX; Brig. Gen. (Dr.) T. G. Murnane, TX; Dr. John C. New, TN; Dr. Gary D. Osweiler, IA; Dr. John C. Prucha, MD; Dr. Mahdi Saeed, IN; Dr. Parmesh K. Saini, DC; Dr. Dale F. Schwindaman, MD; Dr. Paul Shadbolt, CAN; Dr. Robert H. Singer, TX; Dr. Paul Sundberg, IA; Dr. H. Leon Thacker, IN; Dr. Lewis P. Thomas, WV; Dr. Manuel A. Thomas, Jr., TX; Dr. Mary E. Torrence, DC.

The Committee met at 7:00 am, October 24, 2000, in the Medical Forum I Room, Sheraton Birmingham Hotel, Birmingham, Alabama. Fourteen people attended the meeting including six Committee members.

Dr. William James, Director, Food Animal Sciences Division, Office of Public Health and Science, USDA FSIS, presented an analysis of *Salmonella* serotypes from food animal carcasses and raw ground product sampled as part of the pathogen reduction/HACCP regulation. *Salmonella* samples were collected by the U.S. Department of Agriculture (USDA), Food Safety and Inspection Service (FSIS) from carcasses and raw ground products of cattle, swine, chickens, and turkeys from June 1997 through August 1998 from federally inspected establishments of all sizes as part of an exercise to prepare for the initial implementation of the Pathogen Reduction/Hazard Analysis and Critical Control Point (PR/HACCP) final rule. The samples were analyzed in FSIS laboratories for the presence of *Salmonella*, and a subset of positive samples were sent to the National Veterinary Services Laboratories (NVSL) of the USDA, Animal and Plant Health Inspection Service for serotyping. The serotypes are reported here.

*Salmonella* samples were also collected by FSIS from January 1998 through January 1999 from large federal establishments after implementation of the PR/HACCP rule. These samples were also analyzed in FSIS laboratories for the presence of *Salmonella*, and a subset of positive samples were also sent to NVSL for serotyping. Serotypes for broiler and swine carcasses, and raw ground beef and turkey are reported here.

In the June 1997-August 1998 data from establishments of all sizes, the most common serotype from cattle carcasses (Montevideo), swine carcasses (Derby), chicken carcasses (Heidelberg), and turkey carcasses (Hadar) were also the most common serotypes from the corresponding raw ground products. The most common serotypes from January 1998-
January 1999 from large establishments were remarkably similar to those of June 1997-August 1998. From swine carcasses (Derby) and raw ground turkey (Hadar) they were the same. From chicken carcasses, the two most common serotypes (Kentucky, Heidelberg) were the same, although reversed in order. The top six serotypes from raw ground beef in the January 1998-January 1999 data were all found in the top eight from the June 1997-August 1998 data.

Typhimurium and Enteritidis account for over 40% of human isolates. Typhimurium is commonly found in meat and poultry. Enteritidis, however, is uncommon in meat and poultry. In the June 1997-August 1998 data, Enteritidis was not found in any raw ground products. Enteritidis was found in four of 364 cattle carcass isolates, one of 880 swine carcass isolates, 10 of 803 chicken carcass isolates, and one of 470 turkey carcass isolates. In the January 1998-January 1999 data, Enteritidis was not found in 76 swine carcass isolates, 42 raw ground beef isolates, or 212 raw ground turkey isolates. It was found in 14 of 573 chicken carcass isolates.

**Salmonella serotypes, June 1997-August 1998, all size establishments**

<table>
<thead>
<tr>
<th>Cattle carcasses (364 isolates)</th>
<th>Raw ground beef (173 isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Montevideo</td>
<td>38</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>30</td>
</tr>
<tr>
<td>Muenster</td>
<td>28</td>
</tr>
<tr>
<td>Anatum</td>
<td>26</td>
</tr>
<tr>
<td>Typh (cope)</td>
<td>23</td>
</tr>
<tr>
<td>Mbandaka</td>
<td>22</td>
</tr>
<tr>
<td>Meleagridis</td>
<td>22</td>
</tr>
<tr>
<td>Kentucky</td>
<td>16</td>
</tr>
<tr>
<td>New-Brunswick</td>
<td>15</td>
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</table>

<table>
<thead>
<tr>
<th>Swine carcasses (880 isolates)</th>
<th>Raw ground pork (628 isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Derby</td>
<td>244</td>
</tr>
<tr>
<td>Johannesburg</td>
<td>88</td>
</tr>
<tr>
<td>Anatum</td>
<td>70</td>
</tr>
<tr>
<td>Typh (cope)</td>
<td>62</td>
</tr>
<tr>
<td>Infantis</td>
<td>41</td>
</tr>
<tr>
<td>Saint-Paul</td>
<td>40</td>
</tr>
<tr>
<td>Reading</td>
<td>36</td>
</tr>
<tr>
<td>London</td>
<td>30</td>
</tr>
<tr>
<td>Heidelberg</td>
<td>27</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>24</td>
</tr>
</tbody>
</table>
REPORT OF THE COMMITTEE


**Salmonella** serotypes, June 1997-August 1998, all size establishments

<table>
<thead>
<tr>
<th>Chicken carcasses (803 isolates)</th>
<th>Raw ground chicken (80 isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Heidelberg</td>
<td>210</td>
</tr>
<tr>
<td>Kentucky</td>
<td>157</td>
</tr>
<tr>
<td>Hadar</td>
<td>63</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>42</td>
</tr>
<tr>
<td>Typh (cope)</td>
<td>39</td>
</tr>
<tr>
<td>Thompson</td>
<td>38</td>
</tr>
<tr>
<td>Montevideo</td>
<td>30</td>
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</table>

<table>
<thead>
<tr>
<th>Turkey carcasses (470 isolates)</th>
<th>Raw ground turkey (319 isolates)</th>
</tr>
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<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Hadar</td>
<td>72</td>
</tr>
<tr>
<td>Heidelberg</td>
<td>67</td>
</tr>
<tr>
<td>Agona</td>
<td>43</td>
</tr>
<tr>
<td>Senftenberg</td>
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<td>Muenster</td>
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<tr>
<td>Arizona</td>
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<tr>
<td>Schwarzenburg</td>
<td>18</td>
</tr>
<tr>
<td>Montevideo</td>
<td>16</td>
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<tr>
<td>Saint-Paul</td>
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506
PUBLIC HEALTH AND ENVIRONMENTAL QUALITY

_Salmonella_ serotypes, January 1998-January 1999, large establishments

<table>
<thead>
<tr>
<th>Raw ground beef (42 isolates)</th>
<th>Swine carcasses (76 isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Anatum</td>
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<tr>
<td>Hadar</td>
<td>5</td>
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<tr>
<td>Muenster</td>
<td>5</td>
</tr>
<tr>
<td>Meleagridis</td>
<td>4</td>
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<tr>
<td>Typh (cope)</td>
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</table>

<table>
<thead>
<tr>
<th>Chicken carcasses (573 isolates)</th>
<th>Raw ground turkey (212 isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Kentucky</td>
<td>182</td>
</tr>
<tr>
<td>Heidelberg</td>
<td>96</td>
</tr>
<tr>
<td>Typh (cope)</td>
<td>41</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>40</td>
</tr>
<tr>
<td>Hadar</td>
<td>36</td>
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</tbody>
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_Salmonella_ serotypes, human surveillance laboratory-confirmed

<table>
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<tr>
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<tbody>
<tr>
<td><strong>serotype</strong></td>
<td><strong>n</strong></td>
</tr>
<tr>
<td>Typhimurium*</td>
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<tr>
<td>Enteritidis</td>
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<tr>
<td>Newport</td>
<td>2266</td>
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<tr>
<td>Heidelberg</td>
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<tr>
<td>Javiana</td>
<td>1165</td>
</tr>
<tr>
<td>Agona</td>
<td>988</td>
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<td>Montevideo</td>
<td>823</td>
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<td>Oranienburg</td>
<td>690</td>
</tr>
<tr>
<td>Muenchen</td>
<td>638</td>
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<tr>
<td>Infantis</td>
<td>590</td>
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(* Typhimurium includes var. copenhagen)

Dr. Larry J. Thompson of the University of Georgia Tifton Veterinary Diagnostic Laboratory presented an Update on Carcass Disposal. Animal carcass disposal has been under increasing regulatory and public scrutiny. Factors involved in animal carcass disposal include the type of animal (small companion animal, large or production animal, wild and exotic animals); the size of animal; the number of carcasses to be disposed; the location of the animal carcass; the presence of zoonotic agents or chemical contaminants; the resources available; and finally, the federal, state, and municipal regulations in force for the particular disposal situation.

The main processes used for carcass disposal are burial, landfill, rendering, incineration, and composting. Other processes, such as poultry mortality pits and direct utilization of the carcass for animal food (eg, poultry mortalities for alligator farming) are region and industry dependant. Emerging technologies for carcass disposal include the alkaline hydrolysis process and the use of large enhanced autoclaves. The alkaline hydrolysis process involves the addition of aqueous sodium or potassium hydroxide to the carcass waste in a large pressure vessel. The combination of heat, pressure, and alkaline conditions dissolve the protein and carbohydrate components of the carcass, resulting in a sterile liquid waste with the bones forming ash-like residuals. The resultant liquid has a pH greater than 10.5 and a biological oxygen demand of greater 20,000 ppm but is often sanitary sewer disposable, depending upon the local regulations.

Carcass disposal by use of the rendering industry has come under increased regulatory and public scrutiny. The 1997 mammalian protein-to-ruminant feeding ban (21 CFR Part 589) and the decline of the leather market have signaled hard economic times for the rendering industry. There is increased public scrutiny of raw ingredients destined for animal food, especially for companion animals. While markets for slaughter byproducts remain fairly stable, uses of “dead stock” category have decreased, with salvage value of dead animals decreasing. Rendering companies often charge for pick up of dead stock. An emerging concern in the rendering industry is the use of barbiturates for euthanasia of animals, and the resulting low-level contamination in products making use of these carcasses. The FDA-CVM is presently researching the nature and extent of this problem and will probably issue guidelines/regulations in the future.

Burial of animal carcasses as a means of disposal has been under increasing regulatory scrutiny. Individual municipalities can and have banned or stringently regulated burial of any type of animal within their boundaries. While burial of animals is more common in rural areas, ground water qualities issues remain, especially when pathogens and/or chemical contamination are present. Burial remains a common means of disposal in rural areas for routine individual large animal mortalities and is often used in disease outbreaks involving multiple animal deaths.

Disposal of animal carcasses into a landfill is often stringently regulated by the landfill itself, even when there may be no state or federal regu-
lations against it. Landfilling of animal carcasses is more common in rural areas and concerns of safe transport and handling seem to be of greater importance over scavenger, vermin or water quality issues.

Incineration of animal carcasses has also been subjected to increasing regulatory activity. Although pathological waste was exempted from the US-EPA Hospital Medical and Infectious Waste Incinerator regulations of 1997, many states have interpreted pathological waste as "infectious" or "biohazardous" and have required the use of upgraded incineration facilities. In November or December of 2000 the US-EPA is due to release air emission regulations for pathological incinerators, those solid waste incinerators where 90% or greater of the waste stream is pathological waste. In the HMIWI regulations, pathological waste was defined as waste material consisting of only human or animal remains, anatomical parts and/or tissue, the bags/containers used to collect and transport the waste material, and animal bedding (if applicable). It is anticipated that the regulations will include pollution prevention, operator training, record keeping, good combustion practices, and limits on material other than pathological waste that can be incinerated.

It can be anticipated that animal carcass disposal in the future will be more costly and will come under more and varied regulations. Many effects will be regional in nature, dependant upon local or regional rendering facilities, local and regional landfill capabilities, municipal ground and waste water regulations, and finally upon local or regional incineration and burial capabilities. Animal diagnostic laboratories and veterinary colleges may find a decreased acceptance of their carcass waste by the rendering industry and may be forced to depend more heavily upon on-site disposal options.

Dr. Randall Crom, USDA APHIS Veterinary Services, provided an update on West Nile Virus, especially emphasizing the effect on horses in the United States. The paper was also presented in the USAHA Scientific Session and is printed elsewhere in these proceedings.

Dr. Dale Boyle, Executive Vice President of the National Association of Federal Veterinarians, addressed the topic of Veterinarians in Federal Service. There are 1694 veterinarians employed by the USDA. Within the USDA, 1134 veterinarians are employed by FSIS, 509 by APHIS, 45 by ARS, 4 by CSREES and 2 by ORACBA. The U.S. Department of Health and Human Services employs approximately 182 veterinarians: 78 by FDA, 69 in NIH, with the rest in CDC and ATSDR. The Department of Defense veterinarians include 411 as Army Veterinary Corps officers, 3 Army civilians. 116 Air Force officers, 3 Air Force civilians, 3 U.S. Navy civilians, and 1 at the Uniformed Services University of Health Sciences. The U.S. Department of Interior employs 22 veterinarians and the Environmental Protection Agency has 6 U.S. Public Health Service veterinarians. The Department of Commerce, Veterans Affairs, Smithsonian Zoo and the Joint Institute also employ veterinarians for Food Safety Research.
Dr. Boyle outlined the qualities needed for Federal veterinarians of the future including leadership, epidemiology skills, food safety and public health expertise, research capabilities, and animal welfare interests. He explained that the areas of data management, risk assessment, food safety, genomics, and genetic engineering are currently areas of great demand.

Dr. Lyle Vogel, Director, Scientific Activities, American Veterinary Medical Association, provided the AVMA perspective on the antimicrobial resistance issue. The American Veterinary Medical Association shares the concerns of the public, governmental agencies, and public health community regarding the broad issue of antimicrobial resistance and specifically the potential risk of resistance developing in animals with subsequent transfer to humans. Because of that concern, the veterinary profession has invested considerable resources of personnel and money into what the AVMA believes will be effective responses to the potential problem. The AVMA committed to ensuring judicious use of antimicrobials by veterinarians for the prevention, control and treatment of animal diseases.

The AVMA started a profession-wide initiative, which included companion and food animal practitioner groups, and public health representatives, to develop and implement judicious use principles. The approved document that contains the principles is published in the January 15, 1999, issue of the Journal of the AVMA, is on the AVMA web site and is being distributed in many other ways. The principles encourage preventive actions to avoid disease; but if disease does occur, reminds veterinarians to consider other options before using antibiotics; and, if antimicrobial therapy is needed, don’t use the drugs of last resort first. The next step was to work with the species practitioner groups to develop more detailed guidelines appropriate to each species, disease, and type of client. The American Association of Swine Practitioners developed Basic Guidelines of Judicious Therapeutic Use of Antimicrobials in Pork Production that were subsequently approved by the AVMA in November 1999. The American Association of Avian Pathologists developed Guidelines to Judicious Therapeutic Use of Antimicrobials in Poultry and the American Association of Bovine Practitioners developed Prudent Drug Usage Guidelines. The AVMA Executive Board will consider the AAAP and AABP guidelines for approval next month. The American Association of Feline Practitioners and Academy of Feline Medicine are finalizing their guidelines and the canine and equine guidelines are also being developed.

The AVMA is also working with the food animal practitioner groups to develop and deliver a continuing education program to raise the awareness of the profession to the issue and to encourage utilization of the principles. The AVMA fulfilled a contract with the FDA to write educational brochures that explain judicious antimicrobial use by veterinarians in beef cattle, dairy cattle, swine, and poultry. The brochures have been published by the FDA and are being distributed. A script was also written an educational video that is being produced by the FDA.
The veterinary profession also wants to maximize the use of good scientific information as veterinarians use their professional judgment in the drug selection process. The AVMA and the American Association of Bovine Practitioners, American Association of Swine Practitioners, Academy of Veterinary Consultants, and the National Cattlemen’s Beef Association, National Pork Producers Council, and USP are partnering to fund a project to develop a therapeutically-based antimicrobial use informational database called the Veterinary Antimicrobial Decision Support System. The project’s objective is to provide veterinarians with a source of easily accessible information on the therapy of specific diseases to help veterinarians make wise therapeutic decisions. In the past, therapeutic antimicrobial use has focused on clinical efficacy. But now judicious therapeutic use is being redefined to include the optimization of efficacy and the minimization of resistance. The database will allow veterinary practitioners to utilize current, peer-reviewed information when they select treatment regimens. The information will include a full range of therapeutic options, including alternatives to antimicrobial therapy. The pathogen data will include susceptibility profile information. The informational database will be web-based.

The AVMA is also funding a pilot project in cooperation with veterinary diagnostic laboratories to initiate an animal pathogen resistance monitoring program.

The AVMA believes that these efforts by the veterinary profession will reduce the development of resistant zoonotic pathogens and commensals in animals, and will minimize any risk of a human health impact related to the therapeutic use of antimicrobials in animals.

The Committee discussed the possible role of the USAHA in ensuring science-based, risk-based regulatory decisions for the approval and withdrawal of food animal antimicrobial drugs. Concern was expressed regarding the expected actions of the FDA Center for Veterinary Medicine to initiate the regulatory process to withdraw the approvals for poultry fluoroquinolones. The Committee passed a motion recommending that the USAHA become more active and involved in liaising with the FDA CVM. The Committee believes that drug availability is very important to maintain animal health and welfare and recognizes that this need must be balanced by the need to protect public health. But the regulatory decisions need to be transparent, science-based and risk-based.

There being no further business, the Committee adjourned at 11:30 am.
The USAHA Committee on Public Relations and Communication Technology met at 3 p.m. on Saturday, October 21, 2000, in the Medical Forum F. Room of the Sheraton Hotel in Birmingham, Alabama.

After the roll call by Chairman Zirkle, Mr. Larry Mark, USAHA Public Information Officer (PIO) and Webmaster, gave his report. Public information articles had been sent electronically to all the standard sites.

New features on the web site included an Ideas section and a forum site for discussion of animal health issues. Larry is in the process of establishing a web site for the NAHEMS task force and they will be paying for his time spent on their site. The committee unanimously complemented Larry for his accomplishments in continually upgrading the capabilities and quality of the website.

Following this, Dick McCapes, editor of the newsletter gave his report. There were four issues printed – which comprised a total of 58 pages at a cost to the association of slightly over $13,000

Ernie Zirkle then described the need for the organization to proceed to a budget process and through a system of cost-saving techniques and increased dues find the where-with-all to hire a part-time Director. Also the Board of Directors has suggested that a communications plan be implemented with the goal of integrating the publication and distribution of the newsletter, proceedings, books, press releases and other association publications. Emphasis will be given to utilization of new technologies offered by the printing industry, web page and email technologies.

The final decision was that the membership should be surveyed to determine their preferences and that Dick McCapes, Roger Olson and Larry Mark will draft the questionnaire to be sent out and a report made to the Board of Directors.

There being no more business to come before the committee, adjournment took place at 4:55 p.m.
Dr. C. A. Hanlon, CDC, reported on the status of rabies in various species in the United States. Rabies is widespread in insectivorous bats in the US. Raccoon rabies was first identified in 1947 in the southeast US. When rabid raccoons were transported to West Virginia, it initiated greatest outbreak in history. She discussed the history of oral rabies vaccination that was conceived of in the United States but first used in Europe. Raccoons and skunks are the major reservoirs of rabies in the US. She reported on studies with SAG2 vaccine. This vaccine appears to be safe and effective in raccoons.

She discussed problems with surveillance and evaluation of the effect of oral vaccine programs. She described three priorities for implementation; containment of epizootic fronts, control at areas of high animal human interaction, and eradication. A human case of vaccinia from exposure to oral rabies vaccine was reported.

Dr. Hanlon stressed the importance of education about rabies and rabies eradication programs. There have been four rabies cases in humans reported since Sept 1, 2000, in the United States and Canada.

Rick Rosatte gave a report on rabies in Ontario. Arctic fox rabies has been endemic in Ontario. Raccoon rabies has recently been introduced. In the year 2000, annual human post exposure treatments (PET) cost around $6 million per year. The wildlife vaccination program in Canada uses ERA strain of live racices vaccine. The Province initiated a fox vaccination program in 1989. About 1 million baits are distributed per year. By 1999 the program had practically eradicated disease in foxes, but a persistent focus in skunks has remained. Human PET has dramatically been reduced. He described the introduction of raccoon rabies into Ontario in 1999. and described the activities of a Raccoon Rabies Task Force. They initiated vaccine buffer zones in advance of the epizootic front. In 1999, the first case
of raccoon rabies was reported near the New York outbreak. The Province reacted with a point control strategy that included a population reduction zone, a trap-vaccinate-release (TVR) zone, and an oral vaccination zone. In 2000, there have been 6 cases of rabies on Wolf Island and secondary cases in previously vaccinated areas. They initiated population reduction around cases in April, a TVR program in June and distributed 300,000 baits in June and September. There are 3 urban areas that were hand baited. The Cost has been about $2 million dollars this year. The plan calls for vaccination for 2 years after last case. The efforts of the program have prevented an explosion of raccoon rabies in Ontario as contrasted with the early epizootic in the United States. They feel the effort as worth it. Dr. Rosatte urged an international effort to attack raccoon rabies on a regional basis.

Dr. Albino Belotto from PAHO reported on Rabies Control in South America. He described various PAHO activities including the regional program for the elimination of dog rabies. This has reduced the number of human cases of rabies dramatically in the last decade. The dog is the main transmitter of rabies to man. Since 1991 human and canine cases have reduced proportionately. Bats continue to be important source of rabies in humans. Monkeys, skunks and fox are other important sources of human cases. The region is making progress in testing for rabies and developing capabilities for virus characterization.

Dr. Miguel Escobar described advances at Merial regarding labeling of oral rabies vaccine, which will enable faster response to requests for vaccine in the Texas programs. Dr Kent VanKampen reported on the development of transdermal recombinant adenovirus vaccines. These eliminate the need for needles and cold chain protection.

Dr. Kenny Mitchell reported on the control of rabies in Pinellas County, Florida. Prior to 1995, the county was free of terrestrial rabies. There was an explosion of rabies in 1995. After receiving permission to use the oral rabies vaccine, they used helicopters to distribute half of the baits and hand distributed the rest. They used 75 baits per square kilometer and mosquito control personnel to deliver some bits. The results were dramatic in the reduction of cases over 2 years. The program has continued for 5 years and will now be reduced to vaccination of buffer and high-risk zones.

Dr. Kathy Smith reported on the Ohio oral rabies vaccination program, which was targeted to stop spread or raccoon rabies from West Virginia. The State has made 7 total barrier treatments over an area of 25 by 109 miles. They are evaluating program success by cases, serology, and tetracycline monitoring. No positive terrestrial cases of rabies have been reported in 2000. Submissions are down this year but are still above preinfection levels. A Cost study indicated that ground distribution is cheaper than air distribution. She reported on the human exposure to the oral rabies vaccine. A lady was bitten by dog that was eating a bait. She
developed an inflammatory reaction and was treated with vaccinia antibody. Ohio will initiate follow up on all calls on vaccine contact and will enhance training on ground distribution of vaccine baits.

David Johnston discussed the uses of tetracycline marker in reducing costs of bait distribution. A 50-100% herd immunity rate is needed to control rabies in wildlife populations. He described various possibilities for achieving high levels of bait consumption. The ideal distribution rate is confounded by bait loss and competition from other species, which reduces the number available for target populations. He provided 3 sets of guidelines for determining baiting strategies. It may be necessary to reduce bait distribution rate but to increase the number of lines needed to distribute total, to keep the density the same and increase release lines, or to increase bait density and increase lines of distribution.

Dr. Laura Bigler – New York reported on studies with different baits. She described success of all baits in the St. Laurence area. Used 2 types of fish meal baits and 1 sachet bait. In the St Laurence area they have seen a 92% reduction of cases vs. 74% reduction in control zone. Other areas included the Niagara and Chautauqua regions. A comparison of human contacts with baits by type and year were given. Also a report of the program in Vermont was also presented. The barrier there has not been breached. A minimum 25-mile wide barriers appear to be effective.

Dr. Donald Lein reported on the Northeast International Wildlife Rabies Control effort.

Regional Committees first convened in 1993. These include the Border States and Provinces, Federal Governments, and Universities. The short-term priorities were for developing information on which program strategies could be based and the determination of funding resources. Long-term goals are to expand vaccination areas, refine economic analyses as new data are collected, and merge with other regional rabies control programs. He described the growth of control areas in the northeast and his hopes for future developments. Ultimately there is hope for a national program.

Mr. Dennis Slate. Wildlife Services got its first funding for ORV in 1993/94. In 1997 it was expanded to include Ohio and Vermont. Additional states have been added each year since. In 2000, $1.5 million were funded for oral vaccination programs. The agency is active in air services contracts, cooperative agreements, bait distribution, sample collection for project evaluation and rabies surveillance. His agency has participated in meetings in various areas and developed a strategy for funding. This includes APHIS contingency funds and USDA commodity credit corporation requests. In FY 2001 Wildlife Services received a Congressional directive increase. In 2002 will have internal USDA funding. For FY 2001, funding has been increased by $2 million. The Secretary of Agriculture has signed a request to release these funds. Plans for these funds are to revive the gray fox program in Texas, initiate barriers in the Southeast' and
REPORT OF THE COMMITTEE

add to the Ohio program to stop expansion from West Virginia. Studies are to be initiated in West Virginia to enhance surveillance. Cost benefit studies for containing raccoon rabies have been conducted. This was for purpose of estimating costs for planning.

Business Meeting.

Dr. Fearneyhough announced that he was no longer part of a State government. As a private citizen he was pleased to state his appreciation of progress made to date in controlling rabies in wildlife.

One resolution was adopted for presentation to the Resolutions Committee.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON SALMONELLA

Chairman: Dr. Kakambi V. Nagaraja, St. Paul, MN  
Vice Chairman: Dr. Bradford P. Smith, Davis, CA

Committee Members Present: Dr. Kakambi V. Nagaraja, MN; Dr. Bradford P. Smith, CA; Dr. Charles W. Beard, TX; Dr. Nicholas M. Dorko, Jr., CT; Dr. Erica Dueger, CA; Dr. Dave Dargatz, CO; Dr. Don A. Franco, VA; Dr. Peter Holt, GA; Dr. William O. James, VA; Dr. Hailu Kinde, CA; Dr. Sandra Kelly, MO; Dr. Patrick L. McDonough, NY; Dr. Benjamin S. Pomeroy, MN; Dr. Jean Guard Petter, GA; Dr. H.L. Shivaprasad, CA; Dr. W. Douglas Waltman, GA; Dr. Scott J. Wells, MN; Dr. Mahlon W. Vorhies, IA; Dr. Doreene Hyatt, CO; Dr. Richard R. Wood, IL; Richard K. Gast, GA; Dr. Ching Ching WU, IN; Dr. Donald Munro, PA.

The USAHA Committee on Salmonella met with 50 members and guests. Three resolutions were passed: One recommended that USDA/APHIS provide at least a quarterly summary of Salmonella isolates, the second recommended that USDA, APHIS ensure that adequate amounts of high quality Salmonella serogrouping sera be available to state labs, and the third resolution requested that USDA, APHIS phage type and pro-
vide support for pulsed field gel fingerprinting of all isolates of *S. typhimurium* and *S. enteritidis* submitted to NVSL.

Ten reports or scientific papers were presented. Dr. Mark Wilson of USDA, APHIS presented the NVSL data on Salmonella serotypes from animals and related sources from July 1999 to June 2000. That complete report can be found in this proceedings book.

**Dr. William James, USDA, FSIS,** presented a report of Salmonella serotypes from carcasses and raw ground meat products.

In the June 1997-August 1998 data from establishments of all sizes, the most common serotype from cattle carcasses (Montevideo), swine carcasses (Derby), chicken carcasses (Heidelberg), and turkey carcasses (Hadar) were also the most common serotypes from the corresponding raw ground products. The most common serotypes from January 1998-January 1999 from large establishments were remarkably similar to those of June 1997-August 1998. From swine carcasses (Derby) and raw ground turkey (Hadar) they were the same. From chicken carcasses, the two most common serotypes (Kentucky, Heidelberg) were the same, although reversed in order. The top six serotypes from raw ground beef in the January 1998-January 1999 data were all found in the top eight from the June 1997-August 1998 data.

In the June 1997-August 1998 data, Enteritidis was not found in any raw ground products. Enteritidis was found in four of 364 cattle carcass isolates, one of 880 swine carcass isolates, 10 of 803 chicken carcass isolates, and one of 470 turkey carcass isolates. In the January 1998-January 1999 data, Enteritidis was not found in 76 swine carcass isolates, 42 raw ground beef isolates, or 212 raw ground turkey isolates. It was found in 14 of 573 chicken carcass isolates.

**Dr. A. R. Rhorer, USDA, APHIS, VS,** reported on the status of the National Poultry Improvement Plan. In 1999 and 2000 there have been four outbreaks/isolations of *S. pullorum* (all standard strain) reported. All were in flocks of less than 100 birds. No isolates of *S. gallinarum* have been reported since 1988. *Mycoplasma, gallisepticum, M. synoviae* and *M. meleagridis* were isolated from primary and multiplier breeding flocks 37, 27, and 3 times respectively in 1998 and 1999. *Salmonella enteritidis* was isolated from 69 egg-type flocks containing 717,000 birds.

**Dr. Richard Wood** reported on the *S. enteritidis* status of uncaged chickens used to produce eggs for a specialty market. One hundred and five flocks, averaging 5000 birds per flock, were housed at a density of two square feet per bird in houses with litter, slat areas, and nest boxes. The quality assurance program consisted of humane housing, cleaning and disinfection between flocks, feed pelleting, chick source control, biosecurity, and environmental sampling for Salmonella. The sampling protocol included environmental swabs of laying and pullet houses. If a laying house tested positive, eggs were diverted to pasteurization and the house re-tested in four weeks. After a second environmental positive in a laying
house, the flock was removed. The testing protocol was strengthened in 1997 by adding additional laying house tests. The results of environmental sampling from 1991 and 1999 were monitored to determine the effectiveness of the program. During the first two years of the program, 25 percent of the flocks tested positive for Salmonella enteritidis. During the final three years of the program, this had dropped to less than five percent and only one flock out of 41 had to be depopulated early.

**Dr. Peter S. Holt, USDA, ARS**, reported on immunization of poultry with a live attenuated S. typhimurium vaccine to protect against S. enteritidis infection during a molt. The vaccine used was Megan Vac 1, an attenuated S. typhimurium currently licensed for poultry in the United States. Vaccination did reduce the SE shed in the challenged birds which would help reduce the chance of transmission to unchallenged but exposed birds. On day 3 post challenge 5/20 (25%) unvaccinated exposed hens were shedding SE compared with 1/20 (5%) of the vaccinated hens. By day 10, 15/20 (75%) vs 9/20 (45%) vaccinated hens were shedding SE. The amount of SE shed at this time was much more telling—many of the exposed hens from the unvaccinated hens were shedding over $10^3$ SE/ml of intestinal sample while shedding could be detected in all of the vaccinated hens only after tetrathionate enrichment of the samples. There was less difference between the shed rates in the two groups on days 17 and 24 post challenge but there were still some hens in the unvaccinated group which were shedding over $10^3$ SE/ml, compared with very low numbers of SE by the vaccinated hens. There were significantly fewer culture positive ceca (30% vs 80%) and ovaries (0% vs 40%) in the vaccinated vs unvaccinated hens at day 11 post challenge and, while not significant, there were no positive liver/spleen samples compared with 20% samples in the unvaccinated birds. These results indicate that administration of a live attenuated S. typhimurium vaccine strain to hens prior to molt could provide a major degree of protection against SE infection during the increased risk period of a molt.

**Dr. Michael Jolly of Diachemix Corp.** reported on detection of S. enteritidis in chickens and egg yolks using fluorescence polarization. The O-polysaccharide (OPS) from SE was prepared from commercially available lipopolysaccharide (LPS) by acid hydrolysis and labeled with fluorescein to give a fluorophore (tracer) specific for SE. Fluorescence polarization (FP) was measured on a Sentry™ analyser. Sample (10 or 20μl) was diluted into 1 ml of buffer and a blank serum reading was taken. 10μl of an appropriately diluted tracer added, mixed and its FP measured after 2 minutes. A positive sample was indicated by a reading 10 MP higher than that of the tracer in buffer. A panel of sera was tested by the FPA and results compared to a flagellin ELISA and a commercially available ELISA (Chekit). The results demonstrate that the sensitivity and specificity of the FPA compare favorably with those of the ELISAs. In addition, the speed and cost effectiveness of the FPA was superior to those of the ELISAs.

**Dr. Bradofrd P. Smith, U.C. Davis**, presented the results of on-going
REPORT OF THE COMMITTEE

studies into the epidemiology of Salmonella contamination of milk on a large commercial dry lot dairy. The complete paper can be found in this proceedings book.

Dr. Armando Mirande of the Biomune Company, reported on the use of a new modified live *S. typhimurium* vaccine in chickens. Characteristics of this vaccine include the ability to significantly protect internal organs and the intestine of chickens challenged with paratyphoid species of multiple serogroups, when compared to non-vaccinated, challenged control chickens.

Dr. Erica Dueger, U.C. Davis, presented the results of a field evaluation of the use of two Salmonella vaccines in adult cattle on a commercial dairy. The authors believe this to be one of the only controlled trials evaluating the effects of a Salmonella vaccine in adult cattle (other studies have all involved calves). Prior to initiation of the vaccination trial, fecal swabs were collected from cows and calves to determine the incidence and serogroup specificity of Salmonella fecal shedding on the dairy. Salmonella were isolated from 30% of fecal swabs collected from non-lactating cows, 40% of fecal swabs collected from non-lactating cows, 40% of fecal swabs collected from peripartum cows, and 50% of fecal swabs collected from calves less than 14 days of age. The Salmonella serotypes isolated from all groups of (serogroup B), and *S. anatum* (serogroup E1).

Four hundred and fifty pregnant cows were enrolled in the study over a 6-week period. All of the cows were 225-235 days pregnant on enrollment. At enrollment each cow was randomly assigned to 1 of 3 groups giving 150 cows per group. Group 1 cows were vaccinated at enrollment with a modified live *Salmonella cholerasuis* vaccine (SC-54, NOBL Laboratories, Inc., Sioux Center, Iowa). Group 2 cows were vaccinated at enrollment and again 35 days later with an autogenous *Salmonella montevideo* bacterin, and group 3 cows remained unvaccinated as controls. No significant adverse effects were observed in association with either vaccine.

This study demonstrates that vaccination of cattle with a modified live *Salmonella cholerasuis* vaccine reduces fecal shedding of group C1 Salmonella. Vaccination had no effect on fecal shedding of other *Salmonella* serogroups or on mortality or milk production.

Dr. Jean Guard Petter, USDA, ARS, reported on the enhanced virulence of nonflagellated mutants of *S. enteritidis*. Factors such as length of time allowed for growth before harvest as vaccine can greatly affect the antigenic qualities of a culture. Dr. Petter urged vaccine producers to more carefully monitor such factors, and stated that her laboratory would be pleased to provide support for such quality control.
SALMONELLA SEROTYPES FROM ANIMALS AND RELATED SOURCES REPORTED DURING JULY 1999 - JUNE 2000

K. E. Ferris, B.S., M.S.
B. R. Flugrad, B.S.
J. M. Timm, B.S.
A. E. Ticer, B.S.

Summary
Serotyping results for 22,967 isolates from animals and epidemiologically related sources are reported for July 1, 1999, through June 30, 2000. The most frequently identified serotypes were *Salmonella typhimurium*, *S. heidelberg*, *S. kentucky*, *S. derby*, and *S. anatum*.

Introduction
*Salmonella* isolates submitted by animal disease diagnostic laboratories throughout the United States are received at the National Veterinary Services Laboratories (NVSL) for serotyping. The *Salmonella* are isolated from cases of clinical disease but also from herd and flock monitoring. Data are included on *Salmonella* isolated by the Food Safety Inspection Service as a result of HAACP testing. Some isolates were received from laboratories involved in research projects. Data sent to the NVSL by other laboratories serotyping *Salmonella* are also included in this report.

On October 1, 1999, the NVSL began using a new computer system for all testing done at the laboratory. The same data tables used to compile the past salmonella reports are not available in the new system; this year's report will not be as complete as in past years. All of the data is accessible and computer searches can be done if additional information is needed. We hope to be able to compile and present a more comprehensive report next year.

Discussion
Serotyping results are presented for 22,967 isolates; a 6% increase over the 21,611 isolates reported last year. A total of 310 serotypes were identified from isolates recovered from animals, their environment, or feed in 49 states and the District of Columbia. The 10 most common serotypes (Table 1) accounted for 65% of the total isolates. *Salmonella typhimurium* has been the most frequently identified serotype since 1995 (Table 1).

The percentage of isolates identified as *S. typhimurium* has remained fairly constant for the last 3 years: 23% this year; 22% last year; and 23% the year before. The percentage of *S. typhimurium* isolates identified as *S. typhimurium* var *copenhagen* was 51% this year after remaining at 57% for the last 2 years. In swine, 68% of the *S. typhimurium* were *S.
typhimurium var copenhagen, while in horses, 35% were S. typhimurium var copenhagen. Salmonella typhimurium is again one of the 10 most frequently identified serotypes submitted from chickens, turkeys, swine, cattle, and horses (Tables 2-6). Of the total isolates of cattle origin, 52% were identified as S. typhimurium, while 38% of the horse isolates, 31% of the swine isolates, 8% of the turkey isolates, and 5% of the chicken isolates were S. Typhimurium.

The percentage of isolates submitted from chickens remained the same as last year (22%), while 17% were from swine, 15% from cattle, 10% from turkeys, and 4% from horses. Only 44 isolates were of sheep origin and of those, 11 were S. typhimurium and 23 were 61:1,5 (Subspecies 3b). There were 70 isolates from feed submitted for serotyping and the results are listed in Table 7.

The 10 most common serotypes (Table 1) were the same as last year. Isolations of S. heidelberg increased 58%, S. anatum increased 20%, S. agona increased 41%, and S. montevideo decreased 26%. The majority of S. heidelberg isolates were of chicken origin (67%).

Salmonella agona was among the 10 most frequently identified serotypes from chickens, turkeys, swine, cattle, and horses, and the numbers identified from each of these species were similar (Tables 2-6).

The majority of isolates of S. derby were of swine origin (573 of 873). Of the remaining 300 isolates, 278 were from HAACP testing (species of origin not currently accessible in database), 8 were from cattle, 7 from chickens, 6 from turkeys, and one was isolated from a snake.

References
Table 1.
SALMONELLA SEROTYPES IDENTIFIED MOST FREQUENTLY FROM JULY 1, 1999 THROUGH JUNE 30, 2000, WITH COMPARISON DATA FOR 5 YEARS (ALL SOURCES).

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<td>Typhimurium*</td>
<td>5221**(1)</td>
<td>4818(1)</td>
<td>4500(1)</td>
<td>2915(1)</td>
<td>3508(1)</td>
<td>2926(1)</td>
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<td>Heidelberg</td>
<td>3669(2)</td>
<td>2317(2)</td>
<td>2113(2)</td>
<td>1561(2)</td>
<td>2070(3)</td>
<td>2222(3)</td>
</tr>
<tr>
<td>Kentucky</td>
<td>1239(3)</td>
<td>1589(3)</td>
<td>893(4)</td>
<td>977(3)</td>
<td>924(5)</td>
<td>800(4)</td>
</tr>
<tr>
<td>Derby</td>
<td>873(4)</td>
<td>1049(4)</td>
<td>806(5)</td>
<td>659(7)</td>
<td>987(4)</td>
<td>620(7)</td>
</tr>
<tr>
<td>Anatum</td>
<td>732(5)</td>
<td>611(8)</td>
<td>573(8)</td>
<td>712(4)</td>
<td>444(14)</td>
<td>483(12)</td>
</tr>
<tr>
<td>Agona</td>
<td>730(6)</td>
<td>539(10)</td>
<td>523(11)</td>
<td>688(6)</td>
<td>605(10)</td>
<td>538(10)</td>
</tr>
<tr>
<td>Senftenberg</td>
<td>722(7)</td>
<td>839(6)</td>
<td>902(3)</td>
<td>465(10)</td>
<td>476(13)</td>
<td>445(13)</td>
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<tr>
<td>Enteritidis</td>
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<td>630(7)</td>
<td>414(12)</td>
<td>2471(2)</td>
<td>2626(2)</td>
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<tr>
<td>Montevideo</td>
<td>633(9)</td>
<td>859(5)</td>
<td>496(12)</td>
<td>702(5)</td>
<td>846(6)</td>
<td>609(8)</td>
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<tr>
<td>Hadar</td>
<td>513(10)</td>
<td>566(9)</td>
<td>698(6)</td>
<td>366(13)</td>
<td>718(7)</td>
<td>755(5)</td>
</tr>
</tbody>
</table>

* INCLUDES S. TYPHIMURIUM AND S. TYPHIMURIUM VAR COPENHAGEN
** NUMBER OF TIMES SEROTYPES WAS IDENTIFIED( ) RANK BEGINNING WITH THE MOST COMMON

Table 2.
CHICKEN—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 7/99 THROUGH 6/00

<table>
<thead>
<tr>
<th>SEROTYPE</th>
<th>TIMES IDENTIFIED</th>
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</thead>
<tbody>
<tr>
<td>Heidelberg</td>
<td>2414</td>
</tr>
<tr>
<td>Kentucky</td>
<td>559</td>
</tr>
<tr>
<td>Berta</td>
<td>322</td>
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<td>Enteritidis</td>
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<tr>
<td>Typhimurium</td>
<td>266</td>
</tr>
<tr>
<td>Senftenberg</td>
<td>141</td>
</tr>
<tr>
<td>Ohio</td>
<td>126</td>
</tr>
<tr>
<td>Agona</td>
<td>107</td>
</tr>
<tr>
<td>Infantis</td>
<td>88</td>
</tr>
<tr>
<td>Braenderup</td>
<td>81</td>
</tr>
<tr>
<td>Others</td>
<td>783</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5162</td>
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</table>
SALMONELLA SEROTYPES FROM REPORTED DURING JULY 1999 - JUNE 2000

Table 3.
TURKEY—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 7/99 THROUGH 6/00

<table>
<thead>
<tr>
<th>SEROTYPE</th>
<th>TIMES IDENTIFIED</th>
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<tbody>
<tr>
<td>Heidelberg</td>
<td>398</td>
</tr>
<tr>
<td>Senftenberg</td>
<td>357</td>
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<tr>
<td>Hadar</td>
<td>213</td>
</tr>
<tr>
<td>Typhimurum</td>
<td>198</td>
</tr>
<tr>
<td>Muenster</td>
<td>179</td>
</tr>
<tr>
<td>Reading</td>
<td>125</td>
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<td>124</td>
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<tr>
<td>Saintpaul</td>
<td>112</td>
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<tr>
<td>Bredeney</td>
<td>90</td>
</tr>
<tr>
<td>18:z4,z32 (Subspecies 3a)</td>
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</tr>
<tr>
<td>Others</td>
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<td><strong>TOTAL</strong></td>
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Table 4.
SWINE—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 7/99 THROUGH 6/00

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<thead>
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<th>SEROTYPE</th>
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<td>Typhimurium</td>
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<td>Choleraesuis</td>
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<tr>
<td>Muenchen</td>
<td>135</td>
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<tr>
<td>Orion</td>
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<td>Worthington</td>
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<tr>
<td>Agona</td>
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<td>Senftenberg</td>
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Table 5.
CATTLE—MOST FREQUENTLY IDENTIFIED SEROTYPES
FROM 7/99 THROUGH 6/00

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<th>SEROTYPE</th>
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<tr>
<td>Typhimurium</td>
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<td>Anatum</td>
<td>173</td>
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<tr>
<td>Dublin</td>
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<tr>
<td>Montevideo</td>
<td>155</td>
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<tr>
<td>Newport</td>
<td>135</td>
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<tr>
<td>Kentucky</td>
<td>117</td>
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<tr>
<td>Mbandaka</td>
<td>107</td>
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<td>Cerro</td>
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<tr>
<td>Agona</td>
<td>90</td>
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<tr>
<td>Muenster</td>
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<tr>
<td>Others</td>
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<tr>
<td><strong>TOTAL</strong></td>
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</table>

Table 6.
HORSE—MOST FREQUENTLY IDENTIFIED SEROTYPES
FROM 7/99 THROUGH 6/00

<table>
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<th>SEROTYPE</th>
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<td>Anatum</td>
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<td>Thompson</td>
<td>23</td>
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<td>Muenchen</td>
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<tr>
<td>Montevideo</td>
<td>17</td>
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<tr>
<td>Muenster</td>
<td>15</td>
</tr>
<tr>
<td>Braenderup</td>
<td>13</td>
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<tr>
<td>Others</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>872</strong></td>
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### Table 7. Serotypes identified from feed from 7/99 through 6/00

<table>
<thead>
<tr>
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<td>Barranguilla</td>
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<td>Livingstone</td>
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<td>Fresno</td>
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<tr>
<td>Montevideo</td>
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<tr>
<td>Gera</td>
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<tr>
<td>Cerro</td>
<td>5</td>
</tr>
<tr>
<td>Hadar</td>
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</tr>
<tr>
<td>Mbandaka</td>
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<tr>
<td>Havana</td>
<td>1</td>
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<tr>
<td>Senftenberg</td>
<td>4</td>
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<tr>
<td>Johannesburg</td>
<td>1</td>
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<tr>
<td>Drypool</td>
<td>3</td>
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<tr>
<td>Lexington</td>
<td>1</td>
</tr>
<tr>
<td>Infantis</td>
<td>3</td>
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<tr>
<td>Lille</td>
<td>1</td>
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<tr>
<td>Arkansas</td>
<td>2</td>
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<tr>
<td>London</td>
<td>1</td>
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<tr>
<td>Bietri</td>
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</tr>
<tr>
<td>Norwich</td>
<td>1</td>
</tr>
<tr>
<td>Brandenburg</td>
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<tr>
<td>Oranienburg</td>
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<tr>
<td>Enteritidis</td>
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<tr>
<td>Pomona</td>
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<td>Heidelberg</td>
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<td>Tennessee</td>
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<tr>
<td>Schwarzengrund</td>
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</tr>
<tr>
<td>Typhimurium</td>
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<td>TOTAL</td>
<td>70</td>
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DETECTION OF SALMONELLA ENTERITIDIS INFECTIONS IN CHICKENS AND EGG YOLKS USING FLUORESCENCE POLARIZATION

Mohammad S. Nasir¹, Michael E. Jolley¹, Richard K. Gast², Peter S. Holt².
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Telephone: (847) 548-2339, Fax: (847) 548-2984,
Email: m-nasir@nwu.edu

Abstract

An fluorescence polarization assay (FPA) for the detection of antibodies to Salmonella enteritidis (SE) in chickens has been developed. The O-polysaccharide (OPS) from SE was prepared from commercially available lipopolysaccharide (LPS) by acid hydrolysis and labeled with fluorescein to give a fluorophore (tracer) specific for SE. Fluorescence polarization (FP) was measured on a Sentry™ analyzer. Sample (10 or 20 ml) was diluted into 1 ml of buffer and a blank serum reading was taken. 10 ml of an appropriately diluted tracer added, mixed and its FP measured after 2 minutes. A positive sample was indicated by a reading 10 mP higher than that of the tracer in buffer. A panel of sera was tested by the FPA and the results compared to a flagellin ELISA and a commercially available ELISA (Chekit). The results demonstrate that the sensitivity and specificity of the FPA compare favorably with those of the ELISAs. In addition, the speed and cost effectiveness of the FPA was superior to those of the ELISAs.

Key Words: Fluorescence Polarization Assay (FPA), Salmonella enteritidis (SE), O-polysaccharide (OPS), Lipopolysaccharide (LPS).

1. Introduction:

Salmonella enteritidis (SE) is one of the most common salmonella serotypes associated with human food poisoning.¹-³ This bacterial illness is primarily contracted through salmonella-contaminated chickens and their eggs.³-⁴ Different vaccines and sprays are being developed in an attempt to eliminate this bacterium from the food supply. A diagnostic assay is needed to confirm the absence of this bacterium in birds and to serve as a surveillance mechanism.¹,⁵ Various methods for the detection of SE are available including agglutination, immunoblotting and ELISA tests,⁶-⁷, ¹⁶ with varying degrees of sensitivity and specificity. Most of them are cumbersome, expensive and slow. On the other hand, the poultry industry does not want any surveillance of the disease that is not cost effective.⁵ ELISA-based serological tests for the detection of antibodies against SE
antigens have been the most suitable for the mass screening of chicken flocks.8-9 These ELISA tests identify antibodies to either protein antigens or to the LPS produced by SE.3, 10-12, 17 Although sensitive enough, they are not very specific and give rise to false positives causing undesirable economic effects. An ELISA has been developed for the detection of exposure to SE based on antibodies to an antigen named SEF14.3, 13 Since SEF14 antigen is only expressed in SE serotypes this is a good antigen candidate for a highly specific diagnostic test. The test was claimed to be highly specific but had low sensitivity and therefore needed further examination.3, 16 Recently, a new study by Rajashekara, et.al reports a considerable success in using SEF14 fimbrial ELISA for detecting infected chickens and egg yolks.17

These assays require multiple washing steps, making the assay time consuming and tedious. FP is a homogeneous technique that has been extensively used in immunoassays, requiring minimal manipulations and a few minutes to complete.14 Recently our group reported an FPA using fluorescein-labeled OPS for the detection of antibodies to Brucella sp.15, 19 In the same way we have developed an FPA for the detection of antibodies to SE in chickens and chicken eggs. SE-specific OPS is prepared from commercially available LPS and labeled with fluorescein to give the required tracer. Serum or egg yolk is diluted with buffer and a blank intensity is measured. After adding tracer, its FP is measured after 2 minutes and compared to the FP of a negative control. This report describes the results of a study comparing a flagellin-based ELISA, a commercially available ELISA and the OPS-based FPA for experimentally infected chickens. A study of SE detection in egg yolk from commercially available eggs is also reported.

2. Materials and Methods
All reagents were obtained from Sigma Chemical Company, St. Louis MO: the LPS from SE (cat. no. L-6011, lot no. 27H4127), fluorescein isothiocyanate isomer I (FITC I, cat. no. F-7250, lot no. 15H5059), Sephadex G-25 (cat. no. G-25-50, lot no. 39H0569), DEAE sephadex A-25 (cat. no. A-25-120, lot no. 58H0383), Salmonella Agar, ONOZ (cat. No. S-5806, lot no. 89H0866), polymyxin B sulfate (cat. no. P-1004, 10 million units, 8000 units /mg, lot no. 97H0711) and cyanogen bromide-activated agarose (cat. no. C-9210, lot no.128H7816).

2.1. Instrumentation
FPAs were performed on a Sentry™ (Diachemix Corporation, Grayslake, IL).

2.2. Preparation of Polymyxin B Column
Polymyxin B sulfate was dissolved in 0.1 M sodium bicarbonate (20 ml) with stirring. Cyanogen bromide-activated agarose (5 g) was slowly added
and stirred overnight at room temperature. The resultant slurry was filtered and washed with water and then with 0.1 M sodium bicarbonate. Ethanolamine (3 ml) was added to 50 ml 0.1 M sodium bicarbonate and the polymyxin B-agarose was added. After stirring for one hour the mixture was filtered and the product washed with water and 0.1 M sodium phosphate, pH 6.8. A column (13 ml bed volume) was then prepared in 0.1 M sodium phosphate, pH 6.8. This column can be used repeatedly by regenerating first with 0.1 M sodium hydroxide and then with 0.1 M sodium phosphate, pH 6.8.

2.3. Preparation of SE OPS

The LPS (100 mg) from SE was added to 5 ml 1% acetic acid solution and heated in a boiling water bath for 1 hour. The resultant mixture was cooled and centrifuged for 10 minutes. The supernatant was applied to the polymyxin B column. Fractions (1 ml) were collected and spotted on a TLC plate (silica). The TLC plate was sprayed with 10% sulfuric acid and heated on a hot plate. The spots containing product turned black. Fractions (5-11) were pooled (~10 ml) and refrigerated (4 °C).

