PROCEEDINGS

ONE HUNDRED AND FIFTH
ANNUAL MEETING

of the

UNITED STATES ANIMAL
HEALTH ASSOCIATION

THE HERSHEY LODGE AND
CONVENTION CENTER

HERSHEY, PENNSYLVANIA

November 1-8, 2001
PROCEEDINGS

ONE HUNDRED AND FIFTH ANNUAL MEETING

of the

UNITED STATES ANIMAL HEALTH ASSOCIATION

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Hershey Lodge and Convention Center
Hershey, Pennsylvania
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II. 2002 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

Larry A. Schuler

Dear Heavenly Father, Mighty God:

Thank you for the people that you have brought together for this meeting. Thank you for the knowledge and wisdom that you have given to the AAVLD and the USAHA.

Father, in times like these, we need your comfort and care through the losses of the recent attacks upon us. In times like these, we need your strength to meet the demands of each day. In times like these, we need your wisdom to lead us through each day. We know that you are in control.

Lord, we ask that you would guide our decisions during these meetings. We ask that you would help us to understand the issues and needs before us and help us to arrive at wise decisions. Help us to carry out our tasks.

Father, you have given us a great responsibility. Help us to do what we can to ensure a safe food supply for this country and for the world. Help us to do what we can to ensure the health of your animals and help us to do what we can to assure their humane care and treatment.

Father, we remember those of this organization that have passed away this year. We silently remember:

- Dr Wallace A. Deen - USAHA member - Died October 18, 2000
- Dr Paul Doby - USAHA Life Member - Died February 19, 2001
- Dr Fred D. Maurer - USAHA Life Member - Died June 5, 2001
- Mrs Donna Silberman - Wife of Dr Mort Silberman - Died June 29, 2001

Finally, Father we thank you for your love and your grace.

In Jesus’ name, Amen
Secretary of Agriculture Sam Hayes welcomed the participants to the joint general session to Hershey, Pennsylvania and expressed the Department's pleasure in assisting with hosting this meeting. Secretary Hayes thanked the producers, veterinarians, academia and others for their diligence in planning, rulemaking and education in all aspects of animal agriculture.

He acknowledged the tremendous impact they have had in keeping diseases like Foot and Mouth Disease and BSE out of the United States, and relayed his appreciation for their contributions to animal health, animal research, food safety and policymaking decisions which keep our country number one in exporting safe, healthy products.
RESPONSE TO THE WELCOME

David Hopson, DVM, MPH
Missouri Acting State Veterinarian

Thank you for your warm and gracious welcome to Pennysylvania and the city of Hershey. It is indeed a pleasure to be here in this beautiful setting for the 105th Annual Meeting of USAHA and AAVLD. With the recent events in our country, the health and safety of our livestock and food supply has never been more important. This meeting presents us with an excellent opportunity to work together in achieving the goals of protecting the health of the livestock industry and ensuring a high quality, safe food supply for the American public.

We know that we can have this same type of wonderful fellowship and professional learning experiences in St Louis in 2002. I want to take this opportunity to invite all of you to the great state of Missouri, the “Show-Me” state, for the 106th annual meeting of USAHA and AAVLD.

We want to show you St. Louis. St. Louis is in the center of the country, making it easily accessible from everywhere. This city was founded in 1764 by French fur traders from New Orleans. The city was named for Louis IX, Crusader King of France. This city became a bustling site from which to trade with Native Americans in the land to the west. This was the starting point for the Lewis and Clark Expedition, and became known as the “Gateway to the West”.

There’s much more to St. Louis than the Gateway Arch — beauty and entertainment abound. Attractions such as the Missouri Botanical Gardens, riverboat casinos, the St. Louis Zoo, the Muny Opera, St Louis Union Station, and of course, Anheuser-Busch Brewery and Grant’s Farm will appeal to everyone. Museums, sports events, theatres, and extensive shopping opportunities are available year round. Whether it’s history, culture, music or hundreds of famous restaurants, St. Louis has what you want. Missouri is an important agriculture state with very extensive livestock and poultry industries. We are home to the St. Louis Cardinals baseball team, the St. Louis Rams football team, and the St. Louis Blues hockey team. You’ll find the spirit of St. Louis in the blues and jazz music clubs throughout the city. So meet us in St. Louis, Missouri for USAHA/AAVLD meeting in 2002.
REMARKS OF PRESIDENT OF USAHA

Bob Hillman, DVM
Boise, Idaho

The year 2001. The first year of the new millennium, (or the second – depending upon how you choose to count). The 105th year of the United States Animal Health Association. It has been an historic year.

We began the New Year with a contested election for the presidency of the United States. The end result was a change in political parties in the seat of power. While some may debate whether the change was good or bad, for our purpose, the change provided an opportunity to work with new appointees on issues of importance to USAHA and to animal agriculture in America.

I have been honored with the opportunity to meet Secretary Ann Veneman and discuss important animal health issues with her. I also have had the opportunity to meet Undersecretary Bill Hawks and talk with him about our animal health needs. I am convinced that the leadership of USDA is in good hands - in the hands of people who want to work with stakeholders to address the challenges that confront animal agriculture and to take advantage of the opportunities that present themselves in the new century.

It has been an historic year.

This is the year that we reached zero brucellosis infected cattle herds for the first time in history – actually December, 2000. While we have found a few new infected herds, we are well on our way to elimination of brucellosis from our domestic livestock. Great progress has been made in our efforts to eradicate pseudorabies from our domestic swine herds as well. We have has some setbacks in our efforts to eradicate tuberculosis, but the framework for eradication in domestic livestock is in place.

This is the year that we saw a heightened world awareness of animal health issues with the Foot-and-Mouth Disease outbreaks that occurred in the United Kingdom, other European countries, most of South America and many other countries of the world. Bovine Spongiform Encephalopathy continues to spread across Europe, the former Soviet Republics and Asia. Classical Swine Fever continues to show up in Europe.

The outbreaks of FMD around the world, continued spread of BSE and recurrence of CSF clearly illustrate our vulnerability to introduction of these diseases into the United States. These diseases are a wake-up call to us. Over many years our federal and state animal health system has suffered from success and apathy. We have lost staff, our laboratories are in deplorable condition, our budgets have fallen to below maintenance levels, and our level of training has suffered. Yet, through all of this, we have been able, so far, to prevent introduction of these dangerous diseases.

This is the year that terrorists decided to show us and the world that they could attack our country at will. The September 11, attacks on the
World Trade Center and the Pentagon are appalling to all of us for their brutality and the intentional act of killing innocent people. Add the Anthrax attacks on our citizens. Does anyone doubt that animal agriculture could be a target? Are we prepared?

While we continued to make progress in our traditional animal disease control programs during 2001, and are nearing completion of these programs, other diseases are demanding our attention. West Nile Virus, which was first diagnosed in the United States in 1999 is now in at least eighteen states, has moved from the northeast to the south, as far west as Missouri, and shows every indication that it will continue to move west. Viral Hemorrhagic Disease of Rabbits was diagnosed again this year. While we hoped that the case in the Midwest last year was the only incursion of this disease into the United States, the recent outbreak illustrates that this is not the case.

These two diseases illustrate our vulnerability to foreign or exotic diseases. Our system was not able to keep them out of the United States. We still do not know how or where they entered the country. This statement is meant not so much as criticism but as a call to arms. These diseases are here now. We must deal with them. But, we must not stop there. We must identify all the deficiencies in our animal health system and work until these are corrected.

Foot-and-Mouth Disease, Bovine Spongiform Encephalopathy, Classical Swine Fever and a host of other potentially devastating diseases are waiting in the wings for our system to break down and allow their entry. While I do not want to downplay the significance of WNV and VHD of Rabbits, neither of these have the impact on animal agriculture in the United States that any one of the others would have.

In addition to these serious foreign animal diseases we have several of the “home grown” variety that we must continue to address. Scrapie in sheep, Chronic Wasting Disease in cervidae, Johne’s disease in cattle and other ruminants, brucellosis in deer, elk and feral swine, tuberculosis in deer and pseudorabies in feral swine are several important ones.

While we discuss these issues and deliberate how best to address them, I want to remember one particular past success.

Fifty years ago we were at the mid-point of the FMD Campaign in Mexico. The last FMD outbreak in Mexico began in 1947 and the disease was eliminated by 1954. Mexico has remained free since that time. I know that some of the veterans of the Mexico FMD Campaign are present tonight and I would like to recognize these campaigners for their hard work and perseverance in this important effort. Dr. Frank Mulhern served in a leadership role in this effort for the United States. Would all of the persons who worked on the Mexico FMD Campaign please stand? Would you please join me in giving these people a round of applause? Thank you. A review of the Mexico FMD Campaign will be presented in the Foreign and Emerging Diseases Committee meeting. All who are interested are invited to attend and listen.
to this review.

For many years our animal disease control system has been based upon cooperation among federal and state animal health agencies and the affected industries. We have left the exclusion responsibility to the federal government. We also have relied on federal response teams to lead the response to incursion of a foreign or exotic disease while state animal health agencies and industries have focused on control and eradication of domestic diseases. This system, for the most part has been effective.

However, I believe that now is the time to modify the way we deliver animal health programs in the United States.

This is the year to develop an animal health partnership among federal and state animal health agencies, industries, universities and allied groups. The lesson of 2001 is that we must all be "in it together." Each stakeholder has a role and responsibility to which that stakeholder is best suited to perform, but none of the stakeholders can do it all. Only through an animal health partnership can we truly safeguard animal agriculture in America. Such a partnership is essential if we are to meet the animal health challenges of the 21st century.

This has been an historic year. One of issues, challenges and progress. I believe this organization has much more ahead for 2002, but it is up to us to determine what we will be able to say: "2002 is the year...."
President Hillman, Members of the USAHA, Members of the AAVLD and distinguished guests;

Greetings and welcome to the joint General Session of the 44th Annual meeting of the AAVLD and the 105th Annual meeting of the US Animal Health Association. My name is David Zeman and I am President of the AAVLD and I am pleased to preside over this session along with USAHA President Bob Hillman.

First I would like to take this final opportunity to thank past and present leaders of the US Animal Health Association and the American Association of Veterinary Laboratory Diagnosticians for nurturing a strong relationship between our two organizations. It makes perfect logical sense that the diagnostic arm represented by the AAVLD be in sync and operate efficiently with the state and federal regulatory arm, as we both work together to serve our stakeholders by protecting animal health. Whatever we can do in the future to continue to improve our communications, to enhance our abilities to strategize and to work together efficiently, will surely keep us moving forward in our mutual goals.

My specialty is diagnostic veterinary pathology. When my kids were quite young, they would ask me what I do at work — I would simplify my answer by saying, “I work in food production”. When they were a bit older they would sometimes go to the lab with me after-hours and watch me thru the receiving lobby window as I did a necropsy on a cow or a pig — and then they would say, “that does not look like your making food”.

The point of that story is to remind us that as we go about the wide variety of daily tasks that are represented by the professionals in this room, that we not forget, that food production is at the heart of so much of our activities. We are a part of the most efficient, safe, economical, and secure food production system the world has ever known. And I hope that each and every one of you involved in “food production” can end your daily work with a sense of pride and fulfillment from the performance of your duties. In fact, having a meaningful daily task is a very special blessing in life — and I hope you can occasionally find time to reflect on that big picture in the midst of your busy professional lives.

Last year I participated in a special plenary session of the AAVLD that we called the Future Session. The bottom line from that speculative look into the future of veterinary laboratory diagnostics, was that the future is bright for our specialty. There are major new opportunities for service to the public that mesh well with our traditional roles — such as food safety, food security, zoonosis, and companion and wildlife health. Our expertise can be
applied to the full gamut of animal health and food production issues, as well as that crossover zone between animal health and public health.

But there are also important changes that we will have to navigate through and one important change relative to diagnostic veterinary medicine is the need for AAVLD to work closer with our federal partner labs – the NVSL and the FADDL. I am pleased to report that after a year of work and 10 drafts that AAVLD signed yesterday a Memorandum of Understanding with NVSL. One of the key action items in that MOU is the creation of a management working group charged with developing a national strategy to provide quality animal health diagnostic services. The working group will also have to address international expectations for quality standards in veterinary diagnostic labs. There is much to be done, and the events of September 11 add even more urgency to the task – relative to the serious potential for malicious activities.

I will close where I began. It makes perfect logical sense that the diagnostic arm represented by the AAVLD be totally in sync and operate efficiently with the state/federal regulatory arm, as well as the Federal Diagnostic arm (that's a three armed partnership). For we all work towards the same goal, to serve our stakeholders by protecting animal health. Thank you.
I am very pleased to be here with all of you today. As a former farmer, businessman, and State Senator back in Mississippi, and now as the Under Secretary for Marketing and Regulatory Programs for USDA, I have long been concerned with protecting the health of America’s agriculture. It feels good to be in a room with this many people who are working very hard to keep our animal resources as healthy as they possibly can be. I am glad that all of you are here this week to continue to exchange the important information that will help to maintain our country’s enviable record of animal health. I am pleased to have the opportunity to be here myself and am also here for a special reason—I have a special thank you to deliver to one person in particular who is here with us today.

As many of you know, in past years, the Administrator of USDA’s Animal and Plant Health Inspection Service has presented an award to honor an individual outside of the Federal government who has made outstanding contributions and provided notable service in addressing animal health concerns that have broad effects on the nation’s animal health status. This year, APHIS’ Acting Administrator, Bobby Acord, and I both wanted to present this award, so we decided we would arm wrestle to see who would get the opportunity to do it. Since I’m standing up here, I guess you know who won. But on a serious note, I am very pleased to be here and would like to thank Bobby for giving me the honor of honoring someone who has made a substantial contribution to our efforts to protect and promote animal health.

In introducing our honoree, I would like to take everyone back to February 21, 2001, when an outbreak of foot-and-mouth disease was confirmed in 27 pigs by a veterinarian in the United Kingdom. This day shook the animal health world. As cases of FMD began to be reported across the UK, Secretary Veneman and her new administration, including myself, were faced with the critical responsibility of ensuring that America’s livestock would be protected from the growing threat of FMD.

Shortly after the outbreak in the UK was confirmed, Secretary Veneman called on a veterinarian from her home State of California to assist her in coordinating an effective FMD communications plan. This veterinarian wasn’t expecting the UK FMD outbreak any more than any of us, but he was certainly ready, willing, and known by the Secretary to be extraordinarily capable of doing what she would ask him to do. The task was to ensure that FMD communications were on track—that all of the right people and groups were talking, were sharing the right information with one another, and were working...
to ensure that America's livestock would be properly protected from the growing threat of FMD.

The Secretary knew that the person she would ask to take on this responsibility had the experience, education, and background to make the right communications happen. She also knew that this person had the right combination of skills to get the job done. He had strong leadership capabilities, proven skills in building relationships and partnerships, and a tremendous capacity to make sense of complex situations quickly. The Secretary was thrilled when he agreed to step up to the challenge confronting him, as he had been known to do so many times before.

Our honoree had valuable state and field perspectives and an understanding of the relationships in Washington, which enabled him to appreciate and draw on the different views and strengths of different groups and individuals. For example, he knew that he could rely on the expertise of APHIS' top leaders and veterinarians, who were already working on strengthening our safeguarding measures in light of the growing threat of FMD. He came with a real motivation to synergize the different levels of government, industry, and academia to address FMD concerns collectively, but in a relatively short period of time. He had a strong determination that said, "Let's make things happen"—and he did. Over a 5-week period he orchestrated a series of very important meetings that allowed all interested persons to exchange vital information on FMD and other foreign animal disease concerns.

The meetings he helped bring about included two educational forums: an FMD Awareness Workshop that was held in cooperation with APHIS' Veterinary Services program, and an FMD Exclusion meeting that was held in cooperation with APHIS' Plant Protection and Quarantine Program. Our honoree also facilitated a meeting of the Catastrophic Disaster Response Group at the request of Secretary Veneman. This meeting, held in early April of this year, brought together representatives from several emergency response groups who would have an interest and hand in managing a catastrophic disaster response plan. Attendees at this meeting included representatives of twenty-some organizations and agencies including military groups, crisis planning groups, the Federal Emergency Management Agency, the Department of Health and Human Services, the Food and Drug Administration, the Centers for Disease Control, the American Red Cross, and State and Federal agricultural departments. I know you can appreciate the level of detail and coordination that went into planning this critical meeting in such a short period of time. The event was very successful in allowing attendees the opportunity to meet with each other and to communicate how they would work with one another in the event of an outbreak of FMD or other emergency situation affecting U.S. animal health.

The communication and coordination didn't stop there. One week later,
the Import Export Working Group met to give State veterinarians and agricultural commissioners, representatives of Native American tribes, producers, and others with an interest in agricultural health issues a chance to discuss their FMD and other foreign animal disease concerns. Less than 2 weeks after that, those with an interest in biologics and research were brought together to discuss appropriate issues at a meeting of the FMD Research Working Group. The very next day, a meeting of the FMD Quarantine and Control Working Group was taking place. This allowed State veterinarians, representatives of Native American tribes, border port veterinarians from border States, and those in academia to gather together with representatives from every major constituent group, including rendering and packing companies and the cattle, equine, sheep, pig, chicken, and turkey industries, to discuss quarantine and control measures. Zoo representatives and individual veterinary practitioners participated as well. During this meeting, smaller breakout sessions were held to allow focused conversations about quarantine and control plans and strategies.

Through these forums and meetings, we were able to educate the national agriculture community on the prevention, preparedness, and control measures for FMD. I don't need to tell you just how important this collective awareness is to protecting against the FMD threat. Now our honoree certainly didn't accomplish all of the planning and organizing by himself, and he would be the first one to tell you that. What he did do was to call on the best people available to coordinate this enormous effort. I'm told that along the way, he made a point to value each contributor's input and treat each of them with professionalism and respect. I'm also told that he used a consultative approach in his planning, and sought and trusted the judgement of some of USDA's finest veterinarians and leaders. He has been described as having a very nice way of getting things done without trampling on anyone's toes; yet he is also known to be demanding and strong when situations call for it. In short, he epitomizes a genuine leader and team player.

I think it is also very impressive that our honoree split his efforts between Washington and California while taking on the Secretary's challenge. In addition to orchestrating the FMD educational forums, our honoree also fulfilled his duties as the Director of Animal Health and Food Safety Services for the California Department of Food and Agriculture. Some of you may know that he is an active member of many state and national animal health and veterinary associations and currently serves as Chairman of the USAHA Food Safety Committee. He also serves on the Executive Committee of the National Institute for Animal Agriculture and is a member of the USDA Secretary's Advisory Committee for Foreign Animal and Poultry Diseases. He has been a leader in developing food safety and quality assurance plans with several livestock and poultry commodities which now serve as models for the rest of the nation. In addition, he is also a founding member of the
National Animal Health Emergency Management Steering Committee, which was established in 1996. In addition, he is a very active and supportive member of the Animal Health Safeguarding Review Panel, which is working for the National Association of State Departments of Agriculture to conduct a review of APHIS' animal health safeguarding system.

By now I hope that you have a pretty good idea of who I've been talking about for the past several minutes. There is no doubt in my mind that he has earned and is most deserving of the 2001 APHIS Administrator's USAHA Award. I could go on further about this person, but thought instead that I would ask Dr. Richard Breitmeyer to join me at the stage to accept my thank you, the APHIS Administrator's thank you, and the national animal health community's thank you for a job very well done. I am pleased to announce that Dr. Breitmeyer is the recipient of this year's 2001 APHIS Administrator's USAHA Award.
Mr. William T. Hawks, Under Secretary, Marketing and Regulatory Program, APHIS, USDA presents the APHIS Administrator's Award to Dr. Richard E. Breitmeyer, State Veterinarian of California.
A number of years ago, the NACLHO established an award that is now given annually to an individual who is recognized for performing service over and above what is normally expected of them.

We have experienced such an event in this year of 2001.

In November of 2000, a new President of the United States was elected. And in January of 2001, a new administration came to Washington, D. C. At the same time, in February, we began to hear reports of Foot and Mouth Disease (FMD) diagnosed in the United Kingdom (UK). Within weeks, we came to understand that this highly contagious disease was spreading rapidly across the English countryside. We were soon treated to scenes on the nightly news of livestock, cattle and sheep being diagnosed with FMD with graphic pictures of lesions of the disease, followed soon after by scenes of these animals being killed and then the never ending scenes of fires consuming thousands and thousands of animal carcasses.

As State Veterinarians, we soon realized that there is a tremendous of amount of travel between the United States and the UK especially in the Springtime. We all received many calls from anxious livestock producers very concerned about the danger to their livestock if neighbors, family members and friends were to travel to the UK. As Veterinarians, I believe we felt the disease could be kept out of the U.S., as it has been since the 1950’s. However, the public was yet to be convinced.

Into this excitement came a new Secretary of Agriculture, Ann Venneman, of California; and before she could put in place her administrative team, she was besieged by the press and the public demanding to know how she planned to protect the country from this disease. While she had an extremely able division within her Department to address this issue, she had yet to be comfortable with them.

The person she was comfortable with was her own State Veterinarian. She immediately brought this person into her office for advice, counsel, and support in this extremely trying time.

Her decision to take this action, and his willingness to help, had to make the Secretary very relieved, and certainly made those of us in the State offices feel much better.

This year’s recipient of the National Assembly Award is a 1980 graduate of the University of California at Davis. He has been a practicing veterinarian, a veterinary medical officer in the field, is trained as a Foreign Animal Disease Diagnostician, is a designated Brucellosis Epidemiologist and is the Director of the Animal Health and Foot Safety Services, California Department of Food and Agriculture, and is the State Veterinarian of California.
We are pleased to make this award to Dr. Richard Breitmeyer, State Veterinarian of California.

Dr. Thomas J. Hagerty, President of the National Assembly of Chief Livestock Health Officials, presented the twelfth National Assembly Award to Dr. Richard E. Breitmeyer, State Veterinarian of California. 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

First Business Session

The following reports were presented during the First Session:

State of the Association by B. R. Hillman
Treasurer’s Report by H. W. Towers
Report of the Committee on Nominations and Resolutions by Ernie W. Zirkle.

STATE OF THE ASSOCIATION

Bob Hillman, DVM
President
Monday, November 5, 2001

This report will give a brief overview of where we are, what progress has been made and provide an insight into the things we have yet to accomplish.

Your Board of Directors continues to work toward full implementation of our long-range plan. Work still must be accomplished in order to fully implement phase two. I am confident that President Lea and the Board of Directors will continue this effort until completed.

We continue to strive toward hiring a part time Executive Director for our Association. National and international events of this year show more than ever the need for USAHA to be a year around organization. A few of the issues that your president and board of Directors have worked on, or participated in, this year include Animal Health Protection Act, NASDA Safeguarding Review of USDA, Foot-and-Mouth Disease Working Groups, Canadian Animal Health Consultative Committee; NASDA mid-year and annual meetings, OIE annual meeting, US/EU Working Group on FMD, Michigan TB, Brucellosis in the Greater Yellowstone Area, West Nile Virus, EIA, Viral Hemorrhagic Disease of Rabbits, efforts to support Resolution 1 – funding for and implementation of the Master Plan for facilities at Ames, consultation with USDA staff on many animal health issues, conference calls on animal health safeguarding, and numerous other meetings, conference calls and communications. All of your Board of Directors have taken some of the load in increasing our impact on animal health and animal agriculture issues.

In 1999 President McCapes established a Constitution and Bylaws Review Task Force to review current constitution and bylaws and make recommendations for changes. At the 2000 Annual Meeting in Birmingham, Alabama, the Task Force presented a draft that would completely replace
the Constitution and Bylaws and recommended approval of the new bylaws. The Executive Committee approved a resolution accepting the recommendation and acknowledged eleven proposed amendments to the draft bylaws. During the Executive Committee Session on Tuesday the Executive Committee will consider the new Bylaws for our association and the proposed amendments to these Bylaws. The bylaws approved by the Executive Committee will be brought before the membership for consideration at the Business Section on Wednesday afternoon. The outcome of these efforts will determine how our Association will conduct business in the future. I encourage each of you to carefully review the proposed bylaws and amendments and be prepared to act upon them on Wednesday.

Significant progress is being made toward completion of our national disease eradication programs for Brucellosis, Tuberculosis and Pseudorabies. We must redouble our efforts to complete these programs. However, we must not forget that all of these diseases are present in wild or feral animals. At the last annual meeting we dedicated a general scientific session to wildlife diseases. Last month USAHA published a Wildlife Diseases Special Edition of the USAHA Newsletter. I want to give a special thanks to Dr. John Fischer for his work in getting authors for the articles and for editing this special edition. Whether it is Brucellosis in bison and elk of the Greater Yellowstone Area, Tuberculosis in White-tail Deer in Michigan or Swine Brucellosis or Pseudorabies in feral swine in any of a dozen or more states, we must not give up the battle to control and eventually eradicate these diseases from the United States.

Significant effort has been made toward passage of an Animal Health Protection Act. Everyone will recall that H4801 died last year. In an effort to develop an Animal Health Protection Act that could garner broad support and have a good chance for congressional action, USAHA and the Animal Agriculture Coalition developed an AHPA Working Group, which met in Riverdale in April and worked through the old bill to develop language for a new bill that would have broad support. The result of this effort is H2002 and S1482. The language of the bills is similar with three exceptions: S1482 deletes the word "premise" from the extraordinary emergency provisions; includes language requiring consultation with state animal health authorities on veterinary accreditation; and contains language requiring USDA to work with Native American Tribes on animal health matters. Both of these bills have been introduced. We have a strong coalition of animal health officials and industries supporting S1482 and there is a significant effort to get this bill passed in the Senate.

Foot-and-Mouth Disease in the United Kingdom and many other countries of the world has been cause for great concern to USAHA and all of animal agriculture. Shortly after the FMD outbreak in the UK began, USDA began an effort to review and upgrade our exclusion system and review and revise
our guidelines and manuals for dealing with a highly contagious disease in the United States. I was asked to help identify a number of state veterinarians and industry members to participate in Working Groups to review and make recommendations for revision and upgrading of guidelines and manuals for a highly contagious disease. Many USAHA members participated in these working groups during the spring and summer. The process is ongoing. Deficiencies in our exclusion system are being identified and corrected. Updated guidelines and manuals are being developed. I want to give a special thanks to all of our members who participated in this effort. I am not going to try and mention names because I know that I would leave someone out.

Within the next few weeks we should see the results of the National Association of State Department's of Agriculture's Safeguarding Review of USDA. This review began in December 2000. NASDA established four Committees and a Review Panel to conduct this review. The four committees included: Exclusion, International Information, Surveillance and Detection, and Response. The work of the committees has been completed. The Review Panel has completed the final review of the Executive Summary. We expect that the Executive Summary along with the complete Committee Reports will be published very soon. The Safeguarding Review contains many recommendations for improvement of our safeguarding system and provides supportive documentation to congress for improved budgets. Again, many USAHA members served tirelessly on the committees and on the review panel. I want to give a heartfelt thank you to all of those who served on this important effort.

The FMD Working Groups and the Safeguarding Review illustrate the extensive expertise that our members possess, the willingness to get involved in important national efforts and the prestige that our organization has earned over the years.