2.4. Fluorescein labeling of SE OPS

The OPS (500 ml) was mixed with 100 ml of 1M sodium hydroxide and incubated for 1 hour at room temperature. 25 ml dimethylsulfoxide (DMSO) solution of FITC I (100 mg/ml) was then added and incubated at room temperature for 1 hour. This was purified by passing through a G-25 sephadex column (2.5 ml bed volume) in 0.1 M sodium phosphate, pH 7.5. 1ml fractions were collected. Fraction number 2 contained the product which was further purified on a Sephadex anion-exchange A-25 column in 0.1M sodium phosphate, pH 7.5. 2 ml fractions were collected using 0.1 M sodium phosphate, pH 7.5, 0.25 M sodium chloride in 0.1M sodium phosphate, pH 7.5, 0.5 M sodium chloride in 0.1 M sodium phosphate, pH 7.5 and 1M sodium chloride in 0.1M sodium phosphate, pH 7.5. The major product (2 ml) was obtained with 0.5 M sodium chloride. This was diluted 1:50 in 0.01 M sodium phosphate, pH 7.5, containing 0.15M sodium chloride and 0.1% sodium azide (PBSA) and 100mg/ml of bovine gamma globulin (stock tracer).

2.5. Samples

Serum samples were from USDA-ARS Southeast Poultry Research Laboratory, Athens, GA 30605 (Table 1). Laying hens were infected orally with SE strains of phage types 13a (bird numbers 1-24) or strain 14b (bird numbers 49-72). Sera were collected weekly from week 0 (pre-inoculation) to week 4. Each sample number combines the week of sera collection after inoculation followed by the bird number (i.e. sample 0-9 means week 0 (pre-inoculation) of bird number 9). Egg cartons were bought from a local grocery store (Jewel). Sample eggs were taken from each carton.
for testing as follows: (Table 2) 1,2 large, extra large, eggs respectively from Food Club, Topco Assoc. Inc. 7711 Gross Point Rd., Skokie, IL 60077), 3-5, 21-23 large, American Procurement & Logistics, Co., Salt Lake, City, UT 84127, 6-8 large, brown, American Procurement & Logistics, Co., Salt Lake, City, UT 84127, 9-11, 24-32 large, Farm Fresh, egg-land best (EB), Herbruck Poultry ranch, Seranac, MI 48881 (all vegetarian hen feeding program), 12-14, 42-50 jumbo, American Procurement & Logistics, Co., Salt Lake, City, UT 84127, 15-17 nest eggs, large, Food Animal Concerns Trust (FACT) approved from uncaged hens, P. O. Box 14599, Chicago, IL and 18-20, 33-41 medium, American Procurement & Logistics, Co., Salt Lake City, UT 84127.

2.6. ELISAs

An ELISA (CHEKIT) was obtained from Dr. Bommeli, AG, Stationsstrasse 12, CH-3097 Liebefeld-Bern. Samples were performed in duplicate along with positive and negative controls. The test was performed according to the manufacturer’s instructions. A flagellin-based ELISA was performed as described previously. 18

2.7. Detection of Salmonella enteritidis antibodies using FPA

10 ml of serum was diluted in 1 ml of PBSA. Some selected weak FPA positive samples and two presumed-negative samples were repeated using 20 ml of serum to assess the increase in sensitivity attained by doubling the sample volume. After blanking, 10 ml of tracer was added, mixed well and the FP measured after incubating for two minutes. A sample with a mP value greater than 10 above that of the tracer (Cutoff value) in PBSA was considered positive. Egg yolks were diluted 1/10 in PBSA and 20 ml of this diluted yolk was further diluted in 1 ml of PBSA. After blanking FP was measured as described for serum samples.

3. Results and Discussion

Table 1 shows the comparison between the flagellin ELISA, the ELISA (CHEKIT) and the FPA. Figure 1 depicts the results of the ELISA (CHEKIT). The agreement between the assays was generally quite good. Samples 0-9, 0-65 and 1-21 were ELISA (CHEKIT) false positives. Samples 1-13, 1-15, 1-50, 1-61 and 3-21 were flagellin ELISA false negatives. Sample 1-59 was either a flagellin ELISA false positive or a ELISA (CHEKIT) and FPA false negative. The FPA test was repeated on another FPA machine (FPM-1, Jolley Consulting & Research, Inc.) and the results were replicative. Table 2 shows the FPA results for egg yolk samples. A small but consistent nonspecific binding is observed in all the egg samples. Therefore the cutoff is raised to compensate the nonspecific binding. Adding 10 ml of a high titre serum in the presence of a 20 ml of egg yolk sample did not interfere with the assay and gave the same FP value as for serum only. Eggs 6, 9, 12, 19, 26 and 34 were cultured using Salmonella agar, Onoz and found to be
negative. A routine egg testing for SE is normally hindered by the cost associated with various testing methods available to date. Using FPA as a surveillance test for SE in egg yolk and chicken serum can easily compensate this factor.

In conclusion the FPA, based upon the OPS of SE, is a rapid, sensitive and cost effective alternative to existing ELISAs. The data on the limited number of samples presented here suggest that the FPA might possibly be superior to these ELISAs. The cost effectiveness and the simplicity of this assay makes FPA a viable assay in testing eggs. Further study will be required to confirm this observation.

Table 1:
Detection of *Salmonella enteritidis* antibodies in Chicken serum using ELISA (Flagella antigen), ELISA (CHEKIT) and FPA.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Flag. ELISAa</th>
<th>CHEKITb</th>
<th>FPA-1 (mP)c</th>
<th>FPA-2 (mP)d</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP-Tracer</td>
<td>——</td>
<td>——</td>
<td>94</td>
<td>92</td>
</tr>
<tr>
<td>Neg. Cont.a</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-9</td>
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<td>3</td>
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<td></td>
</tr>
<tr>
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<td>0.19</td>
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<td>97</td>
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<td>103</td>
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<tr>
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<td>4</td>
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<td>2-1</td>
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<td>2-7</td>
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<tr>
<td>2-11</td>
<td>0.249</td>
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</table>
## FLUORESCENCE POLARIZATION DETECTION OF SALMONELLA ENTERITIDIS IN CHICKENS AND EGG YOLKS

<table>
<thead>
<tr>
<th>Sample</th>
<th>Flag. ELISA</th>
<th>CHEKIT\textsuperscript{b}</th>
<th>FPA-1 (mP)\textsuperscript{c}</th>
<th>FPA-2 (mP)\textsuperscript{d}</th>
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<tr>
<td>2-15</td>
<td>0.341</td>
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<td>2-24</td>
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<td>118</td>
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<tr>
<td>3-16</td>
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<td>4-72</td>
<td>0.795</td>
<td>6</td>
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<td>117</td>
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</table>

\textsuperscript{a.} ELISA OD based upon flagella antigen,  
\textsuperscript{b.} ELISA (CHEKIT) results given as color from 0-6,  
\textsuperscript{c.} FP assay using 10 ml of sample. Cutoff = 104 (tracer in buffer + 10 mP),  
\textsuperscript{d.} FP assay using 20 ml of sample. Cutoff = 102 (tracer in buffer + 10 mP),  
\textsuperscript{e.} Negative control provided by ELISA (CHEKIT) kit.
Eggs were pierced with a needle, white drained and yolk collected for analysis (~0.5 ml diluted to 5 ml in PBSA, 1/10 dilution). 20 ml of this diluted yolk was mixed with 1 ml PBSA and a blank taken on the instrument. After adding 10 ml of tracer, FP (mP) was monitored for ~2 minutes (Cutoff = 115, tracer in buffer + 20 mP).

Table 2:
Detection of *Salmonella enteritidis* antibodies in Egg Yolk samples using FPA:

<table>
<thead>
<tr>
<th>Sample</th>
<th>FPA (mP)</th>
<th>Sample</th>
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<tr>
<td>Buffer</td>
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<td>105</td>
</tr>
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<td>2</td>
<td>106</td>
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<td>106</td>
</tr>
<tr>
<td>20</td>
<td>106</td>
<td>4-56a</td>
<td>212</td>
</tr>
<tr>
<td>19 + 4-56b</td>
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<td></td>
</tr>
<tr>
<td>Buffer</td>
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</table>
FLUORESCENCE POLARIZATION DETECTION OF 
SALMONELLA ENTERITIDIS IN CHICKENS AND EGG YOLKS

a. 10 ml of a strong positive serum sample (4-56) added in 1 ml of buffer without adding yolk.
b. 20 ml of yolk sample and 10 ml of strong positive serum sample added in 1 ml buffer.

Figure 1:
Results of the ELISA (CHEKIT) for various chicken serum samples. Sample 0-9 is in wells A1, 2. Sample 1-1 is in wells H1, 2. Sample 1-13 is in wells A3, 4 and so forth to well A11, 12 which contains sample 4-72. Wells B11, 12 contain no sample. Wells C11, 12 contain the ELISA (CHEKIT) positive control and wells D11, 12 contain the ELISA (CHEKIT) negative control. Wells E11, 12 to H11, 12 are substrate only.

References:
JOLLEY, ET AL


The propensity for *Salmonella* to contaminate milk has been recognized for many years however the epidemiology of *Salmonella* contamination of milk has not been defined. There are numerous reports of human salmonellosis linked to contaminated milk and *Salmonella* contamination of milk and colostrum represents a direct mechanism of disease transmission from cows to calves. Possible origins of *Salmonella* in bulk tank milk include *Salmonella* infected mammary glands and fecal contamination during milking. There is a paucity of studies documenting the frequency of intra-mammary *Salmonella* infections in cattle, however, cows with chronic *Salmonella* infections have been observed to shed *Salmonella* in milk as well as feces. The bovine mammary gland may be infected hematogenously or via intra-mammary inoculation. Chronic *Salmonella* infections are most commonly associated with *S. dublin* but have also been reported to occur with *S. typhimurium* (B), *S. ohio* (C), *S. enteritidis* (D), and *S. muenster* (E). The objective of the present study was to determine the frequency of *Salmonella* shedding in milk by cattle on a farm endemic for *Salmonella* and to identify risk factors for intra-mammary *Salmonella* infections and *Salmonella* contamination of bulk tank milk.

This study was conducted on a dairy that milks 10,000 cows and has a rolling herd average of 21,000 lbs. The farm has a history of having had 2 *Salmonella* outbreaks in the last 5 years the first in 1995 and the second in 1997. In January of 1998 we initiated a herd health program with a focus on *Salmonella*. *Salmonella* monitoring on the dairy includes weekly collection of feed, fecal, milk, and environmental samples for *Salmonella* culture. The prevalence of fecal *Salmonella* shedding varies seasonally and according to stage in the production cycle. Lactating cows shed more *Salmonella* than non-lactating cows and cows in early lactation shed *Salmonella* more frequently than cows later in lactation. The incidence of fecal *Salmonella* shedding ranges from 0 – 70%. The peak incidence of fecal shedding by adult cows is in the hot wet summer months. The same seasonal pattern of *Salmonella* fecal shedding is also observed in calves suggesting a possible connection between cow and calf health. Potential modes of transmission between cows and calves include the maternity pen environment, colostrum, and milk.
To determine the incidence of *Salmonella* shedding in colostrum and milk, samples were aseptically collected from 5 groups of 200 cows. The sample groups included cows at parturition, cows and heifers 7 – 21 days in milk, heifers in mid lactation, cows in mid lactation, cows and heifers with mastitis, and cows and heifers that had recovered from mastitis that were awaiting antimicrobial residue withholding (Source of milk fed to calves). *Salmonella* were isolated from 5.5% of samples collected from cows with mastitis, from 1.5% of cows that were awaiting milk withholding for antimicrobial residues, from 1% of colostrum samples and heifers in mid lactation, and from 0% of early and mid lactation cow milk samples. There are 7 milking parlors on the dairy with cows segregated by parity, stage in lactation, and health status. *Salmonella* were isolated from 22 of 71 (30.9%) bulk tank milk samples and from 28 of 46 (60.8%) milk filters. *Salmonella* were isolated from 6 of 11 (54.5%) tank samples from the dairy used to milk cows and heifers for the first 3 weeks of their lactation, from 7 of 21 (33%) samples collected from the dairies used to milk mid and late lactation cows, and from 3 of 12 (25%) samples collected from the dairy used to milk mid and late lactation heifers.

Examination of the herd's mastitis records reveals a seasonal pattern of mastitis, with a peak incidence during the hot wet summer months (figure 1). The frequency of *Salmonella* mastitis followed the herd trend. For the months of October through to and including June *Salmonella* were isolated from 12 of 602 (1.99%) mastitis samples, for July through September *Salmonella* were isolated from 20 of 670 (3%) samples. Milk samples are collected from every cow with mastitis and cultured on blood, MaConkey, and mycoplasma agar. During the summer months the most common organisms isolated are coliforms. As depicted in figure 1 the average maximum daily temperature during the summer months is typically above 90 F and the majority of the rainfall falls during the summer months. Following rainfall the corrals become muddy contributing to fecal contamination of cows udders.
Mastitis and Environmental Conditions

Figure 1. Monthly incidence of mastitis with an overlay of rainfall and maximum monthly average daily temperature. The seasonal peaks in mastitis correspond to the hot summer months. During the summer of 1999 the association between the weather and frequency of mastitis was presented to the owner of the dairy. In response to this the owner increased the frequency of corral scraping during the summer and changed teat dips. The decline in the number of cases of mastitis occurred during a herd expansion of ~ 1,000 cows without expansion of the facility.

Salmonella was isolated from 54 of 74 samples (73%) of bedding collected over the last 12 months indicating bedding is frequently contaminated with Salmonella. The number of Salmonella present in the bedding ranges from 0.3 to $10^7$ Salmonella per gram. A histogram depicting the number of Salmonella found in bedding is presented in Figure 2. Assuming Salmonella is an environmental mammary pathogen and that the most common route of infection in adult cattle is via inoculation of the teat canal. A logical approach to prevention would be to minimize Salmonella contamination of the environment. Over the last 2 years Salmonella were isolated from approximately 70% of fecal swabs collected from fresh cows during
the late summer months. In the winter the incidence of fecal shedding declines to 10 – 20%. High producing cows produce ~ 100 lbs of manure a day and may excrete $10^7$ *Salmonella* per gram of feces. The high prevalence of fecal shedding in the summer is likely to contribute to environmental contamination, however the cause of the increase in fecal shedding during the summer has not been defined. The increase in fecal shedding may reflect compromised cow immunity subsequent to heat stress, increased pathogen exposure due to increased environmental contamination, or both. If the number of *Salmonella* present in the environment can change independently of fecal shedding by cows it is possible that the increase in fecal shedding is, at least in part, precipitated by a higher level of pathogen exposure.

![Histogram of Number of Salmonella per Gram of Bedding](image)

Figure 2. Frequency histogram of number of *Salmonella* isolated from environmental samples collected from dairy corrals over a 12 month period.

To evaluate the influence of moisture and temperature on the number of *Salmonella* present in cow bedding, bedding was collected from a corral and incubated for 24 hours at different temperatures and dry matter contents. The original sample contained 6 *Salmonella* per gram and had a dry matter content of 92%. This sample was divided into 3 and sterile water added to 2 of the aliquots to give 3 samples with dry matter contents of 40, 70, and 92 percent. Each of these samples was in turn split into 3 and
incubated at 4, 20, and 37 °C. Both moisture and temperature influenced the growth of *Salmonella* in corral bedding. Moisture content had the greatest impact. *Salmonella* multiplied to \(10^7\) *Salmonella* per gram in both of the 40% dry matter aliquotes incubated at 20 and 37 °C for 24 hours (Table 1).

<table>
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<th>Dry Matter Content (%)</th>
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<tr>
<td></td>
<td>4</td>
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<tr>
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<td>20</td>
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<tr>
<td>92</td>
<td>68</td>
</tr>
<tr>
<td>70</td>
<td>146</td>
</tr>
<tr>
<td>40</td>
<td>681</td>
</tr>
</tbody>
</table>

Table 1.

Number of *Salmonella* per gram of bedding following incubation of the same sample under different temperature and moisture conditions. Sterile water was added to the sample to reduce the dry matter content. The range in dry matter was selected according to the range of dry matter previously observed in the corrals.

The first 2 weeks after cessation of milking and the 2 weeks prior to parturition are high-risk times for cows to acquire intra-mammary infections. Approximately 60% of the new *Salmonella* mastitis cases were detected in cows less than 120 days in milk (Figure 3.). On this dairy 120 days represents the first one third of the average lactation.

Figure 3. Histogram of the interval from parturition to diagnosis of *Salmonella* mastitis for 32 cows. *Salmonella* appears to have a propensity to cause mastitis in the first 120 days of lactation a finding consistent with other environmental mastitis pathogens.
On this and many other dairy farms *Salmonella* frequently contaminates milk. Our preliminary data suggests there may be a link between environmental *Salmonella* contamination, *Salmonella* mastitis, and *Salmonella* contamination of bulk tank milk. The owner's response to the observed association between environmental conditions and mastitis was to increase the frequency of corral scraping. The effect was a dramatic reduction in the incidence of mastitis reflected by a decrease in number of cases in the face of increasing herd size. Simple quantification of *Salmonella* numbers in cow bedding indicates *Salmonella* contamination is common and the number of organisms may be large. It was also demonstrated that *Salmonella* proliferates in bedding under moist conditions. Considering the volume of manure cows produce further research appears warranted to evaluate management strategies to control proliferation of *Salmonella* in the dairy environment.

References
REPORT OF THE COMMITTEE ON SALMONELLA ENTERITIDIS (SE) IN EGGS

Chairman: Dr. David C. Kradel, State College, PA
Vice-Chairman: Dr. David M. Castellan, Sacramento, CA

Dr. J. Lee Alley, AL; Dr. Joan Arnoldi, WI; Dr. Marilyn F. Balmer, MD; Dr. Charles W. Beard, GA; Dr. Charles Benson, PA; Dr. Richard Breitmeyer, CA; Dr. Max Brugh, GA; Dr. Jones W. Bryan, SC; Dr. Gregg Cutler, CA; Dr. Sherrill Davidson, PA; Dr. Richard L. Dutton, NE; Dr. Robert J. Eckroade, PA; Dr. John Enck, Jr., PA; Dr. Richard K. Gast, GA; Dr. Eric N. Gingerich, PA; Dr. Thomas J. Gomez, GA; Dr. Jean Guard Petter, GA; Dr. Peter Holt, GA; Dr. Keith A. Honneger, IN; Dr. Williams O. James, VA; Dr. Kenton S. Kreager, IA; Dr. Joan Leonard, KS; Dr. John Mason, NY; Dr. Richard H. McCapes, CA; Dr. Armando Miranda, GA; Mr. Donald S. Munro, PA; Dr. Thomas J. Myers, DC; Dr. Kakambi V. Nagaraja, MN; Mr. Albert E. Pope, GA; Dr. Morris E. Potter, DC; Mr. Andrew R. Rhorer, GA; Dr. Martin A. Smeltzer, NC; Dr. Jill A. Snowdon, DC; Dr. David E. Swayne, GA; Dr. Gary L. Waters, MT; Dr. Nora E. Wineland, CO.

The Committee met on October 21, 2000 from 12:00 to 5:15 pm with 52 members, speakers and guests in attendance. This committee first met in 1999, following the establishment of the SE Task Force two years earlier. The SE Task Force, co-chaired by Dr. Gary Waters and Dr. Robert Eckroade, was charged to develop a science-based model quality assurance program to minimize transmission of SE to eggs during production, processing and storage and submitted the proposal entitled “Proposed Voluntary National Standardized SE Reduction Program in Eggs” in March of 1999. The task force proposal was discussed and modified by the 1999 USAHA Committee on Salmonella enteritidis in Eggs prior to submission to the U.S. Food and Drug Administration (FDA) and Food Safety Inspection Service (FSIS).

At this year’s committee meeting, Mr. Louis Carson, FDA and Dr. Alice Thaler, FSIS presented current thinking regarding the proposed FDA/FSIS regulations governing egg safety under the Egg Safety Action Plan. The so-called “Current Thinking Papers on National Standards for Egg Safety” were released at a public meeting on July 31, 2000 and have received wide circulation. It was emphasized that the Plan is still in the government review process and will be released for public comment by late 2000. The finalized rule is scheduled to be published in 2001 with implementation between the years, 2002-2004.

The Egg Safety Action Plan addresses the presence of SE in shell eggs and egg products using a farm-to-table approach. The Action Plan offers egg producers and processors the flexibility to choose from two
equivalent SE reduction strategies to meet the Action Plan's interim goal, a 50% reduction in egg-associated human illness by the year 2005. *Strategy I* is designed to reduce SE contamination of eggs at the production level of the food chain while *Strategy II* is designed to reduce SE contamination of eggs at the processing level. The Action Plan also addresses retail, research and educational means of reducing the risk of human illness due to SE. Any mandatory provisions that might be promulgated will be justified based on a supportable cost: benefit basis.

Dr. John Mason, who has worked with SE since the late 1980's and is currently a food safety consultant, commended the FDA/FSIS on the goals of the *Egg Safety Action Plan* but he expressed concerns about the economic impact this Plan will have on smaller producers. He presented 6 specific recommendations as an interim measure until a truly equitable national program could be formulated. He also commented on his belief that it is more appropriate for the U.S. Department of Agriculture – Animal and Plant Health Inspection Service (USDA – APHIS) to be responsible for on-farm activities associated with this type of program. Discussion ensued about the economic impact in areas of the country where breaker capacity was limited or absent, particularly in the western region and the State of Hawaii.

The only formal action taken by the Committee was in relation to a resolution presented by Dr. Richard Breitmeyer, California, that addresses "Recognition of Existing Egg Quality Assurance Programs in the Proposed Egg Safety Action Plan". The resolution was modified slightly following some discussion by the Committee, and passed unanimously. The point was made, that in many respects, State Egg Quality Assurance Programs exceed proposed federal regulations, particularly in relation to education for producers and processors. The resolution urges FDA to recognize existing State Egg Quality Assurance Programs that meet the minimum requirements of the *Egg Safety Action Plan* and would establish an agreement between FDA and the cooperating state agency administering the proposed federal regulation.

Deanna Baldwin, Maryland, briefly reviewed a survey conducted by the National Egg Regulatory Officials (NERO) exploring potential federal/state cooperation and the feasibility of having State Department of Agriculture employees perform inspections under the *Egg Safety Action Plan*. The survey included producer, packer and retail components of the food chain. Twenty-six out of fifty (26/50) states responded to the survey and 25 states indicated their willingness to cooperate in implementing the Plan.

SE by administering questionnaires on 252 of 526 total farms included in the study. Environmental samples were collected from 200 layer houses and rodents were collected in 129 houses. Overall, SE was found in 7.1% of layer houses sampled and in 3.7% of mice. The complete report is available from the Centers for Epidemiology and Animal Health; USDA-APHIS-VS, Attention: NAHMS – 555 South Howes, Fort Collins, CO 80521; Telephone: (970) 490-8000. Internet Site: www.aphis.usda.gov/vs/ceah/ceahm

Dr. Marilyn Balmer, FDA, briefly reviewed human SE trends during 1999. The proportion of Salmonella isolates identified as SE, declined to 16%. There were 44 confirmed SE outbreaks in 1999 and 26 so far in 2000. The Committee was provided with SE outbreak data from the Centers for Disease Control and Prevention (CDC) for the year, 1999. Human salmonella isolates submitted in 1999 for sero-typing included Phage Type (PT) - 4 (49%), PT-8 (11%), PT-13a (11%) and PT-2 (11%). Public health data from the publication EuroSurveillance illustrated similar declines for SE in 12 Western European countries. From 1995 to 1998, between 41,870 and 55,278 cases were reported annually.

Dr. Andy Rhorer, USDA-APHIS, updated the Committee on the SE situation in the National Poultry Improvement Plan (NPIP). During the early 1990’s, the predominant Phage Types found in breeder flocks were PT-8 and PT-13a, which became the predominant types found in commercial flocks and human outbreaks. Efforts to eradicate SE in breeders have been very successful. In 1999, a small increase was observed with 4 flocks being identified. PT-4 is the predominant type of SE in western layer flocks and represents the predominant human sero-type found in outbreaks however, it has never been found in U.S. breeder flocks. Poultry and human data from California indicate that the humans with links to Mexico were likely the original source of PT-4 as human isolates pre-dated the index poultry flock by several years. The Committee agreed that regardless of the origin of SE, once it gains entry to a commercial layer facility, significant potential for inter-flock transmission is established. Finally, NPIP has produced 3 training videos with the support of the U.S. Poultry and Egg Association on 1) Isolation and Identification of SE 2) Collection and Transport of Environmental Swab Samples and 3) Salmonella Serology. These training videos have been distributed to laboratories and are available from the U.S. Poultry and Egg Association. Interactive CD-ROM training materials are forthcoming.

Dr. Kakambi Nagaraja, Minnesota, briefly reviewed serological tests for SE that have been developed throughout the world and he provided a list of references for these tests. Many tests currently in use have problems with low sensitivity and/or specificity. His laboratory has developed a fimbrial-orign antigen used in an agglutination test. In tests, the only non-specific cross-reactions have been with Salmonella dublin, another Group D salmonella rarely seen in poultry. They are using the test in the Minne-
SALMONELLA ENTERITIDIS (SE) IN EGGS

sota Diagnostic Laboratory. This test was used in the 1999 NAHMS study for serologic testing of eggs but correlation between the findings in NAHMS, based on bacteriologic status of the flock and serologic results was inconclusive. Dr. Nagaraja is continuing additional studies.

Dr. David Castellan, California, reviewed the results of a statewide Se prevalence survey undertaken at 133 premises over a 16-month period. Single swab samples and pooled swab samples (4 swabs/sample) gave the same isolation results on a row basis whether for Salmonella in general, or for SE specifically. Overall, 10.5% of premises sampled were positive for SE while 4.5% of all rows sampled (16 randomly selected rows/ premises) were positive for SE when considering samples analyzed using either single enrichment or delayed secondary enrichment. The majority of swabs from positive premises had few positive rows per premises, commonly with less than 12.5% of the rows being positive. The prevalence survey also found that ammonia, pH and water activity are important parameters affecting the survival of SE, and that wet areas under leaking water dispensers in layer houses had 1,000 times more Salmonella isolated from them as compared with dry areas. Another recently published California study illustrated that the optimal distance to drag manure drag swabs is 30-40 feet when litter is dry and shorter distances when the litter is wet.

Dr. Hailu Kinde, California, presented an economic analysis, which compared producer prevention and control strategies for SE in the State. The annual SE monitoring cost estimate for California Egg Producers, including environmental sampling, cleaning an disinfection, rodent control, SE vaccination and consultant fees equals $907,722 (all100 farms) or roughly $9,077 per farm. The cost of controlling the presence of PT-4 on the California index farm in 1994 including loss of markets for shell eggs, vaccination costs, costs to the State and veterinary consulting fees was $2.5 million. Dr. Kinde stressed the great economic benefit to producers by adopting an SE prevention strategy as opposed to a reactive control strategy.

Dr. Dave Kradel, Pennsylvania, provided previously unreported findings including the following: 1) PEQAP environmental samples submitted for analysis show a marked decrease in positive SE samples from a high of 22% in 1992 to 1.3% in 2000, 2) Environmental sampling is superior to culturing birds in classifying flocks, 3) A 1989 to 1992 study found that "blood eggs" were 2-3 times more likely to be positive for SE than normal eggs, 4) A 1995 study indicated that 'returning' equipment and supplies can be a significant risk factor for introducing SE onto a premises, 5) Past and proposed studies relative to the efficacy and justification of requiring complete wash-down and disinfection of houses – some evidence suggests that this may be contraindicated and may have additional operational and economic limitations, 6) Field studies indicate that SE bacterins have been very helpful in reducing SE problems in some flocks 7) Data
from 1989 indicate that 0.39% and 0.32% of eggs from 2 positive SE-positive breeder flocks were SE-positive, \(8\) A study in which other salmonella were common, but no SE could be found in intensive sampling of animal protein, \(9\) A 1989 study found that SE was isolated from dead, in-shell embryos and was subsequently found in 17% of inspissated yolk sacs in birds ranging from 8 to 23 weeks of age \(10\) A study suggesting that SE may grow better in an egg-containing food than an non-egg-containing food – this has potential implications when eggs are assumed to be the source of SE when any food containing eggs is implicated in a foodborne outbreak, \(11\) Studies showing the major risk sources for SE – and suggesting that today we need better information on why sporadic SE-positive flocks are occurring.

Mr. Don Bell, California, submitted a report for the Committee that summarized his research in the area of induced-molting, including methods and economics.

Dr. Peter Holt, Georgia, reviewed experimental studies on SE in relation to molting. Under experimental challenge, molting was associated with an increase in SE-positive eggs, however he emphasized the need for field studies to determine if there is a significant association when birds are challenged under field conditions.

Dr. Charles Beard, Georgia, submitted a 5-page summary of the Public Meeting on Salmonella enteritidis Research for the Committee. The Public Meeting was held at Atlanta, GA on September 8, 2000. Research priorities included the following areas: molting, electrostatic systems to reduce airborne dust, shell treatment of eggs including ozone, standardization of SE sampling and isolation procedures, early detection of SE-positive flocks, SE virulence factors, shell quality as an indicator for SE, developing appropriate cleaning and disinfection procedures, competitive exclusion, impartial and controlled field evaluation of SE vaccines, the role of rodents in food establishments, egg storage time and temperature relationships affecting yolk membrane integrity, and the ecology of SE in production and processing facilities. Dr. Christine Bruhn, California, presented results of a consumer survey investigating attitudes and practices that will assist in targeting future consumer education needs.

General Committee discussion on the Egg Safety Action Plan and SE Vaccines was lead by a panel comprised of the following individuals: Dr. Richard Breitmeyer, Dr. Richard Dutton, Dr. David Glauer and Dr. Eric Gingerich. In relation to The Plan, Dr. Glauer offered that laboratory capacity, auditing and standardization were key areas that remain to be to be resolved. Committee members were in agreement, that rigorous controlled field trials with SE vaccines are needed and yet difficult to undertake. The consensus of most discussants seemed to be that killed vaccines have been helpful in reducing problems with SE. Several veterinarians reported encouraging results with a live vaccine available in the U.S. Vaccination was strongly advised as an important part of a comprehensive SE risk
SALMONELLA ENTERITIDIS (SE) IN EGGS

reduction management program. Dr. Richard Dutton stated that rodent control and vaccination are of major importance in reducing SE.

The live vaccine currently available for use in the U.S. is as yet, licensed for use in young birds and will cause some birds to test positive for *Salmonella pullorum* for a period of time due to antigenic similarities.

Dr. Jean Guard Petter proposed that USDA could provide a standard challenge strain of SE to test for vaccine efficacy in field trials. Pharmaceutical supply companies in attendance provided brief comments and product information for the Committee.

The committee discussed C&D. Both field and experimental studies demonstrate that there are difficulties associated with decontaminating houses and equipment. One possible reason for this is the relationship between moisture (wash-down) and survival or growth of SE. Dr. Davidson, University of Pennsylvania, School of Veterinary Medicine, is coordinating a multi-group study including producers that will evaluate a variety of alternative C&D procedures.

Dr. Paul Shadbolt, Canadian Food Inspection Agency (CFIA), described historical Canadian research and experience with SE. The prevalence of SE in Canadian layer flocks is estimated to be approximately 3%. Environmental sampling is used as a monitoring tool. The government program in Canada is very aggressive and subsidizes producers when they have an SE-positive flock for flocks that participate in an industry-lead SE control program. Flocks that do not participate in such a program are not supported financially to the same extent. Producers with positive flocks are subsidized for eggs that are diverted to pasteurization. CFIA is pursuing research in the area of vaccinating mice in poultry houses since they are such an important source of SE for birds. Although CFIA permits the use of SE vaccines, their use is generally discouraged as an integral part of a comprehensive control program. Dr. Shadbolt also briefly mentioned CFIA’s concern with government liability when developing on-farm regulations and that “due diligence” must be demonstrated by government agencies by enforcing regulations adequately.

The Committee also discussed the following issues worthy of further consideration:

- What are less obvious sources of SE?
- There is a critical need to develop methods that will assist in identifying high-risk flocks
- Educational programs are the basis of a comprehensive risk reduction strategy for SE
- The proposed federal program will require increased resources for laboratory services and site audits
- There were differing opinions surrounding the single test for SE during each production cycle. Some members support this testing requirement, however others favor more frequent testing and/or more flexible risk-based testing.
REPORT OF THE COMMITTEE ON SHEEP AND GOATS

Chairman: Mr. Paul E. Rodgers, Ronceverte, WV
Vice Chairman: Dr. Katherine N. Bretzlaflf, College Station, TX

Dr. Ramesh Akkina, CO; Dr. Arthur A. Andersen, IA; Dr. Wilber W. Clark, MT; Dr. John R. Clifford, DC; Dr. Linda A. Detwiler, NJ; Dr. Nancy E. East, CA; Dr. James E. Fox, GA; Dr. Chester A. Gipson, VA; Dr. R. David Glauer, OH; Mr. Joe N. Huff, CO; Dr. Michael M. Jochim, CO; Dr. Cleon V. Kimberling, CO; Dr. Donald P. Knowles, Jr., WA; Dr. Howard D. Lehmkuhl, IA; Dr. Linda L. Logan-Henfrey, TX; Dr. Michael R. Marshall, UT; Prof. C. John Maré, AZ; Dr. Bert A. Mitchell, MD; Dr. Bennie I. Osburn, CA; Dr. Charles Palmer, CA; Dr. Robert A. Robinson, CA; Dr. Mo D. Salman, CO; Dr. John A. Schmitz, NE; Dr. William P. Shulaw, OH; Dr. Ralph E. Slaughter, NE; Dr. Susan M. Stehman, NY; Dr. Diane L. Sutton, MD; Dr. Peter H. Timm, CA; Mrs. Michele C. Turner, CA; Dr. Percy R. Turner, CA; Dr. Tim R. Turner, TX; Dr. Howard W. Whitford, TX; Dr. George O. Winegar, MI; Dr. Nora E. Wineland, CO; Dr. Cindy B. Wolf, MN; Dr. Nathan Zauel, MI; Dr. Andres de la Concha, TX.

Chief Veterinary Officers from 5 countries were invited to present reports on the state of their sheep and goat industries and on disease issues that impacted their imports and exports.

Dr. Darek Belton, Director of Animal Biosecurity for New Zealand presented a variety of facts and figures concerning agriculture in New Zealand. They have 45.7 million sheep, down from 70.3 million in 1982. They have 0.1 million goats, down from 0.9 million in 1989. Export dollars from meat has surpassed that from wool in recent years. New Zealand reported a 114.7% lambing rate this past year, the second highest on record due in part to favorable weather patterns. Fine wool prices have undergone a recovery recently to $4.62 US/kg. Several export figures were presented showing the very high percentage of sheep meat that is exported.

The McKinsey Report resulted in the dissolution of the Wool Board with the formation of commercial companies whose functions and funding sources have yet to be entirely worked out.

Johne's disease was described as being endemic in every district but presenting very little clinical disease. There are some Johne's disease vaccine trials underway, but farmers are not recognizing the value of vaccinating because the disease is almost entirely subclinical. The vaccine used modified Freund's adjuvant which results in large injection-site reactions/abscesses. In addition, vaccinated animals require special inspection at slaughter which increases expenses and results in packers discounting vaccinated animals.

Salmonella brandenburg is a problem on the South Island, being asso-
SHEEP AND GOATS

associated with a 3-4% abortion rate and mortality of 30-50% in aborting ewes. It occurs in older animals. Prevalence has increased from one farm in 1996 to 278 farms in 1999. It has spilled over into bovine and human populations. It is thought to have spread amongst sheep by the widespread movement of sheep due to drought. Vaccine trials for *S. brandenburg* to date have given only equivocal results.

New Zealand is scrapie free and provides negative controls for scrapie research in other countries.

Goats are a boutique industry in New Zealand, being somewhat hard to farm in that environment. Parasite resistance, foot rot, and increased fencing requirements have all contributed to the decline in goat numbers.

Dr. Phillip Corrigan presented information on the state of the sheep industry in Australia. Historically Australia's sheep industry was based on wool production from Merino sheep of Spanish origin. A huge stockpile of wool led to the collapse of wool prices and the introduction of British breeds resulted in an increase in the lamb and mutton industries. Today there are 125 million sheep, approximately one-quarter of the world's sheep, the majority of which are located in New South Wales and Victoria. In 1999, 650 kilotonnes of wool, 300 kilotonnes of mutton, and 310 kilotonnes of lamb were produced. Much of the mutton and five million live sheep were exported to the Middle East. Approximately 30% of lamb produced is exported, primarily to the U.S. Domestic consumption was 5 kg mutton and 11.8 kg lamb per person, considerably higher than in the U.S.

Australia is free from all OIE List A diseases of sheep, Foot and Mouth Disease, Vesicular Stomatitis, Peste de Petits Ruminants, Rift Valley Fever and sheep and goat pox. There has been some seropositivity to Blue-tongue but no clinical disease. The *Culicoides sp.* vectors are monitored by the National Arbovirus Monitoring Programs (NAMP). The List B diseases endemic in Australia include anthrax, hydatidosis, and Johne's disease.

The Australian Animal Health Council, Ltd. is a partnership of the Federal Minister of Agriculture, presidents of industry bodies, and the Australian Veterinary Association whose function it is to agree and coordinate the management of national animal health. Under the umbrella of the AAHC are five core programs, the National Animal Health Information System (NAHIS), the Emergency Animal Disease Preparedness (ADP), Animal Health Services, Animal Disease Surveillance, and Endemic Disease Management and four non-core programs, the National Johne's Disease Control Program, the National Arbovirus Monitoring Program, the Tuberculosis Freedom Assurance Program and the Accreditation Program for Australian Veterinarians.

There is some economic loss due to Johne's disease in sheep in Australia. With the National Johne's Disease Control Program, culture of pooled fecal samples (20 animals each) are relied upon for diagnosis. Once an infected property is identified, there is some voluntary depopulation to de-
crease the prevalence. A limited number of farms are vaccinating and there are some project farms with ongoing trials.

The National Transmissible Spongiform Encephalomyelitis Surveillance Program completed its second year of operation in 1999. A total of 393 cases of TSE were reported by states.

Virulent foot rot is a notifiable disease in some states and is subject to local control programs. Contagious ecthyma (scabby mouth) is endemic in Australia with voluntary vaccination programs practiced by some farmers.

A five-year strategic plan was devised in 1996, which included a Meat Industry Plan and a Food Safety Enhancement Plan. One objective was to have all sectors of the industry meeting HACCP/ QA standards which would be monitored by a third party. This began with a farm level "Flockcare" plan where all drugs used, diseases diagnosed, management practices, handling and loading practices would be recorded. The goal is to present a clean animal to the abattoir. Abattoir-based programs include a National Residue Survey, pathogen reduction programs, a National Microbiological Database, TSE Surveillance, and antemortem inspection by trained inspectors. Meat inspection reform was outlined as well as a post-mortem inspection, which will include ultrasonographic detection of abnormally large lymph nodes that require trimming. These programs have resulted in a decrease of rejection of sheep meat products at U.S. ports from approximately 4% in 1994 to about 0.1-0.2% in 1999.

Future issues for Australia include further acceptance and development of the "Flockcare" programs and "Paddock to plate" HACCP/QA programs, sheep identification, and importation of sheep germplasm.

Dr. Judith Bourne, from the Australian Dept. of Agriculture, Fisheries & Forestry made a presentation on the Australian Quarantine Import Risk Analysis for Canada, the US, and Member States of the EU. Using scrapie as an example, the process of assessing the presence of a disease, the likelihood of presence of the disease agent in embryos or semen, the risk of establishment of a disease agent in the native population and the potential for adverse consequences were outlined. Other diseases on the "hazard list" were presented, including FMD, Bluetongue, capripoxvirus, Johne's disease, brucellosis, mycoplasmosis, chlamydiosis, ovine progressive pneumonia, caprine arthritis encephalitis, and ovine pulmonary adenomatosis. Risk management options were discussed such as following IETS/OIE guidelines for processing and storage of embryos and semen, donor selection, determination of disease status of the flock of origin, etc.

Canadian information was presented in hard copy form after the committee meeting had adjourned. Sheep numbers in Canada are 864,850 and goat numbers are 125,819. There was a steady decline from 1939 until a low of 338,000 in 1978 in sheep numbers. An updated list of OIE List A, B, C and other diseases that are foreign to Canada or subject to mandatory federal government program controls was provided from the Internet.
SHEEP AND GOATS

Scrapie is a reportable disease and a control program is in place. Infected or exposed sheep are destroyed and burned or buried. There is an indemnity program.

Dr. Eduardo Luna-Martinez presented for Mexico. Sheep and goats were described as less of an organized industry and more of a family-oriented enterprise centered around poor people. Only 15% of sheep and goats are bred under controlled conditions. The nomadic and open grassland production systems widely used make disease control and surveillance difficult in some areas. In compliance with the North American Free Trade Agreement (NAFTA), Mexico’s National Epidemiologic Surveillance System compiles data on the presence of OIE List A and B diseases. There is only one official program to control a sheep and goat disease in Mexico, and that is for brucellosis. Otherwise the reported diseases included Vesicular Stomatitis, anthrax, hydatidosis, leptospirosis, rabies in the vampire bat, Johne’s, and CAE. It is difficult to get poor people to vaccinate for prevention—they tend to wait until a problem arises. Johne’s is common in imported purebreed animals—Mexico will be starting a monitoring program soon. CAE was imported from goats from the U.S. Serologic surveys for CAE will begin in December and soon official regulations will be in place to decrease the risk of further importation of the disease.

The Goat Brucellosis Program strategy has been designed to include vaccination with the Rev-1 vaccine in high-risk areas to adults and young females. In association with vaccination in some areas is a strategy called the "Sanitary Package" where there is an approximately 60% subsidy by the government on drenching, dipping, vaccination against clostridial infections, pasteurellosis, and brucellosis, and official tagging.

List A diseases reported not to occur in Mexico include FMD, Rinderpest, Peste des Petits Ruminants, and Rift Valley Fever. List B diseases that do not occur are contagious caprine pleuropneumonia, ovine chlamydiosis, ovine pulmonary adenomatosis, Salmonella abortus ovis, Maedi-Visna virus, screw-worms, and contagious agalactia. There have been a couple of bluetongue seropositive cows but no clinical signs or viral isolation. There is no evidence of scrapie and there is an active scrapie surveillance program. Canada, the U.S. and Mexico are cooperating on diagnostics and surveillance for TSE's.

Mexico’s achievements have been to develop a full procedure to regulate the importation of sheep and goats.

Dr. Nora Wineland, coordinator of the National Animal Health Monitoring System reported on the current status of the Sheep 2001 survey. Not all states will be participating, since some indicated they did not have the numbers of sheep and/or the resources to collect the data. Sheep industry priorities that have been identified for which prevalence data will be obtained will be Johne’s disease, Ovine Progressive Pneumonia, and intestinal parasites. In addition, husbandry practices, scrapie risk factors, and
forage nutritional information will be determined. Additional information can be obtained from the following website: www.aphis.usda.gov/vs/ceah/cahm

Dr. Diane Sutton, National Scrapie Program Coordinator presented a brief overview of the current status of the scrapie program. The long-term goal of the program is eradication. Intermediate goals include development of effective scrapie control programs in all states, determination of regional prevalence of scrapie, development of an effective traceback program, acceleration of validation and field evaluation of live animal tests, among others. As of 10/2/00 there were 617 enrolled flocks, 51 certified flocks, 558 complete monitored flocks and 8 selective monitored flocks. Case numbers by state and by breed were reviewed.

Dr. Sutton reviewed the plans for $10 million available for the scrapie program. Bids to produce official USDA individual and premises tags will be out soon. Plans exist to perform slaughter surveillance on 1000 animals/month for a year. There is a Pilot Projects Final Rule, and Interstate Movement Proposed Rule, a Consistent State Proposed List, an Approval of Markets to Handle Sheep and Goats in Interstate Commerce and a Scrapie Eradication Uniform Methods and Rules document in the works. Additional updates and information can be obtained at the APHIS website.

Dr. Wineland updated the Committee on the Scrapie Test Validation Project. This is a collaborative ARS-APHIS project involving the purchase of high-risk and test-positive sheep. Tests used include the third-eyelid test and the capillary immunoelectrophoresis test. To date 691 animals from 27 flocks have been tested. They are trying to understand the low percentage of animals that have "not sufficient follicles" (NSF) in their third eyelid tissues. A limited number of animals are in quarantine in Ames (25 animals) and DuBois (6 animals). To date 234 animals have been necropsied although not all the follow-up lab work has been completed on these. Validation protocols for the third eyelid tests should be completed in 3 weeks.

Dr. Wineland described the Scrapie Slaughter Surveillance Program. The objective is to determine the national prevalence of scrapie in mature slaughter sheep and determine if a geographic difference exists. Eighteen cooperating slaughter plants in 11 states have been identified and sample collection begins this fall. A total of 10-12,000 samples will be collected.

Dr. Sutton described the increased diagnostic capacity that is being developed at NVSL and other laboratories to handle the surveillance program samples.

Dr. Roger Perkins presented the U.S. import/export policies. The U.S. requires testing for Brucellosis and TB for importation from New Zealand. For importation of sheep from Australia, Brucellosis, TB, and Bluetongue, Akabane, AINO, and EHD are required. The Brucellosis and TB requirements for these two countries are under review.

For importation from Canada, certain assurances must be made in ref-
SHEEP AND GOATS

erence to the scrapie status of the flock of origin, but otherwise there are no specific health requirements unless the flock has imported animals or germplasm from countries other than New Zealand or Australia. Then the imported animals come in under a restricted status and must enter a flock participating in the voluntary scrapie eradication program. The imported animals must remain within a monitored flock, but offspring have much latitude as to where they can go as long as individual ID with the capability of traceback is maintained.

For importation from Mexico, Brucellosis and TB tests and dipping for external parasites are required. Since we are endemic for scrapie, we allow entry of animals into monitored flocks even though Mexico has not had a scrapie control program in place.

The U.S. is in negotiations with the Republic of South Africa which was declared free of FMD and Rinderpest on 5/2/2000. However a localized outbreak of FMD occurred subsequently and must be cleared up before direct importation of embryos and semen can occur.

Dr. Perkins concluded by listing the diseases that South Africa must test for in the donor animals and other requirements that will be made in confining donors in approved facilities.

Dr. Linda Detweiler of USDA provided an update on the situation with the sheep flocks in Vermont that are under quarantine for having a TSE of foreign origin. The owners of the two flocks are resisting depopulation of their sheep.

Dr. Steve Hennager presented a preliminary evaluation of available serologic tests for ovine Johne's disease. There is no commercially available test for sheep, so his group evaluated three different ELISA kits approved for bovine Johne's diagnosis, the CF test for cattle and an AGID test developed by Cornell for sheep. Known negative, positive, Johnin and CL antigen exposed animals were tested. Overall the AGID test (which is not the AGID test run at some diagnostic labs for cattle) was the superior test.

Dr. Katherine Bretzlaff presented background information and a resolution on behalf on Mr. Bill Hoag, a sheep producer from Texas. The resolution stated that “USAHA urges USDA, ARS and CSREES to fund research projects necessary to elucidate the genetic factors associated with parasite and disease resistance in hair sheep.” After a second and discussion, the motion was tabled.

Dr. Cindy Wolf presented the following resolution:

USAHA supports the USDA-APHIS NAHMS 2001 sheep study. The motion was seconded and approved.

Dr. Cindy Wolf presented the following resolution:

USAHA supports USDA efforts to expeditiously depopulate the two Vermont sheep flocks under quarantine for a TSE of foreign origin.
The motion was seconded and approved.

Dr. Bill Shulaw presented the following resolution:

BACKGROUND INFORMATION:
Both Johne's Disease culture and serologic test performance varies across species lines. The strains of *M. avium paratuberculosis* that infect sheep, and goats differ from cattle strains in their culture requirements and are not readily cultured using bovine culture techniques. Culture (or agent detection) is considered the definitive test for paratuberculosis (Federal Register 65 (69): 18878, April 10, 2000) and is the recommended confirmatory step to determine the infection status of seroreactors. Most Diagnostic Laboratories do not currently have the methods to culture the sheep and goat strains or to provide PCR confirmation nor do they have validated or standardized methods to identify seroreactors.

RESOLUTION:
USAHA urges that USDA/ARS develop and evaluate new or improved serological and agent detection methods for diagnosis of *Mycobacterium avium subspecies paratuberculosis* infection in sheep and goats.

Finally, as a matter of record, the Committee voiced support for the modernization plan that has been proposed for the National Veterinary Services Lab and the National Animal Disease Control Lab.

Respectfully submitted,
Katherine Bretzlaff, Vice-Chair
Committee on Sheep and Goats

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
As of September 6, 2000, there were 623 flocks participating in the Voluntary Scrapie Flock Certification Program (VSFCP) of which 61 are certified, 552 are complete monitored, and 10 are selective monitored flocks. As of the same date, there were 5 Scrapie Source Flocks and 41 Scrapie Infected Flocks. The number of scrapie cases confirmed by the National Veterinary Services Laboratories (NVSL) during FY 1999 was 38 and is 53 as of August 31, 2000.

The National VSFCP Oversight Committee has added two goat producers to the committee to represent the interests of meat and dairy goats. Tom Boyer, International Boer Goat Association and Dr. Joan Rowe, American Dairy Goat Association were selected. The committee intends to add up to three additional VSFCP enrolled producers to the committee.

The deadline for comments on the Proposed Rule, Scrapie in Sheep and Goats: Interstate Movement Restriction and Indemnity Program (Published November 30, 1999) was extended to January 14, 2000. We received 171 comments before the comment period closed. We intend to finalize the rule with substantial changes made in response to the comments. This will probably take 5 months to complete. APHIS is currently drafting a UM&R for scrapie which we hope to have available for discussion at USAHA.

In preparation for finalizing the interstate movement rule APHIS published a proposed list of Consistent States on August 15, 2000 which proposes listing all fifty States as Consistent States. The proposed rules can be found at http://www.aphis.usda.gov/ppd/rad/webreport.html.

Veterinary Services has received $10 million in Commodity Credit Corporation (CCC) funding for the scrapie initiative. The following scrapie activities will be conducted through the CCC funding in FY 2000 and FY 2001:

1. Sheep Identification
   The purpose of sheep and goat identification is to be able to trace scrapie infected and exposed animals. The identification methods that will be required will not be finalized until the interstate movement rule is finalized. At that time APHIS will start an all-out effort to inform producers, marketers, dealers, and slaughter establishments about any new identification requirements for interstate movement that will be required. This effort will be followed up with ongoing information and any necessary enforcement activities.

   The proposed rule allows for the use of either premise based identification in limited circumstances, premise based individual animal identifi-
cation, or individual animal identification. This would mean that if the rule is finalized either standard USDA metal eartags, or in the case of animals moving direct to slaughter, backtags could be used by accredited veterinarians, markets, dealers, or producers as long as the tag numbers have been assigned by a State or APHIS representative and recorded in the scrapie database. Alternatively, producers could elect to purchase eartags or backtags that are imprinted with an assigned premise identification number that either contains or is used in association with a unique production number. APHIS would approve tag companies to make eartags and backtags for this purpose. We anticipate that premise eartags will range in cost from $0.06 for metal tags to $1.00 for tamper resistant flap tags. Tags approved for use in the VSFCP may be used for this purpose.

2. Slaughter Surveillance

The purpose of slaughter surveillance will initially be to determine the prevalence of scrapie in the United States. Once the prevalence work is completed slaughter surveillance will be used to identify infected flocks. Slaughter surveillance will be initiated on a limited basis this fall to test the procedures for sample collection and handling and insure a smooth start to the prevalence work. Full implementation for determination of scrapie prevalence will begin as soon as adequate identification is present on sheep, will continue for 12 months, and will include the sampling of 11,300 sheep. The sheep will be traced to their State of origin so that the prevalence of scrapie can be calculated on a regional basis. No individual animal results will be provided to the area offices or to owners and no regulatory action will be taken unless the owner requests the results for their sheep.