On international issues, President-elect Lea participated in the OIE meeting this year and has many of the same impressions that Dr. Zirkle and I formed from our experiences at the meeting. In early October, I was asked by Dr. Torres' staff to participate on a USDA/EU FMD Working Group under the auspices of the Veterinary Equivalency Committee. This opportunity provided a first hand view of the work that must go into our safeguarding efforts. It also provided a view of the EU safeguarding system and a comparison to our own. This is the first such opportunity for USAHA and I sincerely hope that it becomes an ongoing opportunity. In November, Dr. Zirkle will participate in an OIE of the Americas meeting to discuss how USAHA functions with our South American neighbors. This opportunity is a direct result of interactions that began at OIE. USAHA must continue to be involved on international animal health issues if we hope to safeguard animal agriculture in the United States. It is my hope that these activities are only
I want to take a moment to talk about our financial situation. Last year we increased member dues and non-member registration fees in an effort to improve our financial picture. The increased dues and registration fees have helped, but the full impact will not be seen until after this meeting. Individual members who paid their dues when they registered for the 2000 annual meeting paid the old fees. Individual members paid the new fees when they paid dues and registered for this annual meeting. Our financial picture is improving and we should end the year with a healthy balance. We do have a budget and the Board of Directors have worked diligently to keep within the budget. Our budget for 2001 is $245,000. Revenues to date are $140,000 while expenses are approximately $100,000. We must keep in mind that these are incomplete figures and we will not have a complete financial picture until after this meeting, since much of our expense and significant portions of our income are related to the annual meeting. It is our hope that we will generate sufficient revenue to enable the association to employ a part time Executive Director. Additionally, the Board of Directors continues to explore additional sources of revenue and opportunities that would help achieve our goal more quickly.

President-elect Lea has done an excellent job in development of our Program and Scientific Section agenda, with the able assistance of AAVLD President-elect Pat Blanchard. I want to thank Mack for stepping up to fill the void left by the resignation of Dr. Chaddock. Mack has done an excellent job and will be a great President.

First Vice-president Bob Frost has spent countless hours promoting implementation of Resolution 1 – the Master Plan for Combined Laboratory Facilities at Ames. Bob has worked tirelessly on this project and I am sure he will continue his effort until our objective is accomplished.

Past President Zirkle has been a continuous source of support for me and for USAHA during his year as past president. Ernie has made a number of trips to Washington, DC and Riverdale on behalf of USAHA. These efforts have been significant to our purpose.

I want to thank my fellow officers, your Board of Directors, for the commitment and hard work in which they have been engaged throughout the year. Their support has been critical to the successes that we have had. I also want to thank the many USAHA members who have answered the call of duty during the year. Everyone who I asked to help did so. Together we have achieved much during 2001. Much remains to be done and I believe USAHA is in good hands as we continue to address animal health issues in America.

Thank you!
TREASURER'S REPORT

Dr. H.W. Towers

I am pleased to report that our organization remains on a fairly sound financial basis, at least we ended the year 2000 in the black. The Board of Directors has worked very hard this year to keep our expenses pretty much at a flat line level with last year's expenses. Every effort is being made to keep expenses in line with our budget.

Last year, I reported that new software had been purchased that would help us keep accurate, up to the minute records of our receipts and expenditures. The Board of Directors receives a print out of the income and expenses for each month as well as year-to-date totals. It is a real comfort to be able to look at these print outs and know just where the organization stands financially.

I am pleased to report that for the year 2000, there was a positive balance in our accounts of $53,854.53. Before anyone gets too euphoric, I need to point out that that figure includes $30,000 from a cashed in certificate of deposit and a $15,000 grant from the Bayer Company to put our foreign animal disease book on a CD.

It will be a strong recommendation from the financial advisory committee that the organization make every effort to increase its cash reserves to at least one year's operating expenses.

REPORT OF THE COMMITTEE ON NOMINATIONS AND RESOLUTIONS

Dr. E. W. Zirkle


Dr. Zirkle announced that the slate of officers would be posted on the bulletin board overnight and we be brought forth for discussion during the Business Session II, the following day at 3:45pm. 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.
BUSINESS MEETING MINUTES

Second Business Session

Dr. Hillman: Dr. Zirkle will you give the report on the action of the Committee on Nominations.

Dr. Zirkle: This is the second reading of the action of the Nominating Committee. Monday was the report and action is the same today. Our nomination slate is for President President – M. A. Lea, Louisiana; President-elect – B. E. Frost; First Vice-President – D. H. Lein, New York; Second Vice-President – R. D. Willer, Arizona; Third Vice-President – B. D. Marsh, Indiana; Treasurer – H. W. Towers, Delaware. Thos nominated as regional delegates are: Northeast – R. J. Eckroade, Pennsylvania, V. P. LaBranche, Massachusetts; North Central – 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. That is our report of the Nominees and I move for approval.

Dr. Hillman: You’ve heard the report of the Nominating Committee. There is a motion on the floor for acceptance, is there a second?

Dr. Byrd: Second

Dr. Hillman: Is there any discussion on amendments to the report. All those in favor of the motion say Aye. Those opposed, like sign. Report of the Nominating Committee is accepted.

Dr. Hillman: Each of you has a copy of the proposed bylaws for the association. These bylaws were published in the 2000 proceedings and have been approved by the Executive Committee. Is there any discussion or questions concerning these new bylaws? Hearing none is there a motion to approve the new bylaws.

Dr. Zirkle: Move for approval.

Dr. Lea: I second the motion.

Dr. Hillman: There is a motion to approve the new bylaws. Is there any discussion? All those in favor of the motion say, Aye. Those opposed, like sign. Motion approved. Now we need to address the Associations Constitution. The Constitution and Bylaws Review Task Force is recommending that the Associations Constitution be eliminated. Is there a
motion to do away with the current constitution and operate the association on the new bylaws?

Dr. Williams: I move to abolish the association’s current constitution.

Dr. Alley: Second.

Dr. Hillman: We have a motion and second. Is there any discussion? All in favor of the motion signify by saying, Aye. Those opposed, like sign. Motion approved. 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. Lea...

Dr. Lea: Remarks

Dr. Lea: At this time I would like to call on Dr. Zirkle.

Dr. Zirkle: Thank you, Dr. Lea. This is the part of the program that we recognize the immediate past president, who this year will be Bob Hillman. On behalf of the association we thank you Bob for your service as president during 2000/2001. As a sign of the memberships gratitude to you I would like to present you the traditional gold key, the president’s plaque and the presidents gavel that is inscribed to read “USAHA Bob Hillman, President 2001.” Again this is a token from the membership of the association in recognition of your service. I now officially proclaim you to be Past President, Bob Hillman.

Dr. Hillman: Thank you Ernie.

Dr. Lea: I declare this Second Session of the Business Meeting adjourned.
Dr. Ernest W. Zirkle, Immediate Past President of USAHA, present plaque, tie tack and life member badge to outgoing USAHA President, Dr. Bob R. Hillman.
REPORT ON THE ACTION OF
THE NOMINATING COMMITTEE

E. W. Zirkle

Dr. Zirkle read the report of the Nominating Committee yesterday and
the report of the action of the committee is the same as yesterday. Our
nomination slate is for President — M. A. Lea, Louisiana; President-elect —
B. E. Frost; First Vice-President — D. H. Lein, New York; Second Vice-
President — R. D. Willer, Arizona; Third Vice-President — B. D. Marsh, Indiana;
Treasurer — H. W. Towers, Delaware. Thos nominated as regional delegates
are: Northeast — R. J. Eckroade, Pennsylvania, V. P. LaBranche,
Massachusetts; North Central — 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. That is our report of the
Nominees, slate of officers for 2002. The slate was unanimously approved
and we now go before the Executive Committee.

ACTION ON THE CONSTITUTION AND BYLAWS

There has been a lot of discussion throughout the week and we have a
motion to approve the new Bylaws. Dr. Ernie Zirkle moved its approval; and
Dr. Mack Lea, seconded. It was approved

Now we have to take care of the old Constitution & Bylaws. We have a
motion on the floor to delete the old Constitution.
PRESIDENT ELECT'S ADDRESS

M. A. Lea

Thank you Dr. Hillman. Ladies and Gentlemen, it is indeed an honor to be at the office of president of this organization. Thank you for giving me the opportunity to serve the USAHA and animal health in this country.

First of all, a sincere thank you to Dr. Bob Hillman for the fantastic job he has done over the past year. There have been any number of events that have arisen this year and they have all been handled exceptionally well. I hope that I will be able to do even half as well as Bob has done this year. Bob, thank you. You have done an exceptional job. This organization could not have been in better hands.

We, as animal health officials, researchers, teachers and producers have our job cut out for us. Maintaining the health of this nation’s animal agriculture is what we do. At no other time that I am aware of have we been so challenged to keep our livestock safe and healthy. This past year has seen a tremendous epidemic of Foot and Mouth Disease in England and other countries. BSE in cattle has spread to several countries in Europe. We have seen increased cases of Chronic Wasting Disease in this country. West Nile Virus has now been diagnosed in 27 states—that’s an increase of 12 states in the year 2001.

Hard work and cooperation by everyone associated with animal health has prevailed. The United States is FMD and BSE free. Scientific knowledge and hard work have made it possible for us to stay free, but we cannot let down our guard or reduce our security or give one inch to those who would say everything is OK. Terrorism is at hand. The possibility that we will be faced with attempts to terrorize agriculture, in particular animal agriculture, is great. We must continue to work hard and work together to protect the human and livestock population of this country.

For the past year the “Master Plan” for the renovation and revitalization of the research and laboratory facilities at Ames, Iowa, has been our number one priority. The events of September 11 serve only to increase that priority, urgency and need to vastly strengthen our laboratory’s capability. The “Master Plan” will continue to have top priority from USAHA. This organization will continue to support the fight to keep BSE and FMD out the U.S., as well as other threats, foreign or domestic, to this country’s animal agriculture.

These efforts can only be accomplished through cooperation of all interested and involved parties—Federal animal health officials, state officials, researchers, teachers and producers. No one group has the resources to maintain this vigilance alone. All stakeholders must be involved and work together to keep our livestock and wildlife safe.
USAHA will continue to support and encourage the passage of the Animal Health Protection Act now pending in Congress. This legislation to consolidate and update the nation's animal health laws is important to this industry at this critical time.

Again, I want to thank you for this opportunity. I look forward to working with everyone in this organization. Please help me and the Executive Board to continue to support animal health in the United States through sound, scientifically based policies, recommendations and actions.

Thank you.

Dr. M. A. Lea, 2002 President of USAHA
PASSING THE PRESIDENTIAL GADEL

B. R. Hillman

Dr. Bob R. Hillman, 2001 USAHA President, passing the gavel to Dr. Maxwell A. Lea, 2002 USAHA President.
BSE: EPIDEMIOLOGY OF THE DISEASE AND VALIDITY OF DIAGNOSTIC TESTS USED

Marcus G. Doherr

Bovine spongiform encephalopathy (BSE) is a fatal neurological disease in cattle that was first diagnosed in 1985/86 in the United Kingdom. It belongs to the family of transmissible spongiform encephalopathies (TSE) that are known to cause histological lesions (spongiform degeneration) and accumulation of protein plaques in the central nervous system (CNS). The causal infectious agent is considered to be a proteinaceous infectious particle (prion) that is converting routinely synthesized "healthy" prion protein (PrPc) into a protease-K resistant diseased form (PrPsc) which in turn forms pathological aggregates. Other known TSEs in animals are scrapie in sheep and goats (first mentioned as a clinical entity around 1730), transmissible mink encephalopathy (TME, 1965), chronic wasting disease (CWD, 1980), feline spongiform encephalopathy (FSE, 1990) and various TSEs in laboratory rodents (experimental infections). Five distinct human TSEs are known in addition: the sporadic Creutzfeldt-Jakob disease (sCJD, 1920), the inherited Gerstmann-Sträussler-Scheinker (GSS, 1928) and fatal familiar insomnia (FFI, 1986) diseases, Kuru (1957) transmitted by cannibalism, and a new variant of the CJD (vCJD, 1996) that is linked to BSE.

There is a considerable debate on the origin of BSE in cattle. The main hypothesis was and still is that a species jump of sheep scrapie, which was rather prevalent in the UK, to cattle took place sometimes between 1970 and 1975. Other hypotheses are that a spontaneous mutation, similar to that leading to the sCJD in humans, occurred in cattle, or that the disease originated from wildlife (or products thereof) that were imported to the UK. Pathogenesis studies have shown that oral exposure of calves with 0.1 gram CNS tissue material from clinical BSE cases is sufficient for infection. The incubation time (time between exposure and first clinical signs of disease) in a limited number of calves exposed at 4 months of age was between 32 and 40 months, while the average age at clinical disease of field BSE cases in the UK and in Switzerland is around 65 months (range 22 months to 18 years). This indicates an interaction between age at exposure, length of incubation time, infectious dose and possibly some other yet unknown parameters. Infectivity distribution was determined by intracerebral injection of sampled tissues from experimentally infected cattle and from field cases into BSE-susceptible mice strains. Infectivity was, with the exception of the anatomical region of the Peyers patches of the distal ileum in calves, only detectable in the final months of BSE incubation and during clinical disease. In all cases it was restricted to the CNS (brain, spinal cord), the dorsal root ganglia, and in some of the experimentally infected cattle again the Peyers
patches of the distal ileum. No infectivity was detected in any other of the
over 40 screened tissues including blood, milk, colostrum, muscle, peripheral
nerves, lymphatic tissues and spleen. Typical spongiform lesions detectable
in histopathology (HP) are only present in animals with clinical disease, and
the accumulation of the diseased PrPSc reaches detection levels at the end
of the incubation period. With the diagnostic tools currently available, an
ante-mortem diagnosis of BSE is not possible, and BSE-incubating cattle
will only test positive in the post-mortem tests if they are close to (i.e. within
a few months of) clinical disease.

There is no evidence for excretion of infectivity and horizontal transmission
of bovine BSE and very limited data that indicates a low probability – if at all –
of maternal transmission. Epidemiological studies have shown that
interlinked risk factors for the transmission of BSE are (1) an intensive cattle
production that requires feeding of concentrate feed, (2) routine inclusion of
bovine protein, mainly as meat-and-bone meal (MBM), into calf and cattle
rations, (3) the use of specified risk material (brain, spinal cord) and carcasses
(fallen stock) in the rendering industry (i.e. for MBM production), and (4)
rendering parameters (processes) that would not fully inactivate BSE
infectivity. Presence of all these risk factors allowed for the large-scale
recycling of infectivity from slaughtered or culled cattle to susceptible animals
via feed after 1970 in the UK. This caused the subsequent BSE epidemic
with close to 180,000 clinical cases observed between 1986 and 2001. Control
of all these risk factors seems to reduce the risk on new infections sufficiently
to, over time, eliminate an epidemic.

The export of live breeding cattle and of animal protein (mainly as MBM)
from the UK resulted in smaller BSE epidemics in the receiving countries
such as the Republic of Ireland (first domestic cases in 1989), Switzerland
(1990), France (1991), Portugal (1994), Belgium and the Netherlands (both
1997). By now all EU Member States (with the exception of Finland, Sweden
and Greece) and the neighboring countries Switzerland and the Czech
Republic have reported at least one domestic BSE case. Some additional
countries such as the Kingdom of Oman and Canada only detected BSE
cases in imported cattle.

Until 1999, monitoring and surveillance systems (MOSS) for bovine
spongiform encephalopathy (BSE) worldwide were primarily passive, relying
essentially on the examination of diseased adult cattle reported to the
veterinary authorities. Brains were examined by HP for spongiform lesions
indicative of BSE, and, after 1994, with increasing frequency also by
immunohistochemistry (IHC) to demonstrate the presence of PrPSc. Due to
the lengthy fixation process both tests are not considered suitable for (fast)
mass screening. Three new tests, the Prionics Western blot, the BioRad
ELISA and the Enfer ELISA, were validated by the EU in 1999 a blinded trial
with 300 samples from clinical BSE cases (confirmed by histology and
immunohistochemistry) and 1000 samples from a BSE-free region. All three tests were 100% sensitive and 100% specific against these gold standards, and were approved as fast (6-8 hours) screening assays. Fife further BSE screening assays are currently under similar evaluation.

Case inclusion in a "passive" MOSS is not randomized by authorities but influenced by the degree of disease awareness of owners and veterinary practitioners, and by the consequences (incentives and disincentives) of reporting a suspect case, i.e. the "risk" of confirmation. It is well known for other stigmatized diseases, such as sexually transmitted diseases (STD) of humans, that in such a system the reported incidence of clinical cases underestimates the true risk of clinical disease in the population. The passively acquired surveillance data for BSE therefore did not provide a reliable or comparable estimate of the BSE status of a country or region, other than indicating that BSE was present when cases were detected. After a BSE risk assessment initiated by the EU commission in 2000 had shown that BSE might have a wider geographic distribution than indicated by passive surveillance data, a decision was taken to follow the Swiss targeted screening approach and screen all adult cattle in risk groups (emergency-slaughtered cattle, fallen stock), and routinely slaughtered (healthy) cows over the age of 30 months for BSE. All three validated screening tests were used in Europe. Positive samples are often re-tested in the (regional) laboratories, but have to be submitted to the central (national reference) laboratories for confirmation with the same test, but typically also by IHC and HP. Both IHC and HP require that a formalin-fixed or non-homogenized frozen segment of the brain stem (obex region) is still available. In several occasions, positive screening test results were subsequently ruled out by the confirmatory tests (most often IHC) as false-positive. This was estimated to occur at a frequency of between 0.1% and 1%, however, reliable data are not readily available. For a very small number of screening-test positive samples, repeated testing with the same and with other tests yielded conflicting results. Interpretation is difficult for these samples, but the final decision can be crucial especially if this would be the first BSE case in a given country or region.

The EU Member States (excluding UK) and Switzerland have an adult cattle population (over 24 months of age) of approx. 36 Million. Between January 1 and May 31, 2001, more than 1500 clinical BSE suspects were reported in these countries, of which 140 (9%) were confirmed with BSE. Among the 0.22 Mill. emergency-slaughtered cattle and fallen stock tested within this program, 105 cases (0.047%) were detected, and 96 (0.0038%) of the 2.45 Mill. healthy-slaughtered cattle tested positive for BSE. The odds of detecting BSE cases in the risk cohort was 12.28 (9.22 – 16.35) times higher when compared to that of the healthy-slaughtered cattle. Approx. 40% of all detected BSE cases were captured by passive MOSS. However, this proportion varied between 0% and 90% depending on country, which
indicates the large influence of the quality of the passive MOSS, and the definitions used in the respective countries to differentiate between BSE suspicion on the farm (= clinical suspect category), suspicion during pre-slaughter examination (= clinical suspect or emergency-slaughtered category), and no suspicion despite clinical symptoms (= emergency-slaughtered or fallen stock category). In general, however, screening data were comparable between the target populations in the different countries. The first five month of screening, however, do not yet allow assessing whether the increase in detected cases is the result of an increasing BSE epidemic in continental Europe, an artifact of the intensified surveillance, or both. Only UK, with mandatory suspect reporting, and Switzerland with over 30 months of passive and active MOSS data can reliably document a steadily declining epidemic curve since 1992 resp. 1995.

A range of other species was exposed to BSE infectivity either by feed or food containing CNS tissue from infected cattle. This lead to "natural" TSE cases in domestic cats, cheetahs, lions, ocelots, mountain lions and tigers (FSE), several zoo ruminants, and humans (vCJD). Experimentally the disease was transmissible from cattle to pigs, but only by intracerebral inoculation, and orally to sheep and goats, lemurs and mice. Passage of the infectious agent from these species through specific mice strains revealed the typical BSE pattern in incubation time and CNS lesion profile, and allows to differentiate these diseases from other TSEs such as scrapie in sheep and goats.

In conclusion, BSE is a new TSE in cattle that first occurred in the UK and that now has been detected in most of the EU Member States. Infectivity is transmitted via feed or food, and the BSE agent is infectious for several other species including humans. Reporting of clinical suspect cases is not sufficient to reliably assess the BSE situation in a country or region. The EU in January 2001 implemented a targeted BSE screening program in which during the first five months over 2.5 Mill. adult cattle have been tested, and more than 200 additional BSE cases detected. Our diagnostic abilities so far are limited to the post-mortem detection of infected cattle close to or with clinical signs. Control of the disease seems possible by eliminating the main risk factors (recycling of infectious tissue), however, eradication takes time, and current surveillance data cannot yet tell whether the BSE epidemic in continental Europe is still increasing or decreasing.

References on request from the author
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Introduction

Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy (TSE) affecting free-ranging and captive deer and elk. Chronic wasting disease was first recognized by biologists in the late 1960s as disease of unknown etiology among captive mule deer (*Odocoileus hemionus*) at wildlife research facilities in Colorado and by the 1970s it had been found in a similar facility in Wyoming. Chronic wasting disease was determined to be a spongiform encephalopathy by histopathologic examination of the brains of affected mule deer in 1977. Diagnosis of CWD in Rocky Mountain elk (*Cervus elaphus nelsoni*) from these same facilities quickly followed. The presence of CWD in populations of free-ranging mule deer, white-tailed deer (*Odocoileus virginianus*), and elk was identified through the 1980s. The rise of bovine spongiform encephalopathy and the related variant Creutzfeldt-Jakob Disease of humans in the United Kingdom and more recently in Europe, focused scientific and regulatory attention on all of the TSEs. There has been renewed interest in the longest recognized and most widespread TSE in North America: scrapie of sheep and goats. Chronic wasting disease, because of its novelty and wildlife hosts, has also become a disease of interest to animal health authorities, wildlife management agencies, veterinary diagnostic laboratories, captive cervid industries, and the public. Many individuals at many institutions and belonging to many agencies have studied various aspects of CWD biology; this report is a summary of the work of many people.

Host Range

Natural Hosts: The primary host of CWD appears to be mule deer. The disease was first recognized in this species and the prevalence of CWD infection in mule deer in captive and free-ranging populations is relatively high. Essentially all mule deer maintained in CWD endemic facilities succumb to this disease and in localized free-ranging populations CWD infection may reach 15%. White-tailed deer are also susceptible to CWD, though they are not as common within the CWD endemic area and the dynamics of the disease in this species is not yet well understood. However, preliminary observations suggest that the dynamics of the disease in white-tailed deer and mule deer are probably similar. Rocky Mountain elk may be less susceptible to CWD than deer based on epidemiological observations in captivity and in free-ranging elk. The prevalence of CWD infection in elk in the endemic areas is low (<1%); however, prevalence in captive herds may

CHRONIC WASTING DISEASE:
HOST RANGE AND DISTRIBUTION

Elizabeth S. Williams
CHRONIC WASTING DISEASE: HOST RANGE AND DISTRIBUTION

exceed 75%. Subspecies of *O. hemionus* and *O. virginianus* are likely to be susceptible to CWD. One black-tailed deer (*O. hemionus columbianus*) that was living in the Wyoming facility developed CWD. It is not known if subspecies of *Cervus elaphus* other than *C. elaphus nelsoni* are susceptible to CWD. Rocky Mountain elk are the only free-ranging subspecies found in the CWD endemic area. However, some commercial elk farms maintain red deer (*C. elaphus elaphus* and other subspecies) with elk thus potentially resulting in exposure to CWD.

Experimental Hosts: The host range of the TSEs has traditionally been studied by experimental transmission, most commonly by intracerebral inoculation (though other parenteral routes have also been used). This route is obviously abnormal but has the advantage of resulting in reduced incubation periods in susceptible species compared to the oral, and presumed natural route, and has been useful for comparative pathology. Some species may be susceptible to intracerebral exposure to TSE agents but are not susceptible to the natural disease. Primary transmission of CWD has been accomplished by intracerebral inoculation of domestic ferrets (*Mustela putorius furo*), mink (*Mustela vison*), and squirrel monkey (*Saimiri sciureus*) by the late Dr. Richard Marsh and his colleagues at the University of Wisconsin; laboratory mice by Drs. Moira Bruce and Hugh Fraser at the Neuropathogenesis Unit, Edinburgh, Scotland; domestic cattle by Drs. Cutlip, Hamir, and others at the National Animal Disease Center, Ames, Iowa; and mule deer and domestic goats in studies in Wyoming and Colorado.

Intracerebral inoculation has failed to transmit CWD on primary passage to Syrian hamsters. However, Dr. Jason Bartl and colleagues at the University of Wisconsin were successful in transmitting the disease to hamsters following passage in ferrets. This indicated the potential for host-range alteration on interspecies passage of field isolates of the CWD agent as with other TSE agents.

Oral transmission is considered the primary natural route of transmission of CWD as for the other TSEs of animals. Mule deer, white-tailed deer, and elk experimentally exposed to the agent orally developed CWD with incubation periods that were shorter or similar to those observed in the natural disease.

Domestic cattle have been exposed orally to the same inocula used in the cervid transmission studies, and after more than 4 years, the cattle show no evidence of CWD.

Species Exposed: A wide variety of species, from rodents such as deer mice (*Peromyscus maniculatus*) to moose (*Alces alces*), have been exposed to CWD agent in endemic facilities and have not developed CWD. This includes ruminants such as domestic goats, sheep, and cattle, pronghorn antelope (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), bison (*Bison bison*), mountain goats (*Oreamnos americanus*), and moose. The number of individuals of each of these species is relatively small; however,
these uncontrolled observations suggest that these species are, at least, not as susceptible as the cervids to the CWD agent.

Distribution

Commercial Elk. Chronic wasting disease was first identified in the commercial elk industry in 1996 by Dr. Maria Spinato in samples sent to the Saskatchewan provincial veterinary diagnostic laboratory in Regina. Since that time, CWD has been found in herds in South Dakota, Nebraska, Oklahoma, Colorado, Montana, and Saskatchewan. Most of these herds have been depopulated and the industry and state, provincial, and federal agencies have established or are in the process of establishing eradication programs for CWD in commercial elk. As these programs come into widespread implementation, there will be a more complete picture of the distribution of CWD in commercial elk.

Free-ranging Cervids. The primary CWD endemic areas encompasses over 40,000 km² in southeastern Wyoming, northeastern Colorado, and the contiguous corner of southwestern Nebraska. This endemic area may be slowly expanding. Most recently, CWD was identified during surveillance in two free-ranging mule deer in western Saskatchewan. Surveillance of over 8,000 free-ranging deer and elk, by many agencies, has not resulted in identification of CWD elsewhere. Surveillance for CWD using targeted and harvest surveillance techniques is ongoing in many states and provinces.