APHIS' Centers for Epidemiology and Animal Health (CEAH) has developed a preliminary sampling plan for the prevalence study. 18 plants in 11 States have been included in the plan. This accounts for 122,755 head or 58 percent of the published mature sheep slaughtered in the United States.

We anticipate that we will have adequate funding in fiscal years (FY) 2001 and 2002 to maintain slaughter surveillance at the level of 1,000 samples per month through FY 2002.

After the initial prevalence work, we will trace only scrapie-positive animals. The slaughter surveillance is expected to yield between 50 and 300 infected animals per year and will necessitate subsequent traces, epidemiologic investigations, flock testing, and flock cleanup planning.

3. The Scrapie Test Validation Project

The primary purpose of the Scrapie Test Validation Project is to determine the reliability and best uses of the third eyelid test. USDA also intends to assess the role of genetics and the validity of the CIE test.

The APHIS and ARS began the Scrapie Test Validation Project in May
2000. As of September 27, 2000 there were 23 flocks comprising 1580 test eligible sheep participating in the project. Sheep in scrapie affected flocks whose owners have volunteer to participate in the project are being tested by third-eyeid and genotype methods. Owners of source, infected, and trace flocks and high risk sheep will be contacted and asked to participate as space is available at the lab for testing. APHIS will purchase all test positive and high risk animals that are old enough to test from participating flocks for diagnostic purposes. High-risk animals in flocks that are not designated infected, source, or trace will be tested and purchased whenever possible.

Third-eyeid positive sheep will be shipped to an ARS or APHIS holding facility. A matched test-negative control group will be maintained at a separate facility, for a total of at least 600 sheep. All remaining high-risk tested sheep will be purchased, euthanized, and necropsied by State or Federal personnel or an accredited veterinarian.

4. Scrapie Control Pilot Projects

In States that sign Scrapie Control Pilot Project agreements, APHIS will offer an option to purchase only test-positive sheep from those owners who are interested in participating in scrapie control pilot project flock-cleanup plans and who have flocks that are suitable based on the epidemiology of the flock and the availability of required records.

The Final Rule, Scrapie Pilot Projects, which allows APHIS to conduct pilot projects to evaluate flock clean up plans based on testing was published June 27, 2000.

To qualify for a pilot project a flock must reside in a State that has signed an agreement with APHIS to conduct a scrapie control pilot project. So far Idaho is the only State that has signed an agreement with APHIS to conduct a pilot project. Three States have provided draft pilot project agreements and several others have expressed interest in conducting pilot projects. To qualify, a pilot project must advance our knowledge with regard to scrapie control and must provide adequate safeguards to prevent the spread of scrapie that are at least as effective as those currently in place. These will include restriction of all high risk animals to the premise except for movement to slaughter. Necropsy and testing of all animals that die over 14 months of age particularly high risk animals. Third eyelid testing of all animals over 14 months of age or when they reach 14 months of age with a retest 18 months after the last known exposure to scrapie and removal of all test positive animals. Restrictions on the movements of other animals out of the flock except to slaughter unless testing or other methods have been used to insure that they are low risk for spreading scrapie. The pilot may include genotyping as a selection criteria.
5. Data collection
The Scrapie National Generic Database (GDB) is operational and is being used to generate the web page. An individual animal information form has been developed and is being tested. This form will facilitate tracking and tracking of test-positive sheep as well as exposed animals. We are looking into methods for listing more than one breed and for listing flock identification numbers.

6. Increasing and upgrading scrapie diagnostic capacity both at NVSL and through approval of State laboratories
NVSL has leased additional space to accommodate the increased number of tests. In order to handle the formic acid treatment of third eyelid tissues they are upgrading the ventilation system. This has delayed their ability to begin third eyelid testing. One hood is now functioning at a safe level and they have begun running check samples from ARS. NVSL and ARS will be running third eyelid slides in parallel using a standard protocol. This work should be the final step needed to gather data for approval of the test for the identification of suspect animals.

Contracts have been issued for immunohistochemistry on brain and third eyelid and a request for bids as been put out for genotype testing at approved laboratories. We plan to contract out the testing of slaughter samples to an approved laboratory and eventually to do the same for third eyelid testing.
The committee met on October 23 and 24, 2000, with 73 attendees and the following reports were presented:

1. Update on FSIS

The following report on Baseline Studies on Campylobacter was presented by Dr. Alice Thaler, USDA, FSIS:

*Campylobacter jejuni/coli* is a leading cause of foodborne bacterial gastroenteritis worldwide. It has been linked to Guillain-Barré Syndrome.
Of particular concern in the public health community is its apparent emerging resistance to fluoroquinolones. Raw poultry carcasses have a high (60-90%) prevalence of this organism and human infection has been associated with poultry consumption.

What such a standard might be like, the Salmonella performance standard can be used an example. The Salmonella standard establishes the maximum number of positive test results permitted in a specified number of FSIS is exploring the potential for using a Campylobacter performance standard under HACCP. To understand samples for each class of product. The standard is used to verify that HACCP systems are effective in controlling Salmonella contamination. Significant reduction of Salmonella prevalence has been demonstrated after implementation of the performance standard.

The rationale for implementing a Campylobacter performance standard is to encourage the use of control measures along the farm-to-table continuum. The need for interventions will encourage research on intervention strategies. Ultimately, a reduction in poultry-associated human illness is the goal.

While Salmonella performance standards were based on prevalence studies from baseline studies, the high prevalence of Campylobacter leads FSIS to consider a performance standard based on actual bacterial levels. Before a quantitative performance standard can be proposed, FSIS must have methodology that allows for high throughput, appropriate baseline data, and a statistical algorithm for determining the standard.

Several methodologies show some promise. The direct plating enumeration method developed by USDA Agricultural Research Service is being evaluated. One concern is that cyclohexamide, which is used, as an antifungal agent in selective Campylobacter and other media, is no longer manufactured. Also, automated regulation of atmosphere is essential for growing the organism. A comparative study included in the Young Chicken Baseline as of October 19, 1999, showed that prevalence and quantitative levels from the ARS method appeared somewhat lower than the MPN method, however statistical analysis is pending. A reformulated CampyLine medium (cyclohexamide-free) will be evaluated by the end of October 2000.

Of particular interest is the identification of fluoroquinolone-resistant C. jejuni and C. coli. These bacteria are not detected by the MLG method due to resistance to naladixic acid and cephalothin, i.e., dual resistance. Cooperative studies are underway to determine the fluoroquinolone-resistant status of dual resistant Campylobacter by Drs. Fedorka-Cray, Mark Englen (ARS-Athens, Georgia), and Wesley (ARS, Ames, Iowa). ARS-Athens is using PCR for C. jejuni targeting hip0 and for C. coli targeting ceuE. Of the dual-resistant organisms studied, 54 were C. jejuni, 11 were C. coli, and 2 were unidentified. ARS-Iowa is using multiplex PCR for C. jejuni and C. coli, PCR for C. lari and Campylobacter spp., Taqman PCR for C. jejuni DNA gyrase gene, and sequencing DNA for 16S rRNA. Alternative confir-
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

Information tests are under consideration such as wet mount microscopic examination plus immunoassay or genetic assay.

*Campylobacter* prevalence in raw product was surveyed in the FSIS 1994-95 baselines. Whole carcasses were shipped to the laboratory where carcass rinses were collected and analyzed using an MLG 3-tube MPN method. The January 1999 to October 2000 baseline is near completion. In this baseline the carcass rinses are collected at slaughter and submitted to the laboratory. A study was completed that demonstrated the results obtained were equivalent whether collection of the rinse was done at slaughter or at the lab. The same method of analysis is being used to maintain consistency and comparability of data. Preliminary results comparing the 1994-95 and 1999-2000 data show an apparent decrease in both prevalence and MPN.

FSIS is now considering collecting poultry samples at retail to see what *Campylobacter* levels are on poultry at the point of purchase.

In conclusion, FSIS is considering developing a *Campylobacter* performance standard, evaluating an ARS enumeration method as an alternative to the MLG MPN method, and is exploring options for modifying confirmation procedures to recognize fluoroquinolone-resistant *C. jejuni*, *C. coli*, and possibly *C. lari*.

2. Update on APHIS

The following report on the Live Bird Market Working Group was presented by Dr. T.J. Myers, USDA, APHIS.

Since 1994, H7N2 low pathogenic avian influenza (LPAI) virus infections have been present in the live bird marketing system in the northeastern United States, centered in the New York and New Jersey urban retail markets. To assist the states with this problem, at our October 1998 meeting the USAHA passed a resolution, which stated:

*USAHA requests that USDA-APHIS convene State regulatory officials from poultry producing states and health specialists from the poultry industry to establish standardized health requirements for birds moving to live bird markets.*

In March 1999, a Live Bird Market Working Group (LBMWG) was formed, consisting of Federal, State, commercial poultry, and live bird market (LBM) industry representatives. This group has met quarterly since then to identify methods to reduce LPAI infections in this marketing system. Over the past year, the working group can report the following four accomplishments:

1. **Coordinated H7N2 surveillance and virus characterization.**

   **Surveillance:** Regular surveillance (virus isolation and serology) is conducted by New York, New Jersey, and Pennsylvania for the production flocks and retail markets located in these states. These data show that 40% of the urban retail markets in New York and New Jersey are positive.
for H7N2 viruses at any given time. In contrast, production flocks which are on a monitored flock program or which are tested prior to shipment of birds to the markets are routinely negative for H7N2 avian influenza antibodies. The working group assumes that there are three likely sources of the continued presence of H7N2 viruses in the retail markets: (1) the virus could persist in the markets themselves, particularly if a retailer does not completely empty his or her market from time to time; (2) birds could become infected during transit from farm to market when exposed to other birds or to dealer conveyances such as crates, trucks, and holding facilities; and (3) the virus could be present on farms which do not participate in a flock monitoring or pre-movement testing program. Epidemiology data will need to be collected to test this hypothesis.

Virus characterization: Work conducted by David Suarez (ARS Southeast Poultry Research Laboratory) and Dennis Senne (NVSL) has demonstrated that the predominant H7N2 virus in the marketing system now has 3 basic amino acids adjacent to the cleavage site of the hemagglutinin surface protein. This mutation first appeared in the markets in 1998 and has since displaced the originally introduced H7N2 virus, which had only 2 basic amino acids at the hemagglutinin cleavage site. Highly pathogenic avian influenza (HPAI) viruses typically have 4 or more basic amino acids at this cleavage site, so there is significant concern that an additional amino acid change at this site could result in a highly pathogenic virus.

2. Definition of LBMWG goal. At the outset, the LBMWG decided that any control activities recommended by this group should focus on the LPAI problem occurring in the northeastern United States and should avoid the development of Federal regulations. Subsequently, the LBMWG has attempted to define our goal within this limited scope. The group discussed two possible goals for our control efforts: containment of the virus within the markets by establishing sanitation requirements to prevent exposure of the commercial poultry industry to H7N2 viruses; or elimination of any H5 or H7 AI virus that might appear in the LBM system. The working group has concluded that eliminating H5 and H7 viruses from the LBM system is the preferred goal, based on the concern discussed above regarding the potential for a highly pathogenic virus to emerge from the current virus pool. Such an emergence would cause severe economic injury to the live bird industry, the surrounding commercial poultry industry, and could potentially threaten public health should the virus be infectious for people as was seen with an H5N1 HPAI virus in Hong Kong in 1997. Furthermore, containment of this virus has already failed twice, when, in 1997 and again in 1998, the H7N2 virus appeared in commercial table egg layer flocks in Pennsylvania.

3. Development of a Best Control Practices Guideline. In order to accomplish the goal of eliminating H5 and H7 viruses from the LBM system, the LBMWG has attempted to outline a number of activities that could be adopted by states interested in controlling or preventing LPAI infections.
A guideline was developed which incorporates some of the practices already conducted by certain states (particularly New York and Pennsylvania) as well as some measures, which have not yet been taken by any state. The guideline is organized to address the farm to market continuum, and discusses such topics as biosecurity, surveillance, animal identification, movement certificates, periodic depopulation, state regulations and enforcement. This represents an ideal approach to controlling LAI infections, thereby providing a benchmark for future activities. The guideline was distributed at this meeting and copies are available from Dr. Myers by calling him at 301-734-8715. The LBMWG encourages states with LBM system participants to review this guideline and consider undertaking actions, which are appropriate for their states.

4. Development of a State-USDA cooperative H7N2 LAI control plan. In order to undertake a more concrete approach to controlling the current H7N2 problem, the LBMWG has developed a State-USDA cooperative action plan. The USDA will seek emergency funds to support the following activities:

a. Conduct an epidemiology study. Over the next several months, we plan to collect survey data and samples to address two questions: (i) what risk factors differentiate retail markets which are positive vs. negative for the H7N2 virus? and (ii) where is the H7N2 virus persisting?

b. Establish emergency/interim State rules or quarantine orders. Rules need to be established to both control H7N2 within the LBM system and to prevent exposure of commercial poultry to the virus. Such state rules or quarantine orders would need to address the issues of: state authority to close markets; uniform test requirements for all markets; sanitation requirements for conveyances; enforcement; and individual bird identification.

c. Institute a regional market closure. We would like to temporarily close the NY/NJ retail markets in an attempt to halt the infection cycle that is occurring within the markets. This would also provide an opportunity to identify and educate dealers supplying the markets. Activities would include: closing all NY/NJ retail markets and wholesalers for 3 days in March 2001; cleaning and disinfecting each market/wholesale facility twice, sampling, and repopulating the markets; retailers/wholesalers would be indemnified for depopulated birds and reimbursed for down time; an education campaign would be conducted during the time leading up to the market closure; H7N2 surveillance would follow the repopulation of the markets; and only birds with ID tags or bands could be sold after the markets reopen.

Finally, the LBMWG believes that the future role of AI vaccines in the LBM system will likely be small. However, as APHIS considers the larger question of AI preparedness, APHIS is considering a revision of our policy
on AI vaccination. The question is: Is it appropriate to allow states to use AI vaccines to help in their control efforts when faced with an H5 or H7 LPAI infection in commercial poultry? The lessons of Pennsylvania in 1983, Mexico in 1994, and Italy in 1999 are that we should do everything possible to prevent mutations of LPAI viruses to HPAI viruses. Of course, enhanced biosecurity and controlled marketing of commercial flocks are absolutely critical to LPAI control, but ring vaccination of a quarantine area may also be of some benefit. Furthermore, communicating a policy shift would encourage more vaccine development than we have seen to date, particularly for recombinant or other marker vaccines. The potential for trade restrictions remains a key concern, and we would need to be transparent with our trading partners regarding the scientific reasons for any policy change. However, a similar reevaluation of the potential role of AI vaccines is already under way in the European Union, so this is an opportune time for an evaluation and discussion.


The following Report on NAHRS was presented by Dr. Stanley Kleven, University of Georgia:

The NAHRS steering committee met in Fort Collins, CO, on September 18-20, 2000 to update the group on progress and to lay future plans. Dr. Bob Good joined me in representing the avian portion of the NAHRS group. The reporting system is now past the pilot stage and is in full swing, but data from the reports is not yet being included in any APHIS reports. Among the states reporting, things have been mostly going smoothly; reports are being submitted without the need for any large amounts of time being expended.

Among the more disturbing aspects is that approximately half of the states are not yet reporting. A great deal of time was spent trying to find out the reasons for non-reporting and to make an effort to induce more states to join. There were many reasons given, ranging from not having enough time, apathy, and a basic mistrust of government on the part of producers. However, a major reason given for lack of participation is that poultry producers have opposed reporting because of a concern about possible negative effects on exports; this results from the experience of the Russian embargo of American poultry meat exports in 1996. Those of us who remember this have to agree that their fears are legitimate.

At this point it is pertinent to reiterate what NAHRS is and what is its purpose:
- The NAHRS system is a passive system. It reports only instances of clinical manifestations of diseases in livestock or commercial poultry which appear on OIE List A or List B. The reports indicate only whether clinical disease was observed in that State during that reporting month and does not attempt to count numbers of
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

outbreaks. Information is gathered through a network of private, state, and university laboratories.

- NAHRS reports are to be submitted monthly by the State Veterinarian to APHIS. Whether any specific instance should be reported according to the accepted criteria is entirely up to his discretion.
- Confidentiality is an issue. Every effort is being made to keep the individual state reports completely confidential.
- The reports will be part (but not all) of the information used by APHIS to prepare annual reports to OIE. These reports are required of all OIE members and have been submitted for years and will continue to be submitted with or without NAHRS. Trading partners also hear of outbreaks through the "rumor mill" and from popular and scientific literature. The value of NAHRS is that we will now have actual hard data to back up our statements.

It seems to me that the basic value of the NAHRS system is not so much the NAHRS reports themselves but the presence of the system. This will prove to our trading partners that our statements about the presence of diseases are based on real data coming through an organized reporting system. NAHRS will not prevent unreasonable demands made by trading partners, nor will it prevent any misrepresentation by other countries of their own disease situation. What it will do is provide our negotiators with a system by which they can make disease occurrence statements backed up with real data; on the other hand, if we are questioned, our negotiators will be able to counter with statements such as "Here is our system. Where is yours?".

This is a situation that needs to be resolved. Some major poultry producing states are now reporting. Others are not. Our commercial poultry industry needs to decide whether the NAHRS system has utility to them. If it does, all states should be encouraged to report. If it does not, let’s stop spending our time on promoting NAHRS.

The following Update on Effort to Inform the Poultry Industry on NAHRS was presented by Dr. Charles W. Beard:

At the conclusion of the large open forum on NAHRS held as part of the Transmissible Diseases of Poultry Committee meeting at the USAHA meeting in San Diego, October 1999, Dr. Beard was charged with the responsibility of communicating with the poultry industry on the subject of NAHRS. The intent was to inform the industry on this complex subject so that they would be aware of the potential advantages and possible consequences of implementing NAHRS.

As a result, Dr. Beard researched the subject and prepared a document explaining all aspects of NAHRS. The draft was circulated to APHIS-VS personnel who provided their input both in the organization and content of the document. The document was then circulated both directly and
through the poultry press to the industry. It has appeared in the *Poultry USA* magazine with a circulation of 20,344 and in the *International Poultry Production* magazine with a circulation of 18,000. It may have also been distributed by some state poultry associations.

Dr. Beard feels he has adequately responded to the assignment of October 1999 and that the NAHRS information has been made available to the industry. He also believes that because of the potential significant economic impact of NAHRS, both positive and negative to the poultry industry, the owners/managers of the poultry companies should have a major voice in deciding the future of NAHRS for poultry. Without their complete support, even in times of export interruption, it is unlikely that NAHRS can be effectively implemented for the long term.

The following report on the **Need for a Transparent Reporting System** was presented by Dr. Ben Pomeroy of Saint Paul, MN:

U.S. livestock and poultry industries are extensively involved in world markets and champions of open markets. Worldwide sales of U.S. poultry and egg products increased 30% in value terms for the first quarter of 2000 compared to the same period a year ago according to statistics compiled by USDA (*Poultry and Egg Marketing* Vol.80, No. 4, p. 1).

The U.S. Poultry Industry has a quality product to offer its world consumers. If the industry expects to continue to expand its global markets, it must be a "Good Partner". Part of the task of being a "Good Partner" is to participate in transparent reporting systems nationally and internationally. The industry has nothing to hide.

The U.S. Poultry Industry has done a remarkable job in reducing losses from poultry diseases and management practices over the past 50 years. This has been accomplished by a cooperative partnership with research workers in governmental and university laboratories and private industry, veterinary diagnostic laboratory workers at state and federal facilities and in private industry, and State and Federal Animal Health Control Agencies. There is a tremendous pool of information available on existing poultry health problems in the U.S. but the question is how to utilize these various sources of information and blend them into a transparent reporting system.

The information on the prevalence and incidence of a specific disease and its economic impact is highly important in developing research funding at state and national levels as well as in receiving industry financial support. That is why it is so important to have a good transparent reporting system at the state and national levels.

Disease reporting is not new to the poultry industry. In 1950, Minnesota initiated a program to survey turkey growers about current health and management losses and their economic impact. This survey was done by the Minnesota Agricultural Statistics Service in cooperation with the Minnesota Turkey Growers Association, Minnesota Board of Animal Health and the University of Minnesota. This survey has been done approximately
every five years to note emerging new diseases and the progress of control and eradication programs. This information was supplemented by diagnostic reports from the University of Minnesota Veterinary Diagnostic Laboratory.

The industry has supported an avian influenza monitoring program and a disease alert system that is coordinated by the Minnesota Board of Animal Health. A similar program has been initiated for pneumovirus.

Over a period of time research programs have been supported by state and federal grants, control and eradication programs have been developed as a result of the research programs, and some have become part of disease control programs of the National Poultry Improvement Plan.

The Southern Conference on Avian Diseases (SCAD) initiated a poultry disease reporting system in the 1960’s using state diagnostic reports. The North Central Poultry Disease Conference followed with a similar reporting system and eventually the American Association of Avian Pathologists (AAAP) took on a national reporting system in 1979. This yearly report was published in *Avian Diseases* until 1989 when the data collection was discontinued because of publication costs and lack of interest.

The National Animal Health Reporting System (NAHRS) should receive full support by the USAHA Committee on Transmissible Diseases of Poultry and other Avian Species.

The following report on the APHIS Perspective on NAHRS was presented by Dr. Alfonso Torres, CEAH:

USDA APHIS Veterinary Services has reported on the status of livestock diseases to the Office

International Epizootic annually, as have many of our major trading partners, for 25 years and will continue to do so in the future. In the past our reporting has been based on collection of information in an unsystematic manner with relatively little documentation supporting the final report. Experiences such as the Russian poultry crisis, the Mexican AI testing demands, and negotiations with Argentina over pork import requirements as well as commitments under the Uruguay Round Sanitary and Phytosanitary Agreement (SPS) of the General Agreement on Tariffs and Trade lead Veterinary Services to believe that the status quo for disease reporting in the United States is subject to legitimate challenge by US trading partners. Veterinary Services also believes that the lack of a national disease reporting system jeopardizes US protection from risky imports by not allowing the US to require such a system from those exporting to the United States.

Rather than awaiting another export crisis, a cooperative effort by the US Animal Health Association (USAHA), the American Association of Veterinary Laboratory Diagnosticians (AAVLD), and USDA APHIS Veterinary Services has established the National Animal Health Reporting System (NAHRS) as a proactive measure to support disease-reporting requirements. The NAHRS collects data on the presence/absence of clinical disease for
the OIE List A and B diseases from the chief animal health official of the states and territories. Using carefully defined reporting criteria, the chief animal health official makes the final judgment call on the presence or absence of clinical disease for their state monthly. Where appropriate the reporting criteria include clinical signs, serological, pathological, histological, and/or epidemiological investigation results. Determination of the presence/absence of clinical disease is not based on one component alone and vaccine-related titers are differentiated from disease-related titers where possible. Because criteria must allow leeway for veterinary interpretation, they depend on the professionalism of the State animal health officials in reporting. These reporting criteria are subject to regular review by appropriate commodity working groups with representatives from industry and laboratories as well as state and federal officials. Recommended changes to the reporting criteria as well as the NAHRS system Uniform Methods and Rules are subject to USAHA approval. A validation process conducted by USDA Veterinary Services is in place to ensure accuracy in reporting.

The NAHRS data are held in a confidential database, which lawyers believe is not subject to Freedom of Information Act provisions. The only out report of the NAHRS is an annual national summary with limited distribution to participating state animal health officials and APHIS Veterinary Services personnel. No individual state level information appears in the annual summary. Twenty-four states have been participating consistently in the NAHRS during 1999 and 2000. In order for NAHRS to become a truly national reporting system for the commodities now included, there must be industry support on a state-by-state basis with all 50 states participating.

4. Diseases of Importance and Related Issues

The following report on Industry Supported Disease Research Priorities was presented by Dr. Charles W. Beard:

Since 1993, USPOULTRY has distributed $8,649,202 to researchers who proposed to conduct research on matters of concern to the poultry industry. As of September 1, 2000, there were 79 active projects. As a result of the most recent competition, 17 additional proposals received funding totaling $588,578. Seven of these projects concern poultry diseases, five are on environmental matters, three are on food safety, one on poultry production and one on processing.

The research proposals are judged and ranked by a panel of industry-employed professionals. Over the years, about one-third of proposals rank high enough to receive funds. Guidelines on proposal preparation and deadlines for submission may be obtained on the web site www.poultryegg.org by clicking on “Research.” Abstracts of completed projects may also be obtained there by using the keyword search aid.

The funds may be used to pay technicians, to pay graduate student stipends, for supplies, animals, and travel. Funds may not be used for
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

professional salaries or to purchase equipment. There is also a limit on the percentage that may be used for overhead expenses.

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Current Health and Industry Issues

The following report on the Broiler Industry was presented by Dr. Tom Holder:

The following is a list of significant disease conditions that the Association of Veterinarians in Broiler Production (AVBP) feels is important and worthy of research funding. The AVBP represent companies growing 85% of the U.S. broilers:

- Infectious bronchitis – This is the major respiratory virus involved in the air sac complex.
- Infectious causes of immune suppression – This is a major concern due to interaction with other stresses and infectious agents to bring on serious diseases.
- Infectious Laryngotracheitis – an improved vaccine is needed.
- Mycoplasma – This condition is making a resurgence after many years. What are the reasons?
- Clostridial Infections – Research is needed on control of these infections in the absence of growth-promoting antibiotics.
- Cellulitis – This process hasn’t been fully explained and satisfactory control measures are lacking.

The following report on the Table Egg Industry was presented by Dr. Eric Gingerich:

The present transmissible disease situation of the table egg industry is relatively stable. No major outbreaks of significance have occurred within the last year. To follow is a summary of certain diseases of interest to the layer industry from my own experiences and using information from my colleagues who are members of the Association of Veterinarians in Egg Production (AVEP):

- Avian Pox - Several minor outbreaks of both cutaneous and wet pox have occurred in various locations throughout the US. It is felt that most of these breaks are due to poor vaccination technique or the use of less than full doses of vaccine. The use of a full dose of both fowl and pigeon pox vaccines per bird where over 98 % takes are seen 7 days post-vaccination has resulted in good protection where breaks have occurred in the past.
Infectious laryngotracheitis (ILT) - Just as with pox, many minor outbreaks due to vaccine strains of ILT are due to inadequate immunization with vaccination methods other than eye drop. Mixing of more than one pullet source in a layer house also appears to lead to breaks due to varying levels of immunity of the pullet sources.

Marek's disease - Very few problems are being seen with Marek's Disease, due to the continued use of the Rispen's Marek's vaccine. Some flocks with higher than expected mortality due to Marek's Disease are seen due to a high challenge from poor cleaning and disinfection efforts between flocks or the close proximity to neighboring, older pullet flocks.

Salmonella enteritidis (SE) - SE is still a concern and many producers are now on new state programs for monitoring and organizing their best management practices to reduce the risk of SE infections. The impending FDA national program is in the final stages of being proposed with implementation in 2002. No new areas have been identified as hot SE areas this past year as was the case in Wisconsin in 1998. Much more interest in the use of SE vaccination, especially using live, gene deleted Salmonella typhimurium (ST) vaccine, is being seen in the areas where SE has been a consistent problem. Two new ST vaccines are being field tested for possible introduction into the marketplace in early 2001.

Mycoplasma gallisepticum (Mg) infection - Problems due to Mg infection are occurring due to older, vaccinated flocks losing immunity and resulting in minor production losses and mortality due to secondary bacterial infections. In addition, some complexes on the east coast are experiencing problems due to strains of Mg that are apparently not being prevented by either Ts-11 or 6/85 vaccines given during growing. The commercial F-strain vaccine is being tried in an attempt to control this infection.

Avian influenza (AI) - No new cases of H7 AI have occurred in Pennsylvania in the last year although the virus continues to be isolated from live market premises in New York City. An outbreak of H6 low pathogenic AI occurred in California resulting in mild upper respiratory disease in the uncomplicated form but significant mortality and morbidity due to secondary bacteria (Hemophilus paragallinarum, E. coli, Pasteurella spp. etc.), plus Mg infections. Vaccination of pullets with an autogenous vaccine to replace layers in one layer complex is being done in an attempt to reduce the shed of infectious material to other flocks. Non-vaccinated sentinel birds are being placed on premises where the infection existed to determine the presence or absence of AI.

Infectious bronchitis (IB) - Variant bronchitis viruses continue to be a concern and are difficult to diagnose. Some operations have experienced significant drops in production, surprisingly with very little loss in shell quality, possibly due to these viruses. Producers respond to these perceived or real variants by adding as many serotypes and strains of vaccine as possible to the pullet vaccination program and adding either a killed vaccine to the pullet program or recurrent vaccinations during lay.
Nephropathogenic IBV continues to be found in a few pullet flocks in Pennsylvania associated with an increase in mortality and kidney pathology. It has been reported that this strain of IBV is being found in chicken flocks in Ontario Canada along the route taken by spent fowl trucks from Pennsylvania.

**Pneumovirus infection** - Pneumovirus infection continues to be prevalent in Minnesota turkey flocks but to date, no commercial layer flocks have been reported to experience infection.

**Fowl cholera** – As an increase in free-range and cage-free egg production flocks occurs, fowl cholera in commercial layers has been seen to be on the increase in some parts of the country. Routine vaccination of growing birds for these premises is becoming more prevalent.

**Erysipelas** - Two cases of erysipelas in cage-free egg production flocks resulting in an increase in mortality occurred in Pennsylvania. The flocks were in close proximity to swine herds.

**Coccidiosis** - Coccidiosis is being seen in caged pullet flocks where exposure to feces and/or insects is occurring and appears to persist in successive flocks once an outbreak occurs in a house. Routine coccidiostat feeding of pullets and young layers is being used for control where problems have been encountered in past flocks. Transmission of the disease to young layers is suspected in one case by contamination of pullet moving equipment.

The following report on the Turkey Industry was presented by Dr. Steven Clark:

In preparation for this report to the USAHA Committee on the Transmissible Diseases of Poultry & Other Avian Species, the subcommittee chair contacted several U.S. turkey industry professionals and veterinarians involved in turkey production, to inquire about the health status of turkeys produced in 1999-2000.

Turkey production in 2000 is estimated to be 276 million head, which is up about 1 percent from 1999. The Turkey Industry reports several disease challenges for this 12 months. These various challenges may vary by geographical regions within a state and across the United States.

**TCV**: Turkey Coronavirus (TCV), also known as Bluecomb disease or mud fever, is a highly infectious and acute enteric (intestinal) viral disease of turkeys. A serologic diagnostic test for TCV is available from several of the State poultry diagnostic laboratories. In 1999-2000, TCV continued to be a complaint in the Southeast and lower Midwest. Typically the incidence of TCV peaks between August and November. TCV is a significant economic problem, mainly due to poor flock performance, causing financial losses for both growers and processors.

**Poult Enteritis**: Poult enteritis of unknown etiologies has been a problem this past year. Some cases of enteritis are diagnosed as TCV and others progress to be identified as PEMS (mortality). But many cases are still not diagnosed with a specific cause, although viral etiologies are com-
monly suspected. Poult enteritis has been identified in the hot and humid areas of the US, particularly in the Southeast and lower Midwest. It is typically observed between 2-5 weeks of age. Some areas have associated enterovirus, rotavirus and/or astrovirus, sometimes complicated by enteric flagellate protozoa, with their poult enteritis cases.

PEMS: Poult Enteritis Mortality Syndrome (PEMS) is defined as an infectious, transmissible disease of uncertain, but probable viral etiology, which typically affects young turkeys between 7-28 days of age. Astrovirus has been implicated as a cause of poult enteritis and may be involved in PEMS. PEMS is characterized by diarrhea, dehydration, weight loss, anorexia, immunosuppression, growth depression (>40%), and mortality (>2% between 7 and 28 days). Two clinical forms of PEMS have been recognized; the most severe is called Spiking Mortality of Turkeys (SMT) while the milder form has been named Excess Mortality of Turkeys (EMT). Turkey Coronavirus (TCV) has been associated with some of the PEMS cases. PEMS, complicated with TCV, has affected a few flocks, in localized geographical areas, in lower Midwest. In North Carolina, where PEMS was first identified, the incidence of PEMS has decreased significantly in recent years. There were no reported cases of PEMS in 2000 in North Carolina.

Protozoal Enteritis: Enteric protozoa (Cochlosoma, Trichomonas and Hexamita) are common in the summer months throughout the Southeast and Midwest. Protozoa severely complicate TCV, PEMS and other enteric. Both the University of Missouri and Virginia Tech are actively researching Cochlosoma infections in turkeys.

MG: Mycoplasma gallisepticum (MG) in turkeys can cause a severe respiratory disease and subsequent airsacculitis condemnations at processing. A MG outbreak in chickens and turkeys, both breeders and commercial, was diagnosed in North Carolina for 1999-2000. MG was a sporadic issue throughout the US, not related to the North Carolina outbreak, with cases reported in other states. The primary breeders have remained free of MG.

MS: MS is caused by Mycoplasma synoviae. Mycoplasma synoviae (infectious synovitis) is one cause of synovitis. It may be present in flocks 10-12 weeks of age with typically low mortality and low morbidity. There are also several bacterial causes of synovitis. Staph. aureus is the most common. Other bacteria identified may include Actinomyces, E. coli, Streptococcus, Salmonella, Erysipelothrix and P. multocida. MS can also be a cause of respiratory disease. MS has been sporadically reported in the Southeast and upper/lower Midwest.

APV: Avian Pneumovirus Infection (APV) in turkeys causes a rapidly spreading respiratory disease of all ages. The disease was first recognized in 1996 in Colorado and subsequently APV has been identified in Minnesota, South Dakota and North Dakota. APV in the US is distinct from TRT virus in other countries. In 1999-2000 APV was limited to upper Midwest. Colorado has been free of APV since 1998.
NDV: Throughout the US, Newcastle Disease Virus (NDV) is a common cause of mild, even inapparent, respiratory disease in both turkeys and chickens. Although NDV is usually not associated with severe pathology, during 2000 lentogenic strains of NDV causing high mortality and severe respiratory disease were identified in two regions. It is assumed that these two cases are unrelated. Dr. Don Reynolds at Iowa State has developed an experimental RT-PCR for rapid diagnosis of NDV.

Bordetella Avium: Coryza, caused by Bordetella avium, is known by many names, including BART, Bordetella, ART, Snick, etc. Turkeys between 2 - 8 weeks of age are most severely affected, though any age bird is susceptible. Bordetella has been a sporadic problem again in 1999-2000, especially during the late summer in areas experiencing high temperatures. It has been characterized as mild to severe respiratory challenge.

Sporadic diagnosis of other diseases has been made this past year. Cholera (Pasteurella multocida) has been a sporadic problem. Salmonella has been a problem for some producers. It has been associated with poor poult quality issues, resulting in excessive poult mortality. Ornithobacterium rhinotracheale (ORT) has been diagnosed throughout the US. Management systems, such as brood-and-move have increased the exposure of ORT-naive birds to ORT in the finisher barns, resulting in respiratory disease and mortality in some operations. Round worms (Ascaridia dissimilk) infestations are common. Erysipelas continues to be a sporadic diagnosis. Some producers again report histomoniasis (blackhead) in turkeys. Lack of effective therapeutic agent(s) remains a concern to the industry.

The following report on Pneumovirus Status in Minnesota was presented by Dr. Benjamin S. Pomeroy, University of MinnesotaAvian Pneumovirus infection (APV) continues to cause significant economic losses in Minnesota since its first diagnosis in 1997. Affected turkey flocks may have up to 100% morbidity and up to 20% mortality. An APV Prevalence Study revealed a statewide prevalence of 34%. A newly created APV Center, established for the isolation and characterization of APV, examined 110 samples, 16 of which yielded virus isolations. Further evaluation of these virus isolates by a comparison of the nucleotide sequences of the nucleoprotein, phosphoprotein, matrix, fusion, and second matrix genes revealed homogeneity among the isolates.A Risk Factor Survey of 32 turkey farms uncovered statistically significant links between high APV prevalence and factors pertaining to the poor handling of carcasses, uncontrolled movement between farms, and a poor commitment to biosecurity.Currently, APV infection is diagnosed using an M-gene based PCR test developed at the University of Minnesota. A more sensitive and specific M-protein ELISA test has been developed and is in the process of being field tested. At the present time, immunization against APV is being approached by a “Controlled Exposure” of turkeys at two weeks of age with a cell culture vaccine passaged 41 times. This has been applied in an eight county region with the highest APV prevalence. The Minnesota Board of Animal Health is
monitoring its usage. The Minnesota Turkey Growers Association Task Force on APV identified these eight counties for the test. Preliminary observations have indicated reduced economic losses with this approach. Other APV research at the University of Minnesota has revealed:

- APV is susceptible to detergents and disinfectants
- APV is susceptible to warm temperatures but survives cool temperatures
- APV is resistant to drying
- Airborne transmission of APV between connected isolators was demonstrated experimentally
- Broiler chickens and ducklings are susceptible to infection of APV of turkey origin
- Poults inoculated with APV and a combination of pathogenic bacteria developed more severe clinical signs than those inoculated with APV alone, bacteria alone or the uninfected controls.
- No differences were seen in the clinical signs or postmortem changes in poults inoculated with APV or a combination of APV and Newcastle Disease Virus after being vaccinated against hemorrhagic enteritis virus
- Poults infected with APV and kept under greater stocking densities developed more severe clinical signs and displayed noticeable depression and decreased activity
- Samples from six of twenty-three species of passerines examined were positive for viral nucleic acid of APV by PCR test.
- More extensive testing of migratory waterfowl (270 Canada geese and 155 Blue-winged teals) revealed many positive for APV.
- The RNA examined from wild and sentinel birds infected with APV revealed genetic homology with APV isolates from Domestic turkeys. The research findings reported here were contributions from researchers at the University of Minnesota. This research on APV has resulted in twelve publications in refereed journals and sixteen published abstracts at national conferences.

The flock incidence rates in Minnesota are listed in the following table. All flocks are ELISA tested using the same slaughter serum samples that are collected for the Avian Influenza Alert System.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Number of Positive Flocks</th>
<th>Circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1997 -</td>
<td>540</td>
<td>Mostly clinical flock testing</td>
</tr>
<tr>
<td>July 1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August 1998 -</td>
<td>1760</td>
<td>Mandatory slaughter testing</td>
</tr>
<tr>
<td>July 2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For the time period August 1998 through July 2000, fifty thousand samples from 5013 flocks were tested. Some 1760 of the 5013 flocks
(35%) were found to be positive for APV. Of the total 87 counties in Minnesota, 32 counties have no poultry farms. Some 38 of the remaining 55 counties (69%) with poultry farms were found to have tested positive for APV. Dr. Keith Freindshuh, Minnesota Board of Animal Health veterinarian provided the test results information for this report.

5. Status Reports

The following report on Newcastle Disease, Velogenic Viscerotropic, in the Laguna Region of Mexico was presented by Dr. Eduardo Rivera:

In the early nineties the Ministry of Agriculture, with the decisive participation of Mexican poultry farmers and the National Association of Poultry Science Specialists, launched a national campaign against the velogenic viscerotropic form of Newcastle Disease (NDVv), which operated by accrediting veterinarians to act under the coordination of the General Animal Health Directorate.

The Campaign started out by certifying disease-free parent and breeder flocks, and later the program was expanded to broilers, layers and commercial flocks, fighting cocks and song birds. On February 28, 1995, an official regulation was adopted, providing the legal basis for control and eradication actions—Official Mexican Standard NOM-013-ZOO-1994, National Velogenic Newcastle Disease Campaign.

To date, thirteen states (and the Laguna Region) in northern Mexico and the Yucatan peninsula are free of this disease; nine are under eradication and ten in the control phase. In 1998 there were 30 foci of Newcastle disease throughout the country, 20 in 1999, and up to September 15, 2000, 41 foci have been identified.

The Laguna Region is located in northern Mexico and is made up of parts of the states of Durango and Coahuila. The region was declared free of Newcastle disease on March 18, 1996. It is one of the biggest poultry producing areas in the country, with a population of 26 million birds on 271 farms, and it accounts for 12% of the country’s broiler production and 7% of table egg production.

Late last March an outbreak of NDVv took place on a 50,000 bird broiler farm in the Laguna Region, located 575 km away from Laredo, TX., and 831 km away from El Paso, TX. The diagnosis immediately triggered the National Animal Health Emergency Operation (DINESA), and the entire region and the state of Durango were placed under quarantine. An emergency program was implemented, taking the following measures: a) control of movement of birds and bird products and byproducts, allowing only the movement of those believed to be of low risk for shipment to other parts of the country, and stopping the exportation of these products; b) an epidemiological surveillance program was initiated in the farms involved; c) depopulation, cleaning, disinfection and sanitary evacuation of the farms was carried out; and d), in coordination with the organized producers,
biosecurity measures were established or strengthened and a new
Newcastle vaccination program was designed. By means of all these mea-
sures, 93 commercial farms in the region have been found to be affected
up to September 15, 2000, and 13,610,008 birds have been killed and
sanitarily disposed of. The last clinical NDV case was diagnosed on May
11, 2000. It should be mentioned that the disease only affected broiler
flocks, backyard poultry, fighting cocks and one ostrich farm.

The epidemiological surveillance effort collected 7,021 organ speci-
mens, taken from the 217 farms in the Laguna Region, of which three were
positive to NDV upon isolation. Some farms have been sampled two or
three times, for a total of 698 visits.

In the case of backyard poultry, both birds with signs of the disease
and apparently healthy birds at risk of having been infected were killed. A
total of 510 yards were inspected and 2840 organ specimens were col-
lected. The laboratory results showed NDV virus isolated in birds from 40
such farms. Consequently, a backyard flock vaccination program was un-
dertaken, divided into two stages: the first, from April 12 to June 3 of this
year, and the second from July 18 to August 19, for a total vaccination of
108,983 birds.

In the course of the epidemiological investigation it was determined
that the virus that originated the problem came from endemic areas, and
was perhaps carried by wild birds or by contaminated persons, vehicles or
equipment. Possibly the NDV virus first attacked backyard flocks and
moved from there to the commercial farms, since the broiler producing
companies had relaxed their biosecurity program and vaccination sched-
ules, due to overconfidence in their zoosanitary status as a free zone. Vac-
cination was carried out with quarter or half doses, usually in the drinking
water, or by spraying.

So far there has been no case of NDV in long lived birds, such as
parents, breeders or commercial laying hens, perhaps because these are
housed in facilities with stricter biosecurity measures and more efficient
vaccination schedules, which include the use of emulsified killed vaccine.

Since one of the factors for the introduction of this disease in the La-
guna Region was the vaccination schedules used for broilers, poultry farm-
ers and veterinarians in the area got together to design a new immuniza-
tion scheme, which includes the use of emulsified vaccine one or two times,
plus the use of a full dose of live virus vaccine (La Sota). A vaccine
hyperconcentrate is used for the first application of emulsified vaccine.

With the purpose of checking that the new vaccination calendar did
provide protection against exposure to the viscerotropic velogenic Newcastle
disease virus isolated in the Laguna Region, the above vaccines were ap-
plied to a group of 26 day old broiler chickens, and to a 30 to 38 week old
layer hen population, raised in another part of the country. Both groups
were exposed to the field viruses and the results showed that this immuni-
ization scheme afforded complete protection.
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

As of September 16, 2000, 5413 permits have been issued for mobilization of bird products and byproducts to NDVV free, eradication and control zones. The movement of chicken and hen droppings is only authorized for marketing in the affected region, after heat and/or chemical treatment. Cooked products may be marketed freely throughout the country.

From July 21 until September 15, 2000, a total of 10,794 unvaccinated sentinel birds have been placed in 50 commercial farms with capacity for 5,270,474 birds, with the purpose of verifying the absence of the virus in those flocks, in which the NDVV virus was never identified. Chicken carcasses and meat from these farms were allowed to be moved to disease-free states.

DINESA personnel are carrying out a program to check disease free flocks in order to authorize the movement of meat and eggs to other zones and to confirm that the products reach the authorized destination. The vehicles that carry such products should be disinfected and closed with sealed straps.

Interviews have been broadcast over national television and radio, and there have been publications in the local and regional press. Moreover, a training program was set up for the poultry farm workers, including talks on the subject and a video on biosecurity. This was done to achieve better communications between industry, the community and SAGAR personnel.

Remarks

The viscerotropic velogenic Newcastle disease outbreak in birds of the Laguna Region was controlled in a relatively short time, thus preventing its spread to other poultry producing areas of the country.

The outbreak fundamentally affected broilers and the disease was never found in commercial layers.

Introduction or improvement of biosecurity measures on the poultry farms, the implementation of a new Newcastle disease vaccination calendar for commercial and backyard flocks, that included the use of emulsified killed vaccine, and the control of movements of birds and bird products and byproducts, together with the decided cooperation of poultry farmers in the Region, were the main factors for the success achieved in the control and, shortly, eradication of the disease.

The following report on Import-Export Activities was presented by Mr. Dennis Senne, NVSL:

A. Poultry and Hatching Eggs

There were 15,612,799 poultry, including day old chicks, and 14,270,208 poultry hatching eggs imported into the United States during fiscal year (FY) 2000.

B. Commercial Birds

The imports of commercial birds are limited to those that are exempt
from the Wild Bird Conservation Act, serviced by the U.S. Fish and Wildlife Service. There were 3,452 birds released from USDA-operated commercial bird quarantine facilities in FY 2000.

C. Pet Bird Program
There were 412 pet birds imported into the United States and quarantined at a USDA-operated animal import center during FY 2000.

D. Smuggled Birds
There were 58 birds seized by the USDA and/or the U.S. Customs Service for illegally entering the United States in FY 2000.

E. Ratite Importations
During FY 2000, no ratites or hatching eggs of ratites were imported into the United States. The current price of ratites and hatching eggs of ratites does not justify the costs of importing such animals.

The following report on *Avian Influenza* and *Newcastle Disease* was presented by Mr. Dennis Senne:

**Avian Influenza**

During FY 2000, 1,457 samples from live-bird markets (LBMs) in the Northeastern United States were tested for the presence of avian influenza virus (AIV). Subtype H7N2 AIV was isolated from 81 of 439 samples (16 of 35 submissions) from New Jersey and from 104 of 900 samples (34 of 75 submissions) from New York (Table 1). Samples collected from Connecticut (16), Massachusetts (76), New Hampshire (2), and Rhode Island (24) were negative for AIV. Pathogenicity of the H7N2 virus was evaluated at different times during the survey by the chicken pathogenicity test and deduced amino acid profile at the hemagglutinin cleavage site; the subtype was characterized as low pathogenic. Other AIV subtypes isolated from LBMs were H3N8, H4N6, and H6N4.

Subtypes of AIV isolated from gallinaceous birds in premises other than LBMs are shown in Table 2. The H5N2 subtype of AIV was isolated from a sentinel chicken in NJ that was being used for West Nile virus (WNV) surveillance. In addition, 8 isolates of the H5N2 virus (4 submissions) from New York were received for identification and characterization. The H5N2 isolates from New York were detected as part of the pre-testing requirements for birds going to the LBMs. The H5N2 viruses were characterized as low pathogenic by chicken pathogenicity test and amino acid profile at the hemagglutinin cleavage site. An H6N2 AIV was isolated from an outbreak of avian influenza in layer chickens in California. Respiratory disease and a drop in egg production were clinical features of the outbreak. The H6N2 virus was characterized as low pathogenic. Other subtypes of AIV recovered were: H1N2, H3N2, H3N8, H3N4,8, H4N6, H6N1, H6N2, H6N8, H9N1,4 and H11N9.
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

Table 3 shows AIV subtype-specific antibodies detected in avian species originating from different states. Antibodies to H7N3 and H7N2 respectively were found in ratites (emu and rhea) in California and chickens in New York. Turkeys from Illinois, Missouri and Ohio had antibodies to AIV H1N2 and those from Minnesota, North Carolina, North Dakota, Ohio, South Dakota and Wisconsin had antibodies to AIV H1N1. Other subtype-specific antibodies found were: H6N1, H6N2, H9N2 and H11N9.

Table 1.

<table>
<thead>
<tr>
<th>State</th>
<th>Species of Bird</th>
<th>Subtypes of AIV (Number of Isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Jersey</td>
<td>Poultry</td>
<td>H7N2* (81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duck H3N8 (2)</td>
</tr>
<tr>
<td>New York</td>
<td>Avian</td>
<td>H3N8 (2), H4N6 (1), H6N4 (3), H7N2* (104)</td>
</tr>
</tbody>
</table>

* The AIV H7N2 was characterized as low pathogenic.

Table 2.
Avian influenza virus (AIV) subtypes isolated from birds in premises other than live-bird markets, FY 2000.

<table>
<thead>
<tr>
<th>State</th>
<th>Species of Birds</th>
<th>Subtypes of AIV (Number of Isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Chicken</td>
<td>H6N2 (4)</td>
</tr>
<tr>
<td>Missouri</td>
<td>Turkey</td>
<td>H1N2</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Chicken</td>
<td>H5N2*</td>
</tr>
<tr>
<td></td>
<td>Duck, Environment</td>
<td>H3N8 (2)</td>
</tr>
<tr>
<td>New York</td>
<td>Chicken</td>
<td>H5N2*</td>
</tr>
<tr>
<td></td>
<td>Avian</td>
<td>H5N2* (5)</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>H5N2* (2), H6N1</td>
</tr>
<tr>
<td></td>
<td>Avian</td>
<td>H3N2 (2), H3N8 (2), H6N2 (3), H6N8 (3), H9N1,4, H3N4,8 (4)</td>
</tr>
<tr>
<td></td>
<td>Chicken</td>
<td>H6N2 (3)</td>
</tr>
<tr>
<td></td>
<td>Goose</td>
<td>H3N4,8</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Duck</td>
<td>H4N6, H11N9</td>
</tr>
</tbody>
</table>

* The AIV H5N2 was characterized as low pathogenic.
REPORT OF THE COMMITTEE

Table 3.

<table>
<thead>
<tr>
<th>State</th>
<th>Species of Birds</th>
<th>Subtype-Specific antibodies (No. submissions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Chicken</td>
<td>H6, H6N2 (13)</td>
</tr>
<tr>
<td></td>
<td>Emu and Rhea</td>
<td>H7 (3)</td>
</tr>
<tr>
<td></td>
<td>Rhea</td>
<td>H7N3</td>
</tr>
<tr>
<td>Illinois</td>
<td>Turkey</td>
<td>H1N2</td>
</tr>
<tr>
<td>Kansas</td>
<td>Chicken</td>
<td>H3</td>
</tr>
<tr>
<td>Minnesota</td>
<td>Turkey</td>
<td>H1N1 (19), H6N1 (5)</td>
</tr>
<tr>
<td>Missouri</td>
<td>Turkey</td>
<td>H1N2 (3)</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Turkey</td>
<td>H1N1 (8)</td>
</tr>
<tr>
<td>North Dakota</td>
<td>Turkey</td>
<td>H1N1 (3)</td>
</tr>
<tr>
<td>New York</td>
<td>Chicken</td>
<td>H7N2</td>
</tr>
<tr>
<td>Ohio</td>
<td>Turkey</td>
<td>H1N1, H1N2, H4, H9N2</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Duck</td>
<td>H6N2 (2), H9N2, H11N9 (2)</td>
</tr>
<tr>
<td>South Dakota</td>
<td>Turkey</td>
<td>H1N1 (4)</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Turkey</td>
<td>H1N1</td>
</tr>
</tbody>
</table>

Newcastle Disease

No velogenic or mesogenic Newcastle disease virus (NDV) was isolated from domestic birds in FY 2000. NDV isolates received from diagnostic laboratories were characterized as lentogenic pathotype based on the chicken pathogenicity test and the amino acid composition at the cleavage site of the fusion protein.

Table 4 shows the velogenic Newcastle disease viruses that were isolated from two shipments of exotic birds (an Amazon parrot in a California quarantine center, and a francolin and an undetermined avian species in a Florida quarantine center). The two shipments of birds were denied entry into the U.S.