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AN INTEGRATED SCRAPIE CONTROL PROGRAM: ACTIVE SURVEILLANCE USING LIVE ANIMAL TESTING AND RISK REDUCTION USING GENETIC SELECTION

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Ovine scrapie is an economically important disease for the US sheep industry. Losses to scrapie and subsequent loss of sheep and marketing potential due to regulatory action of the state and federal government have a significant impact on the viability of this industry. A joint federal-state-industry scrapie eradication program is underway. This program includes a number of novel pilot programs, designed to increase the efficacy of the eradication program while reducing the economic impact of the program on producers. Most pilot programs are initiated following diagnosis of scrapie in a sheep with clinical signs of scrapie, and include identification of preclinically infected flockmates using the third eyelid test, removal of eyelid test positive animals, their progeny, and genetically susceptible flockmates, and replacement with breeding stock of very low susceptibility to scrapie. The state of Wyoming has piloted an additional element: active surveillance to identify infected flocks that have not yet had a reported clinical case. Data showing the current status of that program, the performance of the third eyelid test, the scrapie susceptibility genotypes of apparently infected sheep identified through the eradication program, and the effect of maternal and fetal genotype on transmission potential will be shown.
INACTIVATION OF BSE-LIKE AGENTS

David M. Taylor

There is current worldwide concern regarding bovine spongiform encephalopathy (BSE), and its association with variant Creutzfeldt-Jakob disease (vCJD) in humans because of the increasing number of countries that have been demonstrated relatively recently to be harbouring BSE. The unconventional agents that cause transmissible neurological diseases such as BSE, scrapie in sheep, and Creutzfeldt-Jakob disease in humans, are known to be relatively resistant to a wide variety of inactivation procedures that are effective with conventional microorganisms (Kimberlin et al., 1983; Brown et al., 1986; Taylor et al., 1994; Taylor, 1999b, Taylor, 2000). It is anticipated that the agents that cause vCJD in Europe and chronic wasting disease (CWD) in North American and Canadian cervids will share this property but this has not yet been formally demonstrated. Even some inactivation procedures that were previously considered to be completely effective, are now known to provide a substantial degree of, but not complete, inactivation. Such procedures include exposure to 1M sodium hydroxide for an hour at room temperature, gravity-displacement autoclaving at 132°C for an hour, or porous-load autoclaving at 134-138°C for 18-60 minutes (Taylor et al., 1999a). Nevertheless, the recommended use of sodium hypochlorite solutions containing at least 20,000 ppm of available chlorine still appears to be an effective method although it is not a particularly user- or product-friendly procedure (Kimberlin et al., 1983; Taylor et al., 1994). Despite the doubts about the efficiency of achieving complete inactivation by either sodium hydroxide exposure or autoclaving, a number of studies have indicated that complete inactivation can be achieved by combining these procedures consecutively or simultaneously, even at an autoclaving temperature of 121°C (Taylor, 2000). In addition, an indication that these conditions provide a good degree of “overkill” has been provided by studies in which the 301V strain of mouse-passaged BSE agent was completely inactivated after boiling in 1M sodium hydroxide for only one minute (Taylor et al., 1999a). The 301V agent is known to replicate to relatively high titres in mouse-brain, and is the most thermostable mouse-passaged agent that has yet been identified (Taylor et al., 1999b).

Tallow and its derivatives have been considered to be relatively safe products with regard to any BSE-related risks but this situation has been the subject of continuous review. Once again, this issue is being discussed because of a publication that reported on the effectiveness of inactivating prion rods by autoclaving when suspended in different concentrations of lipid (Appel et al., 2001). The study reported that autoclaving processes (at temperatures up to 170°C) became less effective as the concentration of
lipid within which the prion rods were suspended was increased. The authors suggested that BSE infectivity would have a tendency to associate with tallow, rather than MBM, during the rendering process because of the hydrophobic nature of PrP<sub>Sc</sub>. However, in contrast to what is suggested by Appel <i>et al</i>(2001), there is evidence that BSE infectivity does not preferentially migrate into the tallow fraction during actual rendering conditions but tends to remain in the meat and bone meal fraction (<i>Taylor et al</i>, 1995). In the latter study there was no detectable infectivity in the tallow produced by a process that produced meat and bone meal containing almost as much infectivity as there was in the unprocessed raw materials. In addition, Appel <i>et al</i>(2001) used prion rods (analogous to scrapie-associated fibrils which are large fibrillar polymers of PrP<sub>Sc</sub>) as their source of infectivity. These were obtained by detergent extraction from hamster-brain infected with the 263K strain of scrapie agent. However, these types of fibrillar structures are not actually present as such in either 263K-infected hamster-brain or BSE-infected cattle-brain; they are unnatural agglomerates of PrP<sub>Sc</sub> that are produced by the detergent extraction process. Thus, the experiments were carried out in such a fashion that they did not represent the realistic conditions that prevail in everyday rendering. In addition, the source of infectivity was quite unrepresentative of the way in which BSE infectivity exists in bovine brain-tissue.

In a study that is being partially funded by the EC, the Gelatin Manufacturers of Europe have produced scaled down, but precise, versions of gelatin manufacturing processes that can be run in the laboratory. Using bovine bone spiked with the 301V strain of mouse-passaged BSE agent, gelatin has been produced in these scaled-down systems by the different manufacturing systems and is being bioassayed in laboratory mice. The results to date (<i>Taylor et al</i>, 2001) indicate that the crude gelatin samples obtained after the traditional acid or alkali processes are showing significant losses of infectivity titre. In the acid process, the total amount of infectivity in the spiked bones before processing was log 10<sup>8.8</sup> ID<sub>50</sub>, and the total load in the gelatin produced was log 10<sup>6.0</sup> ID<sub>50</sub> representing a loss of 3.8 logs. In the alkaline process, the total amount of infectivity in the spiked bones before processing was log 10<sup>8.1</sup> ID<sub>50</sub>, and the total load in the gelatin produced was log 10<sup>5.0</sup> ID<sub>50</sub> representing a loss of 4.1 logs. In a further, novel, process the demineralised bone that remains after the acid treatment was exposed to 0.3M sodium hydroxide for two hours. The total amount of infectivity in the spiked bones before processing was log 10<sup>8.1</sup> ID<sub>50</sub>, and there was no detectable infectivity in the gelatin. This has been calculated to represent a clearance of 5.6 logs of infectivity. The measurement of infectivity in these experiments was applied to crude gelatin but this is subjected to further refinement before the end-product is obtained. Such refinement includes depth filtration, ion exchange and ultra-high temperature sterilisation (UHT). Using gelatin spiked
with the 263K strain of hamster-passaged scrapie agent, there are indications that UHT sterilisation substantially reduces the infectivity titre (Grobben, personal communication). Collectively, these studies indicate that gelatin is a safe product even if the starting materials were sometimes contaminated with the BSE agent. If there were to be any lingering doubts about its safety, these could be annulled by introducing the two hour 0.3M sodium hydroxide step described above after the acid process. This would be equally applicable to the alkaline process because this includes the same acid step at the beginning of the process. All of the previous studies relating to the inactivation of BSE-like agents by sodium hydroxide have been carried out on infected brain-tissue. The results obtained during the gelatin studies suggest that 0.3M sodium hydroxide treatment at ambient temperature may be a very effective method of inactivating BSE-like agents when they are not protected by the high load of lipids, proteins etc that are present in crude brain-tissue. The gelatin studies should also serve to provide some reassurance regarding the BSE-related safety of the calcium phosphate that is a by-product of gelatin manufacture and is used in animal nutrition.

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ISSUES INVOLVING THE DISPOSAL OF TSE INFECTED ANIMALS

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There is current worldwide concern regarding bovine spongiform encephalopathy (BSE), and its association with variant Creutzfeldt-Jakob disease (vCJD) in humans because of the increasing number of countries that have been demonstrated relatively recently to be harbouring BSE. The unconventional agents that cause transmissible spongiform encephalopathies (TSEs) such as BSE, scrapie in sheep, and sporadic CJD in humans, are known to be relatively resistant to a wide variety of inactivation procedures that are effective with conventional microorganisms. It is anticipated that the TSE agents that cause vCJD in Europe (at present) and chronic wasting disease (CWD) in North American and Canadian cervids will share this property but this has not yet been formally demonstrated. The resistance of TSE agents to inactivation creates problems with regard to the safe disposal of the carcasses of animals that are known or suspected to be infected, and this will be discussed.

Landfill

A simple and convenient method for the disposal of animal carcasses is landfill. However, it is unknown how long the infectivity in TSE-infected, landfilled carcasses might survive. An experiment carried out by Dr Brown at NIH showed that there was still a significant amount of infectivity left in scrapie-infected hamster brain after it had been buried for three years. Professor Tateishi in Japan showed that a significant amount of infectivity survived when CJD-infected brain-tissue was left at room temperature for 28 months. Also, Dr Palsson reported that sheep considered to be scrapie-free developed scrapie when introduced to pastures that had been grazed by scrapie-infected sheep several years earlier in Iceland. Thus, the present evidence suggests that TSE infectivity is capable of longterm survival in the general environment but does not permit any conclusions to be drawn with regard to the maximum period that it might survive under landfill conditions. Experiments on the longterm survival of the BSE agent after burial are about to be initiated at the Neuropathogenesis Unit in Edinburgh, UK, but it will take up to ten years to gather the results from these experiments. However, burial is not the same as landfill because the latter process usually involves an enhanced degree of microbiological activity because of the variety of waste materials that are present. As far as the author is aware, there are no experiments in progress to study the degradation effects on TSE agents when they are land-filled.

More practically, it should be recognised that risk-assessments have
been carried out in the UK with regard to the disposal of BSE-infected carcases by landfill, and how this might impinge on human health. Although incineration was always the preferred option for the disposal of BSE-infected carcases in the UK, the incineration capacity at the height of the epidemic was insufficient to cope with the problem; landfill was therefore used as a back-up option. The landfill sites used were identified, and the number of carcases disposed of at each site was recorded. It was thus possible for a private risk-assessment company (Det Norske Veritas [DNV] acting on behalf of the UK Environment Agency and the Ministry of Agriculture Fisheries and Food) to subsequently provide an assessment as to what degree of risk had been imposed upon the human population of the UK by landfilling BSE-infected carcases. These studies showed that, even under worst-case conditions where the leachate from landfill sites might escape into water courses, the risk to any given individual was such that they would be unlikely to consume more than 2x10^6 bovine I\textsubscript{50} per annum. Given the acknowledged (but unquantified) species barrier that exists between bovines and humans, the actual risk factor for the development of disease in humans would be further reduced to an entirely acceptable level. However, it is not known at present how long landfill sites might have to remain undisturbed before they can be declared safe for other usage if they contain TSE-infected materials.

Incineration

Although incineration is generally regarded as the optimal method for the destruction of all microorganisms, there have been frequent reports of the discovery of organic material in the resulting ash. These findings indicate that the incineration process does not always perform according to the required standards. Studies carried out at the Neuropathogenesis Unit in Edinburgh, UK have shown that exposure of a hamster-passaged scrapie agent and a mouse-passaged BSE agent to dry heat at 200°C for an hour permitted the survival of a significant amount of infectivity. More significantly, the studies of Dr Brown at NIH have demonstrated the marginal survival of a hamster-passaged scrapie agent after exposure to 600°C for 15 minutes. Dr Brown acknowledges that these are enigmatic data, and that the experiments should be repeated elsewhere. Dr Brown has also indicated that he has designed a laboratory-scale facsimile of the incineration process in which TSE-spiked materials can be processed, and the output materials can be bioassayed for infectivity. The outcome of these experiments is awaited with interest.

Burning

Burning carcases individually or in groups in the open would not normally be considered as a serious option for disposing of TSE-infected carcases because of doubts regarding the complete destruction of all TSE infectivity by this imprecise method. However, the emergency conditions created by the recent foot and mouth disease epidemic in Great Britain necessitated the disposal of large numbers of animal carcases by burning in funeral
pyres. Clearly, some of the sheep or cattle disposed of by this method might have respectively been incubating scrapie or BSE. The DNV company carried out an assessment relating to the risk to human health that might have arisen through the burning of potentially BSE-infected carcases on funeral pyres. In this assessment it was assumed that 10% of the BSE infectivity in infected bovine carcases might survive the burning process and be dispersed within the smoke and ash. DNV also calculated that up to 100 dairy-cattle that were older than five years, and might have been incubating BSE, were processed in this fashion. Nevertheless, it was calculated that the risk of any human receiving an infectious dose was equivalent to a factor of $7 \times 10^{-7}$ which is within the realms of acceptable risk.

Rendering

In 1988, the epidemiological studies of Wilesmith in the UK implicated the feeding of BSE-infected meat and bone meal (MBM) to cattle as the cause of the rapid expansion of the UK BSE epidemic. This raised the question of the capability of rendering systems used within the UK to inactivate the BSE agent. This question could not be immediately answered because the rendering industry worldwide had never been asked to consider whether its manufacturing systems had the capacity to inactivate TSE agents. Nevertheless, from what was known about the time/temperature conditions used in rendering, it was considered that most processes could be suspect, given the capacity of some TSE agents to survive even extended periods of autoclaving. Until the emergence of BSE, the only TSE-infected tissues that UK renderers might have received would have been from scrapie-infected sheep, but there is no evidence that MBM produced from potentially scrapie-infected tissues had previously caused any problems by feeding it to various species, including ruminants.

The occurrence of the BSE epidemic in the UK clearly demonstrated that rendering procedures used in the 1980s to manufacture MBM had not inactivated the BSE agent but it was unknown whether this was related to one procedure or several, or what degree of inactivation might be achieved by any given process. In the early 1990s it was planned to conduct validation studies on the rendering procedures used within the UK but, in recognition of the potential future European dimension of the BSE problem, the EC supported an EU-wide rendering validation study that was conducted in two phases. In the first phase, BSE-spiked abattoir waste was exposed to the range of rendering processes that existed within the EU, and output samples were tested for BSE infectivity by mouse bioassay. In phase two, the same experiments were carried out using scrapie-spiked abattoir waste. Before carrying out these experiments, it was necessary to identify the range of rendering conditions used throughout the EU. This was achieved through surveys carried out by the European Renderers Association, the UK Ministry of Agriculture Fisheries and Food, and the United Kingdom Renderers
ISSUES INVOLVING THE DISPOSAL OF TSE INFECTED ANIMALS

Association. These revealed that the types of equipment used by renderers in the early 1980s was relatively limited but that they were used in many different ways. It was therefore necessary to generically define the processes and then identify the minimal and average time/temperature combinations for each generic process. Because the full details of these studies have been published, the results will only be briefly considered here. The experiments involving BSE-spiked abattoir waste clearly demonstrated that the most-recently introduced rendering system in the UK had little capacity to inactivate the BSE agent, and produced MBM with almost as much infectivity as in the untreated, spiked raw-material. Some of the other systems were also shown to permit the survival of lower levels of BSE infectivity. Apart from one rendering system that involved autoclaving, all other rendering methods permitted the survival of some scrapie infectivity. The autoclaving process involved exposure of the raw materials to steam at 133°C under a pressure of 3 bars for 20 minutes. This appeared to be effective with both the BSE and scrapie agents, and was subsequently adopted as the only approved method for producing MBM for animal feed in the EU. Nevertheless, Taylor stated publicly in 1997 that this process might not be robust under worst-case conditions. This proved to be the case when Dr Schreuder in the Netherlands subsequently reported the survival of some BSE infectivity when spiked raw materials containing $10^6 \text{ID}_{50}$/g of infectivity per gram of tissue (compared with the $10^{1.7} \text{ID}_{50}$/g level achieved in the UK experiments) were subjected to this process. This accords with the known general inability of autoclaving at temperatures ranging from 121-138°C to reliably inactivate high titres of BSE-like agents, even when the exposure times are extended. Nevertheless, the collective data from the UK and the Netherlands studies suggest that the hyperbaric 133°C rendering process is likely to be effective if high-risk tissues such as brain and spinal cord are reliably excluded from the process.

Ultra high-pressure autoclaving

The Biosphere company in Canada has developed a method for the disposal of waste animal carcases and tissues (and other waste products) by a system that is basically an ultra high-pressure autoclaving system that operates at temperatures of up to 215°C. The system produces a dry end-product that, by incorporating organic fibre and ammonium nitrate into the starting materials, can be used as a fertiliser. As discussed above, autoclaving at temperatures of up to 138°C has been unreliable with regard to the inactivation of TSE agents. However, only small amounts of infectivity survived, and this suggests that the Biosphere process operating at up to 215°C is likely to inactivate TSE agents. This is also clearly the opinion of the UK Department of the Environment Food and Rural Affairs (DEFRA) that is funding a validation study to test this system with regard to its capacity to inactivate TSE agents.
Hot alkaline hydrolysis

Although autoclaving at temperatures up to 138°C or exposure to 2M sodium hydroxide are not completely effective per se for inactivating TSE agents, inactivation can be achieved by combining these procedures consecutively or simultaneously at a temperature as low as 121°C. Even this process may represent a significant degree of "overkill" because 301V, which is a high titre and extremely thermostable strain of mouse-passaged BSE agent, can be inactivated by boiling in 1M sodium hydroxide for one minute.

For a number of years the WR² company based in Indianapolis has manufactured equipment for the disposal of animal carcasses and waste tissue by the hot alkaline process. The equipment consists essentially of a pressure-vessel in which the materials to be processed are placed alongside metered quantities of water and alkali. Heat is applied, and steam is produced that reaches temperatures of up to 160°C. The holding time depends upon the weight of the load but is usually in the order of several hours. The process can accommodate intact carcasses of species as large as horses, and produces a soup of amino acids, peptides, sugars and soaps. The only remaining solids look like intact bones but are, in fact, "bone-shadows" that crumble between finger and thumb when handled. Initially, the equipment was marketed for carcase disposal without any thought about the inactivation of TSE agents, and found increasing favour because it offers a practical and cost-effective alternative to incineration. It was more recently recognised that the process is also likely to inactivate TSE agents, and a validation study was funded by DEFRA in the UK to investigate this possibility. The study is now coming to an end, and the results to date have been sufficiently encouraging for the USDA to have used the WR² system to dispose of the carcases of culled TSE-infected sheep in Vermont. The perceived need to to employ special arrangements for the disposal of these particular sheep was because they had been imported from Europe where there is concern that BSE could infect sheep but result in a clinical disease that is indistinguishable from scrapie.

The future

A number of other existing technologies have been claimed to have a practical application with regard to the destruction of TSE agents but, to date, there has been no persuasive evidence presented to support these claims. However, developing technologies and (in the future) completely new processes may provide alternative methods that are practical, simple and cost-effective.

Key references


FOOT AND MOUTH DISEASE
IN CUMBRIA, ENGLAND: SPRING 2001

Brig. Gen. (ret.) Alex Birtwistle
Lt. Col. Paul Baker

Introduction
I tell my story from a soldier's perspective, not as trained scientist nor as a veterinarian.

What is not in doubt is that I feel very privileged to address such an expert and distinguished audience today.

Background
Foot and mouth disease (FMD) was confirmed in the United Kingdom on February 20th, but was quickly traced back to Northern England. This was significant because, at that time I was the commander of 42nd North West Brigade. As such, I was responsible for any military operations conducted in my area and the provision of military supports from my unit to other government departments. The Brigade is divided into 30 units and soldiers in these units are a mixture of both regular army – similar to your normal full time military units – and what we call territorial army, part time soldiers, recruited locally and who serve a minimum of 27 days per year. The latter are comparable to your National Guard. To give you some idea of scale, the North West area is about 8,000 square miles with a population of 6.8 million persons.

By 19 March there had been a rapid spread of the disease, both nationally and locally in Cumbria. It was at this point, one month after the initial diagnosis of foot and mouth, that instructions to provide military support were issued. Initially, my chief of staff and a team of liaison officers were allocated to provide assistance to the farms, help the slaughter process, to assist (the Ministry of Agriculture) in command and control and to try and gain an overview of a very fast-moving situation. On 21 March I deployed for an on-site assessment. It was also at this point that it was announced that the Prime Minister was visiting Cumbria the next day.

The Prime Minister's impending visit required an assessment and summary of the situation such that he could be provided with a briefing that addressed the military's role in fighting FMD. Therefore, my Chief of Staff and I gathered the currently known facts and conducted a detailed analysis of the situation based on those facts. The information that contributed to this assessment included our lay-knowledge the disease, the current efforts to fight it, the application of our own military experience and finally local knowledge of farming practices in the Northwest of England. Some of the factors that emerged as critical in our analysis include the following:
FOOT AND MOUTH DISEASE
IN CUMBRIA, ENGLAND: SPRING 2001

• Confirmation of the disease (by whom and how)
• Valuation/appraisal of stock – methods, choices, appeals
• Slaughter
• Disposal options (bury/burn/render)
• Disinfection and cleaning - both on and off the farms
• Number of veterinarians
• Number of valuers/appraisers
• Number of qualified slaughter personnel
• Safety of personnel
• Equipment and materials
• Weather and terrain
• Availability of suitable buildings and sites for operations

None of the above were problems that the British Ministry of Agriculture, Fisheries and Food (MAFF) was unaware of, however the rapid spread of foot and mouth had limited the ability of MAFF to respond without additional support and resources. It was the military’s role to support MAFF in any way possible, particularly in those operational areas where the capabilities and resources complimented those of MAFF. At that time in March, the following were identified as the most pressing problems in Cumbria:

50,000+ animals on farms. Many had been lying, rotting for weeks and were barely accessible having been killed in the corners of distant fields.

50,000+ animals had been identified for slaughter and the target was 24-hour report to slaughter and 48 hours to subsequent disposal.

Live pickup disposal requirement for an estimated 250,000 sheep.

As of March 21st, it was taking, on an average, 3 days from diagnosis to slaughter and then, many days to clear the backlog of carcasses. These delays were well outside the targeted (by MAFF) 24/48 hour target slaughter and disposal times adopted to halt the spread of the disease. In addition, to hindering disease control operations, the large numbers of carcasses lying dead and rotting in farms contributed to the ever-increasing levels of stress of the farmers and more generally among the affected rural communities.

The military contribution to the MAFF plan had to have an initial immediate impact as well as being effective over the long term. This required the establishment of simple management processes and to coordinate the activities with MAFF.

In the first days of our deployment very few physical resources were organized and available. Therefore, a mobile phone, a car park, and perhaps most valuable of all, a copy of the local yellow pages telephone directory were the starting point. In addition, we had to become as familiar as possible with the disease. In particular, how the disease was spread, the current
statistics and the rate of spread. These factors and others would determine what resources, both qualitatively and quantitatively, would be necessary.

It rapidly became apparent that the scope and complexities of the outbreak required a logistics expert and other specialists. Upon their arrival in Cumbria they were briefed on the current problem of clearing slaughtered animals, and the need to hugely increase the rate of clearance and of slaughter. In addition, we also examined the problem of carcass disposal and determined that a substantial government-owned disposal site was needed in order to be able to “kick start” an accelerated process and guarantee disposal. The logistics team went away with the following clear tasks:

- Find a government owned disposal site.
- Increase the rate of dead animal pick up. The “dead loop”.
- Establish the live pickup slaughter system. The “live loop”.
- Establish a headquarters. A military tactical headquarters first and then a fully furnished combined headquarters in the slightly longer term.
- Finally the following watchwords were put forth as a simple guide for what was going to be an increasing military force:
  - Infectivity – The need to make sure that we undertook to try and control the problem did not lead to it being exacerbated, as this was very sensitive and of great media interest.
  - Humanity – The importance of ensuring that all that we did to fight Foot and Mouth disease was done as humanely as possible.
  - Legacy - The importance of looking beyond the immediate problem to ensure that our solutions did not create unnecessary problems for the future.

By close of play 23 March it was clear that there was a great deal to do. It was also clear that, even with extensive opportunities for contractors, this was a major logistic problem.

The first major task was to find a disposal site. It was now Friday night and our goal was to identify the site and open it before the weekend was over. In addition to all of the technical tasks confronting us at this time, there was intense media interest in the Army’s involvement, raising public expectations for rapid results. Three disused WW2 airfields had already been identified as potential sites and on the morning of Saturday March 24th a reconnaissance team reported that the first airfield they looked at seemed ideal. This airfield, named Great Orton (in reference to a nearby village), was in the infected area, had hard standing for heavy equipment, good access, yet was sufficiently remote and was estimated to have a capacity of 500,000 of sheep equivalents. Ultimately, the equivalent of nearly 1 million sheep were eventually buried in this site alone. The other two airfields were rapidly
excluded. Finally, the necessary support (political and otherwise) and funding authority for us to go ahead and dig had to be secured. In addition, a purchase agreement and surveys were completed. By midday Sunday the 25th of March we had our first trench constructed and we were ready to receive our first carcasses. In the end, in order to get the first “drop” absolutely right, it was carried out on Monday 26 March.

The establishment of the Great Orton site was far from the end of the Army’s involvement at this very important location. It required constant attention and the permanent presence of, initially military personnel, and then a MAFF liaison officer throughout its working life to ensure it ran smoothly and to maximum capacity.

The next three logistic problems we had to address ran concurrently. Each will be described in turn.

First, we had to dramatically improve both the speed and efficiency of the “dead loop”; that is the process of disposing of the animals that were killed on farms. The consensus was that best form of disposal was by rendering. Unfortunately, there was a shortage of national capacity and even with 50% of the nation’s problem with respect to foot and mouth, we received about 30-40% of the available capacity. This level of disposal did not get significantly better throughout the operation. A great deal of disposal was also conducted on farms by burning and burial. Burial was limited with no more than 250 cattle at a time and no more than 1,000 on any one site in total and by the availability of suitable sites on a given farm. Burning also had a number of drawbacks. First, not all farms had suitable sites. Second, the initial methods used were not sophisticated as they contained a great deal of poor quality combustibles used such as treated timber railway sleepers (railroad ties), slack coal and tires thrown on the fires.

Additionally, there was the problem of the lack of separation of age cohorts in cattle during the initial slaughter between cattle over-five years of age and those younger than five years. Any cattle over five years of age could not be buried or burned due to concerns about contamination of the soil and groundwater with the agent of bovine spongiform encephalopathy (BSE). This meant that all intermingled cattle that included those over five years of age could not be buried.

Improvements to the “dead loop” included the following actions:

- Establishing military tactical areas of responsibility with military logistics and national farmer’s union liaison officers assigned to them.
- Increasing the farmers’ involvement using their own or local disinfecting and heavy equipment.
- Increasing disposal capacity by using commercial landfill disposal sites as well as our own government – owned site. This required
BIRTWISTLE, BAKER

careful liaison with local authorities and communities and, in one case the opening of brand new waste cell with an improved access road and a small bridge built by military engineers.

- Constantly increasing the number of 'leakproof' vehicles available to transport carcasses.

The second problem confronting us in this list was to improve the "live loop". The aim of the "live loop" was to provide the 3-kilometer "firebreak" around infected premises and involved an almost completely separate group of people. It took about a day to establish the process. The key to this was the local knowledge and expertise of the livestock valuers (appraisers) who knew the farmers and their animals, the livestock haulers who knew the location of all the farms and any geographic difficulties of gaining access and the local slaughterhouse. Once again the Great Orton site came into its own as we realized that a 'choke point' was a lack of slaughter capacity inside the infected area. The answer was to build a new slaughterhouse using both military and civilian slaughtermen, at Great Orton. Once the animals were slaughtered they then joined the Dead Loop. Our role was to simply assemble the chain, link it together, place a military monitor at the key decision points and 'turn up the heat' on all parts of the process to keep it at maximum performance. At its peak, the "live loop" handled 21,000 sheep and lambs per day.

The last task, which drew on our military experience of Northern Ireland and the Balkans was to build a combined MAFF operations building that could house representatives of all the agencies that needed to be in constant touch. These included the MAFF liaison officer, national farmers union, the environmental ministry, police and of course ourselves. Equally as important we set up the "Bird Table" following the standard military practice was the location of the twice-daily updates. The most important point was that anyone who wanted to know what was going on, who wasn't normally based in the combined operations building could attend one of the updates and be informed or make a contribution. This was crucial to capitalizing on the expertise of all our people and building the team.

At this point, when we had started a lot of concurrent activities, it is worth reviewing what risks we were managing at the time. A summary of my assessed risk areas is as follows:

Compliance Risk was a major concern with such a large and diverse labor force now operating at least 18 hours a day. For example some with 300 plus contracted "leak-proof" there was always the potential that mechanical problems would arise or that personnel would simply not adhere to the standards established and would be tempted to take the wrong short cuts to try and solve the problem quickly.

Public Media Risk was huge, for example some 40 media crews and equipment were in position when the Great Orton site opened and camera
crews were routinely following slaughter teams.

Organizational Risk was apparent in the MAFF headquarters, which had a relatively flat, business-modeled command structure. In the military, we have a relatively rich structure with planned redundancy in manpower to allow for losses and sustained 24-hour operations. This was capitalized on this by focusing efforts at the strategic level and dealing with the bulk of the tactical level issues.

Equipment Risk was predominantly carried by the contractors, although, given the seriousness of the situation, they clearly factored this in to their cost structure. The main point we had to constantly make was the need to ensure that equipment was up to the job. This was particularly important in providing "leak-proof" vehicles as it emerged that FMD was being spread by human/vehicle movement.

Closely linked to this was the risk to the operation posed by the disease itself. We constantly strove, as did those in MAFF, to predict the behavior of the virus and how it was spreading. At the start of the outbreak the picture was very confused. Even well into the operation it was difficult to get rapid test results to try and definitively diagnose the virus in animals before the symptoms became apparent. This lack of 'Epidemiological Intelligence' — what we in the army call the 'enemy picture' — was perhaps the greatest risk to the military aspect of the operation.

At the end of my 5 weeks intensive involvement in the operation what were the key lessons learned that I feel will be of universal value?

First, the need for continuous boundaries. This is again a lesson learned long ago by soldiers. It is essential that the boundaries of all organizations working together are closely aligned to ensure the minimum necessary liaison, effective command and control, thus reducing the scope for interference and confusion. The situation is complicated enough without building in any further "Structural complexity".

Second, the need for constantly updated contingency plans that have the capability and flexibility to address a broad range of disease scenarios. There were many relevant lessons from the last outbreak in 1967, which were either forgotten or ignored. However to be fair, there were also a number of different circumstances, such as large increases in the scale of national livestock movement that makes comparisons difficult.

The need for a cohesive and practiced decision making structure to deal with a national crisis of this type was painfully reinforced. Initially, the disease was moving ahead of our decision making structures. Sadly, recent events of September 11th have probably made that point highly relevant here in the United States for different, even more tragic, reasons.

Lack of proper field testing systems for speedy results led to the intelligence gap I described earlier. I gather that there is a prototype field-testing kit that doesn't need too much expertise to administer and this is
the sort of application that soldiers, with their practicality and self-reliance could quickly be trained in to support veterinarians. We discovered a lack of national strategic resources. I can provide two specific examples: first, the lack of national rendering capacity, the most effective way of disposing of cattle, and second, the reliance on one blood testing laboratory, which was inundated with samples to test by Cumbria alone.

Once again the power of the media was reinforced. As ever, it remains appropriately and fiercely independent but can be a huge force for good where success is being achieved. However, he who believes he 'owns' the media, is destined for a fall!!

Lastly, let's consider the lack of a quick decision on the inoculation policy. It is easy, with the benefit of hindsight, to suggest that an earlier decision on an inoculation policy might have reduced the slaughter significantly. The reality is that the disease caught us by surprise. What we must now do is consider if any inoculation policy has a part to play in fighting any future epidemic, were it to happen.

Finally, we must never forget the cost to animals and humans.
BSE SURVEILLANCE IN THE UNITED STATES

Linda A. Detwiler
Senior Staff Veterinarian
USDA, APHIS, VS

USDA ACTIONS:
Surveillance
• CNS Cases - farms, labs, slaughter
• "Downers" - nonambulatory (fallen stock and emergency slaughter)

TEST METHODOLOGY
• Histology - 1990
• Immunohistochemistry - 1994
• Western Blot - 1994
• Tests - under evaluation:
  • Enfer (High throughput chemiluminescent ELISA - 3-4 hrs)
  • Prionics (modified WB - 8 hrs)
  • Biorad (Sandwich Immunoassay (3-4 hrs)
  • All need brain tissue

BSE Surveillance: Total Bovine Brain Submission by State
May 10, 1990 thru September 30, 2001

Source: USDA, APHIS, NVSL
Total = 16,803
No evidence of BSE found
BSE SURVEILLANCE IN THE UNITED STATES

BSE Surveillance

Yearly Totals BSE Tests (NVSL/VDls*)
May 1990 to September 30, 2001

- Total Submissions: 855, 993
- Downers (fallen stock): 495, 465, 584, 412, 199, 223, 266, 219, 731, 344

Data as of September 30, 1998

Total = 16,803
No evidence of BSE found
NVSL Bovine Brain Submissions FY 93-99

Total Submissions

Downers* (fallen stock)

IHC 1994 downers

NVSL BSE Surveillance
Bovine Brain Submissions FY 00-01 (as of 9-30-01)
US Regions for BSE Surveillance

US Regional Goals for BSE Surveillance - FY 2001

US Regional Goals for BSE Surveillance (2001)

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* as of September 30, 2001
Status of Cattle Imported into the US from the United Kingdom and Ireland (as of September 30, 2001)

[Map showing the status of cattle imported into the US from the United Kingdom and Ireland, with Vermont-3 (VT-3) highlighted.]

Quarantined - No evidence of BSE

Status of Cattle Imported into the US from other European countries in 1996-97 (as of October 30, 2001)

[Map showing the status of cattle imported into the US from other European countries, with two numbered areas (1 and 2) highlighted.]

Quarantined - No evidence of BSE
BSE SURVEILLANCE IN THE UNITED STATES

Status of Cattle Imported into the US from Japan (1993-99)

US Surveillance

- Exceeded OIE standards for 8 years
- 2000 - 5 times higher than OIE standard
- 2001 - 10 times higher than OIE

US Surveillance 2002 - Where are we going?
- Increase in Targeted Populations
If the US goal is 12,500 in FY 2002

Increase of submissions

- aged; dairy
- condemns at slaughter
- 3D/4D
- Renderers
- Deads off farms

www.aphis.usda.gov/oa/bse

BSE Risk Assessment
Harvard School of Public Health
Tuskegee University

BSE Risk Assessment

- Define scope
- Describe potential pathways BSE infectivity into national herd or food supply
- Characterize and quantify steps in pathways
- Identify key steps for research or risk management
BSE SURVEILLANCE IN THE UNITED STATES

On behalf of the USDA:
Thank you Veterinary Services

Surveillance Reminders

Referral Number
VS Form 10-4:
FY
State
Initials of Submitter (3 if no middle initial use 0)
4 digits which continues consecutively per submission
Example: 02NJLAD0001

Surveillance Reminders

Submissions need:
• obex
• age of bovine
• ID
• clinical signs (or down)
• 10-4 & supplemental
• plant number
Questions call NVSL (515-663-7521)
The committee held its fourth annual meeting as a joint committee of USAHA and AAVLD on Sunday, November 4th, 2001 from 1 to 5 p.m. in Hershey, PA. Attendance fluctuated between 20 and 40 people, with 22 participants (9 of 36 members, 6 participants requesting membership) filling out the attendance sheets provided.

Dr. Elvinger welcomed the participants and gave a brief synopsis of the past year's meeting and activities. The year 2000 resolutions #1 and 11 were reviewed and the responses by USDA:APHIS:VS discussed. Discussion focused on response to resolution #11 on evaluation, streamlining and integration of all existing national animal health information and surveillance systems and the support of States for surveillance infrastructure. Questions arose on the adequacy of the response provided by VS, and on the problem of follow-up of resolutions when they are being worked up at VS. It was expected that the report to be released November 15, 2001, from the National Animal Health Safeguarding Review will contribute to enhancement of the national and State side surveillance infrastructure and improve information flow from national agencies to States, animal industries and other stakeholders.

Dr. Nora Wineland (CEAH, Fort Collins) and Dr. Bruce Akey (Virginia Department of Agriculture and Consumer Services, Richmond, VA) presented an update on the status of NAHRS. The NAHRS steering committee had met by teleconference in 4 one and a half hour sessions on September 24 and 25. Nineteen members participated. Five tasks had been assigned in the
year 2000 steering committee meeting: the Unified Methods and Rules had been accepted, the training manual completed, the promotional video was to be completed by November, Dr. Torres had presented NAHRS to the National Chicken Council and obtained their endorsement, and a cost benefit analysis was being prepared.

Participation in NAHRS was reviewed. At present 13 States participate monthly, with an average monthly participation of 20+ States, indicating no increase in average participation since 1999. However, it was noted that the comfort level for participation in contributing States had increased and a record high of 30 states had participated at least once during the year. Some of the non-participating States were contacted or had requested assistance for implementation of reporting to NAHRS. Non participating States were divided in 3 categories:

1. States in which uncertainties about NAHRS prevented full support by commodity groups;
2. States in which animal health infrastructure was not sufficient for participation;
3. States that had not yet gotten around to implementation.

Personal contacts through State Veterinarian's offices from participating States were determined to be the most effective approach for explaining the benefits of participation for those 9 States in which participation was considered controversial by animal industries. These contacts need to be supported by appropriate and effective informational materials, a clear statement of need, cost and benefits of participation or non-participation. CEAH proposed to seek additional support to those 7 States in which infrastructure and resource constraints prevents continuous participation. Steering committee members from surrounding participating States were asked for support. The balance of non-participating States (n=6) does not consider participation a priority. A few of those States, although they do not have numerically significant animal industries, need to be encouraged to participate to guarantee completeness of the reporting system.

Disease reporting and data quality issues were discussed commodity by commodity: Ovine/caprine: lack of case submission to diagnostic laboratories were considered the main deficiency in generating health status information. Submission of cases to out of State diagnostic laboratories may keep diseases under reported, and a mechanism was requested to provide diagnostic laboratory information to the State Veterinarian from originating States. Poultry: to alleviate concerns on misreporting of disease, it was proposed to investigate the possibility of submitting poultry disease information to a central non-USDA data base for validation prior to submission to CEAH. Aquaculture: underreporting of disease was considered and all potential sources of information need to be reassessed. Bovine: sources of information need to be reevaluated as some diseases known to occur regularly do not appear in some monthly reports. Enrollment of major cattle producers is
a priority. Porcine: as for bovine. In addition, needs to reevaluate case definitions, that may be too stringent for definitive diagnoses, and some States do not report on presumptive disease criteria for example for PRRS. Questions arose how the NAHRS data corresponds to data presented to OIE for the Annual OIE report, and how the lack of complete State information will affect the United States status regarding fulfillment of international trade requirements for certain commodities.

During this presentation a draft of the NAHRS video was presented. This draft had also been presented in the morning to the National Assembly of Chief Livestock Health Officials. Several editorial changes were proposed, notably emphasizing the mandatory conduit of information through the State Veterinarian's Office (flow graphic), and emphasizing the scope and proposed uses of the information for the audience. It was also proposed to consider reediting for a broader national and international audience once all States are on board.

Dr. Beth Lautner, National Pork Board, Ames, IA, and Dr. Bruce Akey, Virginia Department of Agriculture and Consumer Services, Richmond, VA, presented overviews of the recent USDA Animal Health Safeguarding Review conducted by the National Association of State Departments of Agriculture (NASDA) at the request of the USDA:APHIS. NASDA set up four committees, Domestic Surveillance and Monitoring, Exclusion Activities, International Information and Domestic Response, to evaluate the effectiveness of current USDA Veterinary Services efforts to safeguard US animal health. Each committee conducted extensive interviews of USDA, State and local staff and visited several major US ports of entry for animals and animal products. A Review Committee synchronized and collated the committee reports into a final report with specific findings and recommendations from each of the committees. The USDA has established an implementation team that includes not only USDA personnel but also members of the Animal Health Safeguarding Review committees, to ensure the recommendations are translated into actions.

Dr. John Wiemers, USDA National Animal Identification Coordinator, presented the Animal Identification – Disease Reporting Interface. The development of an animal identification system has to occur one piece at a time. Standards are set in the first phase: what are standards for numbering systems, premise identification, identification devices. These standard numbers will be associated with the standard devices and standard premises identification in Phase 2. Animal information (species, breed, gender birth date) is attached to that standard ID in Phase 3, and animal health events (type – vaccination, testing, certification, disease; dates) will be attached in Phase 4. Tracking of animal movement from premises of origin through the last premises to slaughter or other disposal will be implemented in the final Phase 5. This system is to evolve to allows complete tracking with information recorded at all points. Present identification priorities are inclusion of adult
animals of all species, "high risk" animals; animals tested or vaccinated and/or certified for APHIS programs, and other animals targeted through risk or cost/benefit analyses. The proposed standard for visual ID is the American Identification Number (AIN), a 12 character alpha-numeric field which corresponds to the Canadian system. Electronic numbers will be ISO standard. The discussion that followed the presentation emphasized the need for Veterinary Diagnostic Laboratory participation in design and implementation of this animal identification system.

Dr. Thomas McGinn, Assistant State Veterinarian, North Carolina Department of Agriculture, Raleigh, NC, presented a report entitled "Geographic Information Systems (GIS) in Monitoring of Animal Populations and Reporting of Disease". Starting in 1988, NC initiated a system to map all livestock operations in the State. System development and implementation was greatly enhanced with the hiring of a professional GIS Analyst, familiar with the use of ARCGIS software. To date, more than 15,000 premises are included in the database, and all premises have been located with global positioning units. The database is used as a resource for local and regional disease management, emergency response, dissemination of information, disease surveillance and eradication (PRV) and epidemiologic investigation. In case of disease outbreak trucks (feed, animal carriers) can be routed such that disease spread can be limited; suitability of soils and height of water table can be determined to locate appropriate sites for burying animals. Topographic maps (drainage) and weather maps (prevailing winds) can be produced to evaluate potential for spread of disease agents; associations between production performance and density of production can be determined. The system is such that producers can receive maps by email or fax showing location of farms infected with contagious agents and nearby farms, as soon as a disease agent is detected at the diagnostic laboratory, and disease exclusion and control zones can be determined within minutes of diagnosis. Plans are to use ARCIMS to create website (limited access) for producers to see diagnostic laboratory information from their premises tied to other data layers in map form. Internet mapping, wireless access/technology, satellite imagery, and novel tools for information dissemination are planned as well. Field personnel and diagnostic laboratory submission information is used to keep data on premises current.

Dr. Michael David, National Center for Import and Export, Riverdale, MD, reported on "List B Diseases That Have Been Used as Barriers to the Flow of Animal Products". Safeguarding global animal health has been delegated by the World Trade Organization to the Office International des Epizooties. One hundred fifty-eight countries, including the United States since 1976, are members of the OIE. The OIE collects and disseminates information on the health status of animal populations in member countries, coordinates research activities, harmonizes health standards for trade of animals and animal products, and provides guidance for disease control and eradication.
Disease reporting requires transparency, and infrastructure for determining and reporting animal health status has to be well defined. The OIE has divided animal diseases in two categories, presented in list A and list B of reportable diseases. List A diseases are highly contagious and have the potential for significant negative impact on animal and public health, animal populations and trade. List B diseases are transmissible diseases of socio-economic and/or public health importance in countries and which also are significant in the international trade of animals and animal products. Countries that participate in international trade have to provide information on outbreaks, immediately for List A diseases, in regularly scheduled reports for List B diseases. The reported information is used in bilateral negotiations with importing and exporting countries. List B diseases, notably IBR and leptospirosis in cattle, leptospirosis and scrapie in sheep as well as others have been raised by US trading partners as trade barriers. It is imperative that the US maintain the necessary monitoring and surveillance systems to be able to counter such trade restrictions. Using data from such systems, the US has been successful in removing trade restrictions on exports to countries in Central and South America, the Caribbean and others. Under the WTO, a country cannot make claims of being negative for an animal disease unless it can demonstrate the required transparency (surveillance, laboratory capacity and infrastructure). Although challenges to claims of negative disease status may take 2-3 years to be decided by the WTO, the country making false claims seriously damages its credibility and will suffer sanctions in the international market.

Dr. Mark Teachman, USDA:APHIS:VS, Riverdale, MD, presented "Animal Disease Reporting Networks in the US and Emergency Response: The USDA Animal Health Emergency Management Reporting System (EMRS)". This system is being developed to meet the vast and varied information management needs during an emergency disease outbreak. First written as a Lotus Notes application, it is being converted to an internet web-based application using Oracle database software. This will allow access to the system by any web browser and will enable links with the USDA Generic Database and eventually other federal, state and local databases as well. The system consists of two modules, one for Task Tracking and one for Administrative Tracking. The Task Tracking module will have subsections dealing with all of the task activities that go on during an outbreak, investigations, tracing animals, vaccination, cleaning and disinfection and etc. The Administrative Tracking module is designed to track information on resources, assets and finances and will be compatible with the Federal Emergency Management Agency (FEMA) system. Input into the system is based on interlinking forms accessible either via the web or by submission of paper documents and reports or notifications will be deliverable via multiple modalities (phone, fax, e-mail). The system will also contain integrated Geographic Information System (GIS) mapping capabilities to facilitate outbreak investigations. USDA
will begin transitioning current investigation reporting to this system in the near future with the first formal training on the new EMRS beginning in December, 2001 and a second training session expected in March, 2002. All Foreign Animal Disease Diagnosticians (FADDs) will receive this training as a start.

At the end of the committee meeting the USAHA Year 2001 Resolution #1 concerning support for the USDA Master Plan to upgrade and replace facilities at the National Veterinary Services Laboratory and National Animal Disease Center in Ames, IA was reviewed. The committee approved this resolution with the following change: "USAHA encourages Congress to provide mandatory and accelerated funding for the Master Plan".
REPORT OF THE COMMITTEE ON ANIMAL WELFARE

Chair: Dr. Carolyn Stull, Davis, CA
Vice Chair: Dr. Steven L. Halstead, Lansing, MI

Dr. Joan M. Arnoldi, WI; Dr. Bonnie Bargstedt, NY; Ms. Ria de Grassi, CA; Dr. W. Ron DeHaven, MD; Ms. Debra S. Duncan, KS; Ms. J. Amelita Facchiano-Donald, TX; Dr. Nancy A. Frank, MI; Mr. Daniel M. Goodyear, PA; Mr. Del E. Hensel, CO; Dr. Richard D. Hull, IL; Mr. Tom J. Hunt, MI; Dr. Arthur J. Kennel, MN; 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, III, NC; Mr. Terry R Menlove, UT; Dr. Raymond L. Morter, IN; Dr. John R. Ragan, MD; Ms. June M. Reed, PA; 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. Elizabeth S. Williams, WY; Dr. Richard W. Winters, TX.

The Committee on Animal Welfare met on Wednesday, November 7, 2001 at the Hershey Lodge in Hershey, Pennsylvania. The meeting was called to order at 7:15 by Committee Chair Stull. Fifteen Committee members and 45 guests were in attendance.

Dr. Carolyn Stull, Chair of Animal Welfare Committee opened the session with a welcome to all members and guests. She indicated that she will step-down as Chair after this year. Dr. Stull has recommended Dr. Steve Halstead, Vice Chair for the Animal Welfare Committee to serve as Chair, and Ms. Ria De Grassi, California Farm Bureau Federation to serve as Vice Chair. Dr. Stull thanked the members of the Committee for their support, suggestions, and participation in the issues addressed in the Committee during the last four years.

Ms. Cathy Liss, Animal Welfare Institute, presented an update of the legislative activities concerning animal protection for farm animals, primates, puppies and laboratory animals. Other concerns highlighted in the report were the potential expansion of hog farms in North and South Carolina with increases in hog sewage and the potential impact on public health in the surrounding communities, the stronger enforcement of the Humane Slaughter Act by Food Safety and Inspection Service (FSIS), and potential amendments to be attached to the Farm Bill on issues including protection of "downed" agricultural animals, interstate transport of "fighting" cocks, and stronger enforcement of Humane Slaughter Act at slaughter plants.

Ms. Adele Douglass, Executive Director of Farm Animal Services, presented the certification program, Free Farmed. The program was launched in September of 2000 and is an affiliate of the American Humane Association.
(AHA). The intent of the "Free Farmed" label is to assure consumers that the dairy, beef, poultry, and swine products are from animals that were treated according to welfare standards developed by AHA. The individual farms are annually inspected and comply with specific management, health, nutrition, and environment standards. The application and inspection process for producers, the role of Agriculture Marketing Services of USDA in compliance verification, and the labeling of the product was explained along with the fees and royalties associated with the program.

Mr. Bud Cribley, Wild Horse and Burro Specialist and Dr. Lisa Hatcher, Veterinarian, USDA, APHIS, VS assigned to the Bureau of Land Management’s Wild Horse and Burro Program, teamed up to present the history and current issues of the Wild Horse and Burro Program, Bureau of Land Management. Gathering of horses to regulate the number of animals on public range land to ensure the viability of range land and the adoption of these horses to public was detailed. On February 4, 1999 a working agreement with USDA, Veterinary Services (VS) was signed to allow shared resources, collaborate expertise, and improve health care of the herds. Examples of the impact of the agreement included the assistance of VS with media requests, serving as a liaison with animal advocacy organizations, administering routine medical care, handling the animals, serving as education resources at herd managers’ meetings, and overseeing the compliance of adoption and subsequent titling of horses to the owners.

Dr. Tim Cordes, Senior Staff Veterinarian, USDA, APHIS, VS, outlined the progress to date of the proposed regulations (98—074-1) on the commercial transport of horses to slaughter which has recently been signed by the Secretary of Agriculture and moved to the Office of Management and Budget. The completed educational package for shippers and handlers was presented which includes a notebook with five chapters on horse handling procedures and a video, which was shown, detailing the correct steps in transporting horses to slaughter facilities. Dr Cordes discussed the two stakeholders meetings held in 1998 for the drafting of the proposed rules, with participants from equine groups, veterinarians, researchers, animal protection organizations, slaughter horse plants, trucking industry, an state and federal veterinarians. The draft owner/shipper certificates was circulated to the members to review. The proposed rule contains a "grandfather clause" to phase out the use of two-tiered trailers over five years. Dr. Cordes suggested that it may be economically advantageous for processing facilities to purchase their own fleet to satisfy compliance with the proposed regulations following the five year phase-out period of two tiered trailers.

Dr. Ron DeHaven, Acting Associate Administrator, APHIS, USDA (formerly Deputy Administrator Animal Care), reported on the many issues facing Animal Care (AC) including the Animal Welfare Act’s settlement discussions in the definition of "animal" to include rats, mice, and birds, the Doris Day Animal Leagues’ Lawsuit to regulate retail pet stores which will drasti-
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cally increase to workload for AC, the Memorandum of Understanding signed between the Department of Transport and USDA concerning policies and procedures of animals during air transport, and the Puppy Protection Bill with inclusions for psychological well-being, socialization mechanisms, and limiting breeding frequency and the associated civil penalties. A web site (www.aphis.usda.gov/AC) has been operational since October for Freedom of Information Act requests on inspection reports from regional offices. Only reports conducted after October 1, 2001 will be available after a 21 day review period. Draft policies on maintaining and handling dangerous animals and the psychological well-being of non-human primates was also presented. 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 Operational Plan for 2001-2003 was signed by six of the nine horse industry organizations. Since the Horse Protection Act has limited funding, only 10% of the horse shows have APHIS inspectors present. The American Horse Protection Association has litigation pending that USDA has given too much enforcement authority of the Horse Protection Act to the Horse Industry Organizations in identifying and assessing penalties for "sored" horses.

Mr. Dave Zuest, Canadian Food Inspection Agency, reported on the development of policies, enforcement mechanisms and future progress in the transportation and handling of “downer” agricultural animals. A 2000-2001 survey across Canada conducted by the Canadian Food Inspection Agency documented 7,382 non-ambulatory cattle which was a low percentage of all cattle presented to slaughter plants and auction markets, but a large absolute number. In Canada, 90% of “downer” cattle are dairy cattle and only 10% are beef cattle. The condemnation rate of these cattle is 37%. There was a need for consensus in addressing this issue between federal regulations, provincial policies, veterinarians, and animal policy. Animals that are sick, injured, disabled, fatigued, or that cannot be moved without causing them additional suffering are unfit for transport in Canada. A veterinary certificate is required for all non-ambulatory animals suitable for transportation and slaughter, and the animal should be moved to the nearest abattoir, andhumanely killed or stunned on the vehicle prior to unloading. The publication of the “Recommended Code of Practice for the Care and Handling of Farm Animals, Transportation” was coordinated by Canadian Agri-Food Research Council and the Canadian Federation of Humane Societies and is a comprehensive guideline (63 pages) in transporting farm animals (http://www.carc-crac.ca/english/codes_of_practice/transport_code.htm).

Dr. Julie Morrow, Research Leader, Director of the USDA-ARS Livestock Issues Research Unit, located at Texas Tech University, Lubbock, Texas opened her talk with an overview on the physiology of stress and the many parameters which may be useful in quantifying stress. Many of the current issues that need to be addressed in today’s production practices are very
complex and possible solutions must be evaluated with other issues such as food safety, environmental impacts, sustainability, and animal health. There are few models to examine the interaction of pre-harvest food safety and stress for example, with little direct physiological evidence linking stress and pathogen shedding. Environmental enrichment for farm animals may decrease stress, but increase the contamination between animals. Shade and water misting treatments are effective on minimizing dust and heat stress in livestock pens, but may increase hide pathogen contamination which poses a food safety risk at slaughter. Currently, the Livestock Issues Unit is studying the epidemiology of Salmonella in different environments which includes indoor, confinement systems and outdoor, sustainable systems for swine. Additionally, experiments using brain cannulas in swine are ongoing to study the interaction of stressors such as isolation and handling in pigs while simultaneously applying a disease challenge.

During the annual meeting in 2000, a recommendation was passed to request USAHA to write a letter to FSIS requesting stronger enforcement of the Humane Slaughter Act. A letter was signed by Dr. Bob Hillman, President of USAHA, and mailed (July 9, 2001) to Mr. Thomas Billy, Administrator, FSIS. Dr. Alice Thayer, Director of Animal and Egg Production Food Safety Staff, FSIS, addressed the Committee on the history of the Humane Slaughter Act, with comments on handling disabled animals, inspection actions, repetitive noncompliance process and actions by the inspector, and the utilization of Dr. Temple Grandin’s humane and appropriate handling guidelines at a slaughter facility including monitoring slipping/falling incidences in the handling chute, vocalizations, use of the electric prods, and stunning efficiency. Dr. Thayer also announced new positions in FSIS, which will partially assist in the enforcement of the Humane Slaughter Act.

Dr. Steve Halstead, Vice Chair of the Animal Welfare Committee, introduced the resolution supporting the Master Plan for the consolidation and modernization of Department of Agriculture facilities. The resolution was unanimously approved by the Committee (Motion by G. Teagarden, seconded by R. Hull).

Dr. Steve Halstead, Vice Chair of Animal Welfare Committee, presented the revised draft model law for the protection of non-ambulatory livestock at markets or in market channels. The proposed 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 draft was forwarded to the USAHA’s Executive Committee on July 9, 2001 with a cover letter signed by Dr. Bob Hillman, President, USAHA for their review and comments. Dr. Halstead collected the comments and the Task Force (B. Bargstedt, R. de Grassi, C. Liss, and G. Teagarden) revised the draft and presented it to the Committee. There was much discussion on specific wording, need for legal review, and the lack of circulation of the revised draft to major stakeholders. However, since this is
a “model law” for states to adopt, it was discussed that some changes in language and definitions would be necessary by each state, and there is a sense of urgency in the protection of nonambulatory animals; thus, a recommendation was unanimously approved by the Committee (Motion by G. Teagarden, seconded by C. Massengill) to include the Proposed USAHA Model Law for the Protection of Nonambulatory Livestock at Markets or in Market Channels in the Committee Report with discussion comments reported for user consideration. These comments include:

“Accepted published euthanasia guides” may be more specified with the additional wording of “AVMA or allied groups published guidelines.”