Pigeon paramyxovirus type-I (PPMV-1) was isolated from six submissions from three states (NJ, PA and WI). All of the samples originated from pigeons. Three submissions were from Pennsylvania (4 isolates), two from New Jersey (21 isolates), and one from Wisconsin (3 isolates). The viruses were characterized by a panel of monoclonal antibodies, the chicken pathogenicity test, and deduced amino acid sequence at the cleavage site of the fusion protein. All the PPMV-1 viruses had multiple basic amino
acids at the cleavage site.

Table 4.
Velogenic Newcastle disease virus (VNDV)* isolated from exotic birds in quarantine centers or confiscated by US Customs, FY 2000.

<table>
<thead>
<tr>
<th>State where species of birds Source</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Amazon parrot US Customs</td>
<td>US Customs</td>
</tr>
<tr>
<td>Florida Francolin and unknown avian sp. Import Bird Quarantine Center</td>
<td>Import Bird Quarantine Center</td>
</tr>
</tbody>
</table>

* Shipments of birds that yielded velogenic Newcastle disease virus where denied entry into the United States.

The following report on the OIE Definition of Newcastle Disease was presented by Dr. James Pearson:
Office International des Epizooties Newcastle Definition
Office International des Epizooties, 12 rue de Prony, Paris, France
The Standards Commission of the Office International des Epizooties (OIE) was asked in 1997 to develop a new definition for Newcastle disease (ND), as the previous one was ambiguous. A definition was developed in September and circulated to the 155 Member Countries. It was subsequently revised two times and circulated to Member Countries after each revision. The definition below was approved by the OIE International Committee in May 1999.

'Newcastle disease is defined as an infection of birds caused by a virus of avian paramyxovirus serotype 1 (APMV-1) that meets one of the following criteria for virulence:

a) The virus has an intracerebral pathogenicity index (ICPI) in 7-day-old chicks (Gallus gallus) of 0.7 or greater. or
b) Multiple basic amino acids have been demonstrated in the virus (either directly or by deduction) at the C-terminus of the F2 protein and phenylalanine at residue 117, which is the N-terminus of the F1 protein. The term 'multiple basic amino acids' refers to at least three arginine or lysine residues between residues 113 and 116. Failure to demonstrate the characteristic pattern of amino acid residues as described above would require characterisation of the isolated virus by an ICPI test.'

In this definition, amino acid residues are numbered from the N-terminus of the amino acid sequence deduced from the nucleotide sequence of the FO gene, 113–116 corresponds to residues -4 to -1 from the cleavage site.'
The conclusion of the Commission was that ND isolates with an ICPI greater than 0.7 are pathogenic or have the potential to become pathogenic. Therefore, these isolates are a threat to poultry and should be reported.

The OIE Working Group on Wildlife Diseases was asked to provide advice on what the ND status of the country would be if the disease were present in wildlife. Their recommendation was that poultry and other birds propagated for commercial use can be ND free even if there is infection in free living birds or racing pigeons. Regular and prompt surveillance with mandatory reporting of ND in poultry would be required. ND in other birds should be reported but its presence will not affect the ND status of the country. Also husbandry systems must be in place to eliminate or minimize exposure of commercial poultry to wild birds.

The OIE Code Commission has developed a revised Chapter for the OIE *International Animal Health Code* to address how this definition will be applied. This Chapter outlines the criteria for commercial poultry to be considered free of ND. This new Chapter is being sent to the member countries for comment.

The following report on the **US Perspective of NDV** was presented by Dr. Michael David:

The 2000 text of the OIE *Manual of Standards for Diagnostic Tests and Vaccines*, Chapter 2.1.15 (Newcastle Disease), incorporates the new definition of ND. Future reporting of ND outbreaks will be based on the isolation of a ND virus with an intracerebral pathogenicity index (ICPI) of 0.7 or greater. This definition would include not only the velogenic ND viruses, but also mesogenic ND viruses and serotype 1 pigeon paramyxoviruses.

The new definition for ND that was adopted reads as follows: Newcastle disease is an infection of birds caused by a virus of avian paramyxovirus serotype 1 (APMV-1) that meets one of the following criteria for virulence:

A) The virus has an ICPI in day-old chicks (Gallus gallus) of 0.7 or greater; or

B) Multiple basic amino acids have been demonstrated in the virus (either directly or by deduction) at the C-terminus of the F2 protein and phenylalanine at residue 117, which is the N-terminus of the F1 protein. The term 'multiple basic amino acids' refers to at least three arginine or lysine residues between residues 113 and 116. Failure to demonstrate the characteristic pattern of amino acid residues as described above would require characterization of the isolated virus by the ICPI test.

While neither velogenic nor mesogenic ND viruses have been identified in US commercial poultry for many years, these viruses, as well as serotype 1 pigeon paramyxoviruses may occasionally be found in wild birds, imported pet birds, and non-commercial backyard poultry. Consequently,
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

the US could experience an increase in the number of reports of ND made to OIE.

The OIE reporting requirements are contained in the International Animal Health Code. The following provisions from the code define the general reporting parameters:

Article 1.1. defines "animal" to mean "a mammal...or bird (domestic and wild species)." Article 1.1. also defines "outbreak of disease" to mean "an occurrence of one of the diseases in List A or List B in an agricultural establishment, breeding establishment or premises...where animals are kept. Where it cannot be defined in this way, the outbreak shall be considered as occurring in the part of the territory in which, taking local conditions into account, it cannot be guaranteed that both susceptible and non-susceptible animals have had no direct contact with affected or suspected cases in that area."

Article 1.2.0.2., Paragraph 1, states that: "Countries shall make available to other countries, through the OIE, whatever information is necessary to minimize the spread of important animal diseases and to assist in achieving better worldwide control of these diseases." Paragraph 4 of this Article clarifies this requirement: "Recognizing that scientific knowledge concerning the relationship between disease agents and diseases is constantly developing and that the presence of an infectious agent does not necessarily imply the presence of a disease, countries shall ensure through their reports that they comply with the spirit and intention of paragraph 1 above."

VS understands the above provisions to require reporting of an outbreak of ND in any domestic or wild avian species, but only if making such a report is necessary to minimize the spread of the disease or to assist in worldwide control of the disease. Clearly, any outbreak in commercial poultry would meet these criteria, and should be reported to OIE. However, outbreaks in wild birds, imported pet birds, and racing pigeons may not always meet these criteria.

The Diagnostic Bacteriology Report from NVSL was not presented this year. A report on Salmonella serotyping by NVSL is included in the report of the Salmonella Committee.

The following NPIP Check Test results was presented by Ms. Linda Schroeder-Tucker, NVSL:

Summary

Check test results for forty laboratories participating in the NPIP Proficiency Test are reported for six specimens. Thirty-eight laboratories reported results for all six specimens. Twenty-one laboratories reported re-
REPORT OF THE COMMITTEE

results consistent with those obtained by the National Veterinary Services Laboratories Diagnostic Bacteriology Laboratory for these six specimens.

Introduction

Six specimens were prepared by the National Veterinary Services Laboratories at the request of the National Poultry Improvement Plan committee. Four specimens were environmental and two were whole egg specimens. The environmental specimens were prepared with sterile swabs dipped in sterile skim milk and dragged through autoclaved chicken manure. The whole egg specimens were prepared with surface disinfected whole shell eggs broken into a sterile container. Sterility was checked by culture prior to inoculation with test microorganisms.

Samples were frozen at -70 C and sent on ice to the participating laboratories. Participants were requested but not required to indicate which media were used for isolation of Salmonella from the specimens received. Three sets of test specimens were processed within the NVSL after refrigeration for two days to simulate transport to the laboratories.

Discussion

Environmental sample #1 contained an \( \text{H}_2\text{S} \) negative \textit{Salmonella enteritidis}, \textit{Proteus mirabilis}, \textit{Pseudomonas aeruginosa}, and \textit{Citrobacter freundii}. Thirty-three laboratories reported this specimen as positive for \textit{Salmonella} group D.

Environmental sample #2 contained typical \textit{Salmonella enteritidis}, \textit{Proteus mirabilis}, \textit{Pseudomonas aeruginosa}, \textit{Citrobacter freundii}, a lysine positive \textit{Citrobacter freundii}, and \textit{Hafnia alvei}. Thirty-seven laboratories reported this specimen positive for \textit{Salmonella} group D.

Environmental sample #3 contained a lysine positive \textit{Citrobacter freundii}, \textit{Escherichia coli}, \textit{Shewanella putrefaciens}, typical \textit{Citrobacter freundii}, and \textit{Proteus mirabilis}. Four laboratories reported \textit{Salmonella} species. Two laboratories reported \textit{Salmonella} group D.

Environmental sample #4 contained \textit{Salmonella typhimurium}, \textit{Hafnia alvei} and \textit{Proteus mirabilis}. Thirty-three laboratories reported \textit{Salmonella} species. Two laboratories reported \textit{Salmonella} group D.

Whole liquid egg sample #5 contained typical \textit{Salmonella enteritidis}, \textit{Pseudomonas aeruginosa}, \textit{Proteus mirabilis}, and \textit{Citrobacter freundii}. Thirty-eight laboratories reported \textit{Salmonella} group D. One laboratory did not report results for this sample.

Whole liquid egg sample #6 contained the same microorganisms as sample #5 at a dilution of 1:100. This gave an average of 1.75 cfu per ml for a total of 17.5 cfu per 10 ml sample. Thirty-six laboratories reported isolation of \textit{Salmonella} species. Thirty-four of these confirmed the isolate as group D. Two laboratories did not report results for this sample.

The following report on the \textit{National Poultry Improvement Plan} was
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

presented by Mr. A. R. Rhorer, Senior Coordinator, NPIP, USDA, APHIS, VS:

Pullorum-Typhoid Status:
In Calendar Year 1999, there was one isolation/outbreak of *Salmonella pullorum* reported to the Poultry Improvement Staff. There were three isolations of *Salmonella pullorum* reported during Calendar Year 2000 from January to October 1, 2000. Isolations in 2000 were reported by three States. There have been no isolations of *Salmonella gallinarum* since 1988 in any type poultry.

All four isolates were Standard strain *Salmonella pullorum*.

The number of birds in *Salmonella pullorum* positive flocks (January 1, 1999- October 1, 2000) were as follow:

<table>
<thead>
<tr>
<th>Number of birds</th>
<th>Flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 birds</td>
<td>= 0</td>
</tr>
<tr>
<td>&gt;5</td>
<td>= 0</td>
</tr>
<tr>
<td>&gt;15</td>
<td>&lt;15</td>
</tr>
<tr>
<td>&gt;25</td>
<td>&lt;25</td>
</tr>
<tr>
<td>&gt;50</td>
<td>&lt;50</td>
</tr>
<tr>
<td>&gt;75</td>
<td>&lt;75</td>
</tr>
<tr>
<td>&gt;100</td>
<td>&lt;100</td>
</tr>
<tr>
<td>&gt;200 birds</td>
<td>&lt;200</td>
</tr>
<tr>
<td>Total</td>
<td>= 4</td>
</tr>
</tbody>
</table>

---

### HATCHERY PARTICIPATION IN THE NATIONAL POULTRY IMPROVEMENT PLAN TESTING YEAR 1999

| Egg and Meat-Type Chickens Participating - Number | 320 |
| Capacity - Eggs                                    | 708,646,926 |
| Average per Hatchery                               | 2,271,304 |
| Participating Dealers                               | 712 |
| Participating Independent Flocks                   | 40 |

585
REPORT OF THE COMMITTEE

**HATCHERY PARTICIPATION IN THE NATIONAL POULTRY IMPROVEMENT PLAN TESTING YEAR 1999**

<table>
<thead>
<tr>
<th>Participating</th>
<th>Number</th>
<th>Capacity - Eggs</th>
<th>Average per Hatchery</th>
<th>Participating Dealers</th>
<th>Participating Independent Flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkeys</td>
<td>53</td>
<td>33,841,782</td>
<td>705,307</td>
<td>159</td>
<td>21</td>
</tr>
<tr>
<td>Waterfowl, Exhibition Poultry, and Game Birds</td>
<td>703</td>
<td>23,344,571</td>
<td>33,493</td>
<td>472</td>
<td>1,952</td>
</tr>
<tr>
<td>Egg-Type Chicken Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year 1999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participating</td>
<td>Number</td>
<td>Capacity - Eggs</td>
<td>Average per Flock</td>
<td>Primary Breeding Flocks</td>
<td>Birds - Proportion of Total</td>
</tr>
<tr>
<td>U.S. Pullorum-Typhoid Clean: Participating</td>
<td>242</td>
<td>3,523,939</td>
<td>14,562</td>
<td>19.4</td>
<td>13.0</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>3,523,939</td>
<td>3,523,939</td>
<td>14,562</td>
<td>19.4</td>
<td>13.0</td>
</tr>
</tbody>
</table>
### Meat-Type Chicken Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year 1999

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Pullorum-Typhoid Clean: Participating- Number</td>
<td>5,664</td>
</tr>
<tr>
<td>Birds in Flocks- Number</td>
<td>78,112,511</td>
</tr>
<tr>
<td>Average per Flock</td>
<td>13,774</td>
</tr>
<tr>
<td>Primary Breeding Flocks</td>
<td></td>
</tr>
<tr>
<td>Flocks-Proportion of Total</td>
<td>15.8</td>
</tr>
<tr>
<td>Birds- Proportion of Total</td>
<td>9.4</td>
</tr>
</tbody>
</table>

### Turkey Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary Testing Year 1999

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Pullorum-Typhoid Clean: Participating- Number</td>
<td>723</td>
</tr>
<tr>
<td>Birds in Flocks- Number</td>
<td>5,548,802</td>
</tr>
<tr>
<td>Average per Flock</td>
<td>7,675</td>
</tr>
<tr>
<td>Primary Breeding Flocks</td>
<td></td>
</tr>
<tr>
<td>Flocks-Proportion of Total</td>
<td>14.7</td>
</tr>
<tr>
<td>Birds- Proportion of Total</td>
<td>6.9</td>
</tr>
</tbody>
</table>

### Waterfowl, Exhibition Poultry and Game Breeding Flocks in the National Poultry Improvement Plan Participation and Testing Summary-1999

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Pullorum-Typhoid Clean: Participating- Number</td>
<td>4,078</td>
</tr>
<tr>
<td>Birds in Flocks- Number</td>
<td>1,354,782</td>
</tr>
<tr>
<td>Average per Flock</td>
<td>332</td>
</tr>
<tr>
<td>Primary Breeding Flocks</td>
<td></td>
</tr>
<tr>
<td>Proportion of total</td>
<td>45.9</td>
</tr>
<tr>
<td>Birds- Proportion of Total</td>
<td>62.8</td>
</tr>
</tbody>
</table>
### Mycoplasma gallisepticum, Mycoplasma synoviae, and Mycoplasma meleagridis status 1998-99.

<table>
<thead>
<tr>
<th></th>
<th>Egg-Type Chickens</th>
<th>Meat-Type Chickens</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mycoplasma gallisepticum</td>
<td>1</td>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>Mycoplasma synoviae</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Mycoplasma meleagridis</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

### U.S. Salmonella enteritidis Monitored - Egg-Type Chickens

No. of flocks and birds in the flocks with *Salmonella enteritidis* isolates, 1990-2000

<table>
<thead>
<tr>
<th></th>
<th>Environmental</th>
<th>Dead Germ</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flocks</td>
<td>47</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>491,571</td>
<td>77,179</td>
<td>148,842</td>
</tr>
</tbody>
</table>

### U.S. Salmonella enteritidis Monitored - Egg-Type Chickens

No. of flocks and birds in flocks by State with *Salmonella enteritidis* isolates, 1990-2000

<table>
<thead>
<tr>
<th>State</th>
<th>Environmental</th>
<th>Dead Germ</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>6,000</td>
<td>15,000</td>
<td>1</td>
</tr>
<tr>
<td>Georgia</td>
<td>46,000</td>
<td>2</td>
<td>15,000</td>
</tr>
<tr>
<td>Illinois</td>
<td>3,900</td>
<td>3,700</td>
<td>1,200</td>
</tr>
<tr>
<td>Indiana</td>
<td>12,545</td>
<td>27,479</td>
<td>15,092</td>
</tr>
<tr>
<td>Kentucky</td>
<td>1</td>
<td>1</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td>6,625</td>
<td>1</td>
<td>1,200</td>
</tr>
</tbody>
</table>
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

<table>
<thead>
<tr>
<th>State</th>
<th>Flocks</th>
<th>Birds in Flocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohio</td>
<td>10</td>
<td>141,200</td>
</tr>
<tr>
<td>Oregon</td>
<td>2</td>
<td>19,516</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>12</td>
<td>146,385</td>
</tr>
<tr>
<td>Texas</td>
<td>1</td>
<td>10,000</td>
</tr>
</tbody>
</table>

U.S. *Salmonella enteritidis* Monitored- Egg-Type Chickens
No. of flocks and birds in flocks by phage type with *Salmonella enteritidis* isolates, 1990-2000

<table>
<thead>
<tr>
<th>Phage type</th>
<th>Environmental</th>
<th>Dead Germ</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flocks</td>
<td>7</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>110,500</td>
<td>3,700</td>
<td>31,400</td>
</tr>
<tr>
<td>Phage type 13A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>63,121</td>
<td>27,479</td>
<td>25,092</td>
</tr>
<tr>
<td>Phage type 2</td>
<td></td>
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</tr>
<tr>
<td>Flocks</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>18,900</td>
<td></td>
<td>18,900</td>
</tr>
<tr>
<td>Phage type 23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>1,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phage type 28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>15,000</td>
<td>46,000</td>
<td></td>
</tr>
<tr>
<td>Phage type 34</td>
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</tr>
<tr>
<td>Flocks</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>12,500</td>
<td></td>
<td>12,500</td>
</tr>
<tr>
<td>Phage type RNDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>7,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following update on West Nile Virus was presented by Dr. David Swayne, USDA, ARS, SEPRL:

Experimental Studies in the Pathogenesis of West Nile Virus Infections for Turkeys and Domestic Geese - David E. Swayne, Southeast Poultry Research Laboratory, USDA, 934 College Station Road, Athens, Georgia 30605

In the fall of 1999, West Nile virus (WNV) was isolated during an outbreak of neurologic disease in humans, horses, and wild and zoological birds in New York, Connecticut and New Jersey. During the first nine months of 2000, WNV infections were identified in over 2200 wild birds from New York, New Jersey, New Hampshire, Connecticut, Rhode Island, Maryland, Pennsylvania, and Massachusetts. Turkeys (Meleagridis gallopavo) and domestic geese (Anser anser domesticus) are a potential reservoir for WNV, but little is known about the pathogenicity of WNV and the pathogenesis of WNV infections for these two domestic poultry species. Subcutaneous inoculation of a WNV isolated obtained from an American crow (Corvus brachyrhynchos) into turkeys failed to produce clinical signs, but one turkey died abruptly on 8 days post-inoculation (DPI). WNV was recovered from plasma between 1-10 DPI, but most turkeys had low titers. Fecal shedding of WNV was detected on 4 and 7 DPI in cloacal swabs, but oropharyngeal shedding was not identified. Virus was not isolated from intestine, myocardium, brain or kidney of the turkey that died, but sparse viral antigen was demonstrated by immunohistochemistry in the heart and spleen. The turkey has lesions suggestive of bacterial septicemia. WNV was not transmitted to in contact turkeys. Subcutaneous inoculation of WNV in goslings resulted in weight loss, decreased activity and depression. One gosling developed neurologic signs. Two goslings died (5 and 6 DPI) and one was euthanatized for persistent neurological signs (10 DPI). WNV was recovered from plasma on 1-5 DPI and in high titers. WNV was not detected in feces (cloacal swabs), but low levels were detected in oropharyngeal swabs of three goslings on 3-4 DPI. Moderate to severe encephalitis and myocarditis were present. Flaviviral antigen was demonstrated in heart, brain, pancreas, kidney, and autonomic ganglion cells of the intestine, but the distribution and intensity varied with individual WNV-inoculated goslings. WNV was transmitted to in contact goslings. These data suggest WNV can be a disease threat to young goslings. Furthermore, the high virus levels in the blood suggest young geese could be an amplifying host and infect permissive mosquito vectors. By contrast, WNV does not threaten to be a new disease of turkeys, but they may support limited viral replication.
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

The following report on the West Nile Virus was presented by Mr. Dennis Senne, NVSL

The first isolation of West Nile virus (WNV) in the Western Hemisphere was made at the NVSL from tissues from a crow and zoological birds submitted from New York. The virus was sent to the Center for Disease Control (CDC) where it was identified as WNV. A study was conducted to determine the pathogenicity of WNV in chickens. Results of the study showed that young chickens (7 weeks of age) remained asymptomatic throughout the 21 days of the study but moderate levels of viremia (as high as 5 logs/ml) were detected up to 8 days post inoculation (DPI). In addition, fecal shedding of WNV was detected in cloacal swabs collected at DPI 3 and 4. Antibodies to WNV were detected as early as 5 DPI. All inoculated chickens seroconverted by 10 DPI. Chickens placed in-contact with inoculated chickens did not have viremia or antibodies to WNV. It would appear from the study that WNV will not pose a significant disease risk to chickens. Results of the study are published in Avian Diseases, 44:642-649 (2000).

The following reports on Newcastle Disease were presented by Dr. Jack King, USDA, ARS, SEPRL. Athens, GA

Efficacy of Vaccine in Protection Against Velogenic Newcastle Disease (ND)

The recent (March 2000) ND outbreak in Mexico has raised a concern about the level of protection to ND in U.S. broiler flocks. This concern followed the observation that the majority of flocks affected by the ND outbreak in Mexico had been vaccinated with live Newcastle-infectious bronchitis vaccines applied as a fraction of the vaccine label field dose, typical of programs used in the U.S. broiler industry. In contrast, flocks vaccinated with full dose live virus as well as inactivated vaccines were not similarly affected (USDA, APHIS).

Efficacious live and inactivated virus ND vaccines have been available for several years. In laboratory studies the vaccines typically provide protection against morbidity and mortality from a virulent Newcastle disease virus (NDV) challenge with either a viscerotropic velogenic (VV) or a neurotropic velogenic (NV) NDV strain. For example, it was shown in a study of protection of day-old SPF chickens vaccinated by eye drop with \(10^{6.4}\) ELD\textsubscript{50} of NDV-B1 or NDV-VG/GA vaccines that both vaccines protected similarly to either an eye drop or intramuscular challenge of \(10^{3.7}\) ELD\textsubscript{50} VVNDV CA 1083 administered at 30 days-of-age. In that study the protection against mortality ranged from 88 to 100% and the pre-challenge geometric mean hemagglutination-inhibition titers (GMT-HI) ranged from 25 to 86 among the vaccine test groups (Beard et al.). Protection of vaccinated birds against infection is usually less effective and is usually seen as a reduction in the amount of virus shed by an infected bird, a reduction that will diminish but not eliminate virus transmission to other susceptible birds (Alexander). It was learned during the ND outbreak in California in 1971-1973 that vacci-
nation reduced losses but it didn’t prevent flocks from becoming infected and shedding virus (Utterback & Schwartz).

NDV vaccines are used widely in the U.S. What then is the current level of protection to velogenic ND of field-vaccinated chickens in the U.S.? In the absence of recent published challenge protection data, two previous studies may give an indication of that protection status. First, a serological surveys done in 1982 and 1983 and second, a challenge study done in 1994. Eight companies in five regions of the U.S. were included in a serological survey of broiler-breeders and their 4 to 6 wk-old broiler progeny to assess the response to standard ND vaccination programs. The percentage of seropositives (HI titers $10) in broiler-breeder flocks ranged from 65 to 100% and GMT-HI titers ranged from 17 to 92. The percentage of seropositive broilers within the sampled flocks was much lower and ranged from 0 to 89%. GMT-HI titers in the broiler flocks ranged from 5 to 26. Flocks with 80% or greater NDV seropositives and GMT-HI titers of 20 or greater were found in only six of eight broiler-breeder companies and two of eight broiler companies (King).

Villegas et al. presented results from a study of the level of protection provided by field vaccination to a NVNDV challenge at the AVMA meeting in 1994. Groups of 10 field vaccinated broilers from different flocks were challenged intramuscularly with $10^4$ ELD$_{50}$ of Texas GB after transfer to an isolation facility at 4-wks-of-age. Vaccination of most of the chickens was by day-old coarse spray but some received only water application after farm placement. In three groups that had pre-challenge GMT-HI of 10 or greater (range was 10 to 17) there was complete protection against signs and mortality. In five other groups with GMT-HI titers of 8 or less there was 20 to 40% ND signs and mortality.

It is known that an efficacious dose of commercially available ND vaccines in a responsive host will induce protection against the morbidity and mortality of a velogenic NDV infection. Results from a serological survey and from a challenge study of field vaccinated broilers are evidence that a level of immunity necessary for protection against ND mortality was not being attained in most of those flocks when the samples were collected. It is anticipated, although not specifically known, that the current level of protection of field vaccinated birds has not changed since those earlier studies. However, there are arguments against increasing the ND vaccination program. For flocks not exposed to endemic velogenic NDV, the intensity of the vaccination program necessary to attain and maintain protection against velogenic ND may reduce flock productivity because of increased post-vaccinal reactions, airsacculitis, and/or reduced feed conversion as well as increasing the cost of vaccination. Further during the ND outbreak in California vaccination was shown to mask clinical disease and decrease lesions therefore making ND diagnosis more difficult (Utterback & Schwartz).
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

References:
4 USDA, APHIS. Information on ND vaccination programs in Mexico as reported in the site visit summary prepared by Martin Smeltzer, Dennis Senne, & John Hahn, May 30, 2000.

Newcastle Disease Update: International ND Problems
Drs. D.J. King and D.E. Swayne, Athens, GA

Only the reported number of foot and mouth disease outbreaks exceeded the number of Newcastle disease (ND) outbreaks reported to OIE in 1997 (Horst et al). A review of current weekly (http://www.oie.int) and bimonthly reports in the OIE Bulletin (OIE) reveals no change in the global scale of ND outbreaks. Those outbreaks of ND from infections with virulent ND viruses are officially called exotic ND in the U.S., but may also be referred to as velogenic ND (VND), viscerotropic velogenic ND, neurotropic velogenic ND, or simply ND in different countries. The clinical disease that is a consequence of infections with low virulence vaccine-like ND viruses is not a reportable disease and is not included here. Outbreaks of ND have occurred around the world during 1999 and 2000. Highlights of outbreaks that resulted in large losses of poultry are given below.

Australia

Velogenic ND outbreaks have occurred in several locations in the state of New South Wales in Australia between 1998 and 2000 (Kirkland). Based on sequence data, the virulent ND viruses from all outbreaks are related and arose by mutation of an endemic low virulent ND virus and not the introduction of an exotic VND virus. This is a unique event in the history of ND because there may be only one other case of a low virulence virus mutating to a strain of high virulence. Low virulence strains have been indigenous in Australia since 1966. There had been no virulent ND outbreaks in Australia since 1932. However, the ND viruses underwent a series of
accumulative mutations over time in the fusion (F) gene that changed the amino acid sequence in the fusion protein cleavage site and the virulence from low -RKQGRL- to high -RRQRRF- (Scott et al.). Factors that precipitated the change in the virus at this time are unknown. The virulent ND virus was identified as Australian-origin rather than exotic to Australia based on an amino acid extension on the hemagglutinin-neuraminidase protein, a characteristic of Australian ND viruses. There was no evidence of wild bird involvement in the origin of the virulent ND virus. Extensive surveillance is ongoing to attempt to identify virus reservoirs. Some details of the Australian outbreaks follow.

The first outbreak occurred in September 1998 in a cluster of farms east of Sydney in New South Wales. The first case was in a multiage layer flock but later affected several broiler farms. The infection produced mostly neurological signs with mortality in some groups reaching 50%. In the layers, the ND spread slowly, had accompanying nervous signs, resulted in low mortality, and was initially misdiagnosed as Marek’s disease. In broilers, the spread was more rapid and accompanied by higher mortality. The farms were depopulated of approximately 100,000 birds and disinfected. No ND virus was found on follow-up surveillance.

The second outbreak began in a pullet rearing farm in the Mangrove Mountain area, near Gosford in New South Wales, north of Sydney on April 2 1999. ND spread to other farms in the vicinity. By May 28 1999, 1,900,000 birds were depopulated within the Infected Zone, Most were broilers but 2000 were aviary and other poultry on small non-commercial farms. Additionally 2,000,000 broilers on farms in the surrounding Surveillance Zone were destocked under a special processing permit by June 9 1999. Disinfection of all farms in the Infected and Surveillance Zones was conducted twice, 14 days apart, before restocking.

The third outbreak was in layers on a farm in Schofield, West Sydney on August 21, 1999. A small number of birds had ataxia and other nervous signs. A mandatory vaccination program was implemented with Australian-origin V4 lentogenic vaccine strain in the Mangrove Mountain area of the second outbreak during December 1999 in response to isolation of low virulent ND viruses in flocks in the Surveillance Zone. In December, ND viruses with F protein cleavage site of virulent ND virus were isolated in the Surveillance Zone of Mangrove Mountain. The Surveillance Zone was extended to West Sydney, Cumberland Surveillance Zone. In January 2000, Virulent ND was identified in the new Surveillance Zone in West Sydney at farms in multiage layer farms at Orchard Hills and Llandillo. Virulent ND was also identified in three layer flocks near Tamworth in February. In these latter outbreaks, clinical signs were less frequent than in 1998 and 1999, and virus isolation more difficult. Quarantine zones were instituted. In a report of April 18, 2000, the chief veterinary officers have concluded that ND due to the virulent virus of Australian origin is not eradicable in the affected areas of New South Wales in the short to medium term. Australia
remains committed to eradication of virulent ND of exotic origin.

Brazil

There were 3 outbreaks in poultry in June 2000 with 1400 deaths and 75,100 birds destroyed in chickens supplying the local market in the State of Rio de Janeiro. The poultry were reared on farms unconnected to the commercial poultry production system. This is a similar situation the commercial poultry industry in the northeast U.S. faces in relation to MPAI (H7N2) in live-bird markets but not in commercial poultry.

Honduras

Six outbreaks were reported beginning in March 2000 in the departments of Francisco Morazán and Cortes involving 1,500 deaths and slaughter of 411,400 exposed and at risk birds. The NDV was confirmed by NVSL as a viscerotropic velogenic ND (VVND). NDV vaccination program was initiated in backyard flocks close to the outbreak using 43,000 doses of vaccine. Subsequently there were three additional outbreaks in July 2000 involving approximately 100,000 layers and backyard birds. Outbreaks were believed to be secondary with spread from the initially infected farms in the same area by movement of contaminated equipment.

Italy

Newcastle disease was diagnosed in Italy beginning in late April 2000 in Piemonte region of northern Italy. Outbreaks spread into several northern and central regions of Italy with 227 outbreaks reported as of 30 June 2000. This included the regions of Toscana, Emilia-Romagna, Marche, Friuli, Umbria, Lombardia, Veneto, Trentino and Piemonte. Based on epidemiology, the disease spread from a hatchery and from some dealer’s flocks in Emilia-Romagna. The suspected origin of the virulent ND virus was the mingling of poultry imported from countries that are ND-free as well as those that are not ND-free (Capua et al.). This was done to repopulate flocks that had been devastated by the prior HPAI outbreak. The infected birds were sold via various outlets to backyard flocks with the initial outbreaks being in small flocks containing layers, turkeys, guinea fowl and pheasants. The ND virus was velogenic and had an intracerebral pathogenicity index of 1.6-1.8. Compulsory vaccination is underway in the affected regions. Serologic surveillance is being conducted.

Mexico

An outbreak of exotic ND began in the Comaraca Lagunera region within the states of Durango and Coahuila of Mexico on March 30, 2000. By July 2000, 13,087,787 chickens from 92 broiler flocks were infected with VVND virus. The flocks were depopulated under government supervision and buried on the farms. The farms were cleaned and disinfected. Replacement flocks have been placed and include some non-vaccinated
sentinels. No indemnity was paid. The industry absorbed all monetary losses.

The affected flocks were under a lentogenic ND vaccination program similar to the one used in the U.S. broiler industry. Before the outbreak, 1/4 dose of ND virus (B1)-infectious bronchitis was given by spray in the hatchery and a boost at 10-14 days in the field by water or spray administration. The ND vaccination program after the outbreak includes a live virus vaccination and injected, inactivated ND vaccine in the hatchery. Reportedly, flocks not affected in the initial outbreak had been vaccinated in the hatchery with both live and inactivated virus vaccines.

A second issue was infection of backyard or village-type poultry in the vicinity of the commercial poultry with VVND virus. Forty VVND isolates were made from such poultry in 16 towns located in the affected area. Vaccination was instituted for backyard and village-type poultry. It is unknown whether VVND appeared first in village or commercial poultry. The role of fighting cocks and pet birds in the outbreak cannot be eliminated.

Acknowledgements. The authors thank Ilaria Capua and Peter Kirkland for providing information through personal communications. Information on the VND outbreak in Mexico was obtained from OIE website and the Mexico Visit-Executive Summary by USDA, APHIS, VS (Martin Smeltzer, Dennis Senne, and John Hahn), May 30, 2000.

References

USDA SEPRL Research Progress on Newcastle Disease and Avian Pneumovirus
D.J. King, B.S. Seal, D.R. Kapczynski, and D.E. Swayne

Newcastle Disease (ND). NDV infected pigeons are a potential hazard for infection of commercial poultry. Pigeon NDV isolates were characterized, including nucleotide sequence analysis, and serially passaged in chickens. The virus recovered from the fourth passage was evaluated for virulence changes by chicken inoculation. Lesions of the brain and heart
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

were a consistent finding even though clinical disease was mild, mostly depression with some nervous signs, in chickens infected with passaged pigeon NDV isolates. Although the increased virulence of passaged virus as measured by standard pathotyping tests was not reflected in an increased severity of clinical disease, the fact that some clinical disease was evident and the similarity of the viruses by nucleotide sequence analysis to more virulent viruses is evidence that the pigeon viruses are a potential hazard to chickens. Every effort should be made to prevent infections of poultry with pigeon NDV.

Avian Pneumovirus (APV). APV from Colorado did not produce disease in experimentally inoculated ducks, but the virus replicated in the nasal cavity of a few birds. A PCR-based diagnostic test was developed and validated to detect avian pneumovirus in tissues and swabs of infected birds.

APV/Minnesota (1a) produced minor respiratory disease in experimentally infected turkeys and was detected in trachea and lung tissue by RT-PCR using primers specific for the F gene. Viral RNA was detected 3, 7 and 14 days post-challenge in tracheal samples, whereas lung samples were only positive 3 days post-challenge. The PCR results correlated with virus isolation studies using tracheal and lung tissue. Following passage in Vero cells, CPE appeared as early as passage 1 and was positive for APV by RT-PCR.

Nucleotide sequences of the fusion protein gene from several APV isolates obtained from turkeys in the state of Minnesota were compared with the original turkey isolate from Colorado. There were a limited number of conserved substitutions present in the fusion protein-predicted amino acid sequences of isolates collected in Minnesota as compared with the Colorado virus. This indicates that there may be limited selection pressures operating on the virus, but overall avian pneumoviruses are maintaining a relatively stable population as they circulate among commercial turkeys. The N, P and F genes from APV/MN and APV/CO have been cloned into expression vectors for protein production. Additionally, sequence information previously unavailable for the European APV/B N and P genes have been obtained.

The following report on Newcastle Disease Related Vaccine Failure was presented by Mr. Dennis Senne, NVSL:

Newcastle disease (ND) continues to be one of the most important viral diseases of poultry worldwide. Recent outbreaks of virulent ND in Australia and Mexico (discussed by Drs. King and Rivera) illustrate the impact this disease can have on the commercial poultry industries. The risk of ND in commercial poultry varies from country to country and region to region. The risk is dependent on the virulence of endemic strains and virulent NDV infections in backyard birds, fighting cocks, and wild and imported birds. In the U.S., infections in domestic poultry with virulent ND
have been rare since the mid 1970's, in part due to the implementation of quarantine programs for imported birds and an aggressive surveillance program in exotic birds. The last virulent ND infection in commercial poultry (range-reared turkeys) was associated with an outbreak of neurotropic velogenic ND (NVND) in cormorants in 1992. In domestic (non commercial) birds, the last outbreak occurred in 1996 when viscerotropic velogenic ND (VVND) virus was detected in a backyard flock of chickens in an urban community in California.

Over the years, effective vaccination programs have been developed in the U.S. to control infections of low virulent strains of ND in poultry. These programs differ by type of bird and the risk of infection but usually employ live-virus vaccines such as B1 and LaSota or a combination of a live-virus and killed vaccines with adjuvant. The type of vaccine, timing and method of administration are important in the development of an adequate immune response.

In the U.S., where the threat of infection with virulent strains is low, companies have been using off-label (reduced) doses of live-virus vaccines to minimize vaccine reactions. Efficacy of licensed live-virus ND vaccines is evaluated according to the recommended label dose of the product. Cutting the dose may compromise the efficacy of the vaccine against field challenge with more virulent strains of ND virus.

On March 30, 2000, VVND was diagnosed in the Comarca Lagunera region in Mexico. A U.S.-based broiler company in the region was severely affected. Of the more than 90 flocks (>13 million birds) affected by the disease, >80% were owned by the U.S.-based company. Prior to the outbreak, the company had been using a vaccination program consisting of an off-label dose (1/4 dose) of live B1/bronchitis virus vaccine administered by spray at the hatchery, followed by a field boost consisting of 1/4 dose B1 at 10 to 14 days, given in the water or by spray administration. Other companies (Mexican-based) in the area, that were less severely affected, were using similar vaccination programs except that a full dose of live-virus vaccine (LaSota) along with an emulsified inactivated ND vaccine at one day of age in the hatchery was used. In the field, some Mexican-based companies were also giving a second injection of emulsified, inactivated ND vaccine at 10 to 14 days of age in combination with live virus (LaSota). Flocks vaccinated according to these programs were generally not affected by ND. Also, in birds where more aggressive ND vaccination programs are routinely used, e.g. layers and breeders, no disease was reported. A study of the epidemiology of the outbreak clearly showed that the use of 1/4 doses of live B1 virus did little to reduce the clinical affects of VVND virus infection. This should provide the incentive for U.S. companies to review vaccination programs where off-label doses of ND vaccine are used. The introduction of virulent ND may be a lower risk in the U.S. than elsewhere. However, if introduced, it undoubtedly would have severe economic consequences.
6. Update on USAHA Committees of Interest
Salmonella Committee

The following report of the Salmonella Committee was presented by Dr. K. V. Nagaraja, University of Minnesota:

The USAHA Salmonella Committee held its meeting on Sunday, October 22, 2000. There were 45 members/guests attending the meeting. There were 10 oral presentations made and three resolutions passed. Eight of the ten presentations were poultry related.

Dr. Mark Wilson from NVSL presented Salmonella Serotype results from July 1999 to June 2000.

Mr. Andy Rhorer from NPlP presented the NPlP status report.

Dr. William James from USDA-FSIS reported on Salmonella Serotypes from Carcasses and Raw Ground Products from June 1997 through August 1998 from federally-inspected establishments. The most common serotype from chicken carcasses was *S. Heidelberg* and *S. Hadar* from turkey carcasses. These were also the most common serotypes from the corresponding raw ground products.

Dr. Richard Wood and co-workers discussed a research project that examined a quality assurance program for a producer of eggs for the "uncaged" specialty market. During the first two years of the program, 25 percent of the flocks tested positive for *Salmonella enteritidis*. During the final three years of the program, this decreased to less than 5 percent.

Dr. Peter Holt from USDA-ARS presented data from their studies on the use of alive attenuated *Salmonella typhimurium* vaccine (Megan Vac 1) to hens prior to molt. Their results indicate that the vaccine could provide a major degree of protection against SE infection during the increased risk period of molt.

Dr. Michael Jolley from Diachemix Corporation presented a test that has been developed on the principle of Fluorescence Polarization for detection of *Salmonella enteritidis* infection in chicken and egg yolks.

Dr. Armando Mirande from BioMune discussed the use of a new modified *Salmonella typhimurium* vaccine in chickens. The vaccine strain was developed by three separate, independent, chemically induced metabolic drift mutations. This vaccine's ability to significantly protect internal organs and intestines of chickens with multiple serotypes was discussed.

Dr. Jean Petter from USDA-ARS discussed the use of vaccines made of highly flagellated strains of Salmonella compared to less flagellated strains of salmonella.

7. Subcommittee Reports
Avian Influenza & Exotic Newcastle Disease

The following report on *Avian Influenza and Newcastle Disease* was presented by Dr. David Swayne, USDA, ARS, SEPRL:
5th International Symposium on Avian Influenza - David E. Swayne

Every 5-6 years, the U.S. Animal Health Association sponsors an international symposium on avian influenza. The 5th symposium will be held in Athens, Georgia on April 14-17, 2002 at the Continuing Education Center of the University of Georgia. Current endorsement and/or sponsorship includes American Association of Avian Pathologists, American College of Poultry Veterinarians and the Office International des Epizooties. Solicitation for sponsorship is being pursued from European Union, U.S. Department of Agriculture and corporations.

The symposium chairs will be David Swayne and Richard Slemons. The program committee is being assembled from international experts. Some oral presentations will be from invited speakers while potential attendees are requested to submit titles and abstracts for oral presentations at the meeting.

Update on International Incidences and Outbreaks of Avian Influenza 1999-2000 - David E. Swayne and David Suarez

Reports of highly pathogenic avian influenza (HPAI) outbreaks are compiled and listed on the Office International des Epizooties (OIE) website, http://www.oie.int/, and in the bimonthly OIE Bulletin. However, the reporting of outbreaks of list A or B diseases is voluntary and some disease outbreaks that are common knowledge among the scientific community and media have not been reported to OIE. For example, the Hong Kong H5N1 HPAI outbreak in poultry was not reported to OIE. Other diseases such as mildly pathogenic avian influenza (MPAI) are not on list A or B and thus are not reported to OIE. This report compiles information from OIE, recent scientific literature and credible personal sources on avian influenza in the world. Much of the information is fragmentary and incomplete, but this report is the best as can be confirmed.

MPAI and HPAI (H7N1) in Italy. Only one outbreak of HPAI was reported during 1999 and 2000. The outbreak began as MPAI in turkeys of northern Italy with the first case reported on 26 March, 1999. The AI virus was identified as H7N1 and was mildly pathogenic for chickens in laboratory tests. The hemagglutinin cleavage site lacked multiple basic amino acids and was comparable with other MPAI viruses. The MPAI virus spread and infected at least 199 flocks by mid-December, 1999; most in the area between Brescia and Verona. The outbreak farms included six in turkey breeders, 11 in broiler breeders, 12 in layers, 164 in meat turkeys, four in broilers, and two in guinea fowl. In turkey breeders, the MPAI virus caused 5-20% mortality, 30-80% drop in egg production, respiratory signs, inappetence, "egg peritonitis" and misshapen and fragile eggs. Respiratory signs and peritoneal lesions in broiler breeders and layers were similar to those in turkey breeders, but mortality rates and egg production drops were less than in turkey breeders. In meat turkeys, mortality varied from 5-97%. The
highest mortality occurred in the youngest birds and in association with secondary pathogens such as *Riemerella anatipestifer*, *Ornithobacterium rhinotracheale*, *Mycoplasma* sp., paramyxovirus type 2, Newcastle disease virus, avian pneumovirus and adenovirus. Clinically, the poults had severe respiratory distress with gasping for air in the most severely affected birds. Lesions identified included fibrin clots in the trachea, swollen sinuses from fibrin clots, rupture of air sacs, and subcutaneous emphysema. In many cases, death occurred by suffocation. Other young poults developed severe necrotizing pancreatitis with accompanying diarrhea. The strategy for MPAI control was serological monitoring, controlled slaughter and limiting shipments from infected breeders. The number of cases declined in the summer, but began to climb in the fall, 1999.

On 17 December, 1999, the outbreak took an abrupt change in character with poults exhibiting 100% mortality, nervous signs and widespread hemorrhages. The MPAI virus had a change in the hemagglutinin protein cleavage site from -PEIPKGR*GLF- to a HPAI virus with cleavage site of -PEIPKGSRVRR*GLF-. This appears to be an insert of four additional amino acids, two being basic amino acids, at the hemagglutinin cleavage site of the MPAI virus to make it a HPAI virus.

The last outbreak of HPAI was identified on 5 April 2000 in meat turkeys. In total, 13,732,912 birds were involved in 413 flocks and an additional 3-4 million were depopulated as a pre-emptive action. Birds affected included 8,118,929 layers; 2,692,917 meat turkeys; 1,625,628 broilers; 743,319 broiler breeders; 260,340 quail, ducks and pheasants; 247,379 guinea fowl, 42,276 turkey breeders, 387 ostrich and 1,737 backyard poultry. Most outbreaks occurred in north central Italy in the regions of Lombardia (234) and Veneto (158), but isolated outbreaks were reported in Piemonte (6), Fruili (5), Emilia-Romagna (5), Sicila (2), Trentino (1), Sardegna (1) and Umbria (1).

**MPAI (H5N2) in Mexico.**

A difficult issue in many underdeveloped countries is accurate, rapid diagnosis of avian influenza and differentiation from velogenic viscerotropic Newcastle disease (vND). This is especially true because mortality patterns and clinical findings in the field can be similar between vND and MPAI co-infected with secondary pathogens. Some confusion exists in Central America as to definitive diagnosis of field cases as vND or AI. This has lead to false reports in media and internet sources, which have resulted in border closures to poultry movement between countries.
MPAI in United States Live-Bird Markets. Surveillance for AI viruses in various poultry species of the Live-Bird Markets (LBM) by the Departments of Agriculture in New York and New Jersey continues with the assistance of National Veterinary Services Laboratory (NVSL), Ames, Iowa. The report of isolations has been previously made by Dennis Senne in this proceedings and David Suarez reports later on molecular changes in these viruses.

MPAI (H9N2) in Asia. MPAI viruses (H9N2) have been reported to cause morbidity and mortality in countries across Asia, primarily in coun-
tries of the Middle East, and in Pakistan. In many cases, the clinical signs and mortality have been associated with secondary pathogens. Infections with H9N2 AI viruses without mortality have been reported in China and Hong Kong. Sequence data of the H9 and N2 gene of H9N2 AI viruses from Saudi Arabia, Iran, Pakistan and Hong Kong by Veterinary Laboratories Agency (Dennis Alexander, United Kingdom) and SEPRL, respectively, have shown they are all closely related and of the same virus lineage. H9N2 AI viruses were first reported in China in the mid-1990's and spread to the Middle East and Pakistan in the late 1990's. In the Middle East and China, the recent appearance of vvND has complicated the diagnosis and control of MPAI viruses.

**HPAI (H5N1) in Hong Kong.** During 2000, in Hong Kong, the Department of Agriculture, Fisheries and Conservation isolated several AI viruses (H5N1) from geese or swabs from goose cages in the wholesale market. In 1999, HPAI (H5N1) were isolated from the environment of LBM where geese and ducks were housed. Based on studies at SEPRL, the 1999 H5N1 viruses have the same hemagglutinin gene as the 1997 H5N1 AI viruses, but the other genes were from separate lineages. These 1999 H5N1 viruses were similar to those circulating in domestic geese in south China in 1996. These 1999 H5N1 viruses were from birds imported from Mainland China and were highly pathogenic for chickens in experimental studies.

**Iran** has reported avian influenza (H9N2) causing severe problems especially in areas where poultry are raised in close geographic locations and in the presence of unhygienic conditions. The outbreak began in 1997 and is ongoing. Cost estimates for 1998 alone were $11 million for 20 million meat chickens affected. Several breeder operations were also involved and these flocks had to be depopulated.

Over the past 3 years, avian influenza viruses (H9N2) have been isolated from chickens in Saudi Arabia. Mortality and morbidity has varied, but it is high when accompanied by secondary pathogens such as vvND or *Mycoplasma gallisepticum*. Avian influenza has not been reported in Syria, Jordan or Lebanon.

During 2000, there was widespread serological evidence of H9N2 infection of chickens in the LBM of Hong Kong, but no associated disease. MPAI viruses of H9N2 subtype were isolated from swabs collected from birds in retail markets.

**Other AI issues: EU definition.** Currently, federal regulatory action is undertaken with HPAI and not MPAI. HPAI is defined as those viruses that kill 6, 7 or 8 of 8 inoculated susceptible chickens, or H5 and H7 AI viruses having a cleavage site with multiple basic amino acids as reported for previous HPAI viruses, or AI viruses that produce cytopathic effect in cell culture without exogenous trypsin. However, the EU is considering a change in definition to include all H5 and H7 AI viruses along with HPAI H5 and H7 AI viruses as requiring regulatory action. This is in response to the outbreak in Italy during 1999 and 2000 when a MPAI (H7N1) mutated and
became a HPAI. They are also proposing the option of using vaccines with future outbreaks of H5 and H7 AI. Below is a summarization of the European Union Scientific Committee Recommendations as reported in the specific website http://europa.eu.int/comm/food/fs/sc/scah/out45_en.pdf:

1. "Avian influenza" means an infection of birds caused by any influenza A virus which has an intravenous pathogenicity index in six-week-old chickens greater than 1.2 or any infection with influenza A viruses of H5 or H7 subtype. However, in making this recommendation the Committee was concerned at the current lack of knowledge on the prevalence of LPAI viruses of H5 and H7 subtypes in poultry populations. It would seem a wise precaution that before the recommendation is implemented serological surveys of poultry populations in Member States should be undertaken to determine this prevalence and the likely economic impact that would be involved.

2. Throughout the EU there is a marked lack of surveillance for avian influenza, particularly in free-living birds, and yet routine surveillance could give an early warning of the prevalence of viruses of H5 or H7 subtype in the locality of domestic birds. Member States should put in place routine surveillance systems for the detection of influenza viruses in free-living birds.

3. Vaccination against influenza A viruses of H5 and H7 subtype should not normally be allowed. The possible use of emergency vaccination should be retained. There is a potential for a greater role of vaccination in the control of avian influenza, that could be realized by the development of novel marker vaccines.

4. In order to improve the efficacy of emergency vaccination as an aid to avian influenza control the Commission is urged to support the development of novel marker vaccines.

5. "Poultry" are all birds that are reared or kept in captivity for the production of meat or eggs for consumption, the production of other commercial products, for restocking supplies of game, or for breeding these four categories of birds.

6. The Committee, recognizing that there is at present no adequate in vitro alternative, agreed to the continued inclusion of an in vivo test for virus virulence, but with some reluctance. The Commission is urged to encourage and support further research into the development of in vitro tests aimed at replacing the use of birds in virulence tests for avian influenza.

**Acknowledgements.** The authors thank Dennis Senne, Ilaria Capua, Max Brugh, Les Sims, Dennis Alexander, Michael Schwartz and Juan Garcia Garcia for providing information through personal communications. Some of the information was presented at the National Poultry Health and Processing Meeting in Ocean City, Maryland, October 18-20, 2000.
The following report on Evolution of H7 Avian Influenza Viruses was presented by Dr. David Suarez, USDA, ARS, SEPRL:

Since 1994, H7 avian influenza viruses (AIVs) have been isolated from different poultry species in the live bird markets (LBMs) of the Northeast United States. The presence of AIVs among birds in these markets is of considerable concern because of the potential for H7 influenza viruses mutating into the highly pathogenic form of the virus. In 1997 and 1998, low pathogenic H7 influenza viruses spread from the live bird markets to several large commercial poultry operations in Pennsylvania causing serious economic losses, and the virus in the LBMs remains a threat to spread back into the large commercial poultry operations. As part of an ongoing surveillance of influenza viruses in the LBMs, selected H7 viruses have been sequenced for one or more influenza viral genes including the hemagglutinin, neuraminidase, nonstructural and matrix genes. The sequencing and phylogenetic analysis of representative H7 viruses has three major goals; first, to determine if only a single H7 gene has been introduced into the LBMs or if multiple introductions of viruses have been occurring; second, to determine if the H7 viruses are reassorting viral genes with other hemagglutinin subtype AIVs that are also circulating in the live bird markets; and third, to characterize how the H7 viruses are evolving and adapting to the birds in the live bird markets.