“Captive cervidae” may be changed to “farm raised cervidae.”

The following sentence, “This does not apply to direct shipments from farm to slaughter facilities” should be considered to follow the paragraph defining “Livestock market channels.”

The word “prompt” should be considered for a more specific definition.

PROPOSED USAHA MODEL LAW FOR THE PROTECTION OF NONAMBULATORY LIVESTOCK AT MARKETS OR IN MARKET CHANNELS

I. Definitions

* Euthanasia - means a mechanical, chemical or electrical method of killing by which an animal is rapidly and completely rendered insensitive to pain prior to any successive action. Such euthanasia shall be consistent with accepted published euthanasia guidelines.

* Direct transportation - means transfer of animals to a destination without unloading the animal en route and without exposure to other animals or bodily excrements or fluids from other animals.

* Livestock - means those species of animals used for human food and fiber or those species of animals used for service to humans. Livestock includes, but is not limited to, cattle, sheep, new world camelids, goats, bison, captive cervidae, ratites, swine, equine, poultry, and rabbits.

* Livestock market channels - means all stockyards, livestock auction markets, conveyances, collection points, dealers and facilities involved in transportation and marketing of livestock.

* Livestock market agents - means persons responsible for livestock market channel facilities and conveyances.

* Nonambulatory - means unable to stand or walk without assistance.

* Person - means an individual, partnership, corporation, cooperative, association, joint venture, or other legal entity, including, but not limited to, contractual relationships.

* Prompt - includes taking clear and documentable steps from
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the point of recognition of a nonambulatory animal.

II. Effective (date):

1. A person shall not cause nonambulatory livestock to enter livestock market channels.
   B. Livestock market agents shall not knowingly accept, receive, hold, buy, sell, transfer, or give away nonambulatory livestock.
   C. Should livestock become nonambulatory or become recognized as nonambulatory while at a market or in market channels, such livestock shall not be dragged, pulled, pushed, rolled or otherwise moved except as passive passengers on or in slings, mats, floats, carts, pallets, containers or as directly necessary to facilitate the use of such devices. When moved by such devices the motive force shall be attached to the device, not the livestock.
   D. Livestock that become nonambulatory at markets or in market channels shall receive prompt physical separation and protection from other livestock and be managed by one of the following methods:
      1. Prompt euthanasia with disposal of the remains as allowed by local and/or state law.
      2. Examination by a licensed veterinarian followed by prompt medical care by or under the supervision of a licensed veterinarian.
      3. Slaughter on the premises consistent with local law.
      4. Upon the approval of a licensed veterinarian, direct transportation with physical separation and protection from other livestock to the nearest state or federally inspected slaughter facility for immediate slaughter. Such transportation shall not be considered entry into livestock market channels and is permissible of livestock market agents.
      5. All expenses incurred for veterinary examination, treatment, and euthanasia of livestock, and expenses for disposal of livestock, are the responsibility of the person owning the livestock. Collection of expenses is not the responsibility of livestock market.

   III. Violations: penalties
   As appropriate under state or local law for intentional animal cruelty.

IV. The responsible authority may develop regulations to aid in implementation and enforcement.

Note: States should compare to existing laws for consistency.
There being no further business to bring before the Committee, adjournment took place at 12:25 PM.
REPORT OF THE JOINT USAHA/AAVLD COMMITTEE ON AQUACULTURE

Chairman: Dr. Scott E. LaPatra, Buhl, ID
Dr. Randy M. White, West Lafayette, IN

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, VA; 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. Robert M. Harbison, AR; 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, VA; Dr. Andrea M. Morgan, MD; 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, DE; Dr. Harvey L. Rubin, FL; Dr. John P. Sanders, WV; Dr. Roy A. Schultz, IA; Dr. Sang J. Shin, NY; Dr. Lewis P. Thomas, WV; Dr. Peter H. Timm, CA; Dr. Michael S. VanderKlok, MI.

MEETING MINUTES OF THE JOINT AAVLD/USAHA AQUACULTURE COMMITTEE MEETING
Held at Hershey Lodge and Convention Center, Room Monarch K, November 4, 2001, 1:00 pm to 5:00 pm.

Dr. White opened the meeting with an approval of the meeting agenda and introductions of all attendees. An attendance sheet was circulated to all attendees.

The first business item was for Dr. White to discuss the acceptance and endorsement of the VS Aquaculture Strategic Plan by this committee. The discussion of this document took place via email this past year. Dr. Otis Miller asked this committee to review this document and endorse or reject this plan. This committee did approve this plan by email discussion with 19 members voting; 14 voted positive and 5 abstained.

The next business item was the resolution that was approved by this committee last year which was entitled, Significance of Aquatic Animal Pathogens in Aquaculture Effluents. This resolution was initially brought forward at the committee meeting in 2000 by Dr. Scott LaPatra. Dr. White carried this resolution forward to executive committee of AAVLD. Dr. LaPatra briefed the committee about this resolution and Dr. White informed the committee of the response by the AAVLD executive committee which chose not to endorse this resolution. This resolution will also be sent to the USAHA executive committee by Dr. LaPatra.

The next business item included an update of new and emerging disease in aquaculture from the different regions. Dr. White discussed the presence of Large Mouth Bass Virus in northeastern Indiana. Dr. LaPatra
discussed issues on the west coast such as Koi herpesvirus, biologics and vaccine production. Dr. Syska mentioned that they had also reported LMBV in Missouri. Dr. Don Hoenig reported on Infectious Salmonid Anemia in Atlantic salmon in Maine.

The next business item was a presentation by Dr. Otis Miller about national aquaculture issues including: National Animal Health Certification/Inspection Program; National Aquatic Animal Health Certification and Inspection Program; Infectious Salmon Anemia as a Foreign Animal Disease and the Joint Subcommittee on Aquaculture Task Force. Following Dr. Miller’s presentation, he answered pertinent questions and there was a short discussion on some issues.

The next business items included passage of the following resolutions:
1. USDAARS/APHIS master plan.
2. Development of a National Aquatic Animal Health Management Plan
3. Control Strategies for Infectious Salmon Anemia in the Northeastern United States

The last business item discussed was an update of the collaborative approach by the American Fisheries Society, Fish Health Section and the United States Fish and Wildlife Services for a procedural manual for aquatic animal pathogens. Dr. LaPatra assured the committee that a draft of this document would be available for all appropriate stakeholders in the immediate future.

Meeting was adjourned at 4:05 pm with approximately 24 attendees.
See attached resolutions.
The Committee on Biologics and Biotechnology met during the annual meeting on Sunday, November 4, 2001, from 12:30 – 5:30 P.M.. Seventeen members and 12 guests were present. The Chairman welcomed the participants to Hershey 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 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).

Dr. Richard Hill, Director, CVB-Licensing and Policy Development (LPD), indicated that LPD activities in Fiscal Year 2001 resulted in 2 new establishment licenses and termination of 1 establishment license leaving 98 licensees and 13 permittees that are authorized to distribute products in or from the United States under the provisions of the Virus-Serum-Toxin Act. One hundred thirteen new product licenses were also issued including 26 unique
new products. One hundred three product licenses were terminated resulting in 2,481 active licenses as of October 1, 2001. The number of research and evaluation permits continued to increase with 235 permits issued in addition to 11 transit shipment permits.

The Center continued to adjust to the transition of the LPD staff from Riverdale, Maryland, to Ames, Iowa, primarily due to multiple vacancies that exist within the Center. As of October 1, 2001, 3 positions remain in Riverdale on the LPD Operational Support Staff (with 1 vacancy) and 3 LPD 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. A (long-awaited) Proposed Rule on changes to labeling regulations is expected to be available early in 2002. The status of recently Proposed Rules, and upcoming Proposed Rules and guidance documents, was reviewed. Progress made by the CVB on international harmonization initiatives in Fiscal Year 2001.

The CVB announced the dates for the eleventh Veterinary Biologics Public Meeting (April 2-4, 2001). The focus of the meeting will be emerging animal health issues. Agenda suggestions for the meeting were requested.

Dr. Randall Levings, Director, Center for Veterinary Biologics – Laboratory (CVB-L) reported that CVB-L currently has 8 vacancies, including supervisory, veterinarian, microbiologist, plant biologics, and technician positions.

CVB-L’s top priority is pre-license testing (master seed/cell and serial), consistent with overall CVB priorities. Overall product testing rates were similar to previous years (~10% of serials tested post-license), although focused more in campaign testing to develop risk-based testing strategies. New reagents, software, and funding mechanisms to reduce the use of animals in testing have been made available or are in development.

The Quality Assurance Improvement initiative has made considerable progress in management and technical areas, is using commercial electronic tools for document control and equipment monitoring, and has been refocused in Veterinary Services - Ames for more efficient use of resources.

The 2002 Agriculture Appropriations bill has passed the House and Senate, but has not gone through conference committee or been signed by the President. Each version has increases (4 and 8%, respectively) over the 2001 budget for CVB. Security of personnel, information, agents, and animals were being increased before the September 11 tragedy and recent anthrax incidents, but has been further heightened due to these events. Perimeter, entrance, and intra-facility measures have been taken. The House and Senate versions of the 2002 Agriculture Bill include $40 million for planning the APHIS-ARS Master Plan for Facility Modernization and Consolidation, which is consistent with the 6-year rapid construction approach favored by stakeholders. The USAHA supported the plan in a 2000 resolution and a 2001 resolution is under discussion at this meeting.
Mr. Steven Karli, Director, Center for Veterinary Biologics-Inspection and Compliance (CVB-IC) reported that CVB-IC activities in fiscal year 2001 have resulted in continued compliance with the regulations and standards promulgated under the authorities in the Virus-Serum-Toxin Act (VSTA). CVB-IC monitors 117 active licensees and permittees located at 180 sites. This last year CVB conducted 44 in-depth inspections, 2 follow-up inspections, and 40 special inspections. Of special note was the increase in special inspections and the decrease in in-depth inspection.

While many of the special inspections were at the request of the CVB Licensing and Policy Development unit as a part of the pre-licensing stage for new products and facilities, this year resulted in several special inspections conducted as part of investigations into violations of the VSTA. Most significantly were 8 special inspections conducted to stop the movement of illegally imported vaccines from Europe for the racing pigeon industry in the United States.

This last fiscal year CVB reviewed and processed 17,785 serials; 17,185 of these were released to the market place. In addition CVB reviewed and processed 299 firm requests related to marketing veterinary biologics, 118 facility documents, and facilitated export of US products abroad by issuing 3,198 export documents.

CVB-IC has taken 59 regulatory actions in the last year and initiated 28 investigations. This increase in regulatory actions stems, in part, to an increase in violations of the VSTA from Internet advertising of unlicensed veterinary biologics. Users of veterinary biologics will soon be able to view letters of regulatory actions taken by CVB on the web site at www.aphis.usda.gov/vs/cvb/index.htm. In addition, efforts continue toward development of electronic forms and processes related to the Government Paperwork Elimination Act. The APHIS Forms 2020, 2008 and 2008A have been targeted for implementation in a web-enabled form by October 2003.

Committee Issues For Discussion With CVB: Vice chairman, Robert Tully reviewed CVB’s response to the committee’s recommendation from last years meeting concerning serial release procedures. He indicated that CVB had been working with the industry to facilitate product release and firms have increased their use of rapid delivery services to speed up the release process. In spite of these efforts, release is not as fast as it was when CVB gave facsimile notification of serial releases. This delay in distribution of products results in a significant economic impact to the industry.

Mr. Karli indicated that CVB was developing electronic procedures for the submission of licensing and release documents, and had hoped to complete this project prior to 2003 as is required under the Government Paperwork Elimination Act, however, CVB cannot publish its guidelines and procedures for such electronic submissions until APHIS publishes agency guidelines. Further discussion of this issue was tabled until the business session to determine if a resolution may be indicated to address this situation.
Biotechnology Products Update: Louise M. Henderson, Ph.D., Chief, Biotechnology and Diagnostics, CVB-LPD, reported that in the past year, biotechnology has been very busy working with new products and new categories of products. CVB has made significant progress in updating its documentation and in developing guidance documents for these products, and has also been successful in developing regulatory cooperation with other federal regulators. While many new products have not reached full licensure at this time, they are seeing increases in Category III, live vectored products, which have increased complexity of review and testing.

The FDA-USDA Working Group was established and has made significant progress on developing Guidelines for Plant-Based Human and Veterinary Biologics and Pharmaceuticals. These guidelines will provide standardized regulatory requirements for all products, facilitating licensure for products regardless of jurisdiction. The Office of General Counsel is currently reviewing the document, which will then be available and will provide the basis for development of regulations for veterinary biologics. April 12-13, 2001, CVB hosted the Biologics for Cancer Diagnosis, Prevention and Immunotherapy meeting. FDA, IICAB, and USDA co-sponsored the meeting. This meeting provided a strong basis for the development of regulatory considerations and also assisted in developing strong working relationships with FDA, oncologists, and researchers developing cancer products. The new SIF is nearing completion as is an example document that will help firms understand the intended use of the format. We expect to provide the new formats at the next APHIS Public Meeting in 2002 along with an update of the Risk Assessment Guidance document. Finally, this past year CVB was successful in cooperating with CVM to determine regulatory jurisdiction for a number of products.

CVB's progress in working with other regulatory officials, scientists, and manufacturers to develop and implement appropriate science-based regulations has been significant in 2001. They believe they are making significant progress toward facilitating the application of new scientific understandings to providing practitioners and animal owners with high quality new products that contribute to improved animal health.

Biotechnology Testing: Dr. Pat Foley, Mammalian Virology Section, CVB-L, reported that U.S. biotechnology products are currently grouped into 3 categories. The first category consists of three subgroups. These categories and subgroups are: I-A, bacterins and killed virus (gene deleted, subunit) vaccines; I-B-1, therapeutic or prophylactic products; I-B-2, diagnostic kit products; II, live gene deleted vaccines; and III, live vectored vaccines. New biotechnology candidates for licensure include DNA and plant-derived vaccines. The Center for Veterinary Biologics-Laboratory (CVB-L) is responsible for testing U.S. veterinary biological products for the diagnosis, prevention, and treatment of animal diseases. Such testing ensures that products are pure, safe, potent, and efficacious. For genetically modified organisms
(GMO's), it is critical that they be adequately evaluated at the master seed and pre-license level, prior to licensure. Pre-license requirements for biotechnology products include testing of the Master Seed and Master Cell, as with conventional products. However, the tests required to demonstrate purity, safety, identity, and stability of the Master Seed may involve more extensive genotypic and phenotypic characterization. The CVB-L testing policy and methodology regarding biotechnology products were discussed.

**Mannheimia and Pasteurella Vaccination with Metaphylaxis for Calf Health:** Dr. Raymond Loan presented a paper written by: Raymond W. Loan, DVM, PhD, Department of Veterinary Pathobiology, Texas A&M University, College Station, TX 77843; Charles W. Purdy, DVM, PhD, Conservation and Production Research Laboratory, USDA, ARS, P. O. Drawer 10, Bushland, TX 79012; Robert E. Briggs, DVM, PhD, National Animal Disease Center, USDA, ARS, P. O. Box 70, Ames, IA 50010.

The prevention of bovine respiratory disease complex (BRDC) by simultaneous *Mannheimia haemolytica/Pasteurella multocida* vaccination and metaphylaxis (dual prophylaxis) at the first point of stocker-feeder calf assembly was evaluated. Experiment 1 was a comparison of no treatment, tilmicosin phosphate metaphylaxis alone, *Mannheimia haemolytica* biotype A, serotype 1 (MhA1) vaccination alone, and dual prophylaxis. Experiment 2 was a comparison of metaphylaxis alone versus dual prophylaxis. The study involved high-risk, assembled calves of 410 lbs. average weight (Experiment 1) and 414 lbs. (Experiment 2).

In Experiment 1, dual prophylaxis compared to no treatment resulted in a decrease in dead calves (0% vs. 22%) and total calves with BRDC (72% vs. 95%) during the receiving period (p<0.05). Compared to untreated control calves there was also a reduction in calves experiencing two or more episodes of BRDC or death (38% vs. 81%) during the same period (p<0.01). Metaphylaxis alone also reduced the number of calves (50% vs. 81%) experiencing this severe form of BRDC (p<0.05).

In Experiment 2, dual prophylaxis compared to metaphylaxis alone resulted in more calves with no clinical illness (56% vs. 33%) during the feedyard receiving period (p<0.05). Also, with dual prophylaxis fewer calves (22% vs. 47%) experienced two or more clinical episodes or died of BRDC (p<0.01). It is suggested that dual prophylaxis at first point of assembly of calves is a valuable management option for keeping high risk stocker-feeder calves healthy throughout their transition from ranch to feedyard.

**Lack of Adequate Protection by current Fowlpox Vaccines: Outbreaks by Genetically Modified Field Strains of Fowlpox Virus:** Deoki N. Tripathy, D.V.M., M.S., Ph.D., Diplomate A.C.V.M., A.C.P.V., Professor, Department of Veterinary Pathobiology University of Illinois, Urbana, Illinois 61802 presented this paper by: Deoki N. Tripathy, P. Singh and W. M. Schnitzlein, College of Veterinary Medicine, University of Illinois, Urbana, Illinois 61802.
REPORT OF THE COMMITTEE

In recent years several outbreaks of fowlpox have occurred in previously vaccinated chicken flocks in all regions of U.S. causing significant mortality and economic losses. Antigenic, genetic and biological evaluations reveal differences among field and vaccine strains of fowlpox virus. Interestingly, the vaccine strains of fowlpox virus contain only remnants of long terminal repeats (LTR) of reticuloendotheliosis virus (REV) while field strains of fowlpox virus contain REV provirus. This “natural genetic engineering” by field strains appears to modify the pathogenesis of the disease, suggesting need for development of a new generation of fowlpox virus vaccines.

Committee Discussions and Resolutions: The Chairman, David A. Espeseth reviewed USAHA resolution number 1 concerning the USDA, ARS/APHIS Master Plan. Following a short discussion and clarification on the content and intent of the resolution, a motion was made and seconded that the Biologics and Biotechnology Committee endorse this resolution. The motion was passed by unanimous vote of the members present.

The issue concerning delays in CVB release of products was reopened for discussion. The committee noted that CVB efforts to implement electronic submission procedures for veterinary biologics program documents should be implemented as soon as possible to facilitating the release of production serials. They also noted the lack of agency guidelines is a barrier to completion of this project and other actions that are necessary for the program to maintain compliance with the Government paperwork Elimination Act.

A motion was made and seconded that the committee support the following resolution to be sent to the APHIS Administrator: “The United States Animal Health Association urges APHIS to immediately develop and publish agency guidelines providing for electronic signatures, confidentiality, integrity, and availability of electronic submissions so that CVB can develop it’s guidelines and procedures for the electronic submission of veterinary biologics program documents in a timely manner in accordance with the requirements of the Government Paperwork Elimination Act.”

This resolution was passed by unanimous vote of the committee members present and the meeting was adjourned.
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. Groocock, NY; 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. 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; Dr. Andres de la Concha, TX.

The Bluetongue and Bovine Retrovirus Committee met in the Monarch G Room, Hershey Lodge and Convention Center, Hershey, PA, from 12:30 PM to 4:00 PM, Monday, November 5, 2001. There were 25 in attendance. Chairman James Mecham conducted the meeting.

Dr. Eileen Ostlund, National Veterinary Services Laboratories, Ames, IA, 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 2000 submissions**

In calendar year 2000, diagnostic submissions for BTV or EHDV isolation included 45 cattle, 15 sheep, 11 deer, 3 bighorn sheep, 1 camel, 1 alpaca, 8 goat, 1 llama, 2 pronghorn antelope, 1 antelope, 1 elk, and 2 bongos. Isolation studies for export or import cases included 178 submissions of bovine blood samples, 4 bovine semen, 8 goat blood samples, and 2 sheep blood samples for BTV, EHDV, or BTV and EHDV isolation. The viruses isolated are listed in Tables 1 and 2. Fifteen vaccines submitted were tested for the presence of BTV. There were 152 submissions of imported fetal bovine serum for BTV safety testing by sheep inoculation requiring 269 sheep. No bluetongue seroconversions were observed from safety testing of fetal bovine serum.

Diagnostic/surveillance samples submitted for BTV PCR testing included 56 cattle, 35 bighorn sheep, 9 deer, 2 sheep, 3 water buffalo, and 1 llama. Export/import testing by BTV PCR was done on 7 cattle and 1 antelope.
Diagnostic or surveillance samples submitted for EHDV PCR testing included 90 cattle, 12 deer, 3 water buffalo, and 1 antelope. Export/import testing by EHDV PCR was done on 8 cattle.

Calendar year 2001 BTV/EHDV positive submissions to date (January 1 - October 23, 2001)

During the period of January 1 to October 23, 2001 there have been 4 positive identifications of BTV by isolation or PCR. BTV-17 was isolated from a California bighorn sheep and BTV-13 was isolated from a Missouri elk. One Missouri deer and one Arizona deer were positive for BTV and EHDV by PCR. Virus was not isolated from either sample. Additionally, two other Missouri deer, three Iowa deer, and one South Dakota deer were positive for EHDV by PCR. Epizootic hemorrhagic disease virus was isolated from one of the Iowa deer but serotyping of the isolate has not been completed.

Table 1.
BTV isolation/PCR positives calendar year 2000

<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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<tr>
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<td></td>
<td>X</td>
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</tr>
<tr>
<td>OR</td>
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<td>sheep</td>
<td>17</td>
<td>X</td>
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<td></td>
</tr>
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</table>

*This bull may have actually been located in GA. Submitter was from GA owner from MT.
Table 2.
EHDV isolation/PCR positives calendar year 2000

<table>
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<th>State</th>
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<th>PCR only</th>
<th>VI/PCR</th>
</tr>
</thead>
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<tr>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

2001 Bluetongue Proficiency Exam
Fifty nine laboratories participated in the 2001 bluetongue proficiency test. The panel consisted of 20 serum samples. The passing score was one or fewer samples missed. Fifty eight laboratories passed on the first attempt. One laboratory failed the first attempt but passed a retest. One laboratory withdrew bluetongue approved status. Fifty eight laboratories are approved to conduct official (export) bluetongue serology tests as of October 26, 2001.

2001 Bovine Leukosis Virus (BLV) Proficiency Exam
Sixty two laboratories participated in the 2001 BLV proficiency test. The panel consisted of 20 serum samples and the passing score was two or fewer samples missed. Fifty nine laboratories passed on the first attempt. Three laboratories failed the first attempt but passed a retest. As of October 26, 2001, there are 62 laboratories approved to conduct official (export) BLV serology tests.

Bluetongue Survey-2000
The 2000 bluetongue survey on market cattle samples from 16 north-eastern and north central states plus Oregon and South Dakota was conducted during the late fall and early winter of 2000. A total of 7000 samples from slaughter cattle were examined. Bluetongue antibodies were detected by the competitive ELISA (cELISA) test using a commercial kit. States assessed individually were Indiana, Michigan, Minnesota, New York, North Dakota, Oregon, South Dakota, and Wisconsin. Areas consisting of more than one state were New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) and combinations of Maryland/Delaware, Ohio/West Virginia, and Pennsylvania/New Jersey.
REPORT OF THE COMMITTEE

Insufficient numbers of slaughter samples were collected from the Maryland/Delaware region for inclusion in the survey results. Oregon and South Dakota were included in the 2000 survey at the request of the states. Testing costs for these two states were covered by state funds. There were 98 of 595 (16.5\%) bluetongue cELISA positive samples from Oregon and 36 of 587 (6.1\%) bluetongue cELISA positive samples from South Dakota.

From the remaining 16 north central and northeastern states (9 geographic areas), there were 65 out of 5,818 (1.1\%) cELISA positive slaughter samples. When the states were combined to form 9 geographic areas, the percentage of positives ranged from 0.3 in New York and New England to 3.6 in Ohio/West Virginia. One of 9 geographic areas exceeded 2.0 percent cELISA positive samples.

Bluetongue Sentinel Survey

In the spring of 2001, approximately 7000 bovine serum samples were tested for antibodies to BTV by cELISA. The samples originated from cattle in Nebraska, North Dakota and South Dakota. Results of testing were provided to the United States Department of Agriculture, Centers for Epidemiology and Animal Health for analysis. A second set of samples from the sentinel survey animals is currently being collected.

Dr. David Dargatz, Center for Animal Health Monitoring, Centers for Epidemiology and Animal Health, USDA-APHIS, Fort Collins, CO, gave an update on a bluetongue surveillance pilot project in three states. This is a joint project between the Centers for Epidemiology and Animal Health, National Veterinary Services Laboratories and the Arthropod-borne Animal Diseases Research Laboratory.

Since BTV infections are classified as a list A disease by the OIE, they can have profound impacts on trade. The USDA:APHIS:VS has been engaged in a pilot project to evaluate methods for BTV infection surveillance. Three states (North Dakota, South Dakota, and Nebraska) were selected to participate in the pilot study because they were thought to straddle a transitional zone from areas considered to be free or at very low risk of infection to areas with seasonal cases of BTV infection. A target of 150 participating operations geographically distributed throughout the states was set for inclusion in the study. Herds were screened by telephone contact to see if they met the inclusion criteria (cattle operation, at least 80\% home raised replacements, at least 95\% individual identification, and a willingness to cooperate with the study). A total of 144 herds were identified that met the inclusion criteria and where up to 65 animals per herd (average of 45 per herd) could be bled prior to the vector season for 2001. All the samples were tested for antibodies to BTV using a cELISA. For herds with a single cELISA positive, that sample was tested using the virus neutralization test against serotypes 2, 10, 11, 13, and 17. In July and August light traps were set up on 73 of the operations. Culicoides from these light trapping activities are being speciated. In addition, mud samples were collected from likely Culicoides
BLUETONGUE AND BOVINE RETROVIRUS

breeding sites on 46 operations. Larvae from these mud samples are being reared and will be speciated upon maturation. All farms are being revisited between November 1, 2001 and February 2002 to rebleed all the animals. Again all blood samples will be evaluated by the cELISA for BTV antibodies. During the summer and fall of 2001 a questionnaire was administered on each operation to collect data on potential risk factors for vector presence and BTV activity. The analysis of the data will include 1) descriptive analysis of seroprevalence data, 2) risk factors for seropositive cattle, 3) spatial distribution analysis of seroprevalence, and 4) spatial distribution analysis of Culicoides.

The serum samples from the pilot project are also being assayed for antibodies to Anaplasma using a cELISA. Seroprevalence data will be described for various geographic regions in the three states.

<table>
<thead>
<tr>
<th>State</th>
<th>Ops</th>
<th>Blood Samples</th>
<th>Mud Sampling</th>
<th>Vector Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nebraska</td>
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<td>2009</td>
<td>11</td>
<td>19</td>
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<td>North Dakota</td>
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<td>South Dakota</td>
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<tr>
<td>ALL</td>
<td>144</td>
<td>7320</td>
<td>46</td>
<td>73</td>
</tr>
</tbody>
</table>

Dr. Sarah Kahn, Deputy Chief Veterinary Officer and Director, Animal Health and Production Division, Canadian Food Inspection Agency (CFIA), Ottawa, Canada, gave a situation update and CFIA policy on bluetongue in Canada.

Bluetongue is a List A disease that is reportable under the Health of Animals Act. It has only occurred in the Okanagan valley of Canada, which has experienced 4 incursions of BTV in the last 25 years. The Okanagan has been defined as a zone, based on OIE standards.

The continued absence of bluetongue from Canada is confirmed by national serological surveys of the bovine population approximately every 3 years. Surveys indicate that Canada’s cattle population remains free of bluetongue below a prevalence level of 0.02% with confidence of 95%. Since 1987, the bluetongue situation has been monitored through ongoing serological testing of sentinel cattle in the southern range of Okanagan Valley, at sites of highest historical seroprevalence. The sentinel animals are distributed at 6 sites, 7 animals per site. Pre-selected animals are tested at approximately 3 week intervals from June until mid October. Serological surveys of cattle have been conducted since 1978. The 1998-1999 serosurvey screened 17,170 bovine sera of which 2 were positive for antibodies to BTV by cELISA. Serum neutralization testing confirmed only 1 positive sample,
REPORT OF THE COMMITTEE

with titers of 1:20 to BTV-11 and 1:10 to BTV-2, BTV-10 and BTV-17. This sample was from a herd in the Okanagan Valley.

Evidence of bluetongue in Canada has been recorded 4 times in 25 years, and only in the Okanagan Valley. In 1976, 221/534 native Canadian cattle in contact with seropositive animals imported from the US into the Okanagan valley tested positive for antibodies to BTV. In October 1987, clinical cases of bluetongue (serotype 11) were reported in cattle and sheep. In 1988, sentinel cattle sero-converted in the Okanagan Valley. In the 1998 survey, BTV was confirmed in a bovine from the Okanagan Valley.

Natural transmission of BTV in North America is believed to be limited to *Culicoides sonorensis*. *C. sonorensis* has a distribution and season in the southern parts of British Columbia and Alberta, between April and October. There is no evidence that BTV transmission has occurred outside the Okanagan Valley. The mild microclimate of the Okanagan is believed to support a potentially longer vector season, estimated at 15 April to 1 November. Overwintering of BTV in adult vectors during the winter of 1987-88 was considered unlikely. The source of BTV in all cases is thought to be windborne incursions of infected vectors from the USA. Canadian populations of *C. sonorensis* may be genetically capable of being infected with BTV, but experimental work has not been done to demonstrate this. However, there may be ecological, environmental and climatic factors that prevent the phenotypic expression of susceptibility. Limited survey work has been done in Saskatchewan and Manitoba. If present, *C. sonorensis* is believed to be limited to the southern parts of these provinces.

Traditionally, CFIA has required permanent identification and keeping of movement records for bluetongue-susceptible animals from the Okanagan Valley. The introduction, in 2001, of the national Canadian identification for cattle and bison has overtaken the previous policy-but identification of sheep and goats (and deer) originating from the Okanagan valley will still be required. The bluetongue status of the Okanagan valley (surveillance zone) is determined annually via a sentinel herd monitoring program during the vector season. Bluetongue is treated as a foreign animal disease. When incursions of BTV have been detected through sentinel testing or disease, movement restrictions have been applied - but only for the remainder of the vector season. Serological reactions in susceptible animals trigger an investigation to determine the origin of the reactor animals. Animals originating from the Okanagan or the USA do not affect Canada's bluetongue-free status. If reactors originated elsewhere in Canada, an epidemiological investigation would be conducted to determine evidence of transmission.

In Sept 2000, the Canadian Cattlemen's Association asked CFIA to extend the current import season for restricted feeder cattle (i.e. to allow importation from 1 Apr- 30 Sept). CFIA has conducted a risk assessment that concludes: "with the importation of 100,000 feeder cattle from selected states...1.4 bluetongue outbreaks per year are expected in cattle herds other
than the recipient feedlot. The report is out for public comment until December 2001. Research is proposed to evaluate the situation with vectors in Canada and with the seroprevalence of bluetongue in imported cattle from Montana.

Mr. Geoff Ryan, Animal Biosecurity, AFFA, Australia, gave a brief overview of bluetongue in Australia. Information gathered by the National Arbovirus Monitoring Program and Northern Cattle Export Enhancement Program has been used to compile a 2 year bluetongue map for Australia. The boundaries to the zone of possible transmission, the surveillance zone and the bluetongue virus free zone are in accordance with the requirements of the OIE International Animal Health Code Chapter on Bluetongue. Bluetongue issues affecting trade include export of cattle from points within the zone of possible transmission and the accepted length of time necessary that cattle from the zone of possible transmission need to spend in the free zone before they pose no risk as a source of virus to competent vectors. Australia maintains that there is no valid scientific evidence indicating that this should be more than 60 days. The 2 year bluetongue map will include a pocket of infection in the Pilbara region of Western Australia. This pocket is south of the main zone of possible transmission as shown in the old "10 year map". Animal Biosecurity is supporting research looking at vector activity under shelter and the efficacy of repellents against Culicoides.

Bovine semen imports from Italy have been interrupted following bluetongue outbreaks. Information on bluetongue monitoring and surveillance has been exchanged with the Italian authorities. It is hoped that these discussions and discussions with other bluetongue affected EU member states will continue next year and lead to a greater understanding of the bluetongue problem and management.

Dr. James Mecham, USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, WY, gave a presentation on the application of baculovirus expressed antigens in enzyme-linked immunosorbent assays for detection of antibody to bluetongue and epizootic hemorrhagic disease viruses.

Bluetongue virus and EHDV show antigenic cross-reactivity that can result in misdiagnoses. Competitive ELISA tests have been developed for the detection of antibody to both these viruses in the serum of infected animals. These tests demonstrate increased sensitivity and specificity over many older conventional diagnostic tests. However, the preparation of cell culture derived viral antigen, for use in these tests, is laborious and variable from batch to batch and laboratory to laboratory. To overcome these problems, genes coding for BTV and EHDV proteins were cloned into baculovirus. Insect Sf9 cells infected with the recombinant viruses expressed either the BTV protein or the EHDV protein. These expressed viral antigens were incorporated into cELISA tests for detection of antibody to either BTV or EHDV.
in cattle. They demonstrated comparable or superior performance to viral antigen produced from infected cell cultures. Baculovirus expressed proteins provide a reliable source of easily standardized reagents for incorporation into BTV and EHDV diagnostics.

Dr. David Stallknecht, Southeastern Cooperative Wildlife Disease Study (SCWDS), University of Georgia, Athens, GA, made a presentation from the graduate work of Dr. Joe Gaydos entitled “Evaluations of white-tailed deer (WTD) host resistance factors to epizootic hemorrhagic disease viruses” and gave an update on hemorrhagic disease activity for 2001.

Experimental studies were conducted to determine the potential role of three host related factors in the epidemiology of EHDV in WTD. These included acquired immunity and cross protection between EHDV-1 and EHDV-2, passive immunity via maternal antibody transfer, and innate resistance within WTD subspecies. Results indicated that previous exposure to EHDV-2 significantly reduced clinical response observed in a subsequent EHDV-1 challenge. Maternal antibodies to both the EHDV and BTV persist in fawns for a period of time coinciding with the transmission season for these viruses. Clinical disease scores from white-tailed deer from Texas, where these viruses are endemic, (challenged with both EHDV-1 and EHDV-2) were significantly lower than those observed from deer where these viruses do not normally occur (PA). These results indicate that host related factors including acquired, passive, and innate immunity represent important components in explaining the clinical variation observed with hemorrhagic disease in WTD throughout their range in the United States and supports the idea of enzootic stability in areas of the West and Southeast where BTV and EHDV transmission may occur annually.

During 2001, seven EHDV isolates were made from deer samples submitted to SCWDS. These included an EHDV-2 isolate from a captive Texas WTD, four EHDV-2 isolates from captive and free-ranging WTD in Kansas, one EHDV-2 isolate from a free-ranging WTD in Missouri, and an EHDV-1 isolate from a free-ranging mule deer in Idaho.

Dr. Geoffrey Letchworth, Research Leader, USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, WY, talked about novel approaches for the control of bluetongue. Current BTV vaccines exemplify the epitome of modern molecular biology. However, the practical use of vaccines for protection against BTV is hampered by the large number of serotypes and the short life span and low value of individual animals. Recent discoveries in many fields have opened exciting novel approaches to bluetongue control. The ABADRL is beginning to explore many new approaches. The unifying theme is to develop control strategies that will be independent of viral serotype making them universally applicable to every BTV serotype and every country. Improved sequencing strategies will allow the completion of the sequences for all BTV serotypes and numerous isolates. This information will provide reliable epidemiologic
markers and be an invaluable resource in configuring additional diagnostic reagents and for understanding the spread of BTV in nature.

Defining proteins in Culicoides insects that may potentiate BTV infection may lead to vaccines and strategies that block infection of the vector or disrupt virus transmission. The use of molecular techniques will help identify and characterize insect gene products that are expressed and function in facilitating viral entry or replication in the vector. This will help us understand the genetic basis for vector competence and physiological functions that foster vector survival and aid us in developing novel, bio-rational control strategies. The hemagglutinin epitope is critical for the successful transmission of BTV. Extending our current knowledge of the molecular nature and function of this protein may help us develop a single strategy for controlling the transmission of multiple serotypes of BTV. Characterization of the types and levels of salinity in aquatic habitats that support populations of larval C. sonorensis, as a basis for predicting the presence and vector competence of populations, may lead to simple environmental modifications that can be implemented on the farm to control BTV spread.

Defining the molecular pathogenesis of BTV and EHDV in ruminant endothelial cells is central to understanding the pathogenesis in the whole animal. Endothelial cell lines developed in Dr. MacLachlan's laboratory at the University of California, Davis will be used to examine the consequences of infection in these cells with BTV and EHDV. This may lead to novel approaches to reducing viremia and therefore transmission to the insect vector.

Viruses replicate in an intracellular environment where their internal and non structural proteins are never exposed to antibodies. These proteins must have critical sites vulnerable to attack by antibodies. The objectives are to see if intracellular antibodies can be produced that protect against BTV infection in cells and in a laboratory animal model. This could eventually lead to transgenic livestock resistant to BTV infection.

A poster entitled “Rapid detection of arbovirus RNA using fluorescent amplification assays” was displayed. This poster presented information about work currently being done at the USDA, ARS, Arthropod-borne Animal Diseases Research Laboratory, Laramie, WY in collaboration with the Armed Forces Institute of Pathology, Washington, DC, for the rapid detection of arbovirus infections.

Dr. Don Monke, Sires, Inc., Plain City, OH, who was unable to attend the meeting, prepared the following report relative to bovine retroviruses.

Following distribution of correspondence requesting members of the Blue-tongue and Bovine Retrovirus Committee to provide suggestions for presentation or discussion, no suggestions or requests were received pertinent to retroviruses. This situation also occurred last year. To evaluate the reasons for this apparently reduced interest in reports on retroviruses, a brief historical review of the virus and the committees or commissions organized to
discuss its management is appropriate.

In 1969, Dr. Janice Miller and colleagues reported that the disease complex recognized as enzootic bovine leukosis (EBL) was associated with a viral etiology. Subsequently, Miller and Olson reported in 1972 the detection of antibodies directed against bovine leukosis virus (BLV) in infected animals. During the first decade following discovery of its viral etiology, considerable research was conducted to develop and evaluate diagnostic tests capable of reliably detecting BLV, or prior exposure to BLV, in infected animals. Concurrent with these efforts were numerous studies to determine and prioritize the potential modes of its transmission.

To encourage the exchange of information about the virology, pathogenesis, and epidemiology of BLV, and efforts toward its control, a series of meetings on BLV were sponsored by the Commission of the European Communities (CEC). The first meeting, in 1974, as well as the 5th and last meeting in 1982, was held in Tubingen, Germany. Other meetings were held in Brussels (1976), Alfort (1978), and Bologna (1980). In an article titled “History of Bovine Leukosis” and printed in the Proceedings of the Fifth International Symposium on Bovine Leukosis, Dr. O.C. Straub stated that “since the research for practical control of BLV infection has been accomplished with the collaboration of research by CEC, the last sponsored symposium [was held] ... in 1982.”

Although “research for practical control of BLV infection had been accomplished,” research to refine diagnostic techniques, to enhance epidemiologic information, and to better implement control procedures continued during the next 2 decades. For example, it was during the second decade following the discovery of BLV that AGID tests became available and widely used. Methods to improve disease control in herds were published by numerous authors. Some countries, concerned with the increasing number of carcass condemnations associated with lymphosarcoma, initiated control programs at either the herd or national level. Within the United States, guidelines for voluntary herd control were made available but were not widely adopted. Control of BLV in the United States has largely been limited to those agribusinesses with significant export markets for germ plasm, and to herds that export livestock or provide livestock to the corporations exporting germ plasm.

During the 1990s (or the third decade of our experience with BLV), the ELISA became commercially available, and was widely adopted in the United States in 1998. Tests to detect BLV-antigen by PCR technology were developed and were offered commercially in 2000. These diagnostic advances provided the opportunity for further refinements in the control of BLV as well as the potential for alternative requirements in the international regulations governing the movement of bovine germ plasm. On the other hand, there were concerns that a related retrovirus, a bovine lentivirus, was associated with several diseases of cattle. Subsequent studies, and a review by this
committee of research published in refereed journals, reported that bovine lentiviruses did not represent a significant cause of disease in cattle.

This committee of the USAHA, the Bluetongue-Bovine Leukosis Committee (as it was originally called), has provided a valuable means of exchanging information about the numerous components of detection and control of these two viral diseases. The purpose of the committee, which was appointed in 1980, was "to give more serious consideration to these specific health problems of livestock which seriously impede the export of valuable breeding stock." To the credit of this committee and its members, numerous advances in international regulations governing the transport of germ plasm and livestock have been achieved in the last 2 decades. While the task of reducing scientific-based trade barriers and achieving greater transparency among trading partners is not complete, it is appropriate to review whether this committee remains the best avenue to achieve continued advances. A periodic review of committee objectives may lead to renewed interest.

A resolution, similar to the resolution approved last year, pertaining to the USDA, ARS/APHIS Master Plan, and addressing modernization and operation of the USDA facilities at Ames, Iowa was circulated throughout the various committees to show their combined support for this effort. The committee voted in support of the resolution.
REPORT OF THE COMMITTEE ON BRUCELLOSIS

Chairman: Dr. Sam D. Holland, Pierre, SD
Vice Chairman: Dr. Claude E. Barton, Nashville, TN

Mr. John B. Adams, VA, Dr. L. Garry Adams, TX, Dr. J. Lee Alley, AL, Dr. Terry L. Beals, OK, Dr. C. Carter Black, GA, Mr. Neal F. Black, MN, Dr. Carole A. Bolin, MI, Dr. Richard E. Breitmeyer, CA, Dr. Ralph B. Busch, Jr, CA, Dr. Conley Byrd, AR, Mr. John S. Cargile, TX, Dr. Norman F. Cheville, IA, Dr. Max E. Coats, Jr., TX, Dr. Terry H. Conger, TX, Mr. Ed Corrigan, WI, Dr. Donald S. Davis, TX, Dr. Thomas A. Dees, FL, Dr. Debbi A. Donch, MI, Dr. John C. Doyle, OK, Dr. Mark L. Drew, ID, Dr. Anita J. Edmondson, CA, Dr. Philip H. Elzer, LA, Dr. Steven R. England, NM, Dr. Brian H. Espe, OK, Dr. Donald E. Evans, KS, Ms. Barbara R. Fox, MD, Mr. Bob Frost, CA, Dr. Arnold A. Gertonson, MT, Dr. Michael J. Gilford, MD, Mr. L. Wayne Godwin, FL, Mr. Francis D. Gregerson, CO, Dr. William L. Hartmann, MN, Mr. Ted A. Hickerson, TX, Dr. Bob R. Hillman, ID, Dr. E. Ray Hinshaw, AZ, Mr. Majon Huff, CO, Mr. Jon G. Johnson, TX, Dr. Arthur J. Kennel, MN, Dr. Maxwell A. Lea, Jr., LA, Dr. Jim Logan, WY, Dr. Bret D. Marsh, IN, Dr. Charles E. Massengill, MO, Mr. Richard E. Nelson, VT, Dr. Don L. Notter, KY, Dr. Roger J. Odenweller, KY, Dr. Steven C. Olsen, IA, Mr. Scott Petty, Jr., TX, Dr. Michael Piontkowski, CO, Dr. Valerie E. Ragan, MD, Dr. Thomas J. Roffe, MT, Dr. Enrique A. Salinas, MEX, Dr. Robert B. Sanders, AR, Dr. John J. Schiltz, IA, Dr. David D. Schmitt, IA, Dr. Larry A. Schuler, ND, Dr. Roy A. Schultz, IA, Dr. Gerhardt Schurig, VA, Mr. Gary Simpson, CO, Dr. Clarence J. Siroky, WI, Mr. Glenn N. Slack, KY, Dr. Barrett D. Slenning, NC, Dr. David A. Stringfellow, AL, Dr. Paul L. Sundberg, IA, Dr. Arnold C. Taft, MD, Mr. George Teagarden, KS, Dr. Lewis P. Thomas, WV, Dr. Tom Thorne, WY, Dr. Kenneth J. Throldson, ND, Dr. James A. Watson, MS, Dr. Gary M. Weber, DC, Dr. Richard D. Willer, AZ, Dr. Larry L. Williams, NE, Mr. Steve Wolcott, CO, Dr. Glen L. Zebarth, MN, Dr. Ernest W. Zirkle, NJ,

The Committee on Brucellosis met on Sunday, November 4, 2001, at the Hershey Lodge and Convention Center, Hershey, Pennsylvania. There were 25 committee members and eight visitors in attendance. Chairman Sam Holland noted that this was an historic meeting by virtue of it being the first to be held with no known brucellosis affected herd in the U.S. A total of 15 presentations were given during the half-day meeting. A summary of presentations and actions taken by the committee are given below.

Valerie Ragan, APHIS, VS, National Brucellosis Epidemiologist, presented the FY 2001 status report of the cooperative brucellosis eradication program. Notable progress toward eradication continued as reflected by the fact that only three newly affected herds were disclosed in FY 2001 compared to 14 in FY 2000, a decline of 79%. There was one newly affected herd each in the states of Arkansas, Kansas and Missouri. There were no known
affected herds remaining at the end of FY 2001. The states of Florida, Oklahoma and South Dakota achieved Class Free brucellosis status during the year. The total number of free states currently is 48, with only Missouri and Texas remaining as Class A states. However, both are well into the countdown toward achieving Class Free Status. The complete text of Dr. Ragan's report is included in these proceedings.

Phillip Elzer, chairman of the Brucellosis Scientific Advisory Sub-Committee presented the report of sub-committee deliberations and recommendations. The report reflected concerns that the brucellosis serum bank at NVSL is being rapidly depleted and needs replenishing. The Polymerase Chain Reaction (PCR) technology was reviewed as a possible presumptive test for brucellosis. Data was presented on the use of the Fluorescence Polarization Assay (FPA) test as a field test on whole blood and milk. The performance data on the recently developed Tecan Ultra FPA test instrument was reviewed and endorsed by the subcommittee. It was announced that the CITE (IDEXX) test will be available until at least December 2003. The complete report was approved by the full committee and is included in the report.

Dr. Ricardo Flores, Mexico, Director of Animal Disease Campaign, presented a status report of the mexican brucellosis program. Currently under way is a review of the brucellosis rules (NOM), the purpose of which is to make them equivalent to the uniform methods and rules in the United States. Mexican government officials, private veterinarians, and industry groups are included in the process. Input from USDA, APHIS, is being solicited also. Dr. Flores reported that progress continues in the reduction of \( B.\) abortus and \( B.\) melitensis infection rates in both livestock and humans. Program data was presented that reflected these reductions and emphasized the importance of calfhood vaccination in this effort. Sonora and two states in the Yucatan peninsula are the most advanced in the Mexican brucellosis eradication effort. A significant problem with \( B.\) melitensis in both goats and humans continues.

Dr. Miguel Cordoba, Director of the Brucellosis Campaign for the State of Sonora, Mexico, updated the status of brucellosis in the state. He reported that the northern part of the state, containing over 80% of the land mass and livestock herds, is free of bovine brucellosis. The remaining southern sector is a medium prevalence zone with a herd infection rate of 1.25%. The State of Sonora is seeking to establish split status for the two areas.

George Teagarden, Kansas Commissioner of Livestock, presented the case report of the Kansas brucellosis affected herd disclosed through tracking a livestock market reactor in May 2001. The herd was located in Kingman County and consisted of 114 animals in five units. Two units were found to be affected with \( B.\) abortus, biovar 1 was isolated. The source of infection is thought to be from exposure to an affected herd in the mid-1990's. The entire herd was depopulated with indemnity. A total of 2,067 animals in 67 units of 24 adjacent herds were blood tested with negative results. No test eligible animals had been marketed from the herd in the past five years.
REPORT OF THE COMMITTEE

Charles (Chuck) Massengill, Missouri Assistant State Veterinarian presented the case report of the Missouri brucellosis affected herd disclosed through tracing a livestock market reactor in July 2001. The initial herd test of 41 animals disclosed 26 reactors and 3 suspects. *B. abortus*, biovar 1 was isolated from the market reactor. The herd was depopulated with indemnity. The most probable source of infection is unidentified heifers purchased at three livestock markets in 1998. There were 884 cattle in 32 adjacent herds within two miles of the affected herd that tested negative on the initial test.

Conley Byrd, Arkansas State Veterinarian, presented the case report of the Arkansas brucellosis affected herd disclosed by first point testing of an entire herd being dispersed at a livestock market. Of 151 animals tested, nine were reactors and two were suspects. *B. abortus*, biovar 1, was isolated from the reactors. The herd was depopulated with indemnity. This herd was previously infected in the mid-1980's and had been whole herd vaccinated at the time. All the reactors were older cows that were in the herd at the time of quarantine release in 1985. All adjacent herds within one mile were tested and found to be negative. The owner had not sold any test eligible cattle through livestock markets since 1985. However, in January 2000, the owner had sold a bull and 25 cow/calf pairs to a single individual without a change of ownership brucellosis test. The blood test of this group disclosed only the bull to be a reactor. This group was depopulated also, with indemnity.

Tom Roffe, Biological Resources Division, U.S. Geological Survey, gave a presentation on the use of an updated ballistic system for biological delivery to bison. Specifically, Dr. Roffe gave the protocol and results of his effort to develop a ballistic delivery system for brucella vaccines in bison. The full text of this paper is included in the proceedings of the scientific session.

Carter Black, Georgia Assistant State Veterinarian presented the report of the Subcommittee on swine brucellosis. The report continues to identify brucella infected feral swine as the single significant factor preventing the eradication of brucellosis from swine in the U.S. The complete report was approved by the full committee and is included in this report.

Terry Conger, Texas Brucellosis Epidemiologist, presented the report of the sub-committee on education. Brucellosis in wildlife of the Greater Yellowstone Area and feral swine were the two main issues considered by the subcommittee. The complete report was approved by the full committee and is included in this report.

Arnold Gertonson, Montana State Veterinarian presented a brief update of the brucellosis situation in the Greater Yellowstone Area (GYA). He reviewed the current organization of the Group Yellowstone Interagency Brucellosis Committee (GYIBC). Also, he announced plans for a two-day symposium on brucellosis problems in the GYA to be held at Jackson, WY, in September 2002. A meeting with the governors and U.S. senators of the three states in the GYA is planned to immediately follow the symposium. Valerie Ragan presented a brief overview of the joint bison management plan.
involving the PS and the State of Montana, included staffing, law enforcement and vaccination in the park. Dr. Gertonson announced that the Environmental Impact Statement (EIS) on bison-elk management in the GYA is two years away from completion.

Jack Ryan, APHIS, VS, presented an update of current research on Yellowstone bison brucellosis projects. The full text of this paper is included in these proceedings of the scientific session.

Steve Olsen, ARS, NADC, presented research data on the response of elk to B. abortus vaccines. A synopsis of the presentation follows:

Immune responses of elk to brucellosis and tuberculosis vaccines were evaluated. Following inoculation with $1 \times 10^{10}$ CFU of the *Brucella abortus* strain RB51 (SRB51) vaccine, elk remained bacteremic for longer periods of time when compared to bison or cattle. Antibody responses of SRB51-vaccinated or *Brucella abortus* strain 19 (S19)-vaccinated elk peaked at 4 to 6 weeks after vaccination, and remained greater than nonvaccinated elk until approximately 18 to 22 weeks after vaccination. Antibody responses to SRB51 could be detected in elk vaccinated with S19, whereas significant antibody responses to S19 could not be detected in SRB51-vaccinated elk. Antibody titers of SRB51-vaccinated elk were greater than responses of SRB51-vaccinated cattle or bison. Proliferative responses of peripheral blood mononuclear cells were delayed in vaccinated elk and were not detected until between 18 and 22 weeks after vaccination, whereas proliferative responses can be detected in SRB51-vaccinated cattle and bison at approximately 14 weeks after vaccination. Data obtained at 14 and 20 weeks after vaccination suggest that proliferative responses of elk peripheral blood mononuclear cells to S19 or SRB51 antigens are primarily in B-cell subsets. Preliminary data following vaccination of elk with BCG suggest that responses of elk to this tuberculosis vaccine is similar to responses following inoculation with brucellosis vaccines. Our preliminary data suggests that elk primarily develop humoral responses to brucellosis or tuberculosis vaccines, and have delayed or poor cellular immune responses. Our data may suggest that currently available brucellosis vaccines will have poor long term efficacy in elk.

Valerie Ragan presented several proposed changes to the Brucellosis Uniform Methods and Rules. Following discussion the proposed changes were approved by the committee and will be forwarded to USDA, APHIS, VS. The proposed changes follow below.

**Purpose:**

- The United States is nearing the goal of eradication of brucellosis from domestic cattle and bison. The Brucellosis Eradication Uniform Methods and Rules (UM&R) is being reevaluated in view of the current status of the program.
- The intent of this reevaluation is twofold;
  1) to ensure that the UM&R is still applicable for the current status and is sufficient to complete the eradication effort, and
  2) in light of regionalization initiatives, to ensure that the UM&R is sufficient to prevent the introduction of brucellosis into the United

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States, since restrictions that we place on animals being imported from other countries, which have achieved equivalent status, cannot be greater than interstate movement restrictions we impose domestically.

1) Class Status Changes:
   A. Class Free
      i. Currently, No infection for a minimum of 1 year, plus surveillance criteria
      ii. Under consideration, No change
   B. Class A
      i. Currently, Up to 0.25% of herds affected
      ii. Under consideration, Up to 0.1% of herds affected
   C. Class B
      i. Currently, Up to 1.5% of herds affected
      ii. Under consideration, Up to 1.0% of herds affected

2) First Point Testing:
   A. Currently, Required in Class B states
   B. Under consideration, Required in Class A as well as Class B states when states are making their initial efforts towards achieving Class Free status. Once Class Free is obtained, it is recommended that first point testing continue for an additional 2 years. If a state is subsequently downgraded from Class Free to Class A status, it is not required that first point testing be reinitiated unless the state has not successfully regained Class Free status within 2 years of the date of the downgrade.