The hemagglutinin gene was compared from representative AIV isolates and most of the viruses were determined to be in the same lineage of virus, suggesting a single introduction of virus was responsible for a majority of infections. Two exceptions were observed. In 1998 a single H7N2 virus isolate was sequenced that was distinctly different from the principal lineage and this virus had an additional basic amino acid at the HA cleavage site at the -5 position. In 1999 several H7N3 viruses were isolated, and sequence analysis showed a HA cleavage site similar to that observed in wild birds.

Additional sequencing of the neuraminidase, nonstructural and matrix genes was also completed for selected H7 viruses. The majority of the H7 isolates from the LBMs were H7N2 viruses, but H7N3 viruses were isolated in 1994 and 1999. The hemagglutinin gene from the 1994 H7N3 viruses appeared to be similar to other viruses from the main lineage of virus and it was assumed that the N3 gene was the result of a reassortment event. All the N2 viral genes examined appeared to form a single lineage, and were likely the result of a single introduction of this viral gene. Four distinct nonstructural genes and three distinct matrix genes were observed from viruses that had H7 genes from the same lineage, demonstrating that reassortment with these two genes was common.

The H7 gene sequence was directly compared and analyzed by regression analysis to determine how rapidly the viruses were adapting and evolving among birds in the LBM system. The earliest isolate available was used as the index case to compare subsequent isolates for sequence
changes. Evidence of rapid evolution was observed in the hemagglutinin gene with isolates accumulating nucleotide and amino acid substitutions. The rate of evolution was similar that observed in influenza viruses in mammalian species. Two different changes were observed near the hemagglutinin cleavage site including a threonine to proline change at the −2 position and an asparagine to lysine change at the −5 position. Isolates with these changes became the predominant isolates in the LBMs. The additional basic amino acid at the −5 position causes greater concern about the possibility of the viruses becoming highly pathogenic, since multiple basic amino acids are required for a virus to be highly pathogenic. An additional unique change that has not been observed with other influenza viruses was a loss of eight amino acids in the HA1 portion of the protein that is believed to be near the receptor binding domain. Again, viruses with the deletion, first observed in 1995, became the predominant isolate observed in the LBMs.

This work provides evidence that H7 influenza viruses are not being maintained in the LBMs by new introductions of virus, but it clearly shows, that a single lineage of virus has been able to persist in the LBM system for over six years. It is unclear exactly what part of the LBM system that the viruses are persisting. It appears unlikely that the viruses are being perpetuated on individual poultry farms, since surveillance studies of poultry farms have found few birds positive for H7 infection. The viruses are likely being maintained in the distribution system or in the LBMs themselves, but no data is available to determine for sure where the viruses are being maintained. The sequence data also demonstrates that both viral reassortment and adaptation of the viruses to poultry are occurring. This rapid change of the virus makes it difficult to predict if and when these viruses could become highly pathogenic, but should certainly increase our resolve to eradicate this virus from the live bird market.

Research Update from SEPRL:

The following report was presented by Dr. David Swayne, USDA, ARL, SEPRL:

USDA Research Progress on Poult Enteritis Mortality Syndrome (PEMS) and Avian Influenza - David E. Swayne, Stacey Schultz Cherry, David Suarez and Mike Perdue

PEMS. Researchers at SEPRL identified the “small round virus” isolated from the thymus of PEMS-infected poults as a new strain of astrovirus and this astrovirus can reproduce a PEMS-like clinical disease when given to turkey poults. An RT-PCR diagnostic test was developed for use in commercial turkey flocks. The astrovirus has been shown to be present in commercial turkey flocks. The astrovirus was not inactivated by many commonly used disinfectants except formaldehyde and Virkon S. Turkeys failed to produce a proper humoral immune response against the astrovirus. A multiplex RT-PCR test was developed that detected astrovirus, reovirus,
and turkey coronavirus from commercial turkey flocks using a single sample.

**Avian Influenza.** The H5N1 viruses from geese in Hong Kong isolated in 1999 shared some genes with the human/chicken viruses of 1997 and were highly pathogenic for chickens, but that in experimental infections of mice, a model for determining if the virus can infect people, no disease was observed. Further studies with the Hong Kong H5N1 viruses of 1997 showed these viruses can cause disease in a variety of gallinaceous birds, geese and emus, but caused no disease in ducks and pigeons. In pathogenesis studies, expression of the nonstructural protein was sufficient to cause cell death and required the RNA-binding domain of the protein. However, viruses with mutated non-structural genes still induced apoptosis. A rapid test to confirm the presence of avian influenza was developed and a baculovirus expressed hemagglutinin protein was produced for use with hemagglutination inhibition assays. Our laboratory has developed a reverse genetics system to look at the impact of individual avian influenza genes on disease pathogenesis. This has allowed us to examine the role of the nonstructural gene in the pathogenesis of a specific virus, WSN33.

**Subcommittee on Mycoplasmosis**

The following report on *Mycoplasmosis in Alabama* was presented by Dr. Fred Hoerr, State of Alabama:

In 2000, Alabama experienced an increase in the number of broiler breeder flocks infected with *Mycoplasma synoviae*. This followed three years of fewer than 5 flocks infected annually. The outbreak involved two companies and originated from infected spike males. The infected males spread the infection to 11 breeder farms in company A, from which the infection spread to a male rearing house of company B. These males were then distributed and spread the infection to breeder houses in company B.

Prior to moving the index flock of males, all sera tested negative for MS, however, one pool of 5 tracheal swabs tested weakly positive for MS. Additional tracheal swabs were obtained and all tested negative for MS by PCR on the second test. The decision was made to distribute the males to the breeder houses. After the move, however, the infection was fully expressed and all of the distributed males seroconverted to MS and became PCR positive. All infections were subclinical and did not cause obvious respiratory or skeletal disease in breeders or broiler progeny.

Several issues surfaced in this epornitic. Company A was diligent in testing the males prior to moving, but the infection involved only a few birds prior to the move. The PCR test indicated there was a problem but it was missed in the follow-up testing, likely due to the low level of infection at the time. Breeder farms contracted to companies A and B were in close proximity.
REPORT OF THE COMMITTEE

The following report on Mycoplasmosis in North Carolina Poultry 1999 - 2000 was presented by Dr. David Ley, North Carolina State University:

David H. Ley, Algis Martinez, and Jean-Pierre Vaillancourt

Since October 1999, North Carolina has experienced unprecedented outbreaks of Mycoplasma gallisepticum (MG) in commercial poultry flocks. This epidemic has involved breeder and meat flocks of chickens and turkeys resulting in 104 farms quarantined (16 broiler breeder, 40 broiler, 8 turkey breeder, 40 commercial turkey) and 11 backyard flocks. Investigations of this epidemic have involved the North Carolina State University College of Veterinary Medicine (Poultry Health Management faculty in the Department of Farm Animal Health and Resource Management) and College of Agriculture and Life Sciences (Cooperative Extension Service, Department of Poultry Science), North Carolina Department of Agriculture, National Poultry Improvement Plan, and commercial poultry integrators. NCSU-CVM efforts have focused on 1) MG isolation, and strain identification by DNA fingerprinting, and 2) epidemiology consisting of field investigations, a case control study, and reporting (supported in part by grants from the USDA Fund for Rural America and US Poultry and Egg Association).

DNA Fingerprinting

Random amplification of polymorphic DNA (RAPD) is a PCR-based method of DNA fingerprinting that results in amplification of ‘anonymous’ stretches of DNA with one (or sometimes more) short arbitrary primers and subsequent visualization of the amplification products by agarose gel electrophoresis. Compared to other currently available methods of avian mycoplasma strain identification, RAPD is fast, relatively simple to perform and cost effective. However, there are disadvantages and limitations to RAPD fingerprinting that must be considered. Starting material for the test requires a pure culture of the mycoplasma isolate. RAPD tests are known to have problems with reproducibility because they are sensitive to alterations in PCR conditions. Interpretation of RAPD banding patterns can also be challenging due to the aforementioned problem of reproducibility, and the possibility of co-migrating bands. The ‘challenges’ of reproducibility and interpretation can usually be overcome by using one or more additional primer sets to confirm apparent relationships or resolve ambiguous results.

Our objective was to perform RAPD analyses on MG isolates from affected flocks in North Carolina. Of 67 mycoplasma cultures that we examined 76% were pure MG, 21% contained MG and MS, and 3% contained MG and some other Mycoplasma species. Of the isolates that we fingerprinted by RAPD we identified four different ‘RAPD types’: approximately 4% were type A, 91% type B, 2% type E, and 4% type F. These RAPD types were defined by fingerprint banding patterns that were distinct from one another using two primer sets. We also found that these RAPD
types or field strains had fingerprints that were different than the MG vaccine strains (F, ts11 and 6/85) and the 'House finch' strain, which indicates that these strains are not involved in this epidemic.

The ability to assign RAPD type or strain identities to MG-positive flocks enabled us to learn more about the epidemiology of the outbreaks. For example, a large cluster of MG-positive flocks in eastern North Carolina involved RAPD types A and B. RAPD type A was isolated from a single backyard flock and multiple houses of a nearby turkey breeder farm and nowhere else. Type B was isolated from a broiler breeder farm, but before the infection was recognized progeny were moved to a site near other poultry farms in a neighboring county. Unfortunately, type B became widespread and was involved in major foci of infections in eastern and western North Carolina. RAPD type E has only been isolated from a single broiler breeder farm in the northwestern part of the state and the suspected origin was a nearby backyard flock. MG RAPD type F was identified in northeastern North Carolina and involved a cluster of farms consisting of a broiler breeder flock and multiple flocks of progeny.

The successful application of RAPD fingerprinting to MG field isolates has validated the utility of strain identification. Future developments and improvements in strain identification technology can be anticipated and may include, 1) the use of computerized DNA fingerprint analysis and database system, and/or 2) new methodologies for molecular typing. Computer-assisted DNA analysis systems can be used to correct, process and analyze gels in order to compare banding patterns, and are particularly effective in epidemiological studies. The power of a computerized DNA analysis system resides in its capacity to compare every new strain with all previously analyzed strains, and to develop large databases for comparison. Additionally, there is the prospect that new molecular typing methodologies will be developed for avian mycoplasma strain identification that improve upon RAPD's requirement for growth a pure culture, and problems of reproducibility and interpretation.

Epidemiology

Soon after hurricanes Dennis (Aug 31), Floyd (Sept 16), and Irene (Oct 18) impacted North Carolina in 1999, outbreaks of MG occurred in broiler and turkey breeders. Cases were first observed in the eastern half of the state. Before the end of the year, chicken and turkey meat flocks had been infected by vertical (broilers) and horizontal (turkeys) transmission. This included 23 broiler farms in western North Carolina that received progeny of infected broiler breeder flocks. However, the majority of cases have occurred in the eastern part of the state. Of 75 cases in eastern North Carolina, 17 resulted from vertical transmission to broilers.

Since March 2000, the vast majority of confirmed MG cases have involved commercial turkey flocks. Typically, infected turkey flocks first showed upper respiratory signs before testing could confirm the presence of MG.
On average, flocks were 13 weeks of age at onset of clinical signs (the median being 12 weeks). The youngest flocks showing clinical signs were 6 weeks of age and the oldest were 19 weeks of age. Some flocks showed signs consistent with MG a few days before processing (normally at 20 weeks), but these cases could not be confirmed by serology or organism detection. When brooder-age birds were present on farms with MG positive grow-out birds, MG was also detected in these younger birds soon after transfer to grow-out at 6 weeks of age. In some instances, MG was not confirmed before the younger flock had reached 13 to 16 weeks of age. However, in these cases there was a history of antimicrobial use that could have delayed the onset of infection and/or clinical signs.

Inciting causes of this epidemic are not clear. One hypothesis is that disruptions caused by hurricanes impacting eastern North Carolina in the Fall of 1999 provided favorable conditions to trigger the initial outbreaks (i.e., strong winds, flooding, severe damage to buildings leading to increased on-farm traffic, etc.). However, two of the four strains of MG involved surfaced in commercial operations several months after these environmental disturbances. Also, it was apparent that in some cases in the Fall of 1999, MG monitoring of broiler breeder flocks was not adequate due to sub-optimal intervals between tests and between sampling and reporting results. These circumstances opened a window of opportunity for vertical transmission of MG from broiler breeders to progeny.

Epidemiological investigation of MG-positive farms where vertical transmission was not involved is ongoing and includes neighboring farms that were not quarantined. These farms are matched with MG-positive farms based on location, type of production, and flock age. Preliminary univariate analyses (Fisher’s Exact test) on data collected from 26 MG-positive and 14 MG-negative farms suggest that relationships among farm workers and biosecurity are primary factors that contributed to this epidemic.

The risk of becoming MG-positive appears to be higher in areas of high farm density. About 7% of farms with at least 10 other farms within a 2-mile radius have been identified as MG-positive compared to about 4% for farms with less than 10 neighbors. On average, MG-positive farms had 2.1 MG-positive neighbors while MG-negative farms included in the case-control study had 2.6. Of course, this was by design since MG-negative farms were selected in MG-positive areas. Nonetheless, it does suggest that proximity to MG-positive farms, by itself, is not the only determining factor. For example, although MG-positive backyard flocks have been directly associated with a few outbreaks, the presence of backyard flocks known to commercial growers in the vicinity of their farms was the same for MG-positive and MG-negative farms (p=0.75). Interestingly, when asked if they knew the owners of these backyard flocks, 12 of 16 MG-positive growers answered yes compared to 2 of 6 MG-negative growers (p=0.14). We could also determine that in 10 of the 26 MG cases, a direct connection existed between a positive farm and a previous case (e.g., grower helped another
 TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

grower who had MG and then returned to his farm without changing clothing or boots). Such connections could not be established for the MG-negative farms that have been investigated so far (p=0.03).

Approximately 63% of growers from MG-positive farms did not require coveralls for visitors compared to 7% of the MG-negative growers (p=0.0009). 25% of MG-positive growers also did not require rubber or plastic boots while all of the MG-negative growers required at least one type of foot cover for farm visits (p=0.04). Factors such as 1) the presence of a washing station at the entrance of the farm, 2) the use of a gate to control on-farm traffic, and 3) the use of sub-contractor to remove used litter did not differ between MG-positive and MG-negative farms.

MG is a reportable disease in North Carolina and all infected farms are quarantined. However, because financial compensation is not available from state government the fate of MG-positive flocks is determined by the integrator and depopulation may not be immediate. In many cases, commercial birds have been kept several weeks after being confirmed MG-positive. The impact of keeping infected flocks in the field on incidence, and duration of the epidemic, is a source of concern and is currently under study. As a case in point, by 28 September 2000 it appeared that the epidemic was slowing. The last quarantine was issued 23 August and the last positive flock was scheduled for processing in late October. However, a new quarantine was issued on 29 September for an 8-week-old commercial turkey flock that was in the same county as some of the remaining positive flocks.

Although investigations are still in progress, current evidence suggests that inadequate monitoring of some broiler breeder flocks, the movements and interactions of people, and lack or lapses of biosecurity were major factors contributing to this epidemic of MG in North Carolina.

The following report on Mycoplasmosis: National Perspective was presented by Dr. Stanley Kleven, University of Georgia:

As an industry, we remain committed to control of the pathogenic avian mycoplasmas (Mycoplasma gallisepticum, M. synoviae, M. meleagrisidis, and M. iowae) by maintaining our breeding flocks free of infection. Although no official records are maintained, it seems evident that over the years there is a tendency for the number of outbreaks to be increasing. During the past year there have been an exceptionally high number of cases of MG infection; the North Carolina outbreaks have been the major contributors, but there have also been a disturbingly high number of outbreaks in many areas of the U.S. in recent years. MS outbreaks have also tended to be on the increase.

To what do we owe this increase and what are the solutions? I don’t know, but here are some of my thoughts:

Our poultry population is larger than ever, and it tends to be concentrated into restricted geographic areas. This increases potential contacts among birds and flocks and increases the probability of inadvertent infec-
REPORT OF THE COMMITTEE

tions. Once an infection is established in a concentrated area or within a company, spread often readily occurs, and control then becomes very difficult. The recent outbreaks in North Carolina are an example of this. Other highly populated areas do not have a history of large numbers of outbreaks. This includes Georgia, Minnesota, and Delmarva. These areas have large poultry populations, and I don’t believe that their biosecurity measures are necessarily better than those found in other areas. I believe that where there is very little MG or MS around, there is essentially no organism to be carried into susceptible flocks. I may be mistaken, but it seems to me that the majority of MS and MG breaks occur where there is a mixture of turkey and chicken production. I don’t understand why. Another major management practice that contributes significantly to increased risk of infection is “spiking males”.

Complacency.

Many of our veterinarians and managers have never experienced disastrous condemnations due to MG infection or seriously crippling of flocks from infectious synovitis. This has led to a reduced sense of urgency in preventing these infections or in eliminating infected breeding flocks. It seems clear that a major factor in the clinical and economic severity of an MG or MS infection depends on the virulence of the organism involved. MG and MS strains vary from virtually avirulent to those, which can cause severe clinical disease. (Turkeys are clearly more susceptible to MG, but even there we have seen many recent instances of breaks without disastrous economic consequence.) We have been blessed(??) with outbreaks with relatively avirulent strains which have not caused severe economic consequences. I know that highly virulent strains still exist; I am concerned that our complacency may cause us to be badly “bit”.

Antibiotic medication.

There are highly effective antibiotics against Mycoplasmas, but none of them offer long term solutions or are able to “sterilize” a flock. However, some of the newer products (notably the fluoroquinolones) are highly efficacious. Many companies have elected to medicate MG-infected broiler parents to reduce the level of infection in the flock and the level of egg transmission rather than to eliminate the flock. From an economic point of view this has worked well; generally, there have not been significant increases in respiratory disease problems in progeny of such flocks. However, I am concerned that if we begin to rely too heavily on such medication, it may backfire on us. I know from personal experience that MG strains can become highly resistant to fluoroquinolones and to other antibiotics as well. I’m concerned that if we rely too heavily on such medications we may in the end have a bigger problem than ever.
Vaccination.

Bacterins and live vaccines for MG have been available for some years now. Commercial egg producers have learned that they can control egg production losses caused by MG very effectively by vaccination. Others and I have had favorable results (outside the U.S.) using live vaccines on multi-age broiler breeder production facilities to control respiratory disease in the broiler progeny. Countries such as Australia now rely almost completely on live vaccines to control MG (and more recently, also MS). With MG vaccines, as with most other live products, the safety of the milder products must be balanced against the better efficacy of F strain. The major problem, however, comes when you factor turkeys into the mix. None of the current products are completely satisfactory for use in turkeys; in fact, one of them (F strain) is virulent for turkeys. There have been numerous examples of “escape” of live MG vaccines into turkeys, resulting in clinical disease. The result may be that widespread use of vaccines to control MG in layers or broiler breeders may not be compatible with raising turkeys free of MG infection.

We have learned much about improving diagnosis and control of avian Mycoplasmosis. Unfortunately, none of these control methods can replace the tried and true method of control by maintaining our flocks free of infection. Medication and vaccines have their place, but they need to be used carefully and judiciously. Overall, however, we need to recommit ourselves to improving rapid diagnosis and biosecurity to maintain our flocks free of infection.

Subcommittee on Infectious Bronchitis – Current Field Strains

The following report on Infectious Bronchitis in Georgia was presented by Dr. John Glisson, University of Georgia:

Infectious bronchitis virus (IBV) continues to be the most common respiratory viral pathogen of commercial chickens in Georgia. Because IBV infection is common and economically damaging, the Poultry Diagnostic and Research Center (PDRC) at The University of Georgia and the Georgia Poultry Laboratory (GPL) have developed programs and services to isolate, identify, and characterize IBV's from commercial poultry. The labs use RT-PCR to characterize the S1 gene, which predicts the serotype of the virus with a high degree of accuracy. These efforts have allowed the Georgia poultry industry to know which IBV's are most common in Georgia and which IBV's are associated with disease.

During the 1990's, Ark serotype IBV has been the most commonly isolated IBV from chickens in Georgia. In the late 1990's, Del-072 serotype of IBV was isolated from several locations in Georgia and the use of live Del-072 vaccine was allowed on a permit basis. Beginning in 1998, IBV’s were isolated that were similar to Del-072 yet distinctly different. The same type of IBV was concurrently isolated in Alabama. Initially, these viruses were
described as Del-072-like. Subsequent research indicated that these viruses were distinct from Del-072 and that an immune response induced by Del-072 gave only partial protection against the Del-072-like viruses. Virus neutralization assays confirmed the in-vivo research. As a result, the Del-072-like viruses were given the new name GA 98 IBV.

In April 2000, a group of poultry industry and university experts met at PDRC to discuss the issues involved with emergence of GA 98 IBV and potential control measures. The group generally felt that it was wise to begin the attenuation process of GA 98 in the event that the virus becomes established long-term in the commercial chicken population.

Since that time, three isolates of GA 98 IBV have been attenuated by serial embryo passage and are available to vaccine manufacturers for product development.

Since late spring 2000, the isolation rate of GA 98 IBV has dramatically declined in both Alabama and Georgia. The poultry industry is cautiously optimistic that GA 98 IBV may not establish itself long-term. The coming winter season will provide the proper environment to allow the virus to present itself, if it has become established.

The following report on Infectious Bronchitis in Alabama was presented by Dr. Fred Hoerr, State of Alabama:

Infectious bronchitis (IB) is the most common viral respiratory disease of broilers in Alabama. Infectious bronchitis virus (IBV) is isolated from broilers with highest frequency from December through April. The Arkansas serotype is the most prevalent IBV serotype isolated and Ark DPI predominates within that group. Ark 99 IBV was the most common in 1997, but has diminished in frequency of isolation. Other common IBV serotypes are Mass and Conn, presumably representing isolations of vaccine viruses.

For diagnosis, IBV is isolated in embryonated eggs. The virus is detected in allantoic fluid by RT-PCR and the serotype is deduced from restriction fragment length polymorphism (RFLP) analysis. In February 1999, an IBV with an RFLP pattern similar to DE 072 was isolated in north Alabama, first from broiler breeders and then from broilers. More than 90 isolates of DE 072-like IBV were obtained from broilers from March 1999 through May 2000. Affected flocks showed minimal signs of disease, however, high condemnations from pneumonia and air sacculitis occurred at processing. Preceding the Alabama experience by a few months, this virus was isolated from broilers in Georgia in late 1998. Serological studies completed at the University of Georgia indicated that significant differences existed between this virus and DE 072, and the other IBV serotypes (Mark Jackwood, personal communication). Partial protection, however, was observed with DE 072 vaccine.

In consideration of these challenge study results and the nomenclature confusion, the DE 072-like virus was named GA 98, based on isolation of the index case from broilers in Georgia in late 1998. Even with the anti-
genic differences, poultry producers began using DE 072 live IBV vaccine as the primary means of control. The rationale was that the partial protection offered by DE 072 vaccine was a better control strategy than having immunologically naïve birds. The incidence of GA 98 isolation declined considerably in north Alabama after widespread vaccination with DE 072 started. DE 072 vaccine was typically administered by spray in the hatchery and by spray or drinking water at age 14 to 17 days, usually in combination with IBV Ark and Newcastle.

The isolation frequency of GA 98 has declined in Alabama during the summer of 2000. Whether the decline in GA 98 isolation in Alabama is due to DE 072 vaccination or the virus has naturally declined in prevalence is not well understood. Other IBV isolates that do not fit the standard PCR/RFLP classification continue to emerge in north Alabama. Most are identified in only a few cases. The serological relationship of these isolates to known IBVs merits further study.

The following report on the Georgia 98 & Del 072 Serotypes of Infectious Bronchitis Virus in Georgia, was presented by Dr. John A. Smith, Fieldale Farms, Baldwin, Georgia.

The Delaware 072 serotype of Infectious Bronchitis Virus (IBV) was identified in Delaware in 1992. The virus was isolated from broilers in northern Georgia by early 1997. In the author’s company, 4 separate isolations of Delaware 072 IBV were made in April and May of 1997, and 2 more in late December of 1997. There were 5 isolations of Delaware 072 IBV in this company in 1998, in January through June, and 6 isolations in 1999, between January and August. Hemagglutination inhibition (HI) testing of serum from processing-aged broilers also indicated possible Delaware 072 IBV challenge during this time period. The predominant isolate of IBV in this company and in northern Georgia during 1997-1999 was the Arkansas serotype and its variants.

These isolations of Delaware 072 and Arkansas IBV in 1997 and early 1998 were generally associated with moderate but significant respiratory disease, and manipulations of the existing B1 Newcastle Disease Virus (NDV) and Arkansas IBV vaccine programs were not producing desired results. Accordingly, permission was obtained to use the Delaware 072 IBV vaccine in early 1998. This vaccine was used along with B1 NDV vaccine and Arkansas IBV vaccine in the field boost, between February and July of 1998. The response was judged to be equivocal.

In late 1998 and early 1999, respiratory disease in broilers became more severe. Use of the Delaware 072 IBV vaccine was resumed between January and May of 1999, again with B1 NDV vaccine and Arkansas IBV vaccine. The Delaware 072 was used in both the day-of-age and field boost administrations. On this occasion the response, while not dramatic, was much more obvious than that observed in early 1998. The incidence of clinical disease, therapeutic antibiotic usage, and condemnation for air...
sacculitis decreased in coincidence with the use of the Delaware 072 IBV vaccine. Cessation of the Delaware 072 IBV vaccine in May 1999 was associated with an uncharacteristic increase in clinical respiratory disease and therapeutic antibiotic usage in the summer of 1999. The Delaware 072 IBV vaccine was resumed in September 1999, and respiratory disease problems in the winter of 1999-2000 were present, but at a decreased level compared to the previous year. Continued use of the program through the summer of 2000 resulted in excellent health and performance.

In late spring of 2000, a trial was conducted to assess the IBV field challenge. One hatchery, producing about 40% of the broiler chicks in the company, was placed on a B1 NDV-Connecticut IBV vaccine program for approximately 6 weeks. These birds were field boosted with the same B1 NDV-Connecticut IBV vaccine. Approximately 210 specific pathogen free leghorn sentinel birds were prepared by eyedrop vaccination with the same B1 NDV-Connecticut IBV vaccine at 1 and 14 days of age, followed by a 3-week holding period in isolation units. The risk of disease in the test broiler flocks was felt to be manageable due to the favorable environmental conditions of late spring. However, a number of the test flocks developed significant respiratory disease. Twenty-one groups of 10 vaccinated sentinel birds were placed in sick test flocks at the onset of illness, and exposed for 6 - 7 days. In addition, 2 groups of unvaccinated sentinels were placed in empty houses following removal of sick flocks, and 6 groups of sick broilers were submitted for examination, for a total of 29 submissions. IBV was recovered from 15 submissions (52%). Of these 15 positive submissions, 9 were Georgia 98 IBV (60%), 5 were Arkansas IBV (33%), and 1 was Nebraska 95 IBV (7%).

ELISA serology for NDV and IBV was performed on 15 slaughter-aged birds from one house on each farm placed from the test hatchery, for 5 weeks before and 5 weeks after institution of the test vaccination program. The NDV titers did not change after the test program began, but IBV titers increased significantly after the program began, indicating that field IBV challenge was occurring. HI testing of selected groups was inconclusive, but suggested challenge with a Delaware 072-like virus.

The Georgia 98 serotype of IBV appears to be derived from the Delaware 072 serotype. The experience of one company in northern Georgia indicates that Delaware 072 and Georgia 98 are present in this area, and that the use of Delaware 072 vaccine is beneficial.

The following report on Nephropathogenic Bronchitis in Pennsylvania was presented by Dr. Sherrill Davison, University of Pennsylvania: Sherrill Davison\textsuperscript{A}, Andre F. Ziegler\textsuperscript{B}, Jack Gelb, Jr.\textsuperscript{C}, Patricia A. Dunn\textsuperscript{D}, and Robert J. Eckroade\textsuperscript{A}—New Bolton Center\textsuperscript{A}, University of Pennsylvania, Lasher Laboratory\textsuperscript{B}, University of Delaware Dept of Animal and Food Sciences\textsuperscript{C}, University of Delaware, The Animal Diagnostic Laboratory\textsuperscript{D}, The Pennsylvania State University.
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

Background

Infectious bronchitis is a viral disease of chickens that primarily causes respiratory disease, but certain serotypes of the virus may produce renal disease (nephropathogenic). Respiratory infections caused by infectious bronchitis virus are common in broilers and layers in the United States and result in millions of dollars in lost income to poultry producers each year due to airsacculitis condemnations, increased medication costs, reduced egg production and shell quality problems and mortality. In other countries, the nephropathogenic form of infectious bronchitis is also an important cause of disease and mortality in broilers and young pullets (1,5,6). The nephropathogenic form of infectious bronchitis is uncommon in U.S. poultry (3,6). From 1997 to date, there have been 25 confirmed cases and approximately 15 suspected cases of nephropathogenic bronchitis observed in chickens raised in Pennsylvania. It is unclear, at this time, how this virus was introduced and spread between flocks in Pennsylvania. Affected flocks are owned by various companies and are located in a variety of geographical areas.

A wide range of poultry in Pennsylvania have been affected by the nephropathogenic strain of infectious bronchitis virus, including eighteen broiler flocks, four commercial pullet flocks, two commercial leghorn layer flocks and one commercial layer breeder flock. Compared with other affected groups, morbidity and mortality appeared greatest in diseased broiler flocks. Mortality as high as 23% has been reported. The primary clinical signs in the broilers and pullets included depression and watery droppings ("diarrhea"). Respiratory signs were minimal. Characteristic gross lesions in broilers and pullets consisted of dehydration and severe, diffuse renal swelling and pallor, with an increase in uric acid crystal retention in ureters and tubules. Gross necropsy findings in the affected layer and layer breeder flocks predominantly consisted of urolithiasis / visceral gout and moderate upper respiratory disease, respectively. Primary clinical signs in layer and layer breeders have included depression and watery droppings ("diarrhea") and a 3-4% drop in egg production.

Diagnosis

The current methods for diagnosing nephropathogenic bronchitis viral infection include observation of the gross lesions, histopathology, serology, immunohistochemistry, virus isolation and RT-PCR. Histopathology of kidneys from birds infected with nephropathogenic infectious bronchitis include an interstitial multifocal to generalized lymphocytic/plasmacytic nephritis. In addition, there is tubular dilatation and degeneration. Isolation of infectious bronchitis virus from diagnostic cases includes inoculation of embryonating chicken eggs and observing "characteristic" lesions. The virus may then be screened by monoclonal antibodies. Subsequent typing by the RT-PCR method for the amino acid sequencing of the hypervariable region of the S1 gene (4) has shown that the Pennsylvania nephropathogenic
isolates are unrelated to previously recognized serotypes. The RT-PCR results have shown that there are two distinct S1 genotypic families of the Pennsylvania nephropathogenic virus. One viral genotype was present in 1997 and 1998 while the second genotype has been present from 1999 to date.

Vaccination
A vaccine trial with modified live infectious bronchitis vaccines was conducted to determine if commercially available vaccines would offer protection against the Pennsylvania nephropathogenic isolates (2). Broilers were vaccinated with various combinations of commercially available vaccines and then challenged with a Pennsylvania nephropathogenic isolate. Overall, there was poor protection from the existing modified live vaccines.

Future Studies
The number of cases of nephropathogenic infectious bronchitis cases in Pennsylvania still appears to be increasing. Additional studies on the epidemiology, economics, alternative vaccination protocols, and improved diagnostic techniques are in progress.

References

SUBCOMMITTEE ON LARYNGOTRACHEITIS
The following report on Laryngotracheitis the Pennsylvania Experience was presented by Dr. Sherrill Davison, University of Pennsylvania: Sherrill Davison and Robert J. Eckroade
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

Background

Infectious Laryngotracheitis (ILT) is an acute viral respiratory disease primarily of chickens. Economic losses attributable to LT are increasingly important in many poultry producing areas throughout the United States and the world.

In the mid 1980's the poultry industry of Pennsylvania began experiencing an increase in the number of ILT cases. In 1984-1985, there were 38 confirmed cases (flocks) affecting approximately 1.8 million chickens. In the following year, 1986, only five cases were reported. Between 1988 and 1990, there were 101 cases of ILT in Pennsylvania. In all outbreaks, cases have been reported throughout the year with the majority occurring between January and May. Since that time a cooperative control program between industry, state and university personnel has been in place and the number of outbreaks have decreased.

Pennsylvania's poultry population is concentrated in five contiguous south-central counties (Lancaster, Lebanon, York, Adams and Berks) with approximately 50% of the flocks in Lancaster County. Pennsylvania has layers, broilers and commercial egg and meat type breeders. These poultry populations are mixed geographically unlike some states where primarily broilers or layers are located.

The majority of flocks that have been affected were unvaccinated broilers; however pullets, layers, breeders, roaster and backyard flocks were also diagnosed with ILT. Historically, chickens less than four weeks of age do not contract ILT. One broiler flock and one pullet flock were confirmed with ILT at three weeks of age. More characteristically, broilers broke between four and eight weeks of age, pullets between seven and fifteen weeks of age and layers between eighteen and seventy-six weeks of age.

Clinically, most flocks exhibited severe respiratory disease including difficulty in breathing and expectoration of blood from the trachea. Other flocks had only a mild respiratory disease and conjunctivitis. Some layer flocks had no change in egg production while others had a decrease rate of egg production between 5-15%. No change in eggshell quality occurred.

Mortality varied greatly between flocks; (mortality range: broiler flocks, 0.7%-50%; pullet flocks, 1.3-16%; layer flocks, normal -12%). Daily mortality in pullet and layer flocks did not follow a pattern but in unvaccinated broiler flocks mortality characteristically doubled each day (e.g. 50, 100, 200, 400 birds).

The most common postmortem lesions were hemorrhage and caseous material in the trachea; however, some broilers did not show the classical form of the disease. In these flocks, conjunctivitis and slight mucus in the trachea were the only lesions. Secondary bacterial infections were rarely seen in conjunction with ILT infection. This is supported by the fact that broilers had no higher condemnation rates due to septicemia/toxemia than normal. Concurrent viral infections were also uncommon. One flock had a concurrent Bronchitis virus infection and another flock had a Newcastle
virus infection. The ILT viruses isolated from these cases cannot be differentiated from chicken embryo-origin vaccine virus.

Control Measures

Vaccination

Two types of vaccines are available for ILT. These include one tissue-culture-origin-virus vaccine and several chicken embryo-origin vaccines. Control and prevention is through vaccination with either chicken embryo vaccines or tissue-culture-origin vaccines. Although the manufacturer recommends eyedrop administration, spray and water vaccination are often used by the poultry industry due to the economic advantage of these routes in vaccinating large numbers of birds. Commercial layers and breeders are vaccinated twice prior to the outset of lay. These flocks are usually vaccinated at 7 weeks by eyedrop and again between 12-15 weeks by eyedrop, water or spray.

Broilers are usually not vaccinated unless they are in the vicinity of an outbreak. When this occurs, they are then vaccinated with chicken embryo-origin virus in the water at 10-12 days of age. Vaccine reactions are minimal when administered at this age and increase, as the birds get older. Many times, vaccination past 3 weeks of age is not suggested due to the increase in associated reactions.

Vaccination also may be used in the face of an outbreak in pullets, layers and breeders. Both water or spray vaccination have been used with success in reducing the spread of the disease within a flock. To obtain the best result, as soon as the diagnosis of ILT is determined, vaccine should be administered. Use of ILT vaccination in broiler flocks during an outbreak has not been as successful in pullets and layers and in many situations has appeared to increase the mortality.

Some producers have switched from spray vaccination to water vaccination at 15 weeks of age because several pullet flocks have had severe reactions including mortality following spray vaccination. This change in the route of administration to water was also in response to producers’ concerns that spray vaccination had a higher potential of spread to neighboring flocks.

In the past, most authorities felt that water vaccination was not an adequate method for inducing protection to ILT, but challenge studies have contradicted that belief. Five broiler flocks were vaccinated at two weeks of age in the water with a double dose of a commercially available chick embryo-origin vaccine and thirteen flocks were given a single does of the same vaccine. In addition, eight broiler flocks were vaccinated in the water with a single does of a different commercially available chick embryo-origin vaccine. These flocks were challenged at the time of marketing and the results indicate that water vaccination with either a single or a double dose appears to afford adequate protection. Field observations also support this
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

finding in that only two broiler flocks that were previously vaccinated by water have broken with the disease.

Communication

Control measures for ILT are based on vaccination and biosecurity, but, more importantly, on good communication with essential poultry industry personnel. The Poultry Health Committee is an important part of the control program of diseases in Pennsylvania poultry. The committee consists of industry, state government and university representatives. This committee is essential for the proper communication of the location of ILT flocks, their proximity to other poultry and vaccination strategies. Since 1990, there have been reduced numbers of ILT outbreaks and in most situations they were related to a breakdown in communication. We have had enough experience with control measures throughout the 1980’s to understand what is our best approach to the control of ILT. ILT may appear in our poultry producing regions, but the key to decreasing the number of affected flocks is good communication and follow-through with the suggested plan. We have found that if an individual chooses to do something different than what the committee has decided, more cases will occur. In general, if all adhere to the plan of control discussed, we are able to minimize the number of cases.

The following report on Laryngotracheitis in Alabama was presented by Dr. Fred Hoerr, Alabama Department of Agriculture

North Alabama experienced 129 cases of laryngotracheitis (LT) in 98-99 and 43 cases in 99-2000. Outbreaks occurred from November 98 through April 99, and from October 99 to May 2000. Although hobby chickens were suspected to be the source of the virus, this was not confirmed. The outbreak coincided with reports of limited introduction of chick embryo origin LT vaccine in breeder pullets due to a disruption of in the supply of tissue culture vaccine. All randomly selected LT virus (LTV) isolates tested had a DNA pattern matching CEO vaccine strains. Company representatives attributed the fewer cases in 99-00 to improved biosecurity. A down time of 21 days and heating houses to 100°F for three days to inactivate virus after an outbreak was advocated. Heating houses proved difficult to enforce because of the expense of high fuel prices.

Alabama used progressively enlarging zones of vaccination both winters. The vulnerable point was the 21-day vaccination age limit (28 days of age maximum in high-risk situations), which allowed older flocks to break in vaccination zones and perpetuate the supply of virus. Cases continually jumped past vaccination zone borders. Some game and hobby chickens were involved and the flocks were vaccinated or depopulated. Possibly 2 broiler farms had recurring outbreaks, attesting to the efficacy of vaccine use and the success of stopping vaccination in mild weather. Broiler vaccination was stopped in the June 1999, again in June 2000.
REPORT OF THE COMMITTEE

Broiler cases varied in severity; milder cases had low mortality and were characterized chiefly by conjunctivitis. Most breaks occur just before processing. More severe cases reached daily mortality of 200 birds per flock and either decreased, or the birds were transported to processing. A mild case occurred a Leghorn flocks. No cases occurred in broiler breeders vaccinated with tissue culture LT vaccine administered by eye drop. One case occurred in a peafowl.

The Alabama laboratories use rapid tissue processing and histopathology for primary, same day or overnight diagnosis of LT. This requires using conjunctiva and trachea for examination, as inclusion bodies in mild or subacute cases are often found only in conjunctiva. Virus isolation in chick kidney tissue culture is the backup. The State Veterinarian sends faxes and letters identifying company, county, and grid (county highway maps) to all poultry companies offices.

The Alabama State Veterinarian has contacted in-state vendors of over-the-counter LT vaccines and asked them to sell only TC LT vaccine. It would be beneficial if other states would also do this, although it is recognized that vaccines can be purchased mail order from many sources. Even with this loophole, reducing the over-the-counter sources of CEO LT vaccine is deemed worthwhile.

The following report on Laryngotracheitis Field Experience and Lessons Learned in Georgia was presented by Dr. John Smith, Fieldale Farms, Baldwin, Georgia: John A. Smith DVM, MS, MAM, Louise Dufour Zavala DVM, MAM

Since the development of intensive broiler production in northern Georgia in the latter half of the 20th century, infectious laryngotracheitis (ILT) in broilers has tended to occur on an approximate 7-to-8-year cycle. Epornitics have typically lasted one or occasionally two years, with a summer hiatus in multiple-year outbreaks. Outbreaks traditionally have begun in late spring. Usually, one production area has been involved. However, in the 1990's, ILT seems to have increased in frequency and distribution in northern Georgia. The following data from the Georgia Poultry Laboratory illustrate the increase in frequency:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994-95</td>
<td>199</td>
</tr>
<tr>
<td>1995-96</td>
<td>95</td>
</tr>
<tr>
<td>1996-97</td>
<td>0</td>
</tr>
<tr>
<td>1997-98</td>
<td>2</td>
</tr>
<tr>
<td>1998-99</td>
<td>32</td>
</tr>
<tr>
<td>1999-2000</td>
<td>26</td>
</tr>
</tbody>
</table>
The 1994-1996 two-year epornitic was the first in a number of years. It was followed by a two-year break, then another multi-year outbreak in 1999-2000. It remains to be seen what will occur in 2000-2001. Persistence of cases into the summer months, and after cessation of broiler vaccination schemes, also seems to be an emerging problem. The monthly incidence of cases at the Georgia Poultry Laboratory in the 1998-2000 episode illustrates this trend:

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Cases</th>
<th>Control Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1999</td>
<td>6</td>
<td>Western Vaccination Zones 1 &amp; 2, 4/13 &amp; 4/16</td>
</tr>
<tr>
<td>April 1999</td>
<td>10</td>
<td>Western Vaccination Zone 3, 5/3</td>
</tr>
<tr>
<td>May 1999</td>
<td>5</td>
<td>Western Vaccination Zone 4-7, 6/8 &amp; 6/28</td>
</tr>
<tr>
<td>June 1999</td>
<td>7</td>
<td>Zone 1 stopped 6/28, small area resumed 7/20</td>
</tr>
<tr>
<td>July 1999</td>
<td>3</td>
<td>Western Vaccination Zone 1 resumed 8/5</td>
</tr>
<tr>
<td>August 1999</td>
<td>1</td>
<td>All broiler vaccination stopped 8/30</td>
</tr>
<tr>
<td>September 1999</td>
<td>0</td>
<td>Western Vaccination Zones 1-7 resumed 10/14</td>
</tr>
<tr>
<td>October 1999</td>
<td>6</td>
<td>Eastern Vaccination Zone 11/15</td>
</tr>
<tr>
<td>November 1999</td>
<td>6</td>
<td>Central Quarantine Zone (No vaccination)</td>
</tr>
<tr>
<td>December 1999</td>
<td>2</td>
<td>All broiler vaccination ceased 5/5</td>
</tr>
<tr>
<td>January 2000</td>
<td>0</td>
<td>Eastern Quarantine Zone (No vaccination)</td>
</tr>
<tr>
<td>February 2000</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>March 2000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>April 2000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>May 2000</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>June 2000</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>July 2000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>August 2000</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

The distribution of cases also seems to be increasing. The 1994-95 and 1995-96 epornitics began in an intensive production area southeast of Gainesville, Georgia, and spread locally from there. The 1998-99 outbreak involved a separate area in northwestern Georgia near Rome, Georgia,
and generally spread along live haul routes to processing plants. This epornitic eventually involved an area of roughly 48 by 96 km (30 by 60 miles), or 4680 km² (1800 square miles). The 1999-2000 epornitic had 3 separate foci. The same area in northwestern Georgia was involved again. Cases in a second area northeast of Athens, Georgia appeared to be a separate outbreak. This area had not been affected in recent history, and eventually expanded to about 32 by 32 km (20 by 20 miles), or 1024 km² (400 square miles). Finally, a small focus in the original area southeast of Gainesville, Georgia developed late in the 1999-2000 epornitic.

The occurrence of ILT in unvaccinated poultry in Georgia prompts the epidemiologist at the Georgia Poultry Laboratory to convene a meeting of the Technical Advisory Committee. This Committee consists of a representative from all commercial poultry producers in the state (primary breeder, broiler, and commercial egg producers), as well as a representative from the game bird association. The Committee formulates control schemes, which include the establishment of ILT vaccination zones and quarantine and biosecurity policies.

**Lessons Learned**

The 1994-95 and 1995-96 epornitics were severe, with 199 and 95 confirmed cases respectively. In those epornitics, there was reluctance to vaccinate broilers, and compliance with control programs was likely incomplete. Small vaccination zones gradually expanded as cases leaped over the borders of the zones.

In 1998-99 and again in 1999-2000 there were fewer cases (32 and 26, respectively) in spite of the fact that larger and even multiple areas were involved. It appears that the industry response to these latter epornitics, via the Technical Advisory Committee, was more aggressive, and compliance was more uniform (although likely still less than perfect). Vaccination zones seem to be more effective when they

1. are established early in an epornitic,
2. are relatively large in relation to the location of cases,
3. include the routes to the processing plants where birds within the zones will be slaughtered, and
4. are observed by all producers in the zone.

Nevertheless, resistance to ILT vaccination of broilers will likely continue, due to the penalties associated with the use of live, chick embryo origin (CEO) ILTV vaccines in intensively reared broilers. These vaccines typically produce harsh reactions and decrease performance, while increasing condemnations due to air sacculitis. Early in an epornitic, broiler managers are faced with a choice between risking a few cases of potentially severe ILT, as opposed to insuring that many flocks will experience moderate disease due to vaccine usage. It is also difficult to successfully vaccinate a rapidly growing, intensively reared bird for ILT, Newcastle Disease Virus, and two serotypes of Infectious Bronchitis Virus (IBV) within a short
6 to 8 week lifespan. In particular, many producers have noted that vaccines for the Arkansas serotype of IBV are difficult to use with ILTV vaccine. Removing the Arkansas vaccine from the program to accommodate the ILTV vaccine jeopardizes the IBV program.

One major question remains to be answered: What is the original source of the epornitics? Molecular epidemiology using current tools indicates that ILT viruses from field cases are indistinguishable from vaccine strains. Use of CEO ILTV vaccines in classes of poultry other than broilers (such as heavy breeders and commercial leghorns) is common, and is one potential culprit. The long hiatuses between outbreaks prior to 1994, in the face of ongoing use of CEO ILTV vaccine in other classes of birds, are certainly mysterious, and may cast doubt on this theory. The reasons for the increasing frequency of ILT in broilers in recent years are easier to speculate upon. Such reasons may include increasingly dense poultry populations, mixing of different classes (breeders, leghorns, and broilers) in the same geographical area, rapid population turnover (due to rapid growth rates and short down times), and lax biosecurity. The obvious alternative of ceasing vaccination of long-lived birds with CEO ILTV vaccines is not likely to be popular, because the risk of ILT in such flocks is not acceptable. This is especially true when one considers that the consequences of CEO ILTV vaccine use in these birds does not appear to be nearly as injurious as it is in broilers. The tissue culture origin ILTV vaccine is safer, but the supply of this vaccine is sometimes limited, and some managers feel that immunity is compromised.

Since the chicken is the only natural host for ILTV, eradication would seem to be a feasible and worthwhile goal. Development of an effective ILTV vaccine that does not shed nor revert to virulence and that is readily available would advance the possibility of eradication. If the use of CEO ILTV vaccines in long-lived classes of birds were indeed the major source of epornitics in broilers, then development of a safer vaccine for use in these long-lived birds would also lessen the urgency for eradication.

The following Report on Laryngotracheitis Field Experience and Lessons Learned in Delmarva was presented by Dr. Bruce Stewart-Brown, Perdue, Salisbury, MD.

Delmarva: Current Status of LT

Delmarva has had cases sporadically for many years. This area goes in and out of vaccination every couple of years. "Cases" for us are in purposely-vaccinated birds or not-vaccinated birds. In other words, we will submit flocks to the diagnostic lab for excessive LT vaccine reaction so we can look for other viruses. These cases end up on the LT case list.

We have submitted some viruses for molecular characterization and have found the virus is indistinguishable from LT vaccine virus. To us this virus is one type of virus and we deal with it as such.
REPORT OF THE COMMITTEE

The virulence varies significantly from case to case. Younger birds are less affected and have lower mortality and morbidity. There are some other obvious issues that influence the virulence such as air quality and Infectious Bronchitis.

Delmarva: LT Control Challenges

Each area has its own challenges and Delmarva is not an exception. To look at an “Outbreak Report” and think you can understand what is going on is a mistake. Although the scientific “best answer” might be somewhat obvious, there are likely many other issues that will make you deviate somewhat from the “obvious plan”.

Delmarva has some issues that make it difficult and somewhat novel (although becoming less so) compared to other poultry areas. There are 4 integrators intermingled. There are 6 types of birds being raised – co-mingled with each other.

1. Cornish – 28-30 days
2. Small Broilers – 40-42 days
3. Large Broilers – 48-50 days
4. Filler – essentially small broilers
5. Roaster – 56-60 days
6. Breeders

Chickens are very concentrated in certain areas. LT is frequently the most prevalent in the most concentrated areas. The growers on Delmarva have “seen it all” as it relates to LT, LT vaccination, and issues associated with biosecurity. Warnings and policy changes are sometimes met with skepticism and low conformance. All contracts (synonymous with complexes in some areas) are competitive. That means each week the growers compete against each other for best performance and best paycheck. The most efficient performance is rewarded. Housing is variable but with some distinct improvements in the past 5 years. Ventilation capability varies with grower and housing makeup. The economics of poultry raising is such that many people cannot afford to care for only their chickens. This means there are multiple caretakers, tenant farmers, and less time in the houses overall.

Vaccination Approaches

Basically, ring approaches (2 or 5 mile radius) are done until there are multiple companies involved and/or it becomes obvious there is no pattern to the outbreaks. Once out of the confined areas, large blocks are identified (using a grid map) that amply covers the area at risk and a large area of vaccination is initiated. General agreement for all integrators is essential and, with some discussion, frequently achieved. The stop date in our area varies. This is essentially due to the different ages of birds and the tremendous difference in risk. A roaster flock will suffer a tremendous loss when compared to a young broiler flock. The younger contracts will pull vaccina-
tion if 6 weeks have gone by with no reported cases. The older birds need a considerably longer time period. In my opinion, the stop date needs to be based on the current reported cases and season. Stopping mid-summer after 6 weeks of "no cases" will look good initially but the opportunities for break-backs in the fall will be high. Although it is a cost, vaccinating through the summer through to early winter is more likely to yield a successful outcome. It allows you to have protected birds into spring. When susceptible flocks get to susceptible age, the air quality is good (virus concentrations are low) and the summer heat is helpful in destroying whatever lingering virus is still around.

In my opinion, vaccination should be avoided as long as possible (especially if the first cases are appearing in mid-winter and you can somehow isolate the area). This is a very problematic concept. The report is very visible and people getting the report have some limited knowledge of all the field issues. When breaks begin to be reported a lot of people start to have opinions of what to do for many reasons other than how best to control and minimize the effects of this virus on our chickens. The worst problems with vaccination are generally at start-up. Once we have worked with the vaccine, vaccine application, and ventilating in the reaction for several consecutive flocks the system usually works with very few issues. We need to avoid going in and out of vaccination for LT (and probably other viruses). When vaccination is initiated it needs to be widespread (in area) and contract-wide much more often than it is. Vaccinating some flocks and not others in a competitive contract situation requires a very good relationship between the grower and the integrator. Although it can be argued that the grower has a big role to play in the presence or absence of viruses entering their farm, they do not have complete control of this issue.

Biosecurity Challenges

As many have said the last few years, we need to treat many of these production areas as multi-age facilities. There is not much "viral downtime" in many of these densely-populated broiler areas. We need to try some new methods. Veterinarians alone will not develop these ideas, it will require a joint effort between the live production managers from all companies involved. In addition, growers will need to be involved. The relationship between growers and integrators will need to be such that we can do some "unconventional" practices and get total cooperation.