3) Quarantine Release Procedures:
   A. Currently.
      ① Two consecutive negative herd blood tests required
      • First negative herd blood test occurring 30 days or more after all reactors removed
      • Second herd test (the releasing test) must occur 180 days or more after all reactors have been removed. Must include all nonneutered cattle over 6 months of age.
      ② Additional blood test required between 6 and 12 months after release from quarantine or between 10 and 16 months after last reactor removed.
      ③ Calves from affected herds restricted as per the UM&R.
   B. Under consideration.
      ① Three consecutive negative herd tests required
      • First 30 – 60 days after all reactors removed
      • Second 180 – 210 days after all reactors removed
      • Third (releasing test) 365 days or more after all reactors removed
      ② Other requirements the same as it currently is, including restrictions on calves out of affected herds

4) Epidemiologic Procedures
   A. Currently.
When a brucellosis-affected herd is released from quarantine, the owners of the potentially exposed herds including adjacent herds must have a final negative herd test unless a variance is granted by the DBE. If the herd owner decides not to have a second test, the State or Federal animal health representative will prepare a statement indicating that the value of a second test was discussed with the owner and will list the reasons the herd was not given the second test. A copy of this statement will be given to the herd owner.

B. Under consideration:

When a brucellosis-affected herd is depopulated, the owners of the potentially exposed herds including adjacent herds must have a final negative herd test a minimum of 6 months, and preferably 12 months after the index herd is depopulated, unless a variance is granted by the DBE. If the DBE determines that the second test is not required, a State or Federal animal health representative will prepare a statement indicating the reason a second test is not needed which will be included in the herd file. A copy of this statement will be given to the herd owner.

5) Testing Required for Breeding Animals for Interstate Movement

A. From Class Free states:
   i. Currently: No test required.
   ii. Under consideration: No change

B. From Class A states:
   i. Currently: Negative brucellosis test within 30 days before interstate movement
   ii. Under consideration: No change (whole herd test initially proposed)

C. From Class B states:
   i. Currently: Negative brucellosis test within 30 days before interstate movement. Quarantined at destination and retested 45-120 days after movement.
   ii. Under consideration: Can only move from certified free herds or from a herd that has had 2 negative whole herd tests 10-14 months apart. In addition, animal must have a negative brucellosis test within 30 days before interstate movement. Cannot move into Class Free states.

D. From below Class B States (no status):
   i. Currently: No provisions in UM&R
   ii. Under consideration: Cannot move into a Class Free state. Can only be moved directly to slaughter, or to a quarantined feedlot in a Class A or B state after being permanently marked, for later shipment to slaughter.

6) Dairy Herd Certification

A. Currently:
   For initial certification, a dairy herd must have a minimum of four con-
secutive BMSTs conducted at intervals of 90 days or more, followed by a negative herd blood test conducted within 90 days after the last negative BMST. A herd may also be initially certified by having at least two consecutive negative herd blood tests, between 10 and 14 months apart. For recertification, a herd must have a negative herd blood test. BMST procedures are not used for recertifying herds.

B. Under consideration:

Allow an additional option for recertification under the following conditions:

- The dairy herd must already be certified under one of the two approved initial certification methods as described above
- A dairy herd may then recertify by conducting 4 consecutive negative BMSTs at approximate intervals of 90 days, with the fourth test conducted within 60 days before the certification anniversary date. Any test-eligible animals that have not been in the milk herd during the certification period, such as bulls or purchased animals, must be blood tested annually. If the recertification test is conducted within 60 days after the anniversary date, the certification period will be 12 months from the anniversary date and not 12 months from the date of the recertifying test. During the interval between the anniversary date and the recertifying test, certification will be suspended.

Resolution #1/2001 Master Plan, pertaining to funding for capital improvement of laboratories at NVSL, was presented by Chairman Holland. Also, a revised resolution previously submitted from the subcommittee on swine brucellosis pertaining to federal funding for research on brucellosis and pseudorabies in feral swine was presented. Both resolutions were discussed, approved, and forwarded to the committee on resolutions.

BRUCELLOSIS SCIENTIFIC ADVISORY SUBCOMMITTEE MEETING

Chairman: Dr. Phillip H. Elzer

November 4, 2001, 9-12 (9-11 open session, 11-12 closed session)
Present: Drs. Phil Elzer, Don Davis, Don Evans, Barb Martin, Steve Olsen
Absent: Dr. Gerhart Schurig. Proxy: Dr. Don Davis held G. Schurig's proxy.
Also there were ten attendees from federal, state, university, and private sectors.
The agenda follows:
1. Introduction of committee members
2. Old business
   a. NVSL serum bank status – Dr. Steve Hennegar
   b. PCR test for brucellosis – Dr. Evans
3. Presentation of biobullet data – Dr. Tom Roffe
4. Presentation of FPA data – Dr. Klaus Neilsen – “Field trials using the FPA for the presumptive diagnosis of brucellosis”
5. Presentation on FPA technologies – Dr. Evans – Ultra machine for bison/bovines
6. CITE test vs. Rivanol test– Dr. Conger
7. UM&R – Presented by Dr. Valerie Ragan

Committee Action:

2. a. The committee recognizes that the NVSL serum bank is inadequate in numbers and recommends that at least 500 culture positive animals be maintained per species at NVSL.
   - Samples that are most valuable are those with known culture and vaccination status
   - Future samples should be in volumes of 50-100 mls in 1 ml aliquots, frozen at -80 °C, and stored
b. The limitations of primers and protocols used for the PCR test indicate that it would not be a suitable presumptive test – unanimous vote

3. No action taken

4. Dr. Klaus Neilsen presented data on the field use of the fluorescence polarization assay test on whole blood and milk.
   - The committee made no recommendation but encourages Dr. Neilsen’s group to follow established procedures for validation of the WBFPA and MFPA for field applications

5. Samples tested showed equivalent sensitivities and specificities of FPA technologies using the ULTRA. The committee recommends approval of the ULTRA technology – unanimous vote

6. Dr. Conger presented data as the 1:75 Rivanol test. The committee was informed that the CITE test will be available until December 2003 therefore Rivanol 1:75 is a mute point.

7. Dr. Ragan presented the proposed UM&R changes to the committee. The committee supports these changes to the UM&R and recommends adoption of the new document – unanimous vote.

Respectfully submitted November 4, 2001 by Dr. Philip H. Elzer, Chairman.

REPORT OF THE BRUCELLOSIS SUBCOMMITTEE
ON EDUCATION

Chairman: Dr. Terry Conger

The education subcommittee met on November 4, and eight members were in attendance.

The committee recognizes that there are two issues concerning brucellosis at the forefront in the educational initiative:
1. Yellowstone National Park and the Great Yellowstone Area received a significant amount of attention. Since the committee convened in 2000, a double-sided USAHA Fact Sheet entitled Brucellosis and Yellowstone Bison has been prepared for presentation to Secretary Norton and Agriculture Secretary Venneman by the president of the U.S.A.H.A. After that presentation, with associated media releases, the document will be available for distribution nationwide to the various commodity groups and state agencies.

Tom Thorn gave a report on the GYIBC and activities:

The GYIBC, consists of representatives from 13 state and federal agencies to address the problems associated in that area. Among their accomplishment is the distribution of the GYIBC newsletter.

The GYIBC also has developed a draft of educational pamphlet on Brucellosis in the Greater Yellowstone Area for hunter education courses in the three contiguous states.

2. Brucellosis in feral swine

Arnold Taft gave a report on that issue. Money has been made available for research in vaccination in feral swine.

As federal monies become available for education in this arena, it is the recommendation of this committee that each state tailor education materials appropriate for their needs.

REPORT OF THE SUBCOMMITTEE ON SWINE BRUCELLOSIS

Chairman: Dr. Carter Black

The subcommittee met on Saturday evening from 8:00 to 9:45 with 30 USAHA attendees present. There were representatives from industry, as well as state and federal personnel.

Dr. Arnold Taft gave a report of the status of the national program. Four states are currently Stage II (TX, AR, FL, and LA). For the past year, nine infected herds were disclosed which is a decrease from 55 the previous year. Currently there are no known infected herds in the U.S. Depopulation has greatly helped the eradication effort. Newly infected herds were disclosed by first-point testing, testing high-risk swine, and good epidemiology.

Depopulation expenditures totaled $97,631.11 for 905 pigs in nine herds for an average of $107 per head.

Dr. Taft also discussed the need for a National Feral/Wild Swine Program. A national program is needed to address OIE issues. In order to participate in international trade, domestic swine must be free of disease and have a mechanism in place to limit disease transmission from feral/wild swine.

A national budget is needed to study population dynamics, implement disease management, aid state programs, provide staff to coordinate pro-
BRUCELLOSIS

gram, set minimum guidelines for state programs, and provide education material and training as needed.

State programs should include but are not limited to:
1. Advisory Committee
2. Authority established for any and all management plans
3. Have population studies in place
4. Disease surveillance in place
5. A separate marketing system in place
6. Education program in place.

For the Stage II states to advance in status, they must go two years without disclosing more infection.

State Reports of Stage II States:

Dr. Jim Amend reported that Texas had three infected herds for FY 2001 (September 1, 2000 – August 31, 2001), down from nine infected herds in FY 2000. For both years, all of the infected herds were east of I-35. Feral exposure was the common thread for the source of infection.

Effective September 1, 2001, Texas law prohibits the feeding of meat or meat scraps. This has already caused a decrease in the number of garbage feeders in the State.

Dr. Bob Sanders reported that Arkansas had five infected herds in the past year. In a new program, Arkansas tested 400 “backyard” operations. Only one infected herd was disclosed. Dr. Sanders stated that the problem in Arkansas is not the “backyard” operations nor the “garbage feeders”. The problem is in feral/wild swine.

Dr. Maxwell Lea reported that Louisiana had one infected herd in the past year. The State has developed systems to differentiate domestic swine from feral swine. Regulatory Veterinarian goes to premise to make determination.

There was no one present from Florida to report.

Arnold Taft gave a report on the result of the FY 2000 resolution submitted by this committee.

Response: A thorough review of the cull sow and boar slaughter surveillance program will be conducted during fiscal year 2001. This review will focus on: 1) the collection of blood samples at all major packer plants that slaughter cull sows and boars, 2) the testing of the samples, and 3) the reporting of the results in an expeditious manner.

Update: Paul Ugstead will head up the VS Working Group to monitor four swine diseases; CSF, PRV, brucellosis, and trichinosis. VS successfully initiated a pilot program to verify collection of blood samples to the donor animal at slaughter for adult cattle in 2001.

Mr. Noel Myers reported on USDA, APHIS, Wildlife Services role on feral swine surveillance. Wildlife Services (WS) worked with oral rabies vaccination, west nile virus, and feral swine program. WS have statutory authority to control wildlife causing damage or disease. WS has a 4-part program; coop-
REPORT OF THE COMMITTEE

oration, coordination, monitoring and analysis, and research. $16.5 million was spent for rabies control in wildlife. WS is working on feral swine projects in nine states and one territory. WS is monitoring numbers, developing capturing systems, and studying delivery systems.

Dr. Max Coats gave a report of the Feral Swine Working Group Meeting. The highlights from the Feral Swine Committee meeting included the following: WS reported that they can do research, study population numbers, and study fertility control. Ned Hahn gave presentation of PRV fingerprinting and disease experiences in Europe. Domestic and feral swine "Separate but not equal". Wild hog hunting highly regulated and managed and is completely separated from domestic pigs. Research money for vaccine development has been released. Phil Elzer, LSU, discussed oral vaccine research. Resolutions and Recommendations – The resolution from 2000 was slightly modified and included the use of brucella strain VTRS-1 in field trial studies.

The subcommittee voted to renew its resolution with slight modifications.

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 U.S. Secretary of Agriculture to recognize the feral/wild swine threat as a high priority for funding for research, program support and field studies through USDA-APHIS-Wildlife Services, ARS, SCREES and USDA-APHIS-VS.

In particular, funding is necessary to:

1. Conduct population studies needed to support the development of threat management strategies, including both domestic and foreign animal diseases.
2. Define the role of brucella strains RB51 and/or VTRS-1 for use as a dual vaccine and conduct field trials to determine their 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.

The meeting was adjourned.
RESEARCH UPDATE ON YELLOWSTONE BISON
BRUCELLOSIS PROJECTS

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The following projects are collaborative efforts involving USDA, APHIS, VS; USDA,ARS, NADC; USDI, USGS, BRD; USDI, NPS; Montana Department of Fish, Wildlife and Parks; and Montana Department of Livestock.

Epidemiology and Pathogenesis of Brucellosis in Yellowstone National Park Bison

This project, begun in 1995, is nearly completed. The objective of this project was to determine the natural course of infection of *Brucella abortus* in free-ranging bison in Yellowstone National Park. The prospective study involved the initial capture and radiocollaring of 20 seronegative and 20 seropositive adult bison. These bison were then subsequently recaptured and specimens (blood, milk, feces, swabs, and products of parturition) were collected in fall, winter, and immediately after calving. The calves born to the cows during the project were also monitored throughout the study. Over the course of the project, specimens were collected from a total of 93 bison. Collars were removed from the last study animals in October of this year. Data from the project is currently being analyzed. Preliminary findings show that over the course of the study, 11 animals converted to seropositive. Though the majority of the seroconverters were calves or young adults, middle-aged and animals over 10 years of age also had positive seroconversion. Positive serologic titers of individual bison remained remarkably stable throughout the study. Following seroconversion nearly all breeding age females had reproductive failure. *Brucella abortus* biovar 1 was isolated from blood, milk, vaginal swabs and post parturient exudate from study animals.

The following two studies (*Brucella* persistence and fetal disappearance studies) were patterned after work done by Dr. Walt Cook of the Wyoming Department of Game and Fish.

Environmental Persistence of *Brucella abortus* on Dead Fetuses in the Greater Yellowstone Area

This study, begun in February 2001, was designed to determine the persistence of *Brucella abortus* on fetuses in the environment at two target sites in the Greater Yellowstone Area (GYA.). Cattle fetuses were immersed in and injected with peptone broth containing 1 X 10⁹ colony forming units (cfu) of *B. abortus* strain RB51. Sixteen inoculated fetuses were placed at each of two sites near the areas of concern (Corwin Springs and West Yellowstone, MT) in February. Additional similar deployments of fetuses
were made at the sites in March, April, and May. Half of the fetuses at each site were placed under artificial shade. At each deployment, 2 uninoculated fetuses (one in shade and one exposed) were equipped with thermisters to record the ambient temperature, and temperatures on the exposed skin surface, unexposed (underside) skin surface and inside the abdomen of the fetus. Additionally, precipitation, wind speed, humidity, and UV light were recorded at each site. One-cm-square specimens of exposed skin, undersurface skin, and abdominal swabs were collected from each inoculated fetus twice weekly, frozen, and shipped to NADC for culture. Laboratory results are nearly complete and data will be analyzed shortly.

Preliminary results show that *Brucella* persistence was longest on the unexposed skin surface and was shortest on the exposed skin surface. *Brucella* survived as long as 80 days on some of the February and March deployed fetuses. All specimens from all fetuses were negative by June 15th. The study will be repeated next spring with minor modifications including the addition of 6 experimentally produced RB51 abortions to compare the persistence of the organism on those fetuses with that on artificially inoculated fetuses.

**Disappearance Rate of Bovine/Bison Fetuses in the Greater Yellowstone Area**

This study, begun in March 2001, was designed to determine how long bison fetuses remain in the environment near target areas in the GYA. Thirty-two bovine fetuses were placed at preselected sites spaced one kilometer apart located in selected areas of YNP and adjacent private ground in March 2001. Two additional similar deployments of bison fetuses were made at different sites in April and May. Fetuses were equipped with radiotransmitters attached to one leg to indicate if the fetus had been moved and to allow radiotracking of at least the radioed portion of the fetus. Motion-triggered cameras were focused on half of the fetus sites and fetuses were visually observed twice a week. Data from the study is currently being analyzed.

Preliminary findings include the following. The vast majority of the fetuses inside YNP were scavenged within two weeks whereas many fetuses on private land remained unscavenged for over two weeks. Many fetuses were transported some distance from the original site by scavengers. The longest distance was over 2 miles. The camera flash sometimes discouraged nighttime scavenging. Photos and visual inspection showed evidence of scavenging by coyotes, wolves, red foxes, grizzly and black bears, mountain lions, eagles, hawks, ravens, magpies, and skunks. Also photographed were bison and elk making contact with the bison fetuses. A modified protocol will be followed in the spring of 2002.
PARENTERAL DELIVERY OF VACCINES TO FREE-RANGING BISON IN YELLOWSTONE NATIONAL PARK

Thomas J. Roffe, Lee C. Jones, Ken Coffin, Steven J. Sweeney, Richard D. Hansen

Biological Resources Division, USGS-USDOI, FWP Bldg, 1400 S. 19th Ave., Bozeman, Montana, 59718; Ballistic Technologies, Inc., Oklahoma City, Oklahoma, 73116

Introduction:

Yellowstone National Park bison have been affected by bovine brucellosis for at least 70 years (Rush, 1932; Tunnicliff and Marsh, 1935). Experimental infections in controlled conditions (Davis et al., 1990) and under some range conditions (Flagg, 1983) have suggested brucellosis induces abortions and can transmit to cattle. Recent studies (Roffe et al. 1999a; Rhyan et al., 2001) have shown that the epidemiology and pathogenesis of brucellosis in Yellowstone bison is similar to that found in chronically infected cattle. Whether and, if so, how to deal with this economically important cattle disease in wildlife has been controversial, and has led to numerous interagency negotiations as well as development of the state-federal cooperative Greater Yellowstone Interagency Brucellosis Committee. One element that has widespread support is use of a safe, effective and deliverable brucellosis vaccine in free-ranging wildlife. Vaccine RB51 has been shown safe in bison calves (Roffe, et al. 1999b) and is currently being considered for use in Yellowstone bison under the negotiated management plan (Anonymous, 2000). Most efforts on vaccine research for bison have focused on safety and efficacy. Deliverability has received little attention even though current brucellosis vaccines are most effective by the parenteral route. Such a route of delivery will be logistically difficult in free-ranging wildlife.

Ballistically-delivered S19 has been used for years on fed elk populations in the southern Greater Yellowstone Area and parts of western Wyoming (Smith et al., 1996). This system uses a hydroxypropyl cellulose biodegradable bullet (biobullet) propelled by compressed air to parenterally deliver encased, lyophilized vaccine. Vaccination of fed elk occurs in very high density populations and requires marking individuals to ensure a high proportion of the target population is vaccinated and multiple vaccinations are minimized. External marking is currently the limiting factor for elk vaccination because the ballistic characteristics of the paint-ball markers is considerably poorer than the biobullet. In our study, we tested the capability of state-of-the-art ballistic systems to effectively vaccinate bison and hypothesized that a high proportion of targeted bison could be effectively vaccinated without external marking. Without the need for an external marker vaccination range should increase. This project used a serum biomarker incorporated into a
mock vaccine biobullet to test the hypothesis, and to assess the intrusive-
ness and assist in development of a field operational program for vaccinating
GYA bison.

Methods:
The project was conducted on the National Bison Range, using 30 male
and female, calf and yearling bison. We used a serum biomarker in this
experiment rather than vaccine so that results were independent of bison
immunocompetence. Previous work on 10 bison had established parenteral
iophenoxic acid (IPA) as a safe, reliable, and useful serum biomarker in
bison with a parenteral delivery half-life of 51 weeks (Sweeney et al. 2000).
IPA was quantified by direct assay using high performance liquid chromatog-
raphy (Jones, 1994) at the University of Pennsylvania. The lower limit of
quantitative determination was 0.5 microgram per mL. In addition, biobullets
containing IPA had been surgically imbedded in two calves to demonstrate
dissolution of IPA biobullets and delivery of payload that resulted in measur-
able levels of IPA in serum. Implantation of IPA-laden biobullets with 0.5 mg
IPA per kg body weight produced serum IPA concentrations of 3.3 micro-
grams per mL IPA in serum, well above our minimum quantitative detection
limits. The difference between injected IPA and implanted biobullet encased
IPA was a 3-week delay in peak serum IPA in the implanted animals.

We used a new Ballistic Technologies, Inc. gun equipped with a blued
steel rifled barrel, 4x telescopic site, and braced on a monopod for shooting.
A high pressure regulator (1500psi) was attached to improve penetration over
the standard regulator (1200psi). Bullet size was 25 caliber, 1.69cm (0.667
inches) length, with an average weight of 583 mg. Ballistic Technologies,
Inc., loaded each bullet with an average of 178mg IPA for a total mean projec-
tile weight of 761mg, approximating biobullets containing lyophilized vac-
cine. This dose provided calves with an average 1.3mg/kg and yearlings with
0.5 mg/kg IPA.

All 30 bison were run through the handling chute for processing. Each
contained a unique brand, was randomly assigned a shooting distance and
biobullet dose (stratified by age and sex; Table 1), and was fitted with a
visible ear tag. Each animal served as its own control with a zero time blood
sample assayed for IPA. However, we also assigned four bison (2 calves, 2
yearlings) as controls receiving placebo-filled biobullets to ensure the simple
acts of biobullet shooting and penetration did not cause an "IPA positive"
reaction.
Table 1. Bison age, sex and dose received used at each biobullet delivery distance

<table>
<thead>
<tr>
<th>Range</th>
<th>Bison</th>
<th>Biobullet IPA Dose**</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 yards</td>
<td>1FC</td>
<td>2</td>
</tr>
<tr>
<td>(n=11)</td>
<td>1MC</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1FY</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1MY</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2FC</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1MC</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1FY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1MY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1MC</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1MY</td>
<td>0</td>
</tr>
<tr>
<td>35 yards</td>
<td>1FC</td>
<td>1</td>
</tr>
<tr>
<td>(n=10)</td>
<td>4MC</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2FY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2MY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1FY</td>
<td>0</td>
</tr>
<tr>
<td>50 yards</td>
<td>2FC</td>
<td>1</td>
</tr>
<tr>
<td>(n=9)</td>
<td>2MC</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3FY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1MY</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1FC</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>30 bison</td>
<td></td>
</tr>
</tbody>
</table>

*MC/FC = male calf/female calf
MY/FY = male yearling/female yearling
** Biobullet dose: Zero, 1 or 2 projectiles containing an average 178mg IPA

Following processing in the chute all 30 bison were held in a single pen. For biobullet delivery, 3 bison at a time were introduced to a large pen that accommodated a 50 yard shot. Each animal was visually identified by its ear tag and its pre-assigned shooting distance determined. Although bison were free to move about, they generally moved against the far corral fence which
permitted us to get to the assigned distance slowly approaching using a laser range-finder. All animals were shot within 2 yards of their assigned distance and only when standing still. All animals were also shot so that the biobullet was observed to strike at or near the caudal thigh. Misses were re-shot. Once shooting was completed, bison were released into a 40+ acre holding pen. On days 22, 49 and 78 days post shooting, bison were herded into the handling chutes and blood sampled. Analyses for IPA were conducted at University of Pennsylvania as above.

Results:

No pre-shooting blood samples had detectable IPA. In addition, the four animals shot with blank biobullets (which included 2 at 20 yards) did not show evidence of IPA in serum over all sampling periods. Of the remaining test bison, all IPA positive bison were positive on all post day-zero samplings. Only bison #31 showed significant change (decline) over the 3 sampling periods. Table 2 summarizes the quantitative IPA levels in serum and the dose received.

Table 2. Bison sera maximum IPA levels following biobullet IPA delivery

<table>
<thead>
<tr>
<th>Distance</th>
<th>Bison ID</th>
<th>Biobullet IPA Dose</th>
<th>Serum IPA*</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 yards</td>
<td>29</td>
<td>0</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>0</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>1</td>
<td>3.92</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>1</td>
<td>2.60</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>1</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>1</td>
<td>5.94</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>1</td>
<td>8.48</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>2</td>
<td>4.83</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>2</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>2</td>
<td>14.39</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>2</td>
<td>8.88</td>
</tr>
<tr>
<td>35 yards</td>
<td>10</td>
<td>0</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>1</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>1</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>1</td>
<td>2.17</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>1</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>1</td>
<td>5.96</td>
</tr>
</tbody>
</table>
Excluding controls, at 20 yards 13 shots were fired at 9 bison and all hit their targets. At 35 yards, 10 shots were fired at 9 bison, one shot missed its target (bison ID #30) and was reshot. At 50 yards, 12 shots were fired at 9 bison, three shots missed their targets (bison ID #17, 18 and 24). All three were reshot. On a per animal basis, 8/9 (89%) bison at 20 yards, 4/9 (44%) at 35 yards, and 1/8 (13%) at 50 yards were IPA positive. On a per biobullet shot basis, 10/13 (77%) at 20 yards, 4/10 (40%) at 35 yards, and 1/12 (8%) at 50 yards were successful.

Discussion:
The highest IPA value of any bison known to have received a single dose of IPA was 8.63 micrograms per mL (bison ID #31). Bison #39 (also shot once) had a value of 8.48 ug/ml. The serum level on bison #34 (8.88 ug/mL) was minimally higher, though its serum levels on the second and third sampling were lower than both bison #31 and bison #39. These data suggest that only one pellet (of 2) shot at bison #34 was successful at delivering an IPA dose. However, since single dose values generally ranged from 2.17 to 5.96 ug/mL exclusive of these 3 bison, it is possible that 2 biobullets penetrated bison #34. In our results, we assume 2 successful deliveries to #34 and thus our data may overstate the actual success rate of the biobullet system.

This experiment optimized biobullet delivery to bison and provided every advantage that may not be realized in a field setting. Bison were constrained
from moving significant distances and the shooter could wait until the proper
distance was obtained. Only optimum targets (broadside standing) were shot. Significant modifications of the biobullet gun (increased pressure, mounted scope) further enhanced performance and some modifications (monopod mounted stability) may not be expected in the field. Yet despite these advantages, removal of the need for an external marking system, and liberally designating a questionably successful shot as a true successful shot, the current ballistic system is quite limited for use in free-ranging bison. Success was about 40% at 35 yards and only slightly better than three-fourths successful at 20 yards. It is quite likely that field success would be considerably less.

These data suggest that a field operational program for vaccinating bison in greater Yellowstone area should be limited to shots at 20 yards or less with the current system. This distance may be very difficult or impossible to achieve on any routine basis. If parenteral delivery of vaccines is the preferred method for vaccine delivery then significant improvements to current ballistic techniques are needed. Alternatively, an effective oral delivery system could make use of parenteral delivery system unnecessary. However, oral Brucella vaccines are notoriously ineffective and further research would be needed to develop a vaccine that is effective by this delivery route.

References:


The meeting of the committee on Captive Wildlife and Alternative Livestock was called to order by Vice Chairman Dr. Robert Cook at 12:30 pm on November 6, 2001. There were 59 people in attendance of which 17 were committee members. In his opening remarks, Dr. Cook informed the audience that Dr. Temple was unable to attend.

Dr. Ron DeHaven, acting associate administrator for USDA-APHIS, was the first speaker of the program. He discussed APHIS Animal Welfare Review of Current Activities. He reviewed organizational changes in APHIS—Bob Acord is APHIS administrator; animal care, plant protection and quarantine, veterinary services, wildlife services, international services are divisions under APHIS. This division is responsible for biomedical research, animal dealers, animal exhibitors, and animal transporters under AWA; animals raised for food and fiber are exempt. Budget constraints lead to decreased numbers of inspections FY 99,00; FY 01—proposed budget increased to $13.5 million; FY 02—$13.7-15.1 with 92 inspectors. Level of compliance—overall 94% based on last inspection.