The following Update on Laryngotracheitis Research was presented by Dr. Maricarmen Garcia, University of Georgia:

Infectious laryngotracheitis (ILT) is a severe acute respiratory disease of chickens caused by infectious laryngotracheitis virus (ILTV). Despite efforts to control the disease through vaccination and implementation of biosecurity measures, outbreaks of ILT are still a threat to the poultry industry. To better understand the epidemiology of the disease a PCR- Restric-
tion Fragment Length Polymorphism (RFLP) assay of the glycoprotein E (gE) gene has been developed. Polymorphism of the gE gene was observed with enzymes Eael and Ddel among vaccine strains. Restriction enzyme Eael allowed easy differentiation of the Tissue Culture Origin (TCO) vaccine from Chicken Embryo Origin (CEO) vaccines (Table 1). Three RFLP patterns were observed with enzyme Ddel. Patterns A and B were characterized as single patterns, while the pattern C was characterized as a mixture of patterns A and B, suggesting that a mixed population of viruses may be present in pattern C vaccines. Pattern A was observed for the TCO vaccine and one CEO vaccine, while pattern C was observed for five of the six CEO vaccines analyzed.

Table 1.
RFLP Analysis ILTV Vaccine Strains

<table>
<thead>
<tr>
<th>Eael Patterns</th>
<th>Ddel Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCO</td>
<td>CEO A B C</td>
</tr>
<tr>
<td>CEO-1</td>
<td>X</td>
</tr>
<tr>
<td>CEO-2</td>
<td>X</td>
</tr>
<tr>
<td>CEO-3</td>
<td>X</td>
</tr>
<tr>
<td>CEO-4</td>
<td>X</td>
</tr>
<tr>
<td>CEO-5</td>
<td>X</td>
</tr>
<tr>
<td>CEO-6</td>
<td>X</td>
</tr>
<tr>
<td>TCO</td>
<td>X</td>
</tr>
</tbody>
</table>

A total of 42 tracheal samples from outbreak related broiler and layer flocks were collected during 1998 and 99, from the mid-Atlantic, southwest, North Central and Southeast regions. Out of 17 samples, from vaccinated flocks, two were from flocks vaccinated with TCO, and 15 were from flocks vaccinated with CEO. As expected, Eael RFLP patterns correlated with the vaccine administered to each flock. RFLP analysis with enzyme Eael on samples from non-vaccinated flocks indicated that 100% of the outbreak-related isolates were CEO-like viruses. Further RFLP analysis of viral samples from non-vaccinated flocks with Ddel indicated that 68% of the samples had an RFLP pattern A, 28% a pattern B, and 4% had the mixed-pattern C typical of most CEO vaccines (Table 2).
Table 2. RFLP Analysis \textit{gE-EaeIDdel} on clinical samples from nonvaccinated flocks

<table>
<thead>
<tr>
<th>Regions $^1$</th>
<th>\textit{EaeI} patterns</th>
<th>\textit{Ddel} patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCO</td>
<td>CEO</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>SE</td>
<td>0/2 $^2$</td>
<td>2/2</td>
</tr>
<tr>
<td>MA</td>
<td>0/20</td>
<td>20/20</td>
</tr>
<tr>
<td>SW</td>
<td>0/3</td>
<td>3/3</td>
</tr>
<tr>
<td>Total</td>
<td>0/25</td>
<td>25/25</td>
</tr>
<tr>
<td>%</td>
<td>100%</td>
<td>68%</td>
</tr>
</tbody>
</table>

The epidemiological data generated during this study showed that 96\% of the CEO-like isolates obtained from non-vaccinated flocks possess single patterns A (68\%) or B (28\%) with \textit{Ddel} enzyme. Based on this finding we speculate that recent ILT outbreaks originated from vaccine-derived viral sub-populations circulating in the field. Identification of molecularly different populations of viruses within the currently used ILT vaccine is the first step towards developing better molecular epidemiological tools to track vaccine isolates and to precisely identify the source of poorly attenuated strains in the field.

The following report on \textbf{Current Status of LT Vaccines and the Need for a New Generation of Vaccines} was presented by Dr. Deoki Tripathy, University of Illinois:

Vaccines consisting of infectious laryngotracheitis virus (ILTV) propagated either in chicken embryos or cell cultures are available commercially for the prevention of infectious laryngotracheitis (ILT) in chickens. These vaccines vary in virulence and are administered either by eye drop or orally through drinking water.

In spite of regular vaccinations, outbreaks of ILT in chickens still occur frequently. Because of the inherent ability of herpesviruses to become latent, ILT vaccines can establish a persistent, undetectable infection in immunized chickens. As a result of stresses, the virus can reactivate and become a source of infection for susceptible birds. In this regard, it is important to determine whether the virus responsible for an outbreak is a vaccine or field strain. In an attempt to differentiate these two types of ILTV, viral genomic DNAs were digested with various restriction enzymes and then subjected to agarose gel electrophoresis in order to evaluate their restriction fragment length polymorphism (RFLP). Although minor genetic differences were detected, these were not sufficient for the differentiation of field strains from vaccine strains of ILTV. Similarly, virulent and avirulent viruses could not be distinguished by such molecular techniques. Recently, a more sensitive comparison involving amplification of specific ILT genomic
fragments by polymerase chain reaction (PCR) and determination of their nucleotide sequences has been used for strain differentiation. Despite the detection of minor genetic differences, their potential role in virulence cannot be fully evaluated until the complete genomic sequence of this fairly large-sized virus is available.

In view of the increasing number of outbreaks of ILT and lack of methods for differentiation of field and vaccine ILTV strains, there is a need for developing a new generation of ILT vaccines. Efforts in this direction include the creation of DNA-based vaccines, virus-vectored vaccines, and genetically attenuated ILTV. Currently, DNA vaccination is not considered to be practical since several administrations of a large amount of DNA are needed. As to a heterologous virus expressing a protective foreign antigen, the gB gene of ILTV has been inserted into the genome of fowlpox virus and the resulting recombinant does make the foreign protein. In an effort to utilize the homologous pathogen in a vaccine and to generate a method of differentiation from field strains, ILTV has been attenuated and "marked" by directed genetic changes. Since herpes virus thymidine kinase (TK) has been associated with virulence, TK gene-deleted ILTV vaccines have been generated. In one study four genetically distinct ILTV isolates were created from a milder strain of vaccine virus whose TK activity was eliminated by insertion of a marker gene into its TK gene. All four recombinant viruses provided protection to vaccinated birds despite a reduction in virulence as compared to the parent virus. In a separate study, two recombinant ILTV generated from a virulent strain also became attenuated without compromising their immunogenic potential. These studies are encouraging and have paved the way for development of a new generation of effective vaccines for control of ILT. In an ideal ILTV vaccine, virulence has to be reduced without loss of antigenicity, the latency associated gene(s) need to be eliminated, the vaccine virus has to be effective under mass inoculation and the vaccine has to be easily distinguishable from field strains. Although all these highly ambitious attributes may not be achieved, with currently available molecular tools a reasonably effective vaccine can be generated especially when the complete ILT genome sequence is known.

8. The U.S. West Nile virus outbreak in 2000: An Update

The following report on West Nile virus was presented by Dr. Linda C. Glaser, USGS National Wildlife Center:

West Nile virus (WNV) is an arthropod-borne virus that had never been reported in the Western Hemisphere until the fall of 1999. Wild birds (primarily crows), horses, and people were affected in last year’s outbreak in the greater New York City area. This year, WNV activity was first detected in wild birds found dead in May in southeastern New York and northeastern New Jersey. The virus continues to expand both geographically (see National Atlas website) and in the number and variety of species infected.
West Nile virus has been isolated from over 2500 birds of 60 species, including 55 free-ranging species from 10 states (NY, NJ, CT, MA, RI, NH, VT, PA, MD, VA) and Washington, D.C. Wild mammal species in New York were found positive for WNV for the first time this year (see table) and horses from at least 6 states were clinically affected with WNV. At least 11 species of mosquitoes in 5 states (NY, NJ, CT, MA, PA) were found positive for WNV including species active at dawn and dusk, species active during the day, and species that feed on avian hosts and mammalian hosts. Staten Island is considered the epicenter of this year’s outbreak where 10 of the 17 confirmed human WNV cases were identified. There has been one human fatality from WNV this year.

Wild birds are playing a critical public health role in our western hemisphere WNV outbreaks. Several native bird species, particularly the American crow, appear to be highly susceptible to this recently introduced arbovirus. An enhanced passive surveillance system for reporting and testing dead birds has been the leading surveillance tool for state public health agencies in detecting WNV activity. West Nile positive birds were found in most areas long before mosquitoes, horses, people, or sentinel chickens indicated the virus was present in an area.

Wild mammals were first found positive for WNV in August of this year (1). Since then, over 22 bats and other mammals found dead in 10 counties in NY have tested positive for WNV. It appears that at least some of the bats found positive for WNV are dying of WNV. It is unknown whether these species are dead end hosts or if they will be capable of transmitting WNV to new species of primarily mammal feeding mosquitoes.

Horses are considered a dead end host for WNV. This year to date 29 horse cases have been identified from 6 states (CT, MA, NY, NJ, PA, RI) (2). Sixteen died or were euthanized. The first case onset date was 8/17/00. The European Union issued import restrictions effective 9/15/00 for horses originating from 5 states with equine cases of WNV.

Seventeen human cases of WNV have been identified this year with their onset of illness dates ranging from 7/18/00-9/13/00; their ages range from 37-87 years old. Public education on mosquito bite prevention and mosquito control efforts are credited with minimizing the number of human cases this year.


Website references
http://nationalatlas.gov/virusmap.html
http://www.cdc.gov/ncidod/dvbid/westnile/index.htm
http://www.health.state.ny.us/nysdoh/westnile/index.htm
9. Old and New Business

The following recommendations from the mycoplasma sub committee were discussed and approved:

1. USAHA/TDP Committee recommends a formal comparison of PCR primers and procedures for the detection of pathogenic mycoplasmas of poultry, as covered by the National Poultry Improvement Plan. Adopted October 24, 2000

2. USAHA/TDP Committee recommends that the General Conference Committee of the National Poultry Improvement Plan review the protocol for the testing of spike males, including testing by serology, PCR, and/or culture, prior to distribution of males to breeder flocks. Adopted October 24, 2000

There was considerable discussion on the closure of the Avian Program at NADC in Ames, Iowa and on the Movement of Poultry Health Programs from Ames, Iowa to Athens Georgia.

The following Resolutions were discussed and approved:

1. Support for the USDA's APHIS-ARS Master Plan
2. Support for the Congressional Feasibility Study on Avian Viral Diseases
3. Support for Avian Health Research Funding
4. Support for Funds to Eliminate H5 and H7 Low Path Avian Influenza Virus from the Live Bird Marketing System in the Northeast

There being no further business the meeting was adjourned.
Dr. Steve Meyer provided an overview of several key pork industry economic issues. He noted that animal health and management gains have contributed to increased pig production from a smaller number of breeding animals. Litter size and litters per breeding animal continue to increase. As packer buying grids narrow, he noted that this will make it more difficult for producers to maintain strict all-in, all-out practices which could contribute negatively to overall swine health. He outlined the reasons for increased number of swine in 2001 and 2002 and what could affect these projected increases.

Dr. Jim Collins provided information on recent isolations of European-like Porcine Reproductive and Respiratory Syndrome (PRRS) viruses. He noted that the first isolation of this EuroPRRS virus was genetically 35% different from U.S. PRRS viruses and 6% different from the Lelystad or European PRRS virus. The initial detection of the EuroPRRS virus was complicated as on PCR testing the virus was negative to U.S. strain primers and was detected only when European strain primers were used. An additional 43 EuroPRRS virus isolations have been made. There are differences between isolates of EuroPRRS virus in their ability to grow on MARC cells and macrophages. It is possible that the North American and European-like strains could recombine resulting in greater diversity of PRRS viruses in swine herds which would complicate control strategies.

Dr. Eric Bush provided an overview of the goals of the National Animal
Health Monitoring Systems (NAHMS) Swine 2000 Survey and gave a status report on the survey implementation. Six main areas are being addressed in Swine 2000 - (1) Respiratory Disease – PRRS, swine influenza and Mycoplasma, (2) National Serum Bank Collection, (3) Food-borne Pathogens – Salmonella, Toxoplasma, Yersinia, Campylobacter and E. coli O157:H7, (4) Antibiotic Use, (5) Environmental Management, and (6) Management Practices. From the initial 4500 farms responding to survey questions, over 600 are receiving on-farm visits. The first data and sample collection visit has been completed with the second visits to start in December 2000.

Dr. Keith Murray gave an update on the National Animal Disease Center-National Veterinary Services Laboratories (NVSL)-Center for Veterinary Biologics master facility plan. The proposed facility would replace outdated and inefficient facilities currently housing these USDA research, diagnostic and biologic groups. It was noted that the demands placed on the facilities are increasing as well as international standards for laboratories. Information was provided on expectations for funding for the proposed facilities.

Dr. Sabrina Swenson gave an update on the swine influenza diagnostic situation. She noted that NVSL is receiving many swine influenza submissions. Currently, there are more H1N1 isolates than H3N2 isolates which is different from the previous year when more were H3N2. Of recent note, an isolation of a H1N2 swine influenza virus has been reported in Indiana. In addition, Canada has reported the first isolation of a H4N6 virus in swine which is of avian lineage. Work is underway in the U.S. to study this H4N6 virus. In a U.S. serologic survey of the swine population, seroreactivity was 28.3% to H1N1, 26% to the Texas H3N2 strain 26% and 8% to the North Carolina H3N2 strain.

Dr. Ken Olson presented an update on the National Animal Health Emergency Management Steering Committee. The Steering Committee is a partnership of Federal and State government, veterinary and industry personnel focused on enhancing prevention of and response to foreign animal diseases and other animal emergencies. The Steering Committee has produced several documents to guide its activities including an Animal Health Emergency Management Model, a Strategic Plan and State Emergency Management Standards. Recently, a survey of national and state industry groups on emergency management was conducted. The survey results pointed out several areas for enhanced effort including communication and awareness plans for industry. The Steering Committee meets four times a year with monthly conference calls.

Dr. Dave Pyburn presented information on three programs from the pork industry. The Trichinae Certification Program is designed to introduce producers to on-farm food safety certification. It is a voluntary program developed by the National Pork Producers Council (NPPC), USDA and allied groups that provides documentation of swine management prac-
TRANSMISSIBLE DISEASES OF SWINE

tices which minimize the risk of exposure of swine to *Trichinella spiralis*. He noted that in the NAHMS 1995 Swine Survey there was a seroprevalence of 0.013%. Audits of on-farm practices are conducted by accredited veterinarians who receive specific audit training with oversight audits by USDA. Pilots are now underway with two packing plants and producers supplying those plants. A PRRS Checklist has been developed collaboratively with the American Association of Swine Practitioners and NPPC to serve as a guide for producers and practitioners in discussing a farm-specific PRRS prevention or control strategy. Another collaborative effort has been the development of biosecurity programs for swine farms. Three indexes to address supply herds, isolation practices, and prevention of indirect spread of diseases have been field tested and will be available for practitioners and producers.

Dr. Paul Yeske provided an update on current and future health issues for practitioners and producers. He noted that there may be multiple herd statuses within the same herd with the potential for more acute disease outbreaks. He noted that PRRS continues to be a significant problem in swine herds. *Mycoplasma* infections have increased in importance with more vaccination usage than in the past. Swine influenza continues to be of concern as new strains enter herds. With regard to enteric diseases, ileitis, colitis and *E. coli* are problems in different stages of production. He noted that cases of Porcine Dermatitis and Nephropathy Syndrome are being seen with the etiology not yet established. Abortions that are not attributable to a specific cause seem to be increasing. With regard to future health issues, his list of important needs included the prevention of foreign animal diseases, development of appropriate truck washing guidelines and facilities, improved disease monitoring tools and disease predictive models.

A panel discussion of four state veterinarians on the role of state departments of agriculture post-eradication programs was held. Dr. Bret Marsh, Indiana state veterinarian, noted that after eradication programs are completed it will be important to maintain an interface with the pork industry. He noted the need to maintain strong diagnostic capabilities within the state and have access to disease surveillance information. States may be called upon to take a more active role in the future in animal welfare. Dr. John Hunt, Missouri state veterinarian, pointed out that it will be important to continue to have new food animal veterinarians. He noted in his state involvement in on-farm certification programs as well as environmental issues is increasing. In the future, there may be a state role in judicious use of antimicrobials. Dr. Dick Hull, Illinois state veterinarian, noted that his state will maintain a swine health advisory group after the pseudorabies group has completed its work. The state is initiating a PRRS monitoring system for herds that want to participate. He highlighted the increased role of the state in preharvest food safety, animal disposal and animal welfare. Dr. Sam Holland, South Dakota state veterinarian, noted
that his state has a swine health committee to continue dialogue on swine health issues. A PRRS certification program has been developed and implemented in the state. He noted that the state has a role in trade arrangements and food safety issues.

Dr. Nora Wineland presented an update on the National Animal Health Reporting System (NAHRS). She noted that NAHRS has 27 participating states that provide information for the U.S. disease report to OIE. Efforts are underway to increase state participation.

Drs. Michael Gilsdorf and Joseph Annelli provided updates of the Animal and Plant Health Inspection Service’s responses to the three 1999 Committee resolutions. One new resolution was passed.

The Committee adjourned at 5:40 PM.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON TUBERCULOSIS

Chairman: Dr. Dennis L. Thompson, Sacramento, CA
Vice Chairman: Dr. Rick Willer, Phoenix, AZ

Dr. L. Garry Adams, TX; Dr. Robert D. Angus, ID; Dr. Daniel R. Baca, TX; Dr. Lowell R. Barnes, IN; Dr. Terry L. Beals, TX; Dr. Carole A. Bolin, IA; Dr. Richard E. Breitmeyer, CA; Dr. H. Michael Chaddock, MI; Dr. Thomas F. Conner, IN; Dr. Robert A. Cook, NY; Dr. James J. Corbett, CA; Mr. Edward C. Corrigan, WI; Dr. Donald S. Davis, TX; Dr. Steven R. England, NM; Dr. Mitchell A. Essey, CO; Ms. Ethel M. Evans, CO; Mr. Joe B. Finley, TX; Dr. Murray E. Fowler, CA; Ms. Barbara R. Fox, MD; Mr. Robert E. Frost, CA; Dr. Arnold A. Gertonson, MT; Dr. Thomas J. Hagerty, MN; Dr. William L. Hartmann, MN; Dr. Burke Healey, OK; Mr. Del E. Hensel, CO; Dr. Bob R. Hillman, ID; Dr. E. Ray Hinshaw, AZ; Dr. Sam D. Holland, SD; Dr. John W. Hunt, Jr., MO; Dr. John P. Huntley, NY; Dr. Sarah B. S. Hurley, WI; Dr. Samuel Hutchins 3rd, VT; Dr. Luisa Ibarra, MEX; Dr. Victor P. LaBranche, MA; Dr. Charles E. Massengill, MO; Dr. Robert M. Meyer, CO; Dr. Michael W. Miller, CO; Dr. Mitchell V. Palmer, IA; Dr. Janet B. Payeur, IA; Mr. Scott Petty, Jr., TX; Dr. Nancy J. Roberts, OK; Dr. M. D. Salman, CO; Dr. David D. Schmitt, IA; Dr. Steve Schmitt, MI; Dr. Larry A. Schuler, ND; Dr. Clarence J. Siroky, WI; Dr. Ralph E. Slaughter, NE; Dr. Charles O. Thoen, IA; Dr. Tom Thorne, WY; Dr. Daryl K. Thorpe, SD; Dr. Cheryl B. Tillman, OR; Dr. Paul O. Ugstad, CA; Mr. Alejandro Varela, AZ; Ms. Diana L. Whipple, IA; Mr. Dave Whittlesey, CO; Mr. Steve Wolcott, CO; Dr. Nathan Zauel, MI; Dr. Glen L. Zebarth, MN

The Committee on Tuberculosis met on Tuesday, October 24. Over 57 people attended.

Dr. Joseph VanTiem, Senior Staff Veterinarian for the USDA, APHIS, VS National Animal Health Programs, presented an update of the U.S. TB eradication program. The exact wording of that report is as follows. "FY 2000 was a year that marked an historic change of direction in the program. Stimulus to achieve final eradication of bovine tuberculosis in the nation's livestock was accomplished this fiscal year. By the end of FY 2000, 48 States, Puerto Rico, and the U.S. Virgin Islands will be free of bovine tuberculosis in cattle and bison. The State of Texas is pursuing split status zoning for the State to enhance eradication efforts in the El Paso, Texas area. The State of Michigan is currently classified as Modified Accredited and has confirmed the presence of 10 infected cattle herds in the State over the past two years. The State may have to be reviewed for further status reduction if more cattle herds are found to be affected within the State. Current regulations have assigned the Modified Accredited status for captive cervids in every State. This status will be temporary for most States, since there is
a one-year grace period for States to justify status within the program.

The Secretary of Agriculture has declared an emergency to accelerate eradication of tuberculosis from the United States. This emergency declaration will allow the U.S. Livestock industry to become more competitive in the global market, and further protect the public from this zoonotic disease. Funds will become available to enable more rapid and complete responding to epidemics and implementation of a comprehensive strategic plan for eradication.

During 2000, 10 newly affected cattle herds were disclosed, one herd was carried over from the previous fiscal year and there were no newly infected captive cervid herds. Seven beef herds and 2 dairy herds were identified in the northeastern part of lower Michigan. These herds are most likely associated with endemic infection of white tailed deer. One large infected dairy herd in El Paso was carried over from the previous fiscal year, due to our inability to depopulate that herd with current indemnity levels. One large dairy herd in El Paso, Texas was found to be re-infected with bovine tuberculosis. This herd was previously infected, but it is just as likely that this herd was re-infected, rather than the occurrence of recrudescence. There were no captive cervid herds affected with bovine tuberculosis during fiscal year 2000 (see figure 2). Since 1991, 36 cervid herds in the United States have been identified with bovine tuberculosis.

An infected herd that was confirmed in North Dakota last year is linked to bovine tuberculosis in an El Paso, TX dairy. DNA fingerprinting of M. bovis from the infected herd in North Dakota shows it to be very similar to DNA isolated from the infected herd in El Paso, TX. The El Paso herd was identified as infected in 1992. Hundreds of animals sold from this herd were traced, however many could not be positively identified or the outcomes of movements confirmed as leading to slaughter. Matching DNAs from two isolates strongly indicate that the North Dakota dairy herd was infected by cattle from the El Paso dairy herd where infection was confirmed in 1992. The DNA fingerprinting process is performed by USDA's Agricultural Research Service and is known as Restriction Fragment Length Polymorphism. The North Dakota bovine tuberculosis was compared to other isolates and found to be very dissimilar to isolates from Michigan deer as well as from other past infected cattle.

Dairy herds in the El Paso, TX area have been affected with M. bovis since 1985. Depopulation of TB affected herds is the method of choice to eliminate this disease from a herd and some of the El Paso dairies have been depopulated. However, current indemnity rates would not cover the losses an owner would incur through depopulation. A herd owner will take a loss of approximately $500 - $700 per animal depopulated. With an average herd size of 2,000 cattle, that would equate to a loss to the producer of approximately $1.2 Million. Even if an owner agreed to take such a loss, the National appropriation for bovine tuberculosis would not be able to indemnify all animals in each herd. Test and slaughter of TB reactor animals
has been the method of eliminating the disease from these herds, however they continue to become re-infected. All but one of the dairies to be depopulated in the El Paso area have been infected with TB at one time or another and two are currently under quarantine.

Only one beef herd has been affected with bovine tuberculosis during these outbreaks in El Paso, and that was due to association with an infected imported Mexican steer that was placed in the herd. Epidemiological studies of cattle herds in the El Paso area have indicated that the risk factors for a herd becoming infected with bovine tuberculosis is the proximity to dairies located just across the river in Mexico and being a dairy type operation. The mechanism for TB transmission has not yet been defined. Many potential sources have been examined but not found to be associated with tuberculosis infection in the area; e.g. introduction of affected cattle, infected workers, wildlife sources such as birds, small mammals and large mammals. All current scientific information indicates TB infection is reintroduced from the infected Mexican herds to the El Paso dairies via some vector yet to be defined, but not for beef herds in El Paso, TX.

Simply depopulating the affected dairies in the El Paso area and allowing them to repopulate and stay in the dairy business will not succeed in eradicating bovine tuberculosis, based on the history of TB in the area. The repopulated dairies would become re-infected and would require depopulating again. This emergency action to depopulate and cease the dairy business in the El Paso area is the only long-term solution to the eradication of TB from cattle in the U.S. This action will create a buffer zone between TB infected dairies in Mexico and tuberculosis free herds in the U.S. This would allow the entire State of Texas to be declared free of TB and leave TB in Michigan the remaining State in the U.S. being recognized internationally as not free of bovine TB.

The science indicates that as long as the Mexican dairies continue to have a high prevalence of TB and are located near the boarder with El Paso, the risk of TB infection to El Paso dairies remains high. Re-infection of these dairies has occurred but infection to beef cattle has not. Thus the action to address this situation is to create a buffer zone in the El Paso area by depopulating dairies and preventing new dairies from going into business until the situation in Mexico is adequately addressed. Fair compensation will need to be paid for all cattle taken as a result of the bovine tuberculosis eradication program.

In Michigan, transmission of TB is occurring by more traditional routes of transmission from an infected to a susceptible species of animal. Transmission from deer to deer is predominately enhanced by artificial manipulation of a wild population, congregation occurs associated with supplemental feeding of deer. Control of the artificial feeding practices will control the congregation of deer and decrease TB transmission among deer. Eradication of TB from the free-ranging white tailed deer will be over a several year period, but increasing prevalence and geographical distribution of in-
fected deer could be curtailed quickly, given adequate surveillance. Since June 1998, there have been nine tuberculosis affected beef herds in Michigan, two dairy herds, and one captive cervid herd.

The main avenue of surveillance for cattle and bison, slaughter surveillance, is still woefully inadequate to detect tuberculosis in the United States cattle and bison populations (see figure 3). Feedlot investigations stand out as suffering from the greatest amount of neglect and apathy. Only 17 feedlot investigations were conducted in fiscal year 2000. Forty seven percent (8) of these investigations had direct evidence of a Mexican origin in the traceback investigation. Eleven (65 percent) of the 17 cases had some form of ID collected. Eight of the 11 ID devices were official Mexican blue eartags, and 3 tags were feedlot bangles. Six cases had either no ID available to collect or it was not collected. Of the 8 cases bearing Mexican identification, 5 cases came from the Mexican State of Durango, 2 from Nuevo Leon, and 1 from Coahuila.

Fiscal year 2000 was another year of low submission of lesions for surveillance for bovine tuberculosis (see figure 3). Only 1,028 samples were submitted for surveillance during fiscal year 2000. Of these submissions, there were 23 cases of bovine tuberculosis identified. This submission rate does not come close to assuring detection of bovine tuberculosis at a prevalence level less than the 0.002 percent. When over four million cattle are slaughtered every year in the US, this rate of 2.4 samples for every 10,000 animals slaughtered is less than one-fifth the amount necessary to detect tuberculosis in the US cattle population as a whole. This trend is disturbing and an indication that efforts need to be made to strengthen surveillance for bovine tuberculosis and to assure that all newly detected herds are depopulated.

Of the positive tuberculosis cases in 2000, 36 percent did not have identification. Overall, 49 percent of the samples submitted had some form of animal identification. This rate was lowest in feedlot cattle where 44 percent of submissions had some form of identification. Recording of accurate identification records is essential for tracing back animals to a herd of origin.

This data is somewhat biased when you look at it on a regional basis. Only 37 States submitted samples for tuberculosis surveillance during 2000. The main proportion of animals identified at slaughter comes from a minority of States. The majority of submissions were from feedlot cattle (75 percent). This represents a real reduction in submission from adult animals, since over the past 10 years adult submissions have accounted for approximately 40 percent of the total.

To assure that our surveillance does not miss any domestically infected herds, slaughter surveillance needs to be enhanced to assure the collection of identification from all samples submitted and to increase the overall number of submissions, especially in adult cattle. Meat inspection personnel also need to be encouraged to submit more samples for tuberculosis
evaluation, especially from animals condemned for any granulomatous like lesion.

The current APHIS budget for bovine tuberculosis is $4.3 Million. This appropriation has not significantly changed in over 10 years, despite greater surveillance needs. Between 1991 and 1995, an average of 3,908 samples obtained by sampling cattle through regular slaughter inspection were analyzed. At that time, APHIS estimated that submission rates were one third of what was necessary to assure the negative status of cattle populations in this country.

There was a 70 percent drop in slaughter surveillance for bovine tuberculosis in FY 1999 and that rate was maintained in FY 2000. The system that has been used for the last three decades is no longer sufficient to meet our goals of eradication nor are they able to maintain credible evidence for our international trading partners of our disease status. The dramatic decrease in granuloma sample submission must be quickly remedied. New surveillance plans under this emergency will create the foundation for future surveillance that will be budgeted for in four years.

Sampling in targeted wildlife species has been conducted in all areas of Molokai. Samples from 350 Axis deer have been examined, and no evidence of M. bovis infection has been identified in this species to date. Mycobacterium avium has been isolated from 6 Axis deer. Seventy-two samples have been obtained from feral goats. Verminous pneumonia has been a common finding on histopathology. Culture results indicate no evidence of M. bovis infection in the feral goat samples collected to date. More intense sampling of the mongoose population has recently been initiated. The 15 mongoose samples examined to date represent a composite sample from 70 individual mongoose. No evidence of TB infection has been demonstrated to date in these samples. One hundred eighty-three samples have been collected from feral swine. Histopathologic evidence of mycobacteriosis has been seen in three samples from feral swine to date. Acid-fast staining bacteria were noted in each sample, and two of the three swine samples were found to be PCR positive for M. tuberculosis complex. M. bovis was isolated from one of these samples. The other suspicious swine sample was PCR positive for M. avium. It is of interest that the two swine showing evidence of M. bovis originated from areas in very close proximity to where the cow infected with bovine tuberculosis was pastured in 1997. DNA fingerprint analysis of the M. bovis isolates from one feral pig and the 1997 TB-infected cow sharing the same pasture showed a similar profile.

State status for captive Cervidae in the US was recently finalized, granting every State a temporary classification of Modified Accredited. States will have until fiscal 2002 to justify a continuation of this status for captive Cervidae, or face status reduction. States that justify a higher status during this time will be allowed to move to that higher status without having to wait the time such a move would normally require.
International trade has changed from a focus of only the species affected by a disease to include the disease organism also. International perspectives for risk analysis include all sources of the organism. Surveillance outside of cattle species must be addressed at levels that will be recognized nationally and internationally. Surveillance for M. bovis in goats, captive Cervidae, wild species, and zoo species must now be created for international trade concerns. Knowledge or lack of knowledge of disease prevalence in species other than cattle will influence risk analysis for international trade.

The regulations that were recently finalized in the tuberculosis program reinforce the concept of risk-based interstate movement. With the addition of these rules in the domestic program, the importation of livestock from our foreign trading partners can better be evaluated. Conversely, our trading partners will be assured that livestock exported from the United States is of minimal risk for bovine tuberculosis infection.

The United States cattle and bison population totaled 99.5 million in 1998 with a value of $58.6 billion. The U.S. livestock industry plays a significant role in international trade. In 1998, the total earnings from exports of live cattle, swine, beef and veal, pork, and dairy products were approximately $3.9 billion. In addition, livestock and related product exports generated about $9.5 billion in output sales and created 81,700 jobs. Because the U.S. competitiveness in international markets does depend on its reputation for producing high quality animals and animal products, overall U.S. trade credibility would be enhanced if bovine tuberculosis was eradicated completely and permanently. Not only would the actual quality of the product for export contribute to continued world market acceptance, but also the purchasers' perception of quality. Thus, efforts to maintain an effective tuberculosis program, to clarify the regulations and to secure the health of the cattle industry will continue to serve the best economic interests of the nation.

Without a program in place, computer models have predicted that the annual losses to the United States would be close to $1 billion. Over the past 80 years, the bovine tuberculosis program has spent a total of close to $666 million ($291 million in federal funds and $375 in nonfederal funds).

To protect the multi-billion dollar cattle industry, APHIS is proposing to address several newly identified threats that have caused the expanding presence of bovine tuberculosis in the US. APHIS estimates that we can eradicate the disease over the next 4 years at a total cost of $97.1 million. The cost of the first year is estimated at $60.3 million. The States of Michigan and Texas will also contribute $9.4 million and $1 million, respectively. In the past 5 years, Texas spent $7.3 million on the eradication of tuberculosis.

The elimination of bovine tuberculosis from the United States will make the U.S. cattle industry more competitive in the global market and minimize consumer concerns regarding the presence of bovine tuberculosis in the
Nation's cattle population. This emergency funding request will supply the necessary resources to jump-start our surveillance measures for bovine tuberculosis. This 4-year funding will give APHIS time to put forward the necessary funding requests to increase the line item in the budget to a level of $12 Million where surveillance activities can be met.

Federal regulations now adopt State status related to the risk of disease. The US has advocated the adoption of risk assessment for international trade and this regulation is in keeping with those principles. Risk will be based on prevalence of disease. Movement restrictions based on risk of disease will be placed on all livestock moving interstate. Animal identification requirements are also being changed as the risk of disease changes at the various status levels.

A number of factors are in place at the present time that makes the eradication of tuberculosis both necessary and feasible. Increased surveillance is needed so that the U. S. does not regress with its tuberculosis program. Surveillance has decreased in recent years so that the number of samples taken is now insufficient to adequately monitor for the disease. In addition, increased levels of surveillance are needed to identify those remaining pockets of disease and to ensure that other areas are disease free.

Tuberculosis has recently been identified in the wild white-tailed deer population in a small area of Michigan. If this situation is not resolved, there is the probability that the disease would spread to other areas of the country. As domestic livestock can become infected by exposure to infected wild animals such as deer, it is vital that the Michigan outbreak be controlled before it can expand.

Mexico is now making good progress in eliminating tuberculosis in areas close to the U.S. border. However, U.S. support is needed to help Mexico's program succeed in order to prevent the transmission of the disease from Mexican cattle to U.S. cattle.

New laboratory methods and technology now exist which make eradication more feasible. Tests now exist that allow for much earlier diagnosis so that epidemiological investigations can begin earlier and spread of disease is less likely.

The international trade situation has changed and new rules of trade are in place. APHIS has the opportunity to establish zones that are free or not free of disease rather than identify entire states or the nation as having the disease even though only small areas actually have the disease. Action on tuberculosis will allow us to protect and expand our important international trade opportunities.

FY 2000 was a very active year in the bovine tuberculosis eradication program. Data collected during this fiscal year has shown that our surveillance for tuberculosis in all livestock needs to be enhanced to assure that the country is ready to declare freedom. If our emergency actions are put into place, then the eradication date of December 31, 2003 is going to be met.
The author wishes to acknowledge the valued contributions of Robert M. Meyer, Epidemiology Officer of the Western Region, VS; Fran Shields, Veterinary Program Assistant, VS, Riverdale, Maryland; Clint Baker, Geographic Information Specialist, VS, Riverdale, Maryland."

Dr. Maria Koller, Canadian Food Inspection Agency, presented an update of their eradication program. Like the U.S., they rely heavily on slaughter surveillance with a target of one sample per 2,000 cull cattle slaughtered. They have made a transition from submitting samples in borate and formalin to submitting frozen samples along with those in formalin. They also rely on the U.S. for slaughter surveillance as many of their cattle are slaughtered in the U.S. Their program covers cattle, and farmed bison and cervids. There has been a farmed bison program since 1990. On-farm testing is required every five years. Because most slaughtered animals are not cows and bulls, this is not a great method of surveillance. Post-import testing is also required. Their farmed cervid program requires on-farm testing every three years. There is some slaughter surveillance in cervids. They also conduct routine post mortem examinations of dead animals. Canada has a movement permit system in place for farmed cervids but eliminated this requirement for farmed bison. If farmed cervid herds are not tested within the last three years, the animals from that herd cannot be moved. In zoos, they conduct testing of cervids and bovines.

Their next step in program improvement is to review the surveillance system. In the year 2000, there were no cattle or bison herds under quarantine for tuberculosis. In 1999, they found one infected cattle herd in Saskatchewan. The index animal was a fifteen year-old cow that was a natural addition. The herd was depopulated and no other animals with lesions were found. There have been no infected farmed-bison herds since 1994. For farmed cervid herds, there have been no infected herds found to date this year. In 1999, one herd was found in Quebec and one in Ontario. No infected farmed cervid herds have been found in western Canada since 1993. The country is TB free except for Saskatchewan, whose status is suspended. The country is free of TB in farmed cervids except for Quebec and Ontario.

Dr. Eduardo Luna, Director of the tuberculosis program in Mexico, gave an update of their eradication program. The bovine tuberculosis control program in Mexico was established relatively recently. Although established in 1971, it was initially only voluntary and few producers participated in the effort. As a result of Mexico’s important trade relationship with the U.S., many cattlemen became motivated to establish tuberculosis free herds. The program was reinforced with creation of the National Commission for Bovine Tuberculosis Eradication (CONETB) in 1993, which established legal and operational infrastructure, as well as the financial resources to work on both diseases.

The current status of Mexico’s program includes area testing in order to establish zones that are recognized as free of disease, intensive slaugh-
TUBERCULOSIS

ter surveillance, traceback and follow-up of suspicious cases detected at slaughter or through area testing, and certification of herds free of tuberculosis. With this approach, six states are currently recognized as being in the eradication phase according to Mexico regulations, and two more will be recognized in the near future. In addition, due to advancements noted in recent visits, it is likely that Sonora will be recognized as having a region that is free of tuberculosis. It is important to note that Mexico's current regulations classify states into one of three stages; control, eradication and free.

In 1994, the U.S./Mexico Bi-National Tuberculosis Committee (BNC) was created with the goal of assisting Mexico with their eradication efforts in order to continue exportation of live cattle to the United States. The BNC evaluates eradication programs in Mexican states and applies the terms of the Consensus Document created by state veterinarians of those states in the United States that share borders with Mexico. The BNC votes on review team recommendations that classify states as meeting requirements of the Consensus Document. States approved as being in Stage II can continue exporting cattle with a single TB test. States approved as being in Stage I may export cattle only through a Stage II state and with two tests. States that are not approved for either level are considered Stage zero. Thus far, Mexico has ten states classified as Stage II, nine as Stage I, and 14 as Stage zero.

Dr. Luna expressed his appreciation for advice and counsel from the U.S. members of the committee, especially Drs. Bob Meyer, Terry Beals, and Billy Jonhson, and Dr. Rick Willer from the Arizona Department of Agriculture.

He also described how recent and planned changes to their U.S regulations will necessitate that countries with commercial relationships with the U.S. modify their regulations to agree with new U.S. rules. Therefore, all the Mexican States will have to be revisited in order to review their advances and determine their classification according to U.S. regulations. In this context Sonora was visited recently and they are requesting that the northern region of that state be classified as Modified Accredited Advanced. Total animals tested has increased from a little more than 500,000 in 1992 to more than 4 million in 1997, with a total of more than 24 million tested from 1992 to 2000. It would appear that the number of reactors is increasing however, when the number of reactors is analyzed relative to the number of animals tested, the trend is a small but significant decrease in the proportion of positive cases.

Although the main objective of Mexico's national program is not directed toward establishing free herds, but rather toward area testing and risk classification, the milk industry has provided economical incentives to owners of free herds which has resulted in a 100% increase in Certified Free Herds from 1998 to 1999.

In spite of the fact that the trend of exportation of cattle from Mexico to
the U.S. is growing each year, the number of animals of Mexican origin having TB lesions at slaughter in the U.S. has decreased remarkably. Even more remarkable is that the number of cases this year originate from only three states, while those from last year originated from only four states. That means the number of high-risk zones in Mexico has decreased and demonstrates improved surveillance.

Funding for our eradication program activities is through a tripartite cooperation of federal and state governments and producers, in equivalent amounts so that specific funds are guaranteed for tuberculosis program in all Mexican states. These funds have been in constant increase each year.

The National Program in Mexico is supporting the development of research projects to enhance diagnostic procedures. They include: validation of alternative tests, including PCR, Gamma Interferon, spolygotyping, immunohistochemistry, and FPA.

New U.S. regulations require Mexican states to clarify its risk level if they want to continue exporting living cattle. Therefore, it is necessary to determine the regionalization status of each state, in agreement with U.S. regionalization rules. So, Mexican states that want to continue exporting cattle have to apply for a waiver from the soon-to-be published interim rule. In addition, we are reviewing our TB regulations, to assure compatibility with world trade needs. We also anticipate that northern Sonora will be recognized as Modified Accredited Advanced.

Finally, indemnity programs have been developed in some states to help depopulate infected herds. Indemnity is funded by the tripartite of producers, and state and federal governments.

Dr. Billy Johnson, Coordinator of the U.S./Mexico Bi-National Tuberculosis and Brucellosis Committee (BNC) gave an update of activities for the past year. Before discussing those activities, he briefly reviewed the history of the BNC. The BNC was formed in 1993 based on a recommendation from the USAHA and was charged with providing oversight to tuberculosis eradication programs in both countries and establishing minimum requirements for exporting Mexican cattle to the United States. Brucellosis responsibilities were added to the Committee at a later time. At the time of formation of the BNC, APHIS was in the process of developing new regulations for movement of steers and spayed heifers from Mexico to the U.S., but because of concerns raised by State Veterinarians of the Border States, the proposed federal regulations were withdrawn. The State Veterinarians from the Border States then developed and submitted comments to the proposed rule, which became know as the Consensus Document. The terms and conditions in that Document have applied to livestock imported since that time. The Document outlines a three-stage program under which states in Mexico can qualify to ship steers and spayed heifers into the U.S. The three stages were Stage I, Stage II, and Free. Each state in Mexico was given time to progress through Stage I and then qualify for Stage II. The BNC assumed responsibility for conducting reviews in each state as
they progressed. Presently, Mexican states must be in Stage II in order to ship cattle to the U.S. States classified as Stage II are; Aguascalientes, Baja California Norte, Chihuahua, Coahuila, Durango, Nuevo Leon, Sonora, Tamaulipas, Veracruz, and Yucatan. The last of those states to be approved was Aguascalientes, in October 1999. The BNC has conducted more than thirty reviews since the Consensus Document was implemented. Each review required three to five days with at least four or five reviewers from the U.S. and one or two from Mexico. The reviewer’s expenses were paid by their employer and supporting organizations. These groups deserve a strong thanks for their interest and desire to make this program work.

Recently, State Veterinarians from the Border States worked closely with the BNC to amend the Consensus Document in ways that would help assure continued progress by Stage II states. However, that work was suspended since APHIS is now in the process of amending both their domestic and international regulations that pertain to tuberculosis. During the past year, the BNC has held three meetings and has concentrated on evaluating progress of tuberculosis eradication programs in each country, and provided input to APHIS as it develops new international regulations governing movement of cattle from Mexico to the U.S.

In the 1993 report to the TB Committee from APHIS, it was reported there were 438 cases of tuberculosis found at slaughter in immature feedlot cattle that year. The goal of the Border States’ State Veterinarians and the BNC was to significantly reduce that number by reducing the amount of tuberculosis in exporting herds in Mexico. As reported by Dr. Bob Meyer at the June 16, 2000 BNC meeting, there have been only nine positive cases found at slaughter in the U.S. during the first nine months of this fiscal year. Five of those cases were traced to Mexico by their blue Mexican export eartags. This very significant reduction has occurred because of the APHIS regulation banning the importation of Holstein and Holstein cross steers from Mexico, and the success of eradication programs in the exporting states of Mexico. The BNC is proud of the progress made up to this point but realizes there are still areas of concern.

The BNC continued to work on three such concerns during the past year. The first is the need to improve collection of identification from Mexican animals slaughtered in the U.S. that have TB lesions. Every steer or spayed heifer exported from Mexico has a blue export eartag. Unless these tags are collected at slaughter, it is very difficult to trace feedlot animals to the herd of origin. Although there were improvements this past year, further improvements must be made before either the U.S. or Mexico can complete their eradication programs. The second problem relates to movement of Holstein cross steers. Border inspection officials have found shipments of cattle that they classify as Holstein crosses. With the extensive testing and reduction of TB from beef herds in the exporting states in Mexico, the greatest risks now come from dairy herds. Although it is often difficult to identify these animals, Mexico officials have committed to correcting this
problem. The third area of concern pertains to “certificates of origin” of Mexico cattle presented at the border. This has been a controversial item but one which Mexico officials agreed to develop recommendations for, that will meet the needs of those states in the U.S. that share borders with Mexico.

Since one of the original charges to the BNC was to establish minimum requirements for exportation of Mexican cattle into the U.S., much of the Committee’s time during the past year has involved working with APHIS to develop import regulations. APHIS has certain legal constraints under which they must work. The BNC is trying to work within those constraints to provide input. It is the desire of the BNC that APHIS recognizes the procedures and progress that have been made under the Consensus Document and that it develops regulations that allow Mexican states that are making satisfactory progress to continue exporting under the new regulations. During the June 16, 2000 meeting, the BNC was informed that it will take APHIS at least two years to fully implement new import regulations. In the meantime, it will publish an interim rule that will designate all of Mexico in one status, i.e. Modified Accredited Preparatory. Waivers for Modified Accredited status will then need to be issued for those states that have adequate programs. The BNC appointed a sub-committee to work with APHIS to develop waiver requirements. The BNC will continue to work with APHIS during this interim period to assure a smooth transition.

Diana Whipple provided an overview of research activities on tuberculosis in animals at the USDA, ARS, National Animal Disease Center, Ames, IA. She described a study that was conducted to determine the distribution of lesions and organisms in deer naturally infected with M. bovis. It was conducted in collaboration with USDA, APHIS, and the Michigan Departments of Agriculture and Natural Resources. Current wildlife surveys for detection of tuberculosis in deer are based on examination of lymph nodes of the head. Results of this study indicate that this method may be detecting less than 50% of deer that are actually infected. In studies to examine transmission of M. bovis among white-tailed deer, they demonstrated that deer experimentally infected with M. bovis readily shed the organism and transmit infection to sentinel penmates, including efficient transmission from infected sentinel deer to previously non-infected penmates. She described studies that indicate that M. bovis survives on feeds used for baiting deer in northern Michigan, i.e. for at least 16 weeks on six feeds when stored frozen. Finally Ms. Whipple described results that demonstrate that calves exposed to soiled pens and feed troughs previously used by infected deer serve as sources of infection to susceptible bovine calves.

Dr. Dorothy York, California Department of Food and Agriculture, discussed a project to enhance granuloma submission. The project was modeled after a 1990 project in Nebraska. The Nebraska project paid blood collectors $5-6 per sample to collect granuloma samples. In 1999, the State of California was reviewed by the USDA to obtain Class Free tuberculosis...
status. In preparation for the review, a 5-year summary of tuberculosis suspicious granulomas submitted to NVSL indicated a continuous decline in the number of submissions.

Table 1.
Summary of CA FSIS Plant
Granuloma Submissions

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<tbody>
<tr>
<td>Total kill</td>
<td>1,189,959</td>
<td>2,247,665</td>
<td>1,125,041</td>
<td>889,707</td>
<td>439,507</td>
</tr>
<tr>
<td>6-35 submissions</td>
<td>91</td>
<td>82</td>
<td>70</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>Submission rate</td>
<td>7.6/100,000</td>
<td>3.6/100,000</td>
<td>6.6/100,000</td>
<td>4/100,000</td>
<td>9/100,000</td>
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</table>

Since 1994, slaughter surveillance has been CA’s principal tool for tuberculosis surveillance. An estimated 20,000 caudal fold tests are performed yearly in CA. The cattle inventory for CA was estimated at 2,210,000 in 1999. Therefore only about 1% of CA’s cattle population was tested. The need for adequate slaughter surveillance to detect tuberculosis is critical. CA would like to achieve a granuloma submission rate of 40 per 100,000 total animals killed.

Beef Packers Inc., FSIS plant #354 in Fresno, CA was chosen for a pilot project to increase the granuloma submission rate. This plant was chosen because it is one of the largest cow-kill plants in the southwestern United States, processing over 24,000 cull cows monthly. BPI also had a 10-month history of 0.8 granulomas/month submitted for tuberculosis testing, resulting in poor tuberculosis surveillance at this plant.

A protocol approved by FSIS personnel at the State, regional and local level was developed for BPI:
1. The IIC (Inspector In Charge) will collect granulomas, place the lesions in plastic bags with an abbreviated version of VS form 6-35, and store in the refrigerator.
2. The Market Cattle Identification Coordinator will visit BPI daily to meet with the IIC and pick up any granulomas collected that day.
3. The MCI Coordinator will corroborate the identification listed on the VS 6-35, prepare samples for shipping, and send samples to NVSL.

The results of the study were; the pilot project ran for 75 days (8/16/99 to 10/31/99) with a mean granuloma submission rate of 10.8 lesions/month, a thousand-fold increase from the previous 10-month period. When the project was suspended for the subsequent 6 months, the submission rate dropped to a mean of 0.7 lesions/month. With FSIS approval, the project became permanent on May 1, 2000, and the submission rate has been maintained at 4.6 lesions/month.
In addition to daily visits to BPI, CDFA and USDA personnel send biannual granuloma submission status letters to CA FSIS personnel, and provide the FSIS with information regarding the tuberculosis status of the United States. The total granuloma submissions from CA slaughterhouses in FY 1999 and 2000 were increased to 58 and 66 respectively.

The study strongly indicated that daily personal contact and assistance with sample preparation and shipping results in sustained increases in granuloma submission rate and an overall increase in the annual granuloma submissions.

Dr. Stephen Jones traveled from Melbourne Australia to summarize new findings about the use of the BOVIGAM™-TB, a bovine gamma interferon test kit that is currently undergoing review for registration with USDA, APHIS. In an outbreak of tuberculosis in a herd in North Dakota in 1999, both the CCT and BOVIGAM™ identified 22 (85%) of 26 confirmed culture positive animals. When used in parallel the two tests identified 24 (92%) of the infected animals. These and other results have been consistent with results reported in New Zealand and justify more effort to determine its performance in the USA.

Dr. Janet Payeur presented a highly informative and humorous summary regarding Mycobacteria isolations in 20 captive elephants from 1994 to the present. Information included: a description of USDA guidelines for testing elephants, (www.aphis.usda.gov/ac/ElephTBGuidelines2000); methods to detect tuberculosis in elephants and; information regarding elephants being treated with anti-microbial agents.

Dr. Linda Carpenter, USDA, APHIS, VS Area Epidemiologist, Washington/Alaska/Hawaii Area, discussed preliminary evaluation of TB testing
in reindeer sensitized to bovine tuberculosis sensitinogen. Members of the Reindeer Owners and Breeders Association doubt the validity of the current cervid tuberculosis testing regime in reindeer. They believe that the false positive rate for the single cervical test (SCT) and comparative cervical test (CCT) in reindeer are higher than in other cervids, particularly since there has never been a case of tuberculosis diagnosed in reindeer in the United States.

Data supports this belief. A recent study (Norden et al., unpubl. ms.) compared SCT and CCT results in reindeer and non-reindeer cervids under the current scattergram and several alternatives. In most comparisons, reindeer were more likely than non-infected non-reindeer cervids to be false positive.

Most of the 4,000 to 6,000 reindeer in the continental United States are used for exhibition, often necessitating interstate movements that require a negative tuberculin test before importation. A positive test prevents such exhibition and requires quarantine of the herd, sometimes resulting in substantial financial losses to herd owners. Since no case of tuberculosis has been diagnosed in U.S. reindeer, owners perceive these financial losses to be unnecessary and believe the testing regime should be changed for reindeer.

The study presented here is the first phase in a project to validate a comparative cervical testing regimen for reindeer in the United States. Collaborators in the study include Dr. Michael Philo, Regional Epidemiologist, Western Region, Dr. Bob Meyer, Regional Epidemiologist, Western Region, and Dr. Bert Gore, Alaska State Veterinarian. Objectives of the study included: 1. calculate a preliminary estimate of sensitivity and specificity of the comparative cervical test (CCT) in reindeer artificially sensitized to \textit{M. bovis}; 2. make a preliminary determination of which scattergram most accurately reflects sensitivity and specificity of the comparative cervical test (CCT) in reindeer; 3. evaluate use of tuberculin sensitization studies in reindeer, including dose of killed \textit{M. bovis} in oil and; 4. determine the response in gamma interferon, ELISA, and Fluorescence Polarization Assay (FPA) of reindeer artificially sensitized to \textit{M. bovis}.

Dr. Michael Chaddock described tuberculosis eradication activities in Michigan. The history of the problem includes the following: Michigan entered the eradication program in 1917, became TB free in 1979, and discovered TB in wild deer in 1994. In June 1995, a privately owned elk herd was diagnosed with TB and depopulated. In December 1997, a privately owned cervid herd was identified as infected. In June 1998, a TB positive cattle herd was confirmed in Alpena County. In January 1999, two additional TB positive cattle herds were identified. In November 1999, one cattle herd was confirmed as infected. In January 2000, three deer were confirmed as TB positive outside of the enforced restriction area (Antrim, Mecosta, and Osceola Counties). In February 2000, one dairy herd in Presque Isle County was confirmed as positive. In March 2000, one cattle herd was confirmed as TB positive. In June 2000, two additional cattle
herds tested positive in Alcona County. In June 2000, Michigan’s status was reduced. On July 2000, one cattle herd was confirmed positive. In October 2000, two additional beef and one dairy herd were identified as TB positive.

The surveillance numbers from January 1995 through October 20, 2000 include over 181,000 tests that have been administered to date. Testing has been done on over 4,275 farms, and over 8,400 privately owned cervids have been tested since January 1999. Changes to their action plan include: identifying livestock prior to movement; identifying high-risk and potential high-risk TB areas; requiring all cattle, goat, and bison herds to have a whole herd test; requiring all dairy farms to have a whole herd test per the pasteurized milk ordinance; requiring intrastate testing requirements; enhancing surveillance at slaughter facilities; and establishing terminal operations.

Future plans in Michigan include eradication of bovine tuberculosis, seeking a zoned State Status, working toward risk based interstate movement requirements, and building a new diagnostic lab at Michigan State University. The financial commitment to the eradication plan includes $28,902,000 from the Michigan Department of Agriculture to be used for testing and surveillance. Other commitments involve 52 staff members dedicated to TB work; indemnification and disposal, on-farm assistance, fee basis testing with 347 contracts, and research and public outreach. The Michigan Department of Community Health is contributing $1,249,000 to increase the capacity of local public health agencies and provide technical in-state support for epidemiological investigations. The Michigan Department of Natural Resources is contributing $6,500,000 for field collection of deer heads, transportation costs, laboratory fees for testing heads, additional trailers and temporary facilities, and research and surveys. The Michigan Department of Consumer and Industry Services is contributing $400,600 to fund Travel Michigan to bolster tourism efforts and increase viability of the tourist industry. The Animal Health Diagnostic Laboratory is contributing $45,340,000 for the new Animal Health Diagnostic Laboratory at Michigan State University, a comprehensive effort to consolidate animal health analytical capabilities. This priority of the new lab will be to rapidly respond to Michigan Producers. The Michigan State University is contributing $1,232,200 for additional research to expand the current knowledge base.

Mr. Bob Frost quickly summarized information about llamas. He also provided background information regarding the proposed resolution pertaining to the federal laboratory system, and expressed his support for it.

Dr. Diana Whipple, Chairperson of this Committee’s Scientific Advisory Subcommittee (SAS) summarized Subcommittee activities. Also serving on the TBSAS are Dr. Garry Adams, Dr. Dan Baca, Dr. Jorge Hernandez, Dr. Bob Meyer, Dr. Janet Payeur, and Dr. Charles Thoen. The TBSAS was requested to review data and other documents and make recommenda-
TUBERCULOSIS

tions on the use of the fluorescence polarization assay (FPA), an antibody
detection test, and the Bovigam™, a commercial interferon gamma assay,
for diagnosing bovine tuberculosis. Both assays are being considered for
use in the State-Federal Bovine Tuberculosis Eradication Program.

Results of the FPA from five different panel evaluations were provided
to the SAS for review. One data set was from tests conducted on serum
samples from a group of Canadian elk with animals that were infected with
or exposed to M. bovis. Sensitivity of the FPA was 75% (9/12) among ani-
mals confirmed to be infected with M. bovis. The second set of data was
from tests conducted using serum samples from cattle in Ireland. In this
set, the estimated sensitivity was 64.7% (11/17) and the specificity was
98.6% (72/73). The third data set was from tests conducted using samples
from another group of cattle from Ireland and the estimated sensitivity was
36% (18/50). The fourth trial was conducted using samples from cattle from
Mexico and was done using three different instruments. The sensitivity val-
ues reported were 18.7% (3/16), 25% (2/8), and 21.4% (3/14) while the
specificity values were 100% (17/17) for all three instruments. The fifth set
of data was from a panel of 75 serum samples from animals that varied in
infection status and species. Sensitivity values ranged from 0% to 25%
while specificity values ranged from 93% to 100%. After considering these
data, the TBSAS has concerns about the wide range of sensitivity values
reported from the different evaluations. Additional data to determine the
sensitivity in animals of known status is needed. The FPA needs to be fully
evaluated using samples from each animal species that the test will be
focused towards. In addition, the specificity of the FPA needs to be more
fully evaluated in different target animal species, and in animals that have
granulomatous lesions caused by agents and diseases other than infection
with M. bovis. The SAS recommends that the Committee on Tuberculosis
take no action regarding the FPA at this time.

Data and published reports on the Bovigam™ were provided to mem-
bers of the Committee on Tuberculosis and to the SAS by Biocor Animal
Health. The manufacturer of the test proposed that the assay be used as
an ancillary or supplemental test for diagnosis of bovine tuberculosis. As
proposed, the assay would be used for detection of interferon gamma in
blood samples collected from cattle 3-30 days after injection of PPD for
skin testing and test results would be used similar to those of the compara-
tive cervical skin test (CCT) for classification of animals. The proposed
method for interpretation of the assay is the same as that used in New
Zealand, where the test is used as an official test for the national tuberculo-
sis control program. The Bovigam™ test kit is currently undergoing the
process of registration and licensing by USDA, APHIS for use in the United
States.

Information reviewed by the SAS included publications describing the
assay and results of field evaluations conducted in Australia, Ireland, New
Zealand, Brazil, and Spain. Results of laboratory and field evaluations con-
DUCTED IN THE UNITED STATES WERE ALSO INCLUDED. THE PROPOSED USE OF THE
TEST IN THE UNITED STATES IS SIMILAR TO THE WAY THE TEST IS USED IN NEW ZEALAND
WHERE THE ESTIMATED SENSITIVITY OF THE ASSAY APPLIED 8-28 DAYS AFTER SKIN
TESTING CATTLE IS 85% (n=163) WHILE THE ESTIMATED SPECIFICITY IS 93% (n=213)
[RYAN TJ, BUDDLE BM, DE LISLE GW. 2000. AN EVALUATION OF THE GAMMA
INTERFERON TEST FOR DETECTING BOVINE TUBERCULOSIS IN CATTLE 8 TO 28 DAYS AFTER
TUBERCULIN SKIN TESTING. RES VET SCI 69:57-61.] IN A STUDY CONDUCTED IN THE
UNITED STATES ON A HERD OF NATURALLY INFECTED CATTLE, THE SENSITIVITY OF THE
INTERFERON GAMMA ASSAY WHEN CONDUCTED 29 DAYS AFTER THE CAUDAL FOLD SKIN
TEST WAS 84.6% (n=26). IN ADDITION, RESULTS OF TWO STUDIES INDICATE THAT
PRODUCTION OF INTERFERON GAMMA BY LYMPHOCYTES FROM CATTLE WITH PRIOR EXPOSURE TO M. BOVIS IS SIGNIFICANTLY HIGHER 3 DAYS FOLLOWING SKIN TESTING COMPARED TO PRODUCTION BEFORE SKIN TESTING. THIS BOOSTING EFFECT PERSISTS FOR AT LEAST 4 WEEKS.

THE SAS RECOMMENDS USDA, APHIS GRANT CONDITIONAL APPROVAL FOR A
PERIOD OF 2 YEARS FOR USING THE BOVIGAM™ AS AN ANCILLARY/SUPPLEMENTAL TEST
to diagnose bovine tuberculosis. THE TEMPORARY APPROVAL PERIOD SHOULD BE
USED TO GATHER ADDITIONAL DATA ON THE PERFORMANCE OF THE TEST UNDER FIELD
CONDITIONS IN THE UNITED STATES. THE ASSAY SHOULD BE USED ALONG WITH THE
CCT, AND DESIGNATED TUBERCULOSIS EPIDEMIOLOGISTS SHOULD BE GIVEN THE AUTHORITY TO USE TEST RESULTS AT THEIR DISCRETION TO MAKE DECISIONS ON THE FINAL CLASSIFICATION AND DISPOSITION OF CATTLE.

THE SAS RECOMMENDS THAT LABORATORIES CONDUCTING THE ASSAY INCLUDE
AN ANTIGEN, SUCH AS POKEWEEED MITOXEN, AS A POSITIVE SAMPLE CONTROL DURING
THE EVALUATION PERIOD. THE MANUFACTURER OF THE TEST KIT NEEDS TO CLARIFY
THE ALLOWABLE TIME FOR STIMULATION OF BLOOD SAMPLES AFTER COLLECTION. THERE
WAS CONFLICTING INFORMATION BETWEEN THE EXECUTIVE SUMMARY (P. 1) AND ASSAY TEST PROCEDURES (P. 17) IN THE INFORMATION PROVIDED FOR REVIEW.

DR. JOSEPH VATIEM PROVIDED A SUMMARY OF SEVERAL CHANGES TO UM &
R'S, AND INFORMATION ABOUT SOME REGULATORY INITIATIVES. THE FORMER INCLUDED
CHANGES TO THE UM & R BASED UPON PREVIOUS RESOLUTIONS AND RECOMMENDATIONS FROM USAHA. ONE CHANGE ADDRESSED PART III, I, 3 (CATTLE AND BISON), WHILE ANOTHER CHANGE INVOLVED AN ADDITION TO PART IV, G, 2 (CAPTIVE CERVIDAE). THIS ADDITION WAS MADE TO ADDRESS THE 1998 RECOMMENDATION BY USAHA TO EXTEND THE QUARANTINE PERIOD TO THE THIRD ANNUAL RETEST. PART II, F, 2 WAS CHANGED TO SPECIFY THAT THE CAUDAL-FOLD TEST IS A PRIMARY DIAGNOSTIC TEST WHEN USED IN LIEU OF THE CERVICAL TEST IN INFECTED HERDS. OTHER CHANGES TO UM & RS INCLUDED SOME ALTERATIONS NECESSARY TO IMPROVE CONSISTENCY BETWEEN THE CFR, SUCH AS "SHOULD VS. SHALL" AND VARIOUS DEFINITIONS SUCH THE DEFINITION OF AN "AFFECTED HERD" IN PART II, D.

REGULATORY INITIATIVES DESCRIBED BY DR. VATIEM INCLUDED CONFIRMATION
THAT THE DOMESTIC RULE WAS FINALIZED ON OCTOBER 23, 2000. IT ESTABLISHED
NEW STATUS CATEGORIES FOR STATES AND TWO ZONES IN TEXAS, AS WELL AS PROVIDING FAIR MARKET INDEMNITY OF UP TO $3,000 FOR ALL LIVESTOCK. THIS NEW RULE ALSO ADDRESSES A BUFFER ZONE BETWEEN MEXICO AND THE UNITED STATES IN THE
TUBERCULOSIS

Dr. Joseph VanTiem also presented a concise summary of information regarding the Comprehensive Strategic Plan for the Eradication of Bovine Tuberculosis. He outlined the Program Goal of eradicating bovine tuberculosis (Mycobacterium bovis) from the domestic livestock population of the United States by December 31, 2003. Factors listed as making eradication of bovine tuberculosis necessary and feasible were listed as: increased surveillance; presence of tuberculosis in wild white-tailed deer in Michigan; progress made in Mexico in areas near the U.S. border; new laboratory methods and technology that make eradication more feasible; and the fact that the international trade situation has changed and new rules of trade are in place. Four strategies were listed as part of the Plan, i.e. 1. Eradicate tuberculosis from remaining pockets of infection in domestic livestock populations; 2. Eradicate tuberculosis from wildlife populations in order to prevent transmission of the disease from wildlife to domestic livestock; 3. Increase laboratory and diagnostic support to increase testing capacity and to incorporate new methods and technology; 4. Implement increased levels of surveillance to ensure that unknown or new incidences of tuberculosis can be eliminated before they spread. He also informed the Committee that Secretary Glickman made a declaration of emergency on October 16, 2000. It authorized $44 million this year to expand the bovine tuberculosis eradication program in the United States. This is initial funding for a multi-year effort. $25,718,000 is earmarked to buy dairies near El Paso, TX. An additional $1,000,000 will be used for wildlife studies and bovine tuberculous surveillance throughout the rest of Texas. In Michigan, funds will be used to hire and equip 20 teams to aid in conducting area testing in cattle. In addition, 10 personnel will be hired to assist with surveillance of tuberculous in wildlife. $4,500,000 million has been allocated for equipment, supplies, travel, and facilities, while $4,000,000 is designated for laboratory services at NVSL and increasing capacity for national surveillance. The remaining $6,000,000 will be spread throughout the remaining 48 states and territories for enhancing surveillance. Dr. VanTiem also described some specific plans to address surveillance including designation of Dr. Robert M. Meyer as the National Surveillance Coordinator. Dr. Meyer will direct the $6 million budget for surveillance and develop innovative strategies to increase and enhance that part of the Plan.

Committee Action Items

The Committee considered and passed three resolutions. One requests that USDA, APHIS grant conditional approval for a period of 2 years for the Bovigam™ assay to be used as an ancillary/supplemental test to diagnose bovine tuberculosis. This period is to be used to compile additional data on the performance of the test under field conditions in the United States. The second resolution asked USAHA to urge Congress to appropriate funds proposed in the President’s 2002 budget to develop, construct, and oper-
ate facilities in Ames, Iowa as described in the USDA Master Plan for the APHIS NVSL, the APHIS Center for Veterinary Biologics, and the ARS National Animal Disease Center. The third resolution requests that USDA, APHIS consult with slaughter plants for the purpose of gathering information to determine an equitable rail out fee, and that a system be established to pay such plants when a carcass is railed out, and a granulomatous lesion is detected, and sufficient identification is collected to enable tracing.

Two recommendations were approved and forwarded to the USAHA President for concurrence and forwarding to USDA, APHIS.

**RECOMMENDATION # 1**

**SUBJECT: CHANGE TO THE UM&R FOR BOVINE TUBERCULOSIS**

**RECOMMENDATION:**

The Committee on Tuberculosis recommends that the USDA, APHIS amend Part III, Section I., Paragraph 5 to require herds with suspects to remain under quarantine in states not designated as Free of bovine tuberculosis.

(Note From Chairman: The Committee expressed their intent that this Recommendation result in continuation of the requirement to quarantine herds with suspects in states not designated as Free, but discontinue that requirement in Free states.)

**RECOMMENDATION # 2**

**SUBJECT: CHANGE TO THE UM&R FOR BOVINE TUBERCULOSIS**

**RECOMMENDATION:**

The Committee on Tuberculosis recommends that the USDA, APHIS amend Part V., Section A., Paragraph 2 to require that Accredited Free Herds only add animals that meet the same requirements necessary for cattle to enter an Accredited Free State.

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
REPORT OF THE COMMITTEE ON WILDLIFE DISEASES

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Vice Chairman: Dr. John R. Fischer, Athens, GA

Dr. Alonso Aguirre, MA; Dr. Wilbur B. Amand, PA; Dr. Robert D. Angus, ID; Dr. Daniel R. Baca, TX; Dr. William W. Buisch, CO; Dr. Robert A. Cook, NY; Dr. Donald S. Davis, TX; Dr. Mark L. Drew, ID; Ms. Barbara R. Fox, MD; Mr. Robert E. Frost, CA; Dr. Cathleen Hanlon, GA; Dr. Robert M. Harbison, AR; Dr. Bob R. Hillman, ID; Dr. David L. Hunter, MT; Dr. Sarah B. S. Hurley, WI; Dr. Susan Keller, ND; Dr. Delorias M. Lenard, SC; Dr. Thomas F. T. Linfield, MT; Dr. Jim Logan, WY; Dr. Juan Lubroth, NY; Dr. Calvin W. S. Lum, HI; Dr. Charles E. Massengill, MO; Dr. Robert M. Meyer, CO; Dr. Victor F. Nettles, GA; Dr. Mitchell V. Palmer, IA; Mr. Scott Petty, Jr., TX; Dr. Morton S. Silberman, GA; Dr. Clarence J. Siroky, WI; Dr. David E. Stallknecht, GA; Dr. Charles O. Thoen, IA; Dr. E. Tom Thorne, WY; Dr. Johna K. Veatch, KY; Ms. Diana L. Whipple, IA; Mr. Dave Whittlesey, CO; Dr. Elizabeth S. Williams, WY; Dr. Richard W. Winters, TX; Mr. Steve Wolcott, CO; Ms. Jill Bryar Wood, TX; Dr. Leslie W. Woods, CA.

The USAHA Committee on Wildlife Diseases met on Wednesday, 25 October 2000 in Birmingham, Alabama; at least 24 committee members and 50 guests participated. A series of reports were given on ongoing and emerging wildlife health issues of interest to USAHA and its members. Summaries of these reports follow:

Wildlife-Livestock Disease Interactions

Drs. Victor Nettles and Tom Thorne opened the meeting with overviews of their USAHA General Session presentations on wildlife-livestock disease interactions. Dr. Nettles began by reviewing some of the disease agents in wildlife that are of real or potential importance to domestic livestock health and are of direct concern to the USAHA. Dr. Thorne followed with a review of issues of authority and responsibility for wildlife disease management, as well as strategies for managing important wildlife disease problems. The full texts of both reports are included elsewhere in these proceedings.

From these presentations, it is clear that many important wildlife disease problems deserve attention by animal health and wildlife management professionals, and that at least some of these may be successfully managed for the benefit of both wildlife and livestock interests. Success will depend on sharing both responsibility and support for such management among a broad range of agencies and constituencies, on setting realistic goals and timetables for disease management in free-ranging populations, and on recognizing and overcoming technical challenges unique to
managing the health and viability of valuable wildlife resources. The remainder of this committee meeting was spent discussing several specific wildlife disease issues in greater detail.

**Bovine Tuberculosis in Riding Mountain National Park, Manitoba, Canada**

Dr. George Luterbach of the Canadian Food Inspection Agency (CFIA; formerly known as Agriculture Canada) presented a review of an apparent focus of bovine tuberculosis (TB) in free-ranging elk in Riding Mountain National Park, Manitoba, Canada. Riding Mountain National Park is a 1500 square mile Park located in Manitoba Canada 100 miles north of the US - Canada border. The Park is an escarpment on the prairies with a transition of ecosystems from flat grasslands through rolling hills to Canadian shield. There is an estimated wild elk population of 5,500.

In 1992, a wild elk was shot within 1 mile of a cattle farm that was considered to be the source premises of a TB outbreak involving 5 herds of cattle in Manitoba. The elk was confirmed by culture to be infected with *Mycobacterium bovis*. There had never been a previous confirmed case of bovine TB in a wild elk in Canada prior to this time. The infected cattle herds were eradicated and a local area hunter survey (55 deer, elk and moose) was done the following hunting season. There was no further evidence of TB found in wild cervids. The positive finding in the wild elk was believed to be an isolated case spilling out of the infected cattle herd.

In 1997, another outbreak in cattle in this area sparked considerable debate as whether a wildlife reservoir played a role in the outbreak. An ongoing comprehensive wildlife survey based upon hunter-shot, found dead and road kill animals was initiated around and within the park. In the first year 200 deer, elk and moose were examined and sampled. There were no positive findings for bovine TB. However, in each of the next two years two elk were confirmed positive in or near the Park. The sampling size was 563 and 453 animals.

A joint stakeholder group including the Canadian Food Inspection Agency, Parks Canada, Manitoba Agriculture, Manitoba Natural Resources, the farmed livestock industry associations and local producers are working together in developing a TB strategy. The wild elk population is being lowered through increased hunting permits. Exclusion fencing is being considered. Capture test and cull programs are also being considered within the Park along with movement studies using radio collars.

All cattle, farmed bison and farmed cervid herds in the vicinity of the positive findings have been tested with negative results.

**Management of Bovine Tuberculosis in Michigan White-tailed Deer**

Dr. Stephen Schmitt provided an update on progress being made in the management of an endemic focus of bovine TB in free-ranging white-tailed deer. Since 1994, the state of Michigan has recognized a problem
WILDLIFE DISEASES

with TB, caused by *Mycobacterium bovis*, in wild white-tailed deer from an eleven county area in northeastern Lower Michigan. A total of 39,500 free-ranging deer have been tested and 285 have been found to be positive for *M. bovis*. The disease has been found in other wildlife species, including 8 coyotes, 2 raccoons, 2 opossums, 2 bobcats, 1 black bear, and 1 red fox, and, in 1998, in domestic cattle, where to date 9 beef cattle and 2 dairy cattle herds have been diagnosed with bovine tuberculosis. Recognizing the potential economic and public health consequences of bovine tuberculosis to the state, the governor has issued orders to eradicate *M. bovis* from the state's deer population. Unfortunately, the situation is unique in that there have never been reports of self-sustaining bovine TB in a wild, free-ranging cervid population in North America. There are no existing control programs for TB in wild deer, and there is much about TB in deer that is currently unknown. Scientists, biologists, epidemiologists, and veterinarians that have studied this situation have concluded that the most logical theory is that high deer densities and the focal concentration caused by baiting (the practice of hunting deer over feed) and feeding are the factors most likely responsible for the establishment of self-sustaining TB in free-ranging Michigan deer. By congregating deer into close contact with each other repeatedly, baiting and feeding provide ideal conditions for the transmission of TB via both inhalation of infectious aerosols and ingestion of TB contaminated feed. The two main strategies for eradicating TB from free-ranging Michigan deer are to minimize concentrations of deer by eliminating baiting and feeding, and to reduce deer numbers through hunting to the biological carrying capacity. Dr. Schmitt reported that baiting and feeding have been banned since 1998 in counties where the disease has been found. In addition, the deer herd has been reduced by 50% in the endemic area with the use of unlimited antlerless permits. The measures of apparent TB prevalence have decreased by half since 1997, providing hopeful preliminary evidence that eradication strategies are succeeding.

USAHA Working Group on the Tuberculosis/Wildlife/Livestock Interface

Dr. Mo Salman presented a brief overview of a draft report on issues related to the TB situation in Michigan prepared by the USAHA Working Group on the Tuberculosis/Wildlife/Livestock Interface. The text of this report can be reviewed on the USAHA web-site (www.usaha.org). Committee members were urged to review this report and provide feedback to Working Group Co-chairs (Dr. Salman of the USAHA Tuberculosis Committee and Dr. Miller of the Wildlife Diseases Committee).

Discussion regarding various aspects of the report followed Dr. Salmon's presentation. The report was regarded as a commendable body of work and committee members encouraged the Working Group to continue their efforts. The committee regarded this as a working document, but offered few suggestions for expanding or altering the draft report as presented.
Committee members' suggestions included additional work on long-term issues raised in the original Working Group charge, as well as some expanded discussion of background information supporting the draft recommendations on extensive TB surveillance in wildlife outside Michigan. Based on committee discussion, a recommendation was adopted encouraging the Working Group to continue to develop specific recommendations and long-term strategies for managing the TB interface of wildlife and domestic livestock in Michigan.

**Efficacy of Brucella abortus strain RB51 Vaccine in Elk**

Dr. Terry Kreeger of the Wyoming Game and Fish Department reported results of the most recent in a series of studies on the efficacy of *Brucella abortus* strain RB51 vaccine in captive elk. All of these studies were designed to determine whether this vaccine protected elk against abortion following subsequent challenge. In the latest study, 30 female elk calves were vaccinated intramuscually with $1.0 \times 10^{10}$ colony-forming units (CFU) of strain RB51 in March 1998. Fourteen of these were given a booster dose of $1.13 \times 10^{10}$ CFU exactly one year later. All vaccinated elk seroconverted to strain RB51 with the booster group having higher titers ($P < 0.001$). Seventeen other elk served as unvaccinated controls. All elk were bred as yearlings in the fall of 1999, determined pregnant using pregnancy-specific protein B analysis, and subsequently challenged in March 2000 with $1.1 \times 10^{7}$ CFU of *B. abortus* strain 2308 administered intraconjunctivally. All elk seroconverted to strain 2308. Fifteen of 17 control elk aborted; 16 of 16 elk given a single vaccination aborted ($P = 0.44$); and 13 of 14 elk given a booster aborted ($P = 0.86$). There were two viable calves in the control group and one in the booster group. Strain 2308 was recovered from fetuses and nonviable calves in all groups. Based on the results of this and other studies reported previously, the use of strain RB51 to prevent abortion in elk cannot be recommended.

**Brucellosis in Idaho Elk**

Dr. Mark Drew of the Idaho Departments of Agriculture and Fish and Game provided an update on the current status of brucellosis in elk in Idaho. Brucellosis was discovered in elk in eastern Idaho in 1998. A Wildlife Brucellosis Task Force was formed in 1998 to make recommendations to deal with this problem from both wildlife and livestock perspectives. There are numerous sites in Idaho where the Department of Fish and Game or well-meaning private citizens feed deer and elk during winter. At least 1 state-sponsored and 3 private feed sites are maintained in eastern Idaho in the area with known seropositive elk (Rainey Creek, Conant Creek, Teepee Creek and Victor).

In 1999, a harvest-based serological survey was conducted in controlled cow elk hunt units in the Department of Fish and Game Upper Snake River Region (Region 6) in eastern Idaho and the McCall SubRegion (Re-
region 3) in central Idaho. Sample kits were sent to 900 hunters in eastern Idaho and 300 hunters in central Idaho. In eastern Idaho, 56 samples were returned; 45 were useable and of those 4 were positive (8.0%). In central Idaho, 22 samples were returned; 14 were useable samples and none were positive. Seropositive results were defined as any sample with a Rivanol titer equal to or greater than 125 or any sample with a CF titer equal to or greater than 1+20.

Based on two years of data collection, the area of concern for brucellosis appears limited to eastern Idaho. Seropositive animals have been identified in 7 hunt zones (60A, 62, 62A, 64, 62A-1, 67, and 67-3). The geographic distribution of seropositive elk does not appear to vary significantly by year, but sample sizes in many zones are small. Further testing of elk in other areas of Idaho with consistent winter feeding is needed to ensure that brucellosis is indeed limited to eastern Idaho.

A trap site at Rainey Creek was operated between February and March 2000. A total of 45 elk were captured and tested for brucellosis. Of these 45 animals, 21 (46.7%) were seropositive for brucellosis. Seventeen seropositive elk were transported to either the Wildlife Health Laboratory (9 cows) or the Caine Veterinary Teaching Center (5 calves and 3 cows). Fourteen female calf elk were vaccinated with RB51; three of these calves were found to be seropositive and removed from the population.

Of the 9 cows at the Wildlife Health Laboratory, all nine were pregnant. All nine cows gave birth, although one calf was stillborn. Culture results indicated that 2 cows (22.2%) were positive for *Brucella abortus*; both isolates were biovar 4. Among the calves, one was infected with a mixed infection of *Brucella abortus* (biovars 1 and 4). Of the eight animals taken to the Caine Veterinary Teaching Center, two were culture positive (one with *Brucella abortus* biovar 4 and one with RB51). The animal with a positive culture for RB51 was vaccinated with RB51 at the trap site.

In addition, a total of four elk were trapped and tested at the Teepee Creek site. One of these animals was seropositive for brucellosis. Further testing of the animals that winter at this location is needed to determine the prevalence of brucellosis within this group of elk. At the other winter feeding sites in eastern Idaho, either no elk were present, no elk were fed or access for trapping was not permitted by the landowner.

Elk feeding was done during the winter of 1999-2000 at the private feed site at Gold Fork (IDFG Region 3) and the 6 sites in the vicinity of Featherville and Fairfield (IDFG Region 4). No elk were tested at Gold Fork. A total of 17 elk were darted at the feed sites in Region 4 and sampled for brucellosis; all 17 were negative.

Active surveillance of brucellosis within Idaho cattle in 2000 was conducted for 3 beef herds on premises where elk were or had been fed and 1 sentinel herd located on the periphery of the brucellosis impact area. Of the 245 cattle on premises with active feeding of elk, 242 were negative, 2 were low-level suspects, and 1 was hemolyzed (not tested).
Passive surveillance using the Market Cattle Identification program and the Milk Ring test was also done in 200, but data collection is not yet complete for this calendar year. To date, a total of 278,553 beef cattle were tested, of which 2178 (0.06%) were seropositive. Among dairy cattle, 944 were tested, 25 herds (1.03%) were found to be responders for brucellosis. None of the responding herds were positive on follow-up testing.

Habitat enhancement projects designed to offset dependence on feedgrounds have focused on three main activities: 1) reduce human disturbance; 2) enhance private land habitats; and 3) enhance public land habitats. Activities to date are encouraging, but the effect and extent of the land involved in these projects will take several years to assess.

The Brucellosis Management program in Idaho is in place and steps are being taken to identify and manage elk herds affected with brucellosis. To date no cattle have been identified with brucellosis. Although the situation is under surveillance, control efforts will take time and public acceptance.

**Current Trends in Hemorrhagic Diseases of Free-ranging Ruminants**

Dr. Daniel Mead provided a brief update on recent hemorrhagic disease epizootics in the US. During 2000, SCWDS personnel have made 32 HD virus isolation from white-tailed deer. These isolations are primarily associated with morbidity and mortality reported from Georgia, North Carolina, South Carolina, Virginia, Maryland, Kansas and Texas. To date, isolates include 26 viruses identified as EHDV-2, one virus identified as EHDV-1, one BW-17. The identification of 4 isolates is pending.

**West Nile-like Virus Epizootic Update**

Dr. Linda Glaser of the National Wildlife Health Laboratory (USGS/BRD) updated the committee on the ongoing West Nile virus (WNV) outbreak in the eastern US. WNV is an arthropod-borne virus that had never been reported in the Western Hemisphere until the fall of 1999. Wild birds (primarily crows), horses, and people were affected in last year’s outbreak in the greater New York City area. This year, WNV activity was first detected in wild birds found dead in May in southeastern New York and northeastern New Jersey. The virus continues to expand both geographically (see National Atlas website) and in the number and variety of species infected (see Table 1). West Nile virus has been isolated from over 60 species of birds, including 55 free-ranging species from 11 states and Washington, D.C. Wild mammal species in New York were found positive for WNV for the first time this year (see table) and 29 horses from 6 states were infected with WNV. Twelve mosquito species were found positive for WNV including species active at dawn and dusk, species active during the day, and species that feed on avian hosts and mammalian hosts. Staten Island is considered the epicenter of this year’s outbreak where 10 of the 18 confirmed human WNV cases were identified. There has been one human fatality
Wild birds are playing a critical public health role in our western hemisphere WNV outbreaks. Several native bird species, particularly the American crow, appear to be highly susceptible to this recently introduced arbovirus. An enhanced passive surveillance system for reporting and testing dead birds has been the leading surveillance tool for state public health agencies in detecting WNV activity. WNV-positive birds were found in most areas long before mosquitoes, horses, people, or sentinel chickens indicated the virus was present in an area. The American crow appears to be one of the most susceptible species to WNV infection. Preliminary results of infectivity studies at the National Wildlife Health Center indicate crows die within 4-7 days after inoculation. Signs in affected birds include weakness, lethargy, lack of response to human approach, and paresis/paralysis of legs. The impact to American crow populations in the outbreak area is unknown.

Wild mammals were first found positive for WNV in August of this year. Initially, bats found alive in homes in Albany, NY were submitted for rabies testing (1). When rabies tests were negative, the animals were tested for WNV and found positive. Since then, over 22 bats and other mammals found dead in 10 counties in NY have tested positive for WNV. It appears that at least some of the bats found positive for WNV are dying of WNV. It is unknown whether these species are dead end hosts or if they will be capable of transmitting WNV to new species of primarily mammal feeding mosquitoes.

Horses are considered a dead end host for WNV. This year 29 horses (15 euthanized) have been clinically affected from 8/17/00-10/18/00 from 6 states (CT, MA, NY, NJ, PA, RI) (2). The European Union issued import restrictions effective 9/15/00 for horses originating from 5 states with equine cases of WNV.

People have been clinically affected by WNV again this year. The age range of the 18 clinical patients is from 37-87. Public education on mosquito bite prevention and mosquito control efforts is credited with reducing human cases.

Dr. Glaser provided several website references, listed below, where additional information on WNV can be accessed:

- http://nationalatlas.gov/virusmap.html
- http://www.health.state.ny.us/nysdoh/westnile/index.htm

Avian Vacuolar Myelinopathy

Dr. John Fischer reported on ongoing investigations of avian vacuolar myelinopathy (AVM) in bald eagles and numerous waterfowl species. First recognized in 1994 in bald eagles in Arkansas, avian vacuolar myelinopathy
(AVM) has caused the deaths of at least 69 eagles in four states to date. The disease also has been detected in American coots, and it is hypothesized that eagles are exposed to the causative agent of AVM via ingestion of affected coots. The cause of AVM has not been determined despite extensive diagnostic and field testing investigations; however, a natural or manmade neurotoxin is suspected.

In 1998, AVM was confirmed in mallards and a ring-necked duck and it was suspected in buffleheads, a northern shoveller and an American wigeon at a single site in North Carolina. Significant developments during the winter of 1999-2000 included bald eagle mortality due to AVM in Arkansas (5) and South Carolina (2). Additionally, two Canada geese from a reservoir on the Georgia/South Carolina border were diagnosed as AVM suspects. AVM has been documented in bald eagles and coots at this reservoir during the last two winters. Studies conducted by the National Wildlife Health Center, U.S. Fish and Wildlife Service, and the North Carolina Wildlife Resources Commission indicated that wing-clipped game farm mallards and wild-caught coots from Wisconsin developed brain lesions of AVM after being placed on Woodlake, NC, a site at which AVM has been diagnosed the last three winters.

The Southeastern Cooperative Wildlife Disease Study (SCWDS), with the assistance of several state and federal wildlife resource agencies, recently completed a research project to investigate the epidemiology of AVM, also known as the "avian brain lesion syndrome" (ABLS). Principal funding for the project was provided by the state wildlife resource agencies of Arkansas, Georgia, and North Carolina and the U.S. Fish and Wildlife Service. Supplemental funding came from the Biological Resources Division, USGS, of the U.S. Department of the Interior and the state wildlife resource agencies of SCWDS member states.

Objectives of the SCWDS epidemiology project were to determine the distribution of coots with AVM and to evaluate the relationship between clinical disease and microscopic lesions in coots. During the two-year project, coots at more than 40 sites in 15 states were observed for clinical signs of AVM, collected, and necropsied. Microscopic examination of brains for AVM lesions detected affected coots at eight locations in Arkansas, Georgia, North Carolina, and South Carolina. Additionally, coots with brain lesions resembling mild AVM were collected at one site in Texas. Many of the birds with brain lesions were clinically normal when observed and did not show neurologic signs typical of AVM such as difficulty with flying or swimming. Results of this study indicate that AVM may be more widespread than originally suspected and that active surveillance is necessary to detect coots with AVM.

During the 2000/2001 migratory season, additional research and diagnostic efforts will be devoted to developing information to determine the cause of AVM. Projects include sentinel bird studies at a North Carolina site, sediment analysis of affected lakes, additional disease distribution stud-
Chronic Wasting Disease Surveillance and Management in Free-ranging Cervids

Dr. Michael Miller provided an update on chronic wasting disease (CWD) surveillance in free-ranging cervids throughout the US. These surveys have been accomplished through various combinations of interagency collaboration between respective state wildlife management agencies, state animal health officials, state diagnostic laboratories, USDA/APHIS Veterinary Services and National Veterinary Services Laboratory, and USDA Agriculture Research Service. Surveillance data reported by Dr. Miller represented a synthesis of data compiled by the Western Wildlife Health Cooperative (WWHC), the Southeastern Cooperative Wildlife Disease Study (SCWDS), and USDA/APHIS/VS. Some level of targeted surveillance and/or harvest-based surveys for CWD in free-ranging cervids has been conducted and reported in at least 30 states in recent years; at least 3 Canadian provinces also have collected CWD surveillance data. In all, brainstems from over 13,750 free-ranging cervids have been examined microscopically for evidence of CWD infection in the US, most over the last 3 years. No evidence of CWD has been detected in over 5,700 samples collected outside Colorado and Wyoming, indicating that CWD is probably not widespread among native deer and elk populations. Ongoing surveillance in the latter two states has continued to support previous observations that CWD in free-ranging cervids is confined to contiguous portions of southeastern Wyoming and northeastern Colorado; additional sampling in the last year has helped refine understanding of this endemic area. Dr. Miller indicated that these data should help answer questions raised by international trading partners and others about the extent of CWD distribution in the US, and encouraged development of some form of CWD surveillance in all states not already participating.

Dr. Miller also briefly described management actions taken in Colorado and Wyoming to help limit spread and reduce the occurrence of CWD in free-ranging cervids. The presence of CWD in Colorado and Wyoming has led to considerable interagency cooperation at the state level. Although initially perceived as solely a wildlife health issue, increasing interest in the TSEs in general, and CWD in particular has fostered increased interagency communication and cooperation among respective state wildlife management, livestock health, and public health agencies, as well as representatives of cattle, sheep, and alternative livestock industries. In addition, a coordinated national approach to CWD research has been an important product of this broad-based cooperative endeavor to better understand and manage CWD.

There is no precedent for attempting to manage a TSE in free-ranging wildlife. Other programs for managing or eliminating animal TSEs have proven only marginally successful to date; moreover, the epidemiologic dif-
ferences between CWD and other TSEs make such programs rather poor models for prospective CWD management. Limited understanding of the epidemiology of CWD makes development and implementation of strategies to prevent, control, and eradicate CWD extremely difficult. Therefore a primary goal of the wildlife management agencies in Colorado and Wyoming has been to invest resources in applied research to understand the epidemiology, distribution, and prevalence of CWD in affected areas. In addition, common sense preventive measures have been instituted, including bans on relocation of cervids from the CWD endemic areas, halting artificial feeding of deer and elk by the public in areas where CWD occurs, limiting growth of infected populations, and culling deer and elk showing clinical signs of CWD. It may be possible to further manage affected deer or elk populations to reduce CWD prevalence in endemic foci, but prevalence reduction will require a long-term commitment and may not eliminate CWD from endemic areas. A cooperative experiment assessing the efficacy of alternative deer management strategies in changing CWD prevalence is underway in two game management units with high CWD prevalence in Colorado and Wyoming. Considering the difficulties inherent in addressing disease in free-ranging wildlife, Dr. Miller advocated an adaptive resource management approach to test candidate strategies for reducing CWD prevalence and distribution is imperative.

Chronic Wasting Disease Surveillance in Captive Cervids: USA

Dr. Lynn Creekmore, USDA, APHIS, VS, National Animal Health Programs Staff Veterinarian and the National Chronic Wasting Disease (CWD) contact for VS presented an update on federal CWD surveillance activities and trends in captive elk in the US.

She began with an update on the current distribution of the disease in farmed elk. Dr. Creekmore noted that since CWD was first detected in the farmed elk industry in the U.S. in South Dakota in 1997, the disease has been identified in a total of 13 farmed elk herds in 5 states (CO, MT, NE, OK and SD). The last positive farmed elk herd was identified in late April of this year. She also noted that 7 of these elk herds have been depopulated or have gone to slaughter and testing; 6 herds remain in CO, NE, OK, and SD.

Dr. Creekmore then reported on recent surveillance efforts. She explained that USDA support of surveillance has included both farmed and free-ranging cervids. Approximately 2100 farmed cervids have been tested as part of surveillance efforts since the latter half of 1997; 1469 of these were tested in FY 2000. Dr. Creekmore pointed out that most submissions were from the north central states and most were from farmed elk operations. She noted that USDA will continue to encourage increased CWD surveillance in both the farmed elk and deer industries. Dr. Creekmore also reported that during the 1999/2000 hunting season USDA supported surveillance conducted in free-ranging cervids in ME, OK, UT, and SD, and
pointed out that the CWD tests for all of the free-ranging animals sampled in these surveillance efforts were negative. She noted that surveillance in ME, OK, and UT was in response to a request by the Centers for Disease Control and Prevention to investigate potential epidemiological connections between free-ranging cervids in these 3 states and unusual cases of Creutzfeldt-Jakob Disease in young patients that had consumed venison. (No connection was found.) She also noted that USDA is providing funds to test 1500 free-ranging cervids from Kansas, Montana, Nebraska, Oklahoma, and South Dakota for the 2000/2001 hunting season; these states were chosen for surveillance because they either contain CWD-infected farmed elk herds or are adjacent to the CWD endemic area.

Chronic Wasting Disease Surveillance in Captive Cervids: Canada

Dr. George Luterbach reported on recent CWD surveillance and program development in Canada’s elk industry. A retrospective epidemiological investigation has led to speculation that a Saskatchewan elk farm was infected with CWD in 1990. The first case is believed to be in a two-year-old cow imported from South Dakota in 1989. This Saskatchewan farm is the source of all known cases of CWD in farmed elk in Canada.

Canada’s first confirmed case in farmed elk was discovered in 1996. The cow was a purchase from the Saskatchewan source farm in 1993. The entire exposed breeding herd was destroyed. Samples taken from these elk were all tested and found to be negative. In 1998, another elk velvet production farm had a confirmed case of CWD. A selective cull of high-risk animals was conducted. Similar to the first case all these cull animals were tested and found to be negative. As a result of a second finding of CWD at this same farm in 2000, the entire herd was destroyed for research purposes. All herd-mate elk were found to be negative. There were no sales from this farm. As well, in 2000 cases have been confirmed in two other cervid farms in Saskatchewan. All of the cases are linked to the common source herd that only recently has been confirmed positive. In total, there have been 9 confirmed cases of CWD found on four Saskatchewan elk farms from 1996 to the present.

Canada is in the process of making CWD a federal Reportable Disease. The policy includes destruction of high-risk animals with financial compensation, and surveillance of low risk animals. The source farm has been categorized as a Highly Contaminated Premise and the entire herd and sales that have left in the past 3 years will be destroyed. Elk that have been sold greater than 3 years but less than 5 years will be placed under mandatory surveillance and not allowed to move from their current premise. Sales greater that 5 years which are clinically normal will not be placed under any restrictions.
Development of a CWD Program for Captive Elk

Dr. Creekmore returned to the podium to present an update on the development of a CWD program for captive elk. She pointed out that key areas of USDA focus and response regarding program development have been prioritized based on resolutions from USAHA made in 1998 and 1999 requesting action from federal and state agencies to address this issue. She explained that in response to these requests VS has submitted a budget for a CWD program as a new line item for FY 2002. At this point in the process the submitted budget will be enough to establish a framework to support a CWD program for captive elk but will not be adequate to cover indemnity. She expressed hope there will be additional discussion about strategies to obtain indemnity and that those states, associations, and producers that support this new line item as well as the establishment of indemnity for the program will work together to obtain sources of funding for indemnity. In addition, she reported that a Veterinary Services study group was convened to revise the North American Elk Breeder's Association (NAEBA) "Model Program for the Surveillance, Control, and Eradication of CWD in Domestic Elk" recommended in 1998 by USAHA. Like the original model, the revision included certification with increase in status based on surveillance as the basis for the program. However, she explained that the revision encouraged the more aggressive approach of depopulation of infected and exposed animals rather than quarantine. She reported that this revised program developed by the VS study group was then taken to a National CWD Working Group for input. This group was composed of stakeholders including agriculture industry, state agriculture and wildlife agency, university, and USDA-ARS representatives. This group provided input on the certification plan adapted by the VS study group from the NAEBA model and a revised plan incorporating their input has been produced and circulated for additional input and comment. Dr. Creekmore pointed out that a copy of this draft proposed program was provided to the committee members. The proposed program is attached in these proceedings as Appendix A of the Captive Wildlife and Alternative Livestock Committee Report. She briefly summarized the proposed program and comments received to date. The proposed program is similar to the NAEBA model with regard to the set up of the certification program but encourages the more aggressive approach of depopulation of CWD positive herds. Dr. Creekmore indicated that she will take the responses received from USAHA back to the VS CWD Study Group and to the National CWD Working Group to continue the effort of program development.

Resolutions

Mr. Robert Frost provided a brief summary of a proposed USAHA resolution supporting congressional funding to aid in consolidation and modernization of USDA laboratory facilities in Ames, IA, as outlined in a master plan jointly prepared by USDA/APHIS and USDA/ARS. After brief discus-
WILDLIFE DISEASES

sion, the resolution was unanimously supported by Committee members and will be forwarded to the Resolutions Committee for further consideration.

Mr. Steve Wolcott presented a resolution encouraging USDA/APHIS/VS to continue developing and implementing a program for controlling CWD in captive elk, including indemnity to support program objectives. After brief discussion, the resolution was unanimously supported by Committee members and will be forwarded to the Resolutions Committee for further consideration.

Respectfully submitted,
Michael W. Miller, D.V.M, Ph. D.
Chair, Committee on Wildlife Diseases
25 October 2000

The text of the resolution(s) approved by the committee can be found in the minutes of the 3rd Business Session.
Table 1.
Documented host range for West Nile virus in the eastern US.

<table>
<thead>
<tr>
<th>Free-Ranging Native North American species positive for WNV</th>
<th>Hummingbird, Ruby-throated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bittern, Least</td>
<td>Chickadee, Black-capped</td>
</tr>
<tr>
<td>Chickadee, Black-capped</td>
<td>Sharp-shinned</td>
</tr>
<tr>
<td>Blackbird, Red-winged</td>
<td>Heron, Great Blue</td>
</tr>
<tr>
<td>Bluebird, Eastern</td>
<td>Heron, Green</td>
</tr>
<tr>
<td>Cardinal, Northern</td>
<td>Warbler, Canada</td>
</tr>
<tr>
<td>Catbird, Gray</td>
<td>Warbler, Yellow-rumped</td>
</tr>
<tr>
<td>Cormorant, Double-crested</td>
<td>Waxwing, Cedar</td>
</tr>
<tr>
<td>Crow, American</td>
<td>Warbler, Black-throated Blue</td>
</tr>
<tr>
<td>Crow, Fish</td>
<td>Warbler, Canada</td>
</tr>
<tr>
<td>Dove, Mourning</td>
<td>Robin, American</td>
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<td>Duck, Mallard</td>
<td>Goose, Canada</td>
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<tr>
<td>Finch, House</td>
<td>Gull, Great Black-backed</td>
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<tr>
<td>Goldfinch, American</td>
<td>Gull, Herring</td>
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<tr>
<td>Goose, Canada</td>
<td>Gull, Ring-billed</td>
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<tr>
<td>Gull, Herring</td>
<td>Grouse, Common</td>
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<td>Grackle, Common</td>
<td>Hawk, Broad-winged</td>
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<tr>
<td>Grouse, Ruffed</td>
<td>Hawk, Cooper's</td>
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<tr>
<td>Hawk, Broad-winged</td>
<td>Hawk, Red-tailed</td>
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<tr>
<td>Hawk, Cooper's</td>
<td>Hawk, Sharp-shinned</td>
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<td>Hawk, Red-tailed</td>
<td>Heron, Great Blue</td>
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<td>Hawk, Sharp-shinned</td>
<td>Heron, Green</td>
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<tr>
<td>Heron, Great Blue</td>
<td>Waxwing, Cedar</td>
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<tr>
<td>Heron, Green</td>
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<tr>
<td>Captive North American species positive for WNV</td>
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<tr>
<td>Crane, Sandhill</td>
<td>Magpie, Black-billed</td>
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<tr>
<td>Eagle, Bald</td>
<td>Night-Heron, Black-crowned</td>
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<tr>
<td>Gull, Laughing</td>
<td>Owl, Snowy</td>
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<tr>
<td></td>
<td>Other Free-Ranging Bird species positive for WNV</td>
</tr>
<tr>
<td>Dove, Rock (pigeon)</td>
<td>Starling, European</td>
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<td>Pheasant, Ring-necked</td>
<td>Swan, Mute</td>
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<tr>
<td>Sparrow, House</td>
<td>Free-Ranging Mammal species positive for WNV</td>
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<tr>
<td></td>
<td>Bat, Big brown</td>
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<tr>
<td></td>
<td>Bat, Keen's</td>
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<tr>
<td></td>
<td>Bat, Little brown</td>
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<tr>
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<td>Pet/Zoo species positive for WNV</td>
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<tr>
<td></td>
<td>Cockatoo</td>
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<td>Chicken</td>
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III. Organizational Matters
   A. Constitution and Bylaws
   B. Proposed Bylaws
   C. Administrative Policies
   D. Previous Meetings
CONSTITUTION AND BYLAWS
OF THE
UNITED STATES ANIMAL HEALTH ASSOCIATION

ARTICLE I - NAME

The name of this Association shall be "The United States Animal Health Association".

ARTICLE II - PURPOSE

The mission of USAHA is to be a forum for communication and coordination among State and Federal governments, universities, industry, and other groups on issues of animal health and disease control, animal welfare, food safety and public health. It serves as a clearing house for new information and methods which may be incorporated into laws, regulations, policy, and programs. It acts to develop solutions to animal health-related issues based on science, new information and methods, public policy risk/benefit analysis and the ability to develop a consensus for changing laws, regulations, policies, and programs.

ARTICLE III - MEMBERSHIP

There shall be five kinds of members: Official, allied organization, individual, elected regional delegates, and nonvoting juniors.

OFFICIAL MEMBERSHIP

The animal health departments of each state, also the United States, and the Canadian, and Mexican governments, Puerto Rico, the Virgin Islands, and of such other governmental agencies as the Executive Committee may by a two-thirds vote approve, shall be eligible to official membership in this Association and be represented on the Executive Committee by the animal health executive official.

ALLIED ORGANIZATION MEMBERSHIP

Any nonprofit organization approved by the Executive Committee that is national in scope and actively and directly concerned with and supportive of the interests and objectives of this Association as outlined in Article II—Purpose, may be elected to allied organization membership and be represented on the Executive Committee by a duly authorized member of the organization.
INDIVIDUAL MEMBERSHIP

Any person engaged in animal health work for Federal, provincial, state, county, or municipal governments, and any other person interested in animal health science or milk and meat hygiene, may be elected to individual membership.

Any individual members who has maintained membership in this Association for 35 years, or if such member is at the point of retirement, for 25 years, may be elected to life membership in USAHA by the Executive Committee. Such life membership shall carry with it all the rights and privileges of regular individual membership, including receipt of the Annual Proceedings of this Association. Such life membership shall be exempt from the payment of dues. Fully retired life members, not otherwise gainfully employed in the field of animal science or health, shall also be exempt from the payment of annual meeting registration fees. All past presidents shall automatically become life members.

Members of the Executive Committee will be eligible for such life membership; but for such member, the requirements for maintaining individual membership will be waived. But the period of time for such membership will be as herein provided.

The Executive Committee may, at its discretion, confer honorary individual memberships. Such memberships shall be exempt from the payment of dues and other assessments and may be withdrawn at the discretion of the Executive Committee.

ELECTED REGIONAL DELEGATE MEMBERSHIP

Such elected regional delegates as provided for in Article V—Executive Committee shall by virtue of such election automatically become members of this organization for such term or terms as may be decided by the Executive Committee and shall pay such dues as the Executive Committee may decide.

NONVOTING JUNIOR MEMBERSHIP

Students in agriculture, medicine, veterinary medicine, vocational agriculture, or any 4-H Club member, as well as future farmers under 21 years of age are eligible to election as nonvoting junior membership.

ARTICLE IV - MEETINGS

The meetings of this Association shall be annual and special.
ARTICLE V - OFFICERS

The officers of this Association shall be: President, President-Elect, First Vice-President, Second Vice-President, Third Vice-President, Secretary, Treasurer, Board of Directors, and an Executive Committee.

BOARD OF DIRECTORS

The Board of Directors shall consist of the officers, including the immediate Past President with the exception of the Executive Committee. It shall handle the financial, administrative, and internal affairs of the Association during such time as the Association and/or the Executive Committee is not in session. It shall handle all other duties and responsibilities as may be assigned to it by the Executive Committee or as may be provided in the Constitution. The Board of Directors shall meet immediately after the adjournment of each annual meeting of this Association and at the same place. The purpose of such meeting is to review plans for the administrative functions of the Secretary for the coming year, to give administrative guidance to the Secretary, and to approve the operations of the office of the Secretary including, upon consultation with him, the employment of an Executive Director and such other employees as may be required which are not otherwise in conflict with the Constitution and Bylaws. The Board of Directors may meet at such other times and places as it, by a majority vote, deems necessary. The Secretary shall keep minutes of all meetings of the Board of Directors, and after approval of such minutes by the President, they shall be presented to the Executive Committee at the next annual meeting of this Association.

EXECUTIVE COMMITTEE

The Executive Committee shall be composed of the executive officer representing the animal health departments of the various states, the principal animal health officer of the United States Department of Agriculture, the Veterinary Director General of Canada, the executive animal health officer of Mexico, Puerto Rico, the Virgin Islands, and of such other governmental agencies as may be approved for official membership by the Executive Committee, the elective officers of this Association, not more than eight (8) delegates at large representing the livestock industry, including poultry, and allied organization members. All past presidents in attendance not included in any other section shall be ex-officio members. For the purpose of having proper credentials, the name of the Executive Committee representative or substitute, if applicable, shall be provided to the Association Secretary by the executive officer of those entities named

Each district, as provided above, shall on a rotating basis, annually submit to the Nominating Committee, nominees for vacancies that shall occur in the following offices: President; President-Elect; First Vice-President; Second Vice-President; Third Vice-President. The order of rotation shall be as follows: Northeastern; Western; Southern; Region-at-Large; North Central. In the event that an elected officer is unable to complete an elected term, the District that originally submitted the nominee shall have the opportunity to resubmit a nominee to fill the vacancy; or, the provisions of Article VII—Duties of Officers shall apply.

The elected officers shall have the authority to place before the Executive Committee applications for allied organization membership. Not more than five (5) such applications shall be presented to the Executive Committee for consideration at any annual meeting of the United States Animal Health Association.

The Executive Committee shall constitute the administrative body of this Association and shall determine its activities and policies. All recommendations and reports of officers and committees shall be referred for consideration to the Executive Committee. The President-Elect shall be ex-officio chairman of the Executive Committee.

The Executive Committee shall elect yearly a Secretary for the Association. The Secretary shall receive such salary and allowance as may be fixed by the Executive Committee.

The Executive Committee shall cause to be audited annually, or oftener if deemed necessary, the receipts and disbursements of the Secretary and of the Treasurer, and shall have authority to hear and determine all complaints filed before it in writing relative to the conduct of any member; and shall accept or reject applications for individual and for allied organization membership properly placed before it. Three negative votes shall disqualify for either such membership.
That, with the exception of a change in the name of this Association, upon the dissolution of this corporation or the termination of activities thereof, all remaining assets thereof shall be contributed for utilization in the advancement of research of diseases of animals, and no part of the net as sets shall inure to any person or group of persons for private gain.

ARTICLE VI - PROGRAM COMMITTEE

The President, the Chairman of the Executive Committee, the Secretary, the Treasurer, and the Chairmen of the respective committees shall constitute the Program Committee. It shall be the duty of the members of the Program Committee to make the necessary arrangements and provide the Program for the annual and special meetings.

ARTICLE VII - DUTIES OF OFFICERS

1. President: It shall be the duty of the President to preside at all meetings of this Association and of the Board of Directors; to appoint all committees excepting the Executive and officer faction of the Program Committee; to call special meetings of the Association whenever he considers the holding of such meetings necessary for the good of the livestock industry or upon written request of five members of the Executive Committee. The President shall be an ex-officio member of all committees. The President shall officially represent this Association in such places and at such meetings as he, with the concurrence of a majority of the Board of Directors, deems desirable or necessary in the best interests of this Association. He may at his discretion designate a member of the Executive Committee to substitute for him. A report of such attendance shall be made annually to the membership, and all actual expenses incidental thereto shall be paid by this Association.

2. President-Elect: The President-Elect shall be chairman of the Executive Committee. In the absence of the President, he shall preside at the meetings of the Association. In the event of the absence, disability, or resignation of the President, he shall perform all duties of the President. He shall be an ex-officio member of the Executive and Program Committees and of the Board of Directors.

3. First Vice-president: The First Vice-president shall assume the duties of the President in the event of the absence disability, or resignation of the President and President-Elect. He shall assume the chairmanship of the Executive Committee in the event of the absence disability, or resignation of President-Elect. He shall be an ex-officio member of the Executive Committee and the Board of Directors.

4. Second Vice-president: The Second Vice-president shall assume the duties of the President in the event of the absence, disability, or
resignation of the President, President-Elect, and First Vice-President. He shall assume the chairmanship of the Executive Committee in the event of the absence, disability, or resignation of the President-Elect and First Vice-President. He shall be an ex-officio member of the Executive Committee and of the Board of Directors.

5. Third Vice-Presiendent: The Third Vice-President shall assume the duties of the President in the event of the absence, disability, or resignation of the President, President-Elect, First Vice-President, and Second Vice-President. He shall assume the chairmanship of the Executive Committee in the event of the absence, disability, or resignation of the President-Elect, First Vice-President, Second Vice-President. He shall be an ex-officio member of the Executive Committee and of the Board of Directors.

6. Secretary: The Secretary shall keep an accurate record of the proceedings of the Association. Whenever authorized so to do by the Executive Committee, he shall publish said proceedings and distribute them to the members of the Association. The Secretary shall also keep an accurate record of the proceedings of the Executive Committee. He shall forward to each Executive Committee member a copy of each regulation approved by the Association.

He shall keep an accurate account of all Association moneys received and disbursed. All moneys due this Association received by the Secretary shall be promptly turned over to the Treasurer, accompanied by transmittal information identifying the amount, the source, and such other information as the Treasurer and the Board of Directors may require. He shall draw on the Treasurer, on proper warrants, over his signature and that of the Executive Director, such sums as may be necessary to discharge the financial obligations of this Association, provided however that for the payment of incidental expenses of his office, the Secretary may draw on the Treasurer from time to time sums not to exceed one hundred dollars ($100) at any one time on his own authority over the sole signature on warrants signed by the Executive Director. The President shall be furnished at the end of each month, for his validation, a list of financial obligations satisfied during the preceding period. He shall also present to the chairman of the Executive Committee a list giving the name, occupation, and address of each applicant for individual membership for the approval of the Executive Committee. He shall present to the Chairman of the Executive Committee for election by that body the names of individual members eligible and applying for life membership. He shall prepare forms for applicants for allied organization membership and shall notify each of the elected officers upon receipt of such completed application. He shall perform such other duties as may be authorized and prescribed by the Executive Committee. He shall be ex-officio secretary of the Executive Committee, ex-officio secretary of the Board of Directors, and an ex-officio member and secretary of the Program Committee. He shall be bonded for not less than ten...
7. Treasurer: The Treasurer shall keep an accurate account of all Association moneys received and disbursed. He shall receive from the Secretary all monies of the Association paid directly to the Secretary along with proper identification of such moneys. By and with the approval of the Board of Directors, he shall deposit the funds of this Association in such types of accounts as may be approved by the Board of Directors, and he shall invest the funds of the Association or liquidate Association investments in such manner as may be approved by the Executive Committee upon recommendation of the Board of Directors. He shall honor warrants for the proper expenditure of Association funds furnished him by the Secretary over his signature and that of the Executive Director. He shall honor warrants from the Secretary on the Secretary’s own authority for incidental expenses of the Secretary’s office in sums not to exceed one hundred dollars ($100) for any given expenditure over the sole signature on warrants signed by the Executive Director. He shall be given guidance and general administrative supervision by the Board of Directors, and he shall furnish the Executive Committee with a financial statement of the Association’s funds annually. He shall be bonded for not less than ten thousand dollars ($10,000), and he shall receive such salary as the Executive Committee may from time to time determine.

ARTICLE VIII - AMENDMENTS

The Constitution and Bylaws of this Association may be amended by a two-thirds vote of the members of the Association present and voting at an annual meeting, provided that the specific amendment to be acted upon shall have been presented in writing at a previous annual meeting, printed in the annual proceedings, and further provided that the amendment has received the approval of a majority of the Executive Committee members present and voting.

In the event of an extreme financial emergency to the association as determined by the Board of Directors, the dues structure of the organization may be amended immediately, solely by action of the Executive Committee at the next annual meeting, as set forth in Article V - Dues of the Bylaws.

ARTICLE IX - COMMITTEE ON NOMINATIONS AND RESOLUTIONS

There shall be appointed annually a Committee on Nominations and Resolutions which shall be comprised of the Association's living immediate past presidents from each of the five districts, and the current president of the Northeast, North Central, Southern and Western Animal Health Associations. The immediate past president of the United States Animal Health Association shall serve as chairman of the committee. The purpose of the committee shall be to receive, consider and present to the general
assembly nominations for officers and elected regional delegates as well as resolutions, following such procedures as are established in Articles X an XI.

ARTICLE X - ELECTION OF OFFICERS AND ELECTED REGIONAL DELEGATES

The Committee on Nominations and Resolutions shall annually report to the Association membership at the first morning general session. Its recommendations for the offices of President, President-Elect, First Vice-President, Second Vice-President, Third Vice-President and Treasurer, as well as Elected Regional Delegates shall constitute its report. Except for the office of Treasurer, nominations shall not originate within this committee but shall be submitted by the appropriate region after caucus of its official and affiliate representatives who are members of USAHA. From such caucus, there must originate every fifth year a nominee for the office of Third Vice-President from the district of that of the retiring President of the Association. Annually, by caucus, two nominees for Elected Regional Delegate will likewise be selected and offered in nomination by each of the four regional associations.

The recommendations of the Committee shall be posted on the registration bulletin board immediately following their presentations at the first morning general session. Any member of the Association, at the second general session, may propose amendments to the slate presented by the Committee. Such amendments shall be made at a time certain specified in the program for "Report of Action of the Committee on Nominations and Resolutions" during that session; provided that if a paper is being presented at that specified time, its presentation will be completed, immediately after which the report will be read. Provided further, if the program is ahead of schedule for that session, a recess will be taken until the time certain established in the program for the "Report of the Action of the Committee on Nominations and Resolutions". The Report of the Committee on Nominations and Resolutions, and proposed amendments to the report, shall be presented to the Executive Committee for consideration. The acceptance of the report or amendments shall constitute election.

ARTICLE XI - RESOLUTIONS

As the concluding committee report at the final session of the meeting, the Committee on Nominations and Resolutions shall present for consideration by the membership those resolutions which it has properly received and reviewed for ambiguity and redundancy. Such resolutions must have been submitted in proper format to the Committee by officially designated committees of the Association, including the Executive Committee, or by its Board of Directors. Resolutions, properly submitted,
will not be altered as to intent by the committee. Majority approval of resolutions or amendments made thereto by the general membership present and voting, will constitute acceptance.

BYLAWS

ARTICLE I - ORDER OF BUSINESS

Registration.
Call to Order.
Report of Secretary.
Report of Treasurer.
President-Elect's Address.
Reading of Papers.
Discussion.
Unfinished Business.
New Business.
Nominations and Election of Officers and eight members to Executive Committee.
Adjournment.

ARTICLE II - APPLICATIONS FOR MEMBERSHIP

Applications for individual membership shall be made in writing to the Secretary. The application shall give the name, occupation, and address of the applicant and shall include the membership dues for one year. Applications shall be presented in proper form to the Secretary, who shall in turn submit them to the Executive Committee.

Applications for allied organization membership shall be made in writing to the Secretary on an appropriate form prepared by him. In turn, notice of receipt of such application shall be provided each of the elected officers. An individual or allied organization member may be expelled for cause by the Executive Committee. A majority vote by the members of the Executive Committee present and voting shall be required in order to expel any such member.

ARTICLE III - MEETINGS

The annual meetings shall be held in a location selected at a previous annual meeting by a majority of the members of the Executive Committee. The annual meetings shall be held in a location selected at a meeting of the geographical districts as outlined in Article V, Executive Committee, on a rotating basis as follows: North Central, Northeast, Western, Southern, and in concurrence with the executive officer of the animal health department of the state in which the meeting is proposed.
Each meeting site in the selected location shall be determined by the secretary with the approval of the Board of Directors, and in consultation with the executive officer representing the animal health department of the state in which the meeting is to be held. The Executive Committee shall be advised of said selecting at least five (5) years in advance of any annual meeting.

The annual meetings shall begin between September 15 and November 15.

The Board of Directors is authorized to select an alternate location and a site in the event that the previous selections, because of any unforeseen circumstance, become unavailable and/or unacceptable.

The place for holding special meetings shall be determined by the President with due regard to the wishes of the members of the Executive Committee, the subject matter to be considered, accessibility, and the information to be obtained. The notice of time and place of holding a special meeting shall be mailed to the members at least thirty days prior to the date fixed for the special meeting.

ARTICLE IV - QUORUM

Twenty-five members of the Association shall constitute a quorum.

Thirty members of the Executive Committee shall constitute a quorum, providing that the majority of those in attendance shall be comprised of the executive officers representing the animal health departments of their respective states.

ARTICLE V - DUES

The Executive Committee shall establish the amount of dues.

ARTICLE VI - ALTERATION OF BYLAWS

For the purpose of changing the order of business or to facilitate important business, Articles I and III of the Bylaws, or any portion thereof, may be suspended during any single meeting by unanimous consent of the Executive Committee.
PROPOSED BYLAWS
OF THE
UNITED STATES ANIMAL HEALTH ASSOCIATION

ARTICLE I – NAME

The name of this Association shall be "The United States Animal Health Association."

ARTICLE II – PURPOSE

The United States Animal Health Association is a forum for communication and coordination among State and Federal governments, universities, industry, and other concerned groups for consideration of issues of animal health and disease control, animal welfare, food safety and public health. It is a clearinghouse for new information and methods, which may be incorporated into laws, regulations, policy, and programs. It develops solutions of animal health-related issues based on science, new information and methods, public policy, risk/benefit analysis and the ability to develop a consensus for changing laws, regulations, policies, and programs.

ARTICLE III – MEMBERS

3.1. Classes of Members. The classes of members are: Official Agency Members; Allied Organization Members; Individual Members; Student Members; Elected Regional Delegate Members; International Members; Life Members; and, Honorary Members.

a. Official Agency Member. The animal health department or agency of each state, U. S. territory or commonwealth, and the District of Columbia; the animal health department of the United States of America; and such other governmental departments or agencies as the Board of Directors may, by a two-thirds majority vote, approve.

b. Allied Organization Member. Any non-profit organization that is national in scope and actively and directly concerned with and supportive of the interests and objectives of the Association as outlined in Article II-Purpose, may become a member upon approval of the Board of Directors by a two-thirds majority vote.

c. Individual Member. Any person engaged in work related to animal production, animal health, food safety, public health, veterinary medicine and animal research and who supports the interests and objectives of the Association as outlined in Article
d. **Elected Regional Delegate Member.** Such elected regional delegates as provided for in Article VI-Board of Directors shall by virtue of such election automatically become members of the Association and shall serve from the close of the annual meeting following their election to the close of the following annual meeting for such period of time they are delegates and shall pay such dues as the Board of Directors may determine.

e. **Student Member.** Any person enrolled in the study of animal production, animal health, food safety, public health, veterinary medicine, and animal health research who supports the interests and objectives of the Association as outlined in Article II-Purpose is eligible to become a member of the Association. Student members may take part in the open proceedings and meetings of the Association but shall not hold voting privileges as provided in 3.2.

f. **International Member.** The chief official agency member from any foreign federal animal health, food safety, public health and animal health research agency or department, and any foreign national animal industry organization or person who supports the interests and objectives of the Association as outlined in Article II-Purpose, or said person's designee, is eligible to become a member of the Association upon approval of the Board of Directors by a two-thirds majority. International members may take part in the open proceedings and meetings of the Association but shall not hold voting privileges as provided in 3.2. However, the Association recognizes that Australia, Canada, Mexico and New Zealand are voting members and shall continue to remain full voting members after the adoption of these bylaws. New International Members shall obtain voting rights only by amendment of the bylaws.

g. **Life Member.** Any individual member who has maintained membership in the Association for 35 years, or if such member is at the point of retirement, for 25 years, is eligible to be a life member. Past Presidents of the Association are deemed to be life members. Life members shall have all the privileges of regular membership and shall be exempted from payment of all dues. Past presidents, or individual members elected to life membership shall be exempt from the payment of one-half of annual meeting registration fees after the year 2001; provided that retired past presidents who receive no remuneration for expenses incurred while in attendance are fully exempt from the payment of annual meeting registration fees.
h. **Honorary Member.** Any person not otherwise a member of the Association who has contributed materially to the advancement of animal science, food safety, public health, veterinary medicine, animal research, or the purposes of the Association, may be nominated by the Executive Committee for Honorary Membership. Honorary Membership shall be conferred by a majority vote of the Board of Directors. Honorary Members shall be exempt from the payment of all dues and shall not have voting privileges as provided in 3.2.

3.2. **Voting.** Each member shall have one vote, unless otherwise provided in these By-Laws. **International members shall have no voting privileges.**

a. **By State and Federal Official Agency Members and Allied Organization Members.** The director or chief executive officer of each Official Agency Member and Allied Organization Member shall appoint and certify in writing to the Executive Director of the Association a person to be its representative who shall represent, vote, and act for each of these classifications of member in all the affairs of the USAHA, until further notification.

3.3. **Dues.** The Board of Directors at any annual meeting shall have the power to determine the amount of dues.

a. **Non-payment of Dues.** Subject to any policy the Board of Directors may establish for reinstatement, failure to pay dues within 90 days of notice of delinquency shall result in automatic termination of membership.

b. **Voluntary Withdrawal of Membership.** A member may voluntarily terminate membership effective upon submission of notice of withdrawal to the Association but shall not be entitled to a refund of any dues paid.

3.4. **Effective Date of Membership.** Membership shall become effective upon submission of written application in the form required, satisfaction of eligibility requirements, election to membership by an appropriate vote of the Board of Directors, and payment of annual dues.

3.5. **Suspension or Expulsion.** For cause, and upon reasonable notice setting forth the specific reasons therefor, any member may be suspended or terminated. Sufficient cause for such suspension or termination of membership shall be violation of these bylaws or any lawful rule or practice duly adopted by this Association, or any other
ARTICLE IV – MEETINGS

4.1. Annual. There shall be an annual meeting between September 15 and November 15 for receiving annual reports and the transaction of other business.

a. Notice Requirements. Written notice setting forth the Agenda and location of the annual meeting shall be mailed or transmitted electronically to all members at least 60 days prior to the first day of such meeting.

b. Annual Meeting Location. The location of the annual meeting shall be selected by the Regional Districts on the following rotational basis: North Central, Northeast, Western, and Southern; and with the concurrence of the chief animal health official of the state in which the meeting is to be held. The location and site shall be finally selected in accordance with guidelines proposed by the Executive Director and approved by the Executive Committee. The Board of Directors shall be advised of the selected meeting location at least five years in advance of the meeting. In the event that any annual meeting location becomes unavailable and/or unacceptable, the Executive Committee is authorized to select an alternate location.

c. Closure. The annual meeting shall be considered officially closed upon the completion of the Board of Directors' meeting held on the last day of the annual meeting.

4.2. Special. Special meetings may be called by the President, in consultation with the Executive Committee, or by a majority of the Board of Directors. Notice of any special meeting shall be mailed, published in the Association newsletter and/or transmitted electronically to the membership with a statement of time and place and information as to the subject(s) to be considered at least 30 days prior to the date of the meeting. Emergency situations shall be dealt with by the Executive Director with the approval of the Executive Committee who shall provide as much notice to the Board of Directors as may be practical under the circumstances.

4.3. Quorum. A quorum of the Executive Committee shall consist of two-thirds of its membership. A quorum of the Board of Directors shall consist of 30 or more members, providing that a majority of..
those in attendance is comprised of Official Agency Members. A quorum of the general membership shall consist of 30 or more members.

**ARTICLE V – OFFICERS AND EMPLOYEES**

5.1. **Elected Officers.** The elected officers of the Association shall be a President, President-Elect, First Vice-President, Second Vice-President, Third Vice-President, and Treasurer. A Secretary shall be elected in the absence of an Executive Director. They shall be voting members in good standing of the Association.

a. **President.** The President is the chief officer of the Association and shall preside at the annual meeting and all meetings of the Executive Committee and perform such other duties as customarily belong to that office or which the Board of Directors or Executive Committee from time to time may assign. The president is an ex-officio member of all Committees and may designate an appropriately qualified member as his designee to attend any committee meetings of the Association in his place and stead.

b. **President-Elect.** The President-Elect shall act in place of the President in the event of his/her absence, death, or inability to act. When so acting the President-Elect shall have all the powers of and be subject to all restrictions upon the President. Specifically he/she **President Elect** shall be the chairman of all meetings of the Board of Directors and shall perform such other duties as the President, Board of Directors or Executive Committee from time to time may assign. The President-Elect shall automatically become President upon election at the close of the annual meeting at the end of his/her term.

c. **First Vice-President.** The First Vice-President shall act in place of the President Elect in the event of his/her absence, death or inability to act; In the event of the President-Elect’s permanent absence, death, resignation, or inability to act, then the First Vice-President shall assume the title and responsibility of the President-Elect for the remainder of the term. and **First Vice-President** shall perform such other duties as the President, Board of Directors or Executive Committee may assign. The First Vice-President shall automatically become President-Elect upon election at the close of the annual meeting at the end of his/her term.

d. **Second Vice-President.** The Second Vice-President shall act in place of the First Vice-President in the event of his/her
In the event of the First Vice-President's permanent absence, death, resignation, or inability to act, then the Second Vice-President shall assume the title and responsibility of the First Vice-President for the remainder of the term. The Second Vice-President shall perform such duties as the President, Board of Directors or Executive Committee may assign. The Second Vice-President shall automatically become the First Vice-President upon election at the close of the annual meeting at the end of his/her term.

e. **Third Vice-President.** The Third Vice-President shall take the place of the Second Vice-President in the event of his/her absence, death, or inability to act; In the event of the Second Vice-President's permanent absence, death, resignation, or inability to act, then the Third Vice-President shall assume the title and responsibility of the Second Vice-President for the remainder of the term. The Third Vice-President shall perform such duties as the President, Board of Directors or Executive Committee may assign. The Third Vice-President shall automatically become the Second Vice-President upon election at the close of the annual meeting at the end of his/her term.

f. **Treasurer.** The Treasurer shall be the chief financial officer of the Association, shall be chairman of the Audit Committee and perform those duties that are delegated to the office by the Board of Directors and the Executive Committee. The treasurer shall not be responsible for the day-to-day financial transactions of the Association, which will be assumed by the if the Association has an Executive Director.

g. **Election.** The Board of Directors shall elect the Third Vice-President and other vacant officers from candidates nominated by the Committee on Nominations and Resolutions pursuant to section 9.3 and 8.2 of these By-Laws or by nomination from the floor by any member of the Association at the annual meeting. The recommendations of the Committee on Nominations and Resolutions shall be posted on the registration bulletin board immediately following their presentations at the first general business session. At the time specified in the program for presentation of the "Report of Actions of the Committee on Nominations and Resolutions, the report shall again be read. Provided, that if a paper is being presented at that specified time the presentation will be completed and immediately thereafter the report shall be read. Any member of the Association may propose amendments to the slate of candidates presented by the Committee on Nominations and Resolutions.
The acceptance of the report or amendments by a majority vote shall constitute election of the nominees to office. The Report of the Committee on Nominations and Resolutions shall then be presented to the Board of Directors for consideration. The acceptance of the report by a majority vote shall constitute election of the nominees to office.

i. Term. The officers shall serve for one year perform their duties from the close of one annual meeting until the close of the following annual meeting, and until their successors are elected and qualify.

5.2. Executive Director. The Executive Director shall be employed by and serve at the pleasure of the Executive Committee, manage the Association's day-to-day affairs and perform such other duties as customarily belong to that office or as the Board of Directors or Executive Committee may assign. The Executive Committee shall prepare and negotiate a contract with the Executive Director for a period of not more than five (5) years which shall be subject to approval by a majority of the Board of Directors. If the Association does not have an Executive Director, the Board of Directors shall elect a Secretary by the provisions outlined in 5.1.h. Elections.

ARTICLE VI – BOARD OF DIRECTORS

6.1. Board of Directors. The Board of Directors shall have authority over all matters of the Association within the limits of the bylaws.

6.2. Composition. The Board of Directors shall be composed of the following:

a. The Official Agency members, or their designees.

b. One representative selected by each of the Allied Organization members.

c. Two delegates-at-large from each of the four regional districts.

d. Past presidents of the Association.

e. The International Member who is the chief animal health executive officer representing the principal federal animal health department of Canada, Mexico, Australia and New Zealand, or said person's designee.

f. The International Member who is the chief animal health executive officer representing the principal federal animal health department of a country other than those listed in 6.2.e., or said person's designee, and who has been approved for membership on the Board of Directors by a two-thirds vote of the Board of Directors.
6.3. **Meetings.** The Board of Directors shall have a regular meeting at the time and place of the annual meeting, and shall meet at such other times and places selected by the President or by request of a majority of the directors, in which latter event, the President shall promptly set the time and place of the meeting. Notice of all meetings of the Board of Directors shall be mailed, published in the Association newsletter or transmitted electronically at least thirty days in advance of such meetings. The President, on such reasonable notice as may be practicable under the circumstances, may call emergent meetings of the Board of Directors.

6.4. **Duties.** The Board of Directors shall: receive all committee reports and accept or reject all or part of them; review and approve or disapprove with comment the actions of the Executive Committee; and perform such other functions set forth in the By-Laws of the Association.

**ARTICLE VII – EXECUTIVE COMMITTEE**

7.1. **Executive Committee.** The Association shall have an Executive Committee composed of the elected officers and the immediate Past President of the Association. In addition the Executive Director shall serve as an ex officio, non-voting member of the Executive Committee and shall not be counted for the purpose of determining a quorum.

7.2. **Duties.** The Executive Committee shall manage the financial, administrative and internal affairs of the Association and the Board of Directors when the Board of Directors is not in session. To exercise the authority of the Board of Directors, the Executive Committee must act as a whole, and must forthwith submit its action for approval at the next meeting of the Board of Directors.

7.3. **Meetings.** The Executive Committee shall meet at least four times each fiscal year at such time and place and upon such notice as the President determines. The Executive Committee is authorized to take action upon the concurring votes of a majority of its members a quorum being present.

7.4. **Emergency Meetings.** Should the President determine that an emergency situation exists, the President may convene a telephone or other type of electronic conference meeting of the Executive Committee, which may then act provided a quorum participates.
ARTICLE VIII - ORGANIZATIONAL DISTRICTS

8.1. Districts. The Association shall be organized into five districts composed of the Northeast Regional District, the North Central Regional District, the Southern Regional District, the Western Regional District and the District-At-Large.


b. The North Central Regional District consists of Association members of the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

c. The Southern Regional District consists of Association members of the states of Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; and the Virgin Islands and Puerto Rico.

d. The Western Regional District consists of Association members of the states of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

e. The District-At-Large shall be composed of the Allied Organization Members and the Elected Regional Delegate Members.

8.2. Each District, on a rotating basis, shall submit to the Nominations and Resolutions Committee a nominee for the vacancy in the office of the Third Vice-President. The order of rotation shall be as follows: Northeast, Western, North Central, Southern, and District-At-Large.

In the event that an elected officer is unable to complete his/her term, the District that originally nominated that officer may nominate another person to fill his/her unexpired term, except in the event of a vacancy in the office of the President-Elect or a Vice President, then, the District from which the vacated officer originated shall submit a nominee for the office of Third Vice President.

ARTICLE IX - STANDING AND SPECIAL COMMITTEES

9.1. General. The President shall annually appoint from the members of the Association such standing or special committees or subcommittees and their chairpersons as may be required by the
bylaws or as he/she may find necessary. Each committee shall meet at least once per year at the time of the annual meetings of the Association, and at such other times as the President of the Association and committee Chairman deem necessary to accomplish the work of the Committee. Only members of the Association permitted by these by-laws are permitted to vote on the work of the committee, unless otherwise restricted under Article 3.2.

9.2. Program Committee. A program committee shall be appointed by the President and shall consist of the chairpersons of all committees and the elected officers of the Association to develop the programs for the annual and any special meetings of the Association with the goal of furthering the purposes of the Association. The Program Committee shall be chaired by the President-Elect and co-chaired by the First Vice-President.

9.3. Committee on Nominations and Resolutions. The Committee on Nominations and Resolutions shall be comprised of the living past presidents of the Association, the Presidents of the Northeast, North Central, Southern and Western Regional Districts, and the President of the District-At-Large.

a. Chairman. The immediate past President of the Association shall chair this committee.

b. Nomination of Elected Officers. This Committee shall receive, consider and recommend to the Association's membership at the annual meeting nominations for the elected officers specified in 5.1 and delegates from each district as specified in 6.2.c. and 8.2. The recommendation of elected officers and delegates from each district shall be submitted no later than the third day of September next preceding the annual meeting at which the election will be held.

c. Resolutions. This Committee shall review all resolutions of the standing and special committees for ambiguities and redundancy but shall not alter their intent. After this review, this committee shall present the resolutions to the general membership for approval, which shall require a majority vote.

9.4. Audit Committee. The Audit Committee shall receive the annual audit report, and confirm that all financial affairs of the Association are in order and make such recommendations to the Board of Directors as may be necessary to ensure the proper management of the finances of the Association.

9.5. Special Committees. The President with the advice of the
Executive Committee shall appoint the chairman and members of such other committees as are necessary to accomplish the purposes of the Association.

**ARTICLE X – MISCELLANEOUS**

10.1. Amendments.

a. In General. These bylaws may be amended by: (1) Specific proposed amendment(s) being presented in writing to the Board of Directors for preliminary approval; (2) If preliminarily approved by majority vote of the Board of Directors, the proposed amendment(s) shall then be presented to the membership; by printing in the next annual proceedings; (3) The proposed amendment(s) shall then be presented to the membership at the next annual meeting for approval by the affirmative vote of two-thirds of the members of the Association present at a meeting at which a quorum is present. In the event the amendment(s) proposed are not approved by the Board of Directors as set forth in (1), then the proposed amendment(s) may be presented by a petition signed by at least thirty members which shall result in their proceeding through steps (2) and (3) as if the Board of Directors had initially approved the proposed amendment(s).

b. Notice. Written notice of an intention to amend the bylaws containing the text of any amendment must be sent to all members. Prior to presentation to the annual meeting for final approval, the amendment(s) shall be printed in the report of the annual proceedings of the immediately preceding annual meeting.

10.2. Fiscal Year. The Executive Committee shall from time to time establish the Association's fiscal year.

10.3. Parliamentary Procedure. Robert's Rules of Order Newly Revised shall govern the proceedings of the Association, the Board of Directors and all committees in all cases not otherwise provided for in applicable federal or state statute or rule, the articles of incorporation or bylaws of the Association or its policies or procedures.

10.4. Confidential Information. Confidential information of the Association shall be maintained in confidence and not used for any other than Association purposes nor disclosed to others, except as permitted by law, these bylaws or written consent of the Association,
by Association members, directors, officers, employees and agents.

10.5. Liability of Officers and Directors. The officers and directors of the Association shall not be personally liable for the debts or actions of the Association.

10.6. Annual Audit. The Association shall cause an independent certified public accountant, selected by the Executive Committee, to make an annual examination of its financial accounts and shall submit the report of examination to Audit Committee.

10.7. Compensation/Reimbursement. No member of the Board of Directors, committee member or elected officer of the Association shall receive any compensation for his or her services as such. The Association shall develop policies providing for reimbursement of expenses reasonably incurred in attending meetings and performing special assignments of the Association by the elected officers.

10.8. Dissolution. In the event of dissolution, the Association shall distribute its assets as required by the laws and statutes of the State of Delaware; and distribute its remaining net assets in a manner permitted an entity to maintain its status as exempt from taxation under Section 501 (c) (6) of the Internal Revenue Code of 1986. as amended, or any successor provision.
USAHA ADMINISTRATIVE POLICIES
(As adopted by the Executive Committee, October 1993)

ESTABLISHMENT AND OPERATION OF STANDING COMMITTEES

1. All members of standing committees must be paid up members of USAHA.

2. The Chairman and all members of USAHA Committees shall be appointed by the President. It is expected that member appointments will be made in consultation with Committee Chairman.

3. Efforts should be made to keep committee size between 15 and 50 members, and to maintain a geographical balance, as well as an appropriate balance of State, Federal, industry and technical members.

4. Committee Chairmen shall be appointed for a term of not more than five years, and may not be reappointed Chairman for at least one year.

5. All recommendations and resolutions shall be approved by a majority of the committee members present before the adjournment of a committee meeting.

6. All USAHA members present at committee meetings may enter into discussions. Only committee members may introduce resolutions or vote on items of business.

7. Committees shall submit reports only to the Executive Committee and Resolutions only to the Committee on Nominations and Resolutions. Committee resolutions and reports have no standing until approved by the Executive Committee.

8. Committee Chairmen may appoint subcommittees as necessary. Subcommittee members must be members of the parent committee. Subcommittees shall report only to the parent committee.
PARTICIPATION IN USAHA OF FEDERAL AGENCIES AND FEDERAL EMPLOYEES

Federal agencies and personnel have long been an integral and valuable part of USAHA. Agencies have taken part in the organization through official membership and representation on the Executive Committee. This provides the opportunity for presenting agency positions and concerns to the association.

Of undoubtedly greater value has been the individual membership and participation of numerous animal health, food safety, and research professionals from a variety of federal agencies. All disease program-related committees have long had key federal agency members who were critical to the committees' success.

A major function of USAHA is to develop and recommend policies and procedures of national disease control and eradication programs. This means that many committee findings and resolutions constitute recommendations to the appropriate federal agency which is responsible for the area of concern. Some of these recommendations are contrary to agency policy or position. For this reason, federal employees should actively share their expertise and opinions as committee members, but should not serve as chairmen where they would be making recommendations to their employer.

A number of committees have used federal employees as assistant chairmen to good advantage. Also, committees which do not deal with federal agency policy may be chaired by federally-employed USAHA members where appropriate.

The committee strongly recommends that we maintain USAHA as a professional and technical advisory organization. We recognize that many of the Association's activities have political implications, but feel that lobbying and other political activity should be left to official, affiliate, and individual members.
# RECORD OF PREVIOUS MEETINGS

<table>
<thead>
<tr>
<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sept. 27-28, 1897†</td>
<td>Fort Worth, TX</td>
<td>* Mr. C. P. Johnston, Springfield, IL</td>
<td>* Mr. D. O. Lively, Fort Worth, TX</td>
</tr>
<tr>
<td>2. Oct. 11-12, 1898</td>
<td>Omaha, NE</td>
<td>* Mr. C. P. Johnston, Springfield, IL</td>
<td>* Mr. Taylor Riddle, KS</td>
</tr>
<tr>
<td>3. Oct. 11-12, 1899††</td>
<td>Chicago, IL</td>
<td>* Mr. C. P. Johnston, Springfield, IL</td>
<td>* Mr. Mortimer Levering, Lafayette, IN</td>
</tr>
<tr>
<td>4. Oct. 2-3, 1900</td>
<td>Louisville, KY</td>
<td>* Mr. C. P. Johnston, Springfield, IL</td>
<td>* Dr. E. T. Eisenman, Louisville, KY</td>
</tr>
<tr>
<td>5. Oct. 8-9, 1901</td>
<td>Buffalo, NY</td>
<td>* Dr. E. P. Niles, VA</td>
<td>* Dr. E. T. Eisenman, Louisville, KY</td>
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<tr>
<td>6. Sept. 23-24, 1902</td>
<td>Wichita, KS</td>
<td>* Mr. W. H. Dunn, TN</td>
<td>* Mr. Wm. P. Smith, Monticello, IL</td>
</tr>
<tr>
<td>7. Sept. 22-23, 1903</td>
<td>Denver, CO</td>
<td>* Mr. W. E. Bolton, Woodward, OK</td>
<td>* Mr. Wm. P. Smith, Monticello, IL</td>
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<tr>
<td>8. Aug. 23-24, 1904</td>
<td>St. Louis, MO</td>
<td>* Dr. J. C. Nolan, AZ</td>
<td>* Mr. Wm. P. Smith, Monticello, IL</td>
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<tr>
<td>9. Aug. 15-16, 1905</td>
<td>Guthrie, OK</td>
<td>* Mr. Wm. P. Smith, Monticello, IL</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
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<tr>
<td>10. Aug. 15-16, 1906</td>
<td>Springfield, IL</td>
<td>* Mr. M. M. Hanksins, Quanah, TX</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
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<tr>
<td>11. Sept. 16-17, 1907</td>
<td>Richmond, VA</td>
<td>* Dr. D. F. Luckey, Columbia, MD</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
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<tr>
<td>14. Dec. 5-7, 1910</td>
<td>Chicago, IL</td>
<td>* Dr. C. E. Cotton, St. Paul, MN</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>15. Dec. 5-6, 1911</td>
<td>Chicago, IL</td>
<td>* Dr. John F. Devine, Goshen, NY</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>16. Dec. 3-5, 1912</td>
<td>Chicago, IL</td>
<td>* Dr. Macyck P. Ravener, Madison, IL</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>17. Dec. 2-4, 1913</td>
<td>Chicago, IL</td>
<td>* Dr. Peter F. Bahnse, Atlanta, GA</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
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<tr>
<td>18. Feb. 16-18, 1914</td>
<td>Chicago, IL</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
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<tr>
<td>19. Dec. 2-3, 1915</td>
<td>Chicago, IL</td>
<td>* Dr. J. L. Gibson, Des Moines, IA</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>20. Dec. 5-7, 1916</td>
<td>Chicago, IL</td>
<td>* Dr. O. E. Dyson, Springfield, IL</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>21. Dec. 3-5, 1917</td>
<td>Chicago, IL</td>
<td>* Dr. J. G. Wills, Albany, NY</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>22. Dec. 2-4, 1918</td>
<td>Chicago, IL</td>
<td>* Dr. M. Jacob, Knoxville, TN</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
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<tr>
<td>23. Dec. 1-3, 1919</td>
<td>Chicago, IL</td>
<td>* Dr. G. W. Dumphy, Lansing, MI</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>24. Nov. 29-Dec. 1, 1920</td>
<td>Chicago, IL</td>
<td>* Dr. S. F. Musselman, Frankfort, KY</td>
<td>* Mr. D. M. Campbell, Chicago, IL</td>
</tr>
<tr>
<td>25. Nov. 28-30, 1921</td>
<td>Chicago, IL</td>
<td>* Dr. W. F. Crewe, Bismarck, MD</td>
<td>* Mr. D. M. Campbell, Chicago, IL</td>
</tr>
<tr>
<td>26. Dec. 6-8, 1922</td>
<td>Chicago, IL</td>
<td>* Dr. T. E. M. Munce, Harrisburg, PA</td>
<td>* Dr. Theo. Burnett, Columbus, OH</td>
</tr>
<tr>
<td>27. Dec. 5-7, 1923</td>
<td>Chicago, IL</td>
<td>* Dr. W. J. Butler, Henena, MT</td>
<td>* Dr. Theo. Burnett, Columbus, OH</td>
</tr>
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* * *
## RECORD OF PREVIOUS MEETINGS

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<thead>
<tr>
<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Dec. 3-5, 1924</td>
<td>Chicago, IL</td>
<td>* Dr. J. G. Femekeough, Richmond, VA</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
<tr>
<td>29. Dec. 2-4, 1925</td>
<td>Chicago, IL</td>
<td>* Dr. J. H. McNeil, Trenton, NJ</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>30. Dec. 1-3, 1926</td>
<td>Chicago, IL</td>
<td>* Dr. John R. Mohler, Washington, DC</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>31. Nov. 30-Dec. 2, 1927</td>
<td>Chicago, IL</td>
<td>* Dr. L. Van Es, Lincoln, NE</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>32. Dec. 5-7, 1928</td>
<td>Chicago, IL</td>
<td>* Dr. C. A. Cary, Auburn, AL</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
<tr>
<td>33. Dec. 4-6, 1929</td>
<td>Chicago, IL</td>
<td>* Dr. Chas. O. Lamb, Denver, CO</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>34. Dec. 3-5, 1930</td>
<td>Chicago, IL</td>
<td>* Dr. A. E. Wright, Washington, DC</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>35. Dec. 2-4, 1931</td>
<td>Chicago, IL</td>
<td>* Dr. J. W. Connaway, Columbia, MD</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<td>36. Nov. 30-Dec. 2, 1932</td>
<td>Chicago, IL</td>
<td>* Dr. Peter Malcolm, Des Moines, IA</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>37. Dec. 6-8, 1933</td>
<td>Chicago, IL</td>
<td>* E. T. Faulder, Albany, NY</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>38. Dec. 5-7, 1934</td>
<td>Chicago, IL</td>
<td>* Dr. T. E. Robinson, Providence, RI</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
<tr>
<td>39. Dec. 4-6, 1935</td>
<td>Chicago, IL</td>
<td>* Dr. Edward Records, Reno, NV</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>40. Dec. 2-4, 1936</td>
<td>Chicago, IL</td>
<td>* Dr. Walter Wisnicky, Madison, WI</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
<tr>
<td>41. Dec. 1-3, 1937</td>
<td>Chicago, IL</td>
<td>* Dr. R. W. Smith, Concord, NH</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
<tr>
<td>42. Nov. 30-Dec. 2, 1938</td>
<td>Chicago, IL</td>
<td>* Dr. D. E. Westmoreland, Frankfort, KY</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>43. Dec. 6-8, 1939</td>
<td>Chicago, IL</td>
<td>* Dr. J. L. Axby, Indianapolis, IN</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>44. Dec. 4-6, 1940</td>
<td>Chicago, IL</td>
<td>* Dr. H. D. Port, Cheyenne, WY</td>
<td>Dr. Mark Welsh, College Park, MD</td>
</tr>
<tr>
<td>45. Dec. 3-5, 1941</td>
<td>Chicago, IL</td>
<td>* Dr. E. A. Crossman, Boston, MA</td>
<td>Dr. Mark Welsh, College Park, MD</td>
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<tr>
<td>46. Dec. 2-4, 1942</td>
<td>Chicago, IL</td>
<td>* Dr. F. S. McAdory, Auburn, AL</td>
<td>Dr. Mark Welsh, College Park, MD</td>
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<tr>
<td>47. Dec. 1-3, 1943</td>
<td>Chicago, IL</td>
<td>Dr. W. H. Hendricks, Salt Lake City, UT</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>48. Dec. 6-8, 1944</td>
<td>Chicago, IL</td>
<td>Dr. J. M. Sutton, Atlanta, GA</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>49. Dec. 5-7, 1945</td>
<td>Chicago, IL</td>
<td>Dr. C. U. Duckworth, Sacramento, CA</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>50. Dec. 4-6, 1946</td>
<td>Chicago, IL</td>
<td>* Dr. William Moore, Raleigh, NC</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>51. Dec. 3-5, 1947</td>
<td>Chicago, IL</td>
<td>* Dr. Will J. Miller, Topeka, KS</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
</tr>
<tr>
<td>53. Oct. 12-14, 1949</td>
<td>Columbus, OH</td>
<td>* Dr. T. O. Brandenburg, Bismarck, ND</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
</tr>
<tr>
<td>54. Nov. 1-3, 1950</td>
<td>Phoenix, AZ</td>
<td>* Dr. C. P. Bishop, Harrisburg, PA</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
</tr>
<tr>
<td>Date</td>
<td>Place of Meeting</td>
<td>President</td>
<td>Secretary</td>
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<tr>
<td>55. Nov. 14-16, 1951</td>
<td>Kansas City, KS</td>
<td>Mr. F. E. Mollin, Denver, CO</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>57. Sept. 23-25, 1953</td>
<td>Atlantic City, NJ</td>
<td>Dr. T. Childs, Ottawa, Canada</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>58. Nov. 10-12, 1954</td>
<td>Omaha, NE</td>
<td>Dr. T. C. Green, Charleston, WV</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>59. Nov. 16-18, 1955</td>
<td>New Orleans, LA</td>
<td>Dr. H. E. Wilkins, Helena, MT</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>60. Nov. 28-30, 1956</td>
<td>Chicago, IL</td>
<td>Dr. A. L. Brueckner, Baltimore, MD</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>61. Nov. 13-15, 1957</td>
<td>St. Louis, MO</td>
<td>Dr. G. H. Good, Cheyenne, WY</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>62. Nov. 4-6, 1958</td>
<td>Miami Beach, FL</td>
<td>Mr. F. G. Buzzell, Augusta, ME</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>63. Nov. 15-18, 1959</td>
<td>San Francisco, CA</td>
<td>Dr. J. R. Hay, Chicago, IL</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>64. Oct. 17-21, 1960</td>
<td>Charleston, WV</td>
<td>Dr. A. P. Schneider, Boise, ID</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>65. Oct. 30-Nov. 3, 1961</td>
<td>Minneapolis, MN</td>
<td>Dr. W. L. Bendix, Richmond, VA</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>69. Oct. 25-29, 1965</td>
<td>Lansing, MI</td>
<td>Dr. C. L. Campbell, Tallahassee, FL</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>70. Oct. 10-14, 1966</td>
<td>Buffalo, NY</td>
<td>Dr. Grant S. Kalei, Albany, NY</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<td>71. Oct. 16-20, 1967</td>
<td>Phoenix, AZ</td>
<td>Dr. John F. Quinn, Lansing, MI</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
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<tr>
<td>72. Oct. 6-11, 1968</td>
<td>New Orleans, LA</td>
<td>Dr. John L. Oharra, Reno, NV</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>73. Dec. 12-19, 1969</td>
<td>Milwaukee, WI</td>
<td>Dr. Frank B. Wheeler, Baton Rouge, LA</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
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<tr>
<td>75. Oct. 24-29, 1971</td>
<td>Oklahoma City, OK</td>
<td>Dr. J. C. Shook Mechanicsburg, PA</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
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<tr>
<td>76. Nov. 5-10, 1972</td>
<td>Miami Beach, FL</td>
<td>Dr. W. C. Tobin, Denver, CO</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
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<tr>
<td>78. Oct. 13-18, 1974</td>
<td>Roanoke, VA</td>
<td>* Dr. J. E. Andrews, GA</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>79. Nov. 2-7, 1975</td>
<td>Portland, OR</td>
<td>Dr. H. E. Goldstein, Columbus, OH</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>80. Nov. 7-12, 1976</td>
<td>Miami Beach, FL</td>
<td>* Dr. A. E. Janawicz, Montpelier, VT</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>81. Oct. 16-21, 1977</td>
<td>Minneapolis, MN</td>
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### Record of Previous Meetings

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<tr>
<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
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<tr>
<td>82. Oct. 21-Nov. 3, 1978**</td>
<td>Buffalo, NY</td>
<td>** Dr. L. E. Bartell, Sacramento, CA</td>
<td>* Dr. W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>83. Oct. 28-Nov. 2, 1979</td>
<td>San Diego, CA</td>
<td>Dr. T. F. Zweigart, Raleigh, NC</td>
<td>Dr. J. C. Shook, Hyattsville, MD</td>
</tr>
<tr>
<td>84. Nov. 2-7, 1980</td>
<td>Louisville, KY</td>
<td>* Mr. B. W. Hawkins, Ontario, OR</td>
<td>Dr. J. C. Shook, Hyattsville, MD</td>
</tr>
<tr>
<td>85. Oct. 11-16, 1981</td>
<td>St. Louis, MO</td>
<td>* Dr. L. W. Hinchman, Indianapolis, IN</td>
<td>Dr. J. C. Shook, Hyattsville, MD</td>
</tr>
<tr>
<td>86. Nov. 7-12, 1982</td>
<td>Nashville, TN</td>
<td>Dr. G. B. Rea, Salem, Or</td>
<td>Dr. J. C. Shook, Hyattsville, MD</td>
</tr>
<tr>
<td>87. Oct. 16-21, 1983</td>
<td>Las Vegas, NV</td>
<td>Dr. J. R. Ragan, Nashville, TN</td>
<td>Dr. J. C. Shook, Annapolis, MD</td>
</tr>
<tr>
<td>88. Oct. 21-26, 1984</td>
<td>Ft. Worth, TX</td>
<td>* Mr. J. O. Pearce, Jr. Okeechobee, FL</td>
<td>Dr. J. C. Shook, Annapolis, MD</td>
</tr>
<tr>
<td>89. Oct. 27-Nov. 1, 1985</td>
<td>Milwaukee, WI</td>
<td>* Dr. David U. Walker, Montpellier, VT</td>
<td>Dr. J. C. Shook, Annapolis, MD</td>
</tr>
<tr>
<td>90. Oct. 19-14, 1986</td>
<td>Louisville, KY</td>
<td>* Dr. N. W. Kruse, Lincoln, NE</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>91. Oct. 25-30, 1987</td>
<td>Salt Lake City, UT</td>
<td>Dr. J. F. Hudelson, Denver, CO</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<tr>
<td>92. Oct. 16-21, 1988</td>
<td>Little Rock, AR</td>
<td>Dr. J. A. Cobb, Atlanta, GA</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<tr>
<td>93. Oct. 28-Nov. 3, 1989</td>
<td>Las Vegas, NV</td>
<td>Dr. P. E. Bradshaw, Griggsville, IL</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<td>94. Oct. 6-12, 1990</td>
<td>Denver, CO</td>
<td>Dr. M. A. Van Buskirk, Harrisburg, PA</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>95. Oct. 26-Nov. 1, 1991</td>
<td>San Diego, CA</td>
<td>* Dr. P. L. Smith, Sacramento, CA</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>96. Oct. 31-Nov. 6, 1992</td>
<td>Louisville, KY</td>
<td>Dr. J. Lee Alley, Montgomery, AL</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<tr>
<td>97. Oct. 23-29, 1993</td>
<td>Las Vegas, NV</td>
<td>Dr. T. J. Hagerty, St. Paul, MN</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>98. Oct. 29-Nov. 4, 1994</td>
<td>Grand Rapids, MI</td>
<td>Mr. J. B. Finley, Jr., Encinal, MN</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<td>99. Oct. 28-Nov. 3, 1995</td>
<td>Reno, NV</td>
<td>Dr. H. Wesley Towers, Dover, DE</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<td>100. Oct. 12-18, 1996</td>
<td>Little Rock, AR</td>
<td>Dr. M. R. Marshall, Salt Lake City, UT</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<tr>
<td>101. Oct. 17-24, 1997</td>
<td>Louisville, KY</td>
<td>Dr. Larry L. Williams, Lincoln, NE</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>102. Oct. 3-9, 1998</td>
<td>Minneapolis, MN</td>
<td>Dr. Jones W. Bryan, Columbia, SC</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>103. Oct. 7-14, 1999</td>
<td>San Diego, CA</td>
<td>Dr. Richard H. McCapes, Davis, CA</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
</tr>
<tr>
<td>104. October 19-26, 2000</td>
<td>Birmingham, AL</td>
<td>Dr. Ernest W. Zirkle, Trenton, NJ</td>
<td>Dr. J. Lee Alley, Montgomery, AL</td>
</tr>
</tbody>
</table>

+ This was the last meeting of the Interstate Association of Livestock Sanitary Boards
105th ANNUAL MEETING
November 1 - 8, 2001
HERSHEY LODGE AND
CONVENTION CENTER
Hershey, Pennsylvania

106th ANNUAL MEETING
October 17 - 24, 2002
REGAL RIVERFRONT HOTEL
St. Louis, Missouri

107TH ANNUAL MEETING
October 9-16, 2003
TOWN & COUNTRY HOTEL
San Diego, California