Hot issues: training and handling of dangerous animals; psychological well-being of nonhuman primates, captive wildlife heath issues, legislation and litigation

Policy on training and handling of dangerous animals - policy needed because "pet" owners circumventing state law; inadequate experience of owners; incidents—aggression and injury, loss of control, improper use of techniques (abuse). Personnel requirements in policy require adequate training and/or experience, and adequate number of staff—USDA won’t issue license
until owner meets requirements. Also includes use of appropriate handling techniques and procedures. Contingency plans although not required are strongly suggested; topics to be covered include recapture methods, restraint measures, euthanasia criteria/methods, contacting local law enforcement.

Policy on psychological well-being of nonhuman primates—purpose to maintain performance based requirements while providing additional guidance; promotes inspector consistency; allows other options that are consistent with the regulation and IAW currently accepted professional standards; helps define “what is an adequate enrichment plan”. Initial survey was performed to determine social grouping in inspected premises; 72% of animals grouped or pair housed; 17% have some limited contact; 11% don’t have contact with nonhuman primates – these animals would require contact with human care-givers.

Animal Health Protection Act – consolidates 20 pieces of legislation affecting animal health; would provide authority to regulate movement of animals when it jeopardizes health of livestock.

Elephant tuberculosis status – currently there are testing requirements for all elephants subject to AWA. These include a trunk wash and culture protocol as well as treatment and quarantine policy for exposed or infected animals. Recently an animal has been identified that is infected with an isoniazid-resistant organism. Based on this case, it may be necessary to update guidelines regarding treatment.

FOIA issues (freedom of information act) – Currently there is a huge backlog in APHIS FOIA office (may be 3 yr delay) due to volume of requests. In order to reduce backlog, inspection reports may be released from the regional offices.

Electronic FOIA amendment – requires release of reports in electronic form when available; starting in Oct. 2001, full inspection reports will be available on the website (http://www.aphis.usda.gov/ac) in PDF format after a 21 day delay. This delay allows correction and comments on the report. Additional delays may occur if the inspection undergoes an appeal process. This service will only be available for reports generated after Oct 1 2001.

FAA re-authorization bill amendment – would require airlines to report any incident of animal escape, injury or death. Additional requirement for a MOU between DOT and USDA so this information is shared. Although the intent was to cover companion animals, the definition of “animal” needs to be worked out in the rule-making process. The bill would require evaluation and improvement in training of airlines employees that handle animals.

Rats, mice, and birds appropriation bill language (AWA) – Congress added the following statement, “none of the funds appropriated or otherwise made available by this Act shall be used to issue a notice of proposed rulemaking, to promulgate a proposed rule, or to otherwise change or modify the definition of “ANIMAL” in existing regulations pursuant to the AWA”. USDA
APHIS is waiting to see if this is added to appropriations for FY 02.

Doris Day Animal League Lawsuit – intent is to include retail pet store under AWA. Litigation is still pending – USDA lost in US District Court. This might lead to regulation of hunting, breeding, and security dogs; Congressional intent was not to regulate hobby breeders. This lawsuit has workload implications for inspection services.

Dr. Tracey McNamara, Head of Dept. of Pathology of the Health Sciences of the Wildlife Conservation Society discussed her experiences with West Nile Virus in the presentation Artificial Boundaries – Bridging the Gap Between the Veterinary and Public Health Communities. WNV was a wake-up call for veterinary and public health community. Many issues were raised by the zoonotic disease hazard; interagency communication, agency mission statements, jurisdictional boundaries, and issue of confidentiality. The event showed the schism between public health and veterinary communities and within the veterinary community. The funding hierarchy for health issues places wildlife at the bottom of the list. Crows, a wildlife species, heralded the arrival of WNV. The veterinary community needs to embrace wildlife in order to address issues of biosecurity.

Dr. McNamara reviewed the sequence of events that lead to the initial misdiagnoses of crow deaths due to pneumonia and pesticides, and the initial human cases as SLE. When cases began to occur on zoo grounds, Dr. McNamara was able to use pathologic findings in crows and other zoo birds to begin to investigate the differential diagnoses including the various arboviruses. NVSL was able to rule-out the veterinary arboviruses and collaboration with the US Armed Services resulted in the identification of the WNV. The sequence of events emphasized the lack of communication and cooperation between veterinary and public health communities.

This event also demonstrated the lack of clarity around jurisdictional boundaries – who would be doing the work on the dead birds, what tests would be performed, and where (need BL3 lab). Public health labs were only testing crows due to economics and their mission to monitor sentinels of human disease.

Additional work was required to create a case definition for the disease – neurologic signs were vague in birds; lesions were often subtle or nonspecific. Work in her lab showed that this virus affected CNS and PNS – first time a flavivirus has been shown to affect peripheral neurons. The virus was also pantropic – virus could be found in heart, adrenal gland, kidney, brain, GI, liver, spleen (kidney was the best tissue to test in birds). This brought up the issues associated with biosecurity recommendations for working with birds and the need to investigate modes of transmission. If it was not just transmitted by mosquitoes, this could change control recommendations.

Dr. McNamara discovered that tissue “touch preps” could be used for presumptive diagnosis; a rapid testing/reporting system needed to be implemented for mosquito spray programs.
CAPTIVE WILDLIFE AND ALTERNATIVE LIVESTOCK

Cases during the summer of 2000 showed that many of the initial assumptions were wrong. Fifteen counties in NY state only detected WNV in birds other than crows.

Oral and bird-bird contact transmission has been confirmed experimentally. WNV spread north into New England instead of south.

A workshop was held in June 2001 to develop a pilot project for WNV surveillance in zoos. Any zoo in US can send samples to Cornell University for diagnostic testing; data will be compiled in a centralized database. The answer to the issue of viral persistence will probably come from zoos (due to ability to follow animals). As a result of the workshop, public health officials recognized the need for confidentiality; agreed that the same rules for people will be applied to animals.

Public health officials are trying to create partnerships with those that can provide data and surveillance; important to recognize abilities of the veterinary community in zoonotic diseases. This led to a suggestion that each state should have a public health veterinarian.

Dr. Sam Holland, South Dakota State Veterinarian, presented a Brief Update on States with CWD Programs: A Need for a National Program.

Overview of cases: fall 1997—250 animals in SD; 1998—infected herds in 3 states, SD-10 herds (430 animals), OK-1 herd, ND-1 herd; 1999—SD-6 herds, NE-2 herds, OK-1 herd, MT-2 herds, CO-2 herds; 2000—CO-3 herds, MT-1 herd, OK-1 herd, NE-3 herds, SD-3 herds.

Jan 2001—an infected free-ranging mule deer was identified in NE; Sept 2001—more CWD on 7 farms in CO. Additional control concerns: Canadian shipments of exposed elk had been shipped to US (7 premises in SD had been exposed to exposed elk—premises were placed under verbal quarantine). One infected Colorado farm had shipped elk to 18 states.

In Sept 2001, USDA authorized $2.6 million in CCC funds for surveillance and indemnity. States with confirmed CWD have implemented variable regulatory programs. As an overview,

South Dakota: regulations enacted Feb 1998
- mandatory surveillance all deaths in animals > 18 months of age (100% surveillance)
- 5 yr quarantine of exposed, affected herd
- CWD status 1,2,3,4,5, (certified)
- imports must be equivalent status
- animals retain individual status – track every animal

Colorado – regulations enacted May 1998
- mandatory surveillance for animals > 15 months
- exempted certain hunts/slaughters

Oct 2001 – emergency rule (due to additional cases)
- imports restricted to animals that have undergone >36 months surveillance
REPORT OF THE COMMITTEE

- may quarantine herds receiving animals in violation
- mandatory surveillance for animals > 16 months
- 5 yr quarantine of exposed, affected herds
- import restricted to herd with equivalent status 1 yr

Review of these variable surveillance programs emphasizes the need for a uniform national program for CWD.

Dr. Lynn Creekmore, staff veterinarian for USDA APHIS VS, NAHPS, presented CWD in Captive Elk—An Update on Surveillance and Program Development in the US. She reviewed the current distribution of disease in farmed elk and program development efforts and activities. The known distribution of CWD in farmed elk included 7 herds in SD, 1 in CO, 1 in MT, and 1 in NE that have been slaughtered or depopulated as of May 2001; 1 herd in NE had quarantine lifted. Out of 13 positive herds, the numbers were down to 2 until additional positive herds started to pop up in June-Sept 2001. USDA-APHIS received funds to trace and purchase positive animals for testing—total of 19 herds since 1997; 8 positive herds; 6 in CO, 1 OK, 1 NE (approx. 1900 animals). Information from NVSL showed the following results for surveillance in farmed cervids—1998-115, 1999-577, 2000-1469, 2001-1920 cases. Surveillance in farmed deer is much lower than elk.

Free-ranging cervid surveillance program uses planned hunter harvest. During the 2000/2001 season, animals in 5 states were monitored (1074 tested—all negative except 1 mule deer buck from NE). Next year the program will be expanded to additional states using hunter surveillance. An estimated 8000 cervids outside the endemic area have been tested. The only positive animals have been from the endemic area. If the endemic area is included, over 15,000 free-ranging animals have been tested.

In 1998, the NAEBAB Model Program for Surveillance, Control, and Eradication of CWD in Domestic Elk was used as a template for the development of a CWD program based on an USAHA recommendation. In 1999, USDA and states establish herd certified status program based on NAEBAB model (USHA recommendation). In 2000, a resolution was presented to continue to develop and implement a federal program for eradication of CWD in domestic elk with the provision of indemnity. The draft was circulated to stakeholders with the final proposal brought to USAHA. USDA will seek formal process of regulation for the program.

Proposed USDA program will cover captive/farmed elk, fencing requirements, animal ID and herd inventory, surveillance of all deaths over 16 months of age, herd status increases based on years of surveillance, herd additions—same or greater status (or herd status regresses), definition of positive animals—brain positive by NVSL approved lab (using immunohistochemical test). Response to a positive herd—preferred option is depopulation with indemnity; less preferred option is quarantine with selective depopulation. Response to trace herds—trace-forward and removal and testing or quarantine;
trace-back and quarantine. Although this is a voluntary program, producer must participate if there is interstate movement of animals. This program would make CWD a reportable disease.

Current activities: declaration of emergency and CCC funds to use for traces, responding to positive herds, and surveillance (funds approved for FY 01—$6.2 million; bulk for indemnity). A line item budget request is being made for 2003 to fund herd certification program. USDA funds available to purchase trace animals (if they have been moved interstate) and euthanize if movement presents a disease threat; 240 traces to 22 states have been completed over a 5 year period. It is hoped that indemnity can be used to encourage surveillance. For more information, see www.ahis.usda.gov/us then click on alternative livestock to find CWD

Dr. George Luterbach, Animal Health Chief-Western Network Canadian Food Inspection Agency, presented CWD in Canada—Policy and Eradication Update.

CWD in Canada has only been found in the province of Saskatchewan. During Feb 2000, a meeting was held with all the stakeholders and the consensus was to go forward with a national CWD program with the following elements: CWD was made a reportable dz; eradication strategy, with a surveillance system in both farmed and wild cervids; and certification system for safe trade of cervids and their products. Producers didn't feel that they could survive a 5 year quarantine and would rather use depopulation.

Program was instituted in April 2001. Producers must report all cervids over 16 months with clinical signs or lab findings suspicious of CWD. Interim policy—quarantined infected/suspect herds; sales/removal—restricted movement, inspection, quarantine. Program was based on a number of assumptions: mainly cervid-cervid spread; premises—environment can be source of disease under certain conditions; clinical signs of disease occur 16-36 months from exposure (with 6 month safety margin); and cervids start to transmit disease before earliest clinical signs (18 months before death, and 15 months before clinical signs).

Definitions of premises for the purposes of the program.

Highly contaminated premise—multiple cases of CWD have occurred; premise has a history of infection; cervids can be infected by exposure to agent from infected cervids and/or from the contaminated environment.

Uncontaminated premise—1-2 cases over a short period of time; no evidence of lateral spread, infection is from exposure to infected cervids, not premise.

Program elements for the different premises were as follows.

Highly contaminated premise—destroy all cervids on premise and any animals removed within the last 36 months. Surveillance of all cervids off the premise for greater than 36 months and less than 60 months that are clinically normal; animals would be restricted to current premise and undergo mandatory surveillance.
REPORT OF THE COMMITTEE

Uncontaminated premise—destruction of cervids that have direct exposure to infected animals within the previous 18 months or since introduction (pen mates, shared water trough, exposure via a fence line). Surveillance of animals with indirect contact by use of handling facilities, equipment; informed movement requirement; surveillance for 60 months (can move if purchaser is informed); hands-on inspection 4x/year.

Ongoing steps:
- slaughter, sampling, and disposal of every individual in infected herds
- testing of samples taken
- complete retrospective study of death losses within 3 years of movement—tracing sales from infected farms and all US imported elk

Status of program: initial farm and 5 others that had purchased from source farm—1520 animals destroyed including traceouts of 189 head to 35 other farms. During second phase, 21 positives were found on 11 traceout premises; 2 were clinical and 19 preclinical; 925 animals destroyed. Currently, 20 infected farms found in traceouts and traceouts of traceouts. All disposal was limited to 5 sites (burial) and 2 pathology labs with incineration capacity to minimize potential contamination.

Status of wild cervids—In April 2001, CWD found in wild mule deer harvested (near source farm) in Saskatchewan. Alberta and Saskatchewan wildlife surveillance program tested 483 deer; a second wild mule deer shot in same vicinity was confirmed with CWD in June 2001.

In Aug 2001, a positive elk was diagnosed in Korea that had been exported.

To date, all farmed cervids subject to destruction under this policy are within Saskatchewan but traceouts are present in other provinces and countries (>3 yr but less than 5 yrs). No traceout animals have been found to be positive.

Summary
- 38 farms infected since Feb 2000
- 7409 farmed cervids destroyed or died (66 WT deer; remainder are elk)
- all known herds destroyed and sampled—pending results on 740 samples
- no history or clinical signs on farms during last round of inspections

Entire outbreak stemmed from one source; CWD diagnosed in Feb 1990 from one animal imported from SD in 1989. This herd infected 20 of 41 traceout herds that received elk over a 10 year period. 7 of the 20 source farm traceout herds infected 17 more traceout of traceout herds. Cattle and bison were exposed to CWD on source farm – 259 cattle and 99 bison were quarantined and destroyed because they grazed on highly contaminated pastures after the infected elk were removed but prior to decontamination.

While we have made progress, there is a need for high vigilance for the
next 2 years (36 month critical period).

Saskatchewan and Alberta have proposed mandatory surveillance – current program is voluntary but it is mandatory that all participants submit all heads for surveillance from animals > 16 months of age. Export access will be largely dependent on full eradication because of the extent of CWD findings. The program has moved from primarily eradication activity to include decontamination activities. Each premise is assessed individually; ½ of premises have been released; restocking issues are not resolved for highly contaminated premises. Decontamination on highly contaminated premises is complex and has not been worked out but includes removal of wooden structures, use of full-strength bleach to disinfect, removal and replacement of top soil, and painting all structures.

Dr. Doug Hoort, from the Michigan Dept. of Agriculture, presented Still no TB in Privately Owned Cervidae—An Update from Michigan. Between Jan 1999 and March 2001, over 16,500 cervids were tested for TB in Michigan. This included 588 whole herd tests out of the 781 white-tail deer and elk herds in MI. No TB has been found in any of the privately owned cervidae.

Plans to continue TB testing, surveillance, and monitoring movement. In partnership with the cervid industry, two Acts were passed to support this program.

Under the Animal Industry Act, all white-tail deer and elk must undergo TB surveillance by July 2000. All other cervidae must be done by April 2002. All animals moved intrastate and all new herds are required to be tested. A slaughter surveillance test project is also underway.

The Privately Owned Cervidae Producers Marketing Act resulted in the movement of authority for this group of animals from DNR to the Dept. of Agriculture. All cervid herds must be registered with DOA. This Act also includes standards for fencing, on-farm records (must be kept for minimum of 3 years), requirement for annual inventory reporting including specifics on additions/removals, requirements for official and visible identification, and development of a recovery protocol. Owners must notify DOA which will work with DNR to recover, and then develop a plan for the recovered animal (quarantine, testing, etc.). Facility inspections will be performed every 3 years, and more frequently on a risk basis.

Other prevention strategies include the exclusion of wild deer from newly established enclosures—DNR will verify that no free-ranging deer are present in these areas and have the option to flush or harvest any deer found.

Registration classes for herds have been established and affect live animal movement.

Hobby—no live animal movement allowed
Exhibition—restricted live animal movement
Ranch—no live animal movement (situation in which all animals cannot be individually identified)
Full—live animal movement allowed (farming operation)

Currently there are 93 untested herds—7 need additional follow-up, 21 herds have less than 5 animals. DOA is in the process of quarantining the untested herds and restricting movement of animals on and off the premise. Animals going to slaughter would be required to go to a state or federal plant.

Dr. Michele A. Miller reviewed the Guidelines for FMD Prevention and Control in U.S. Zoos. In response to the outbreak of FMD in Europe, the Association of Zoos and Aquariums (AZA) and American Association of Zoo Veterinarians (AAZV) developed a set of guidelines addressing public access and staff training for member institutions. An ad hoc group met with USDA-APHIS VS Emergency Programs staff and determined that a FMD prevention and control plan for zoos should be based on the AUSVET Plan for Zoos. The purpose of the guidelines were to: provide information for those involved in managing an animal disease emergency in zoos, provide USDA-APHIS with a framework for decision-making when dealing with zoos, and serve as a set of operational procedures that could be incorporated into routine and emergency strategies for zoos. The contents were divided into 4 sections: nature of the enterprise, risk reduction techniques, response plans in a surveillance zone, and response plans in an infected or suspect premise.

Based on current AZA accreditation standards, the guidelines assumed that only those accredited institutions meeting the requirements for biosecurity, professional animal care, record-keeping, individual animal identification, and veterinary care programs would be covered by this plan.

Risk reduction techniques are those that are already being performed during daily operations of AZA accredited institutions. Additional biosecurity measures specific for FMD included development of an institutional emergency preparedness plan for FMD with staff training, designated staff roles, reporting processes and preparation of public and staff communications. Restricted access and screening of staff or guests that have traveled to FMD areas within 5 days would be instituted with signage and verbal communication in potential contact areas with susceptible species. Vaccination for rare susceptible species should be considered with clarification on the consequences for animal movement and country status.

Response plans in a surveillance zone would be determined by the Local Disease Control Center (LDCC). Zoos would request that they be allowed to continue operations with restrictions on staff/public entry and heightened biosecurity measures as outlined in the guidelines. These would include disinfection/decontamination methods for people and equipment entering and leaving the premises, heightened surveillance for susceptible species and possible isolation of high-risk animals, stopping all animal movements, and minimizing staff contact between groups of susceptible animals.

Response plans for infected or suspect premises would include all of the above biosecurity measures as well as consideration of vaccination of all susceptible species. The feasibility of limited operation would be determined
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by the LDCC and USDA on a case-by-case basis. All susceptible animals would be quarantined and efforts would be directed toward containment and eradication without unnecessary euthanasia. Domestic livestock held at the zoo could be used as sentinel animals, and any infected animal would be euthanized. Current record-keeping systems will allow trace-back and trace-forward as well as internal movements and contacts. Additional tracing of materials, equipment and staff would be performed.

Currently, the draft has been presented to the USDA for consideration and comment. Final guidelines will be available on the AZA/AAZV websites.

The committee members reviewed and passed 3 resolutions. The first resolution recommends continued support for the USDA-APHIS ARS Master Plan and funding by Congress. The second resolution supports program changes that would allow movement of reindeer and caribou under specific circumstances from herds in which a TB suspect or reactor is present. The basis is that the current intradermal testing methods for reindeer and caribou do not show consistent or predictable results and may lead to prohibitive restrictions on movement to shows or exhibitions. The third resolution recommends that USDA continue to develop and implement the federal program for eradication of CWD in domestic elk. The meeting was adjourned at 5:30 pm.
Mr. L. Wayne Godwin, FL; Dr. John P. Honstead, CO; Dr. Tari P. Kindred, VA; Dr. Harry E. Moore, TX; Dr. Gary D. Osweiler, IA; Dr. Jane F. Robens, MD; Dr. Frank Ross, IA; Dr. Manuel A. Thomas, Jr., TX; Dr. Larry J. Thompson, GA.

The Committee Met on November 3, 2001 in Hershey, Pennsylvania with the following members present:

Cat Barr, Mani Chidambaram, Bob Everson, Ramesh Gupta, Dwayne Hamar, Steve Hooser, Anant Jain, Bill Koller, Randall Lovell, Dan McGinness, Gavin Meerdink, Linda Morrison, Lynn Post, John Reagor, Wilson Rumbeiha, Larry Thompson, Christina Wilson, Nora Wineland

Alternatives to Rendering for Disposal of Animal Carcasses

Residues, such as pentobarbital, chlorinated hydrocarbons, etc., in animals that have been euthanized or poisoned cannot be placed into the rendering stream. This is an important issue for animal diagnostic facilities as pentobarbital has been recovered from rendered products.

From the experiences discussed by Dr. Lenn Harrison regarding the Kentucky equine abortion issue, the question of animal carcass disposal arose. Placement of the animal carcass into the rendering stream prior to a diagnosis is hazardous. However, long term cold storage is often lacking and carcasses can be gone before a diagnosis is reached. Incinerators in many facilities are old and lack capacity for large volume (i.e., multiple large animals) capacity. Digesters (alkaline chemical) are environmentally acceptable and are finding use in diagnostic facilities. These destroy etiologic agents including many organic toxicants.

Mycotoxins Update

Dr. Randall Lovell, FDA, presented proposed guidelines for feed concentrations of fumonisins (by species) to this committee two years ago. These guidelines have been published in the Federal Register. Comments have been received and, barring unforeseen obstacles, will become published guidelines.

The use of adsorbants in feeds is being promoted to reduce the adverse effect of the various mycotoxins in animals. This provides "a false sense of security." The committee recommends that individuals investigate experimental data obtained from animal trials (in vivo studies) before recommending these agents.

Agroterrorism

Some of the most economically significant impacts to US agriculture in
the past have resulted from residues (e.g., dioxins, dieldrin, chlorinated hydrocarbons, PCB's, PBB's, etc.). Such agents introduced to our animal and plant production systems afford a significant hazard to our nation's food supply. Veterinary diagnostic laboratories are capable of detecting these agents and are the best position to discover the problem. A private list serve is presently used on a daily basis to communicate between laboratories in the US, Canada and several foreign countries. A continuous stream of questions, recommendations and comments are exchanged by this means. Events and information are quickly exchanged among laboratories.

The Analytical Chemistry laboratory section of the National Veterinary Services Laboratory was recently discontinued. This committee strongly recommends re-institution of this NVSL function. This laboratory served as a central reference to the state diagnostic laboratories for method validation, a referral source for unusual analyses and source for national overview of non-infectious disease problems.
The meeting on Feed Safety was called to order by Chairman Charles L. Hofacre at 8:00 A.M. on Wednesday, November 7, 2001. There were 38 committee members and guests present.

Dr. Dave Wagner, Ph.D., Food and Drug Administration, Center for Veterinary Medicine, Office of Research, described their research that was supported by the President's Food Safety Initiative of 1997. This research assessed the role of animal feed as a potential vector for introduction and dissemination of human foodborne pathogens and antibiotic resistance determinants within the animal production environment. FDA's Center for Veterinary Medicine is the regulatory organization with primary oversight responsibility for assuring the safety of animal feeds.

Animal production units are, in essence, ecosystems created by man for the purpose of efficient production of animal protein. The central rationale for the creation of these environments is to allow effective husbandry and health management of the animals and to allow the controlled delivery of a balanced, high quality nutrient supply. Animal feed plays a central role in this environment. Feed serves as the critical source of nutrients for the animals in production and is also used as a delivery vehicle for growth enhancing and therapeutic drugs.

The feed industry is a parallel industry to that of animal production. During 2000 it supplied the estimated 119 million tons of feed that were required to support intensive animal production in the United States. With the exception of the cereal grains and grasses, virtually all other commodities that
comprise animal feeds are by-products of other industries including the animal production industry. The rendering industry reported the production of 8.8 billion lbs. of protein meals in 2000. A large portion of these products is incorporated into animal feeds. It is not unreasonable to view the feed industry as a recycling business that utilizes by-products of other industries, which have high nutritional value, to provide complex nutrient sources for animal production.

Recently, the issue of antibiotic resistance resulting from the use of antibiotics in animal production has once again become a significant concern to the Center for Veterinary Medicine (CVM) and other national and international health agencies. The potential for resistance development in animal production settings to negatively impact human therapeutic efficacy is being revisited. The role that feed may play in the dynamics of antibiotic resistance development and dissemination in animal environments is essentially unknown. The possibility that feeds may serve not only as a vector for resistance but also may function to maintain and concentrate resistance due to its recycling characteristic may be important. There are essentially no data available to assess the role of animal feed as a potential vector for the transmission and/or maintenance of antibiotic resistant bacteria or resistance determinants in the animal environment.

As part of CVM’s on-going risk assessment activities and in conjunction with the National Antibiotic Resistance Monitoring System (NARMS) we have recently initiated a survey to test animal feed and feed commodities for the presence of antibiotic resistant bacteria. Initially, Enterococcus spp. are being used to assess resistance. This organism is used because it is gram positive, is able to survive in stressful environments and is known to readily acquire and transfer antibiotic resistance determinants. In addition, Enterococcus faecium is a nosocomial pathogen of concern in human health and is the focus of the synercid/virginiamycin risk assessment activity currently being conducted within CVM. Isolates recovered from feed and feed commodities are routinely screened for susceptibility to 17 antibiotics using a panel designed for use in the NARMS program. Five of these antibiotics are drugs routinely used in animal production and 12 are used as therapeutics in both animals and humans. Thus far, samples of poultry by-product meal, meat and bone meal, animal protein blends, whole oats, whole corn, and complete feeds have been cultured and the isolates’ susceptibilities tested.

A total of 42 samples of rendered products have been tested and 41 yielded enterococci positive cultures. All twenty samples of blended animal protein products have been positive. Enterococcus faecalis has rarely been recovered from any of the samples tested, except corn. This is interesting because E. faecalis is the most common cause of human infections accounting for more than 80% of reported cases. It is the species most commonly isolated from animal production environments and from the intestinal contents of animals. All of the samples of whole oats have been positive for
Enterococci (36 samples) but no *E. faecalis* has been isolated. Of the whole corn samples tested (58 samples) only 24 (41%) have been *Enterococcus* positive and 9 of those isolates were identified as *E. faecalis*. The results thus far show that Enterococci are widely disseminated in the environment and can readily be isolated from feed commodities.

What is most remarkable about the data collected to date is the limited amount of antibiotic resistance relative to that seen in animal production environments. For example, about 65% of *E. faecium* isolates collected from the litter of poultry houses in Maryland are resistant to synercid. *Enterococcus faecium* isolates from feed and from rendered animal by-products including poultry by-product meal are completely susceptible to the drug. This observation suggests that feed is not a significant source of resistance to synercid but that the selective pressure resulting from virginiamycin use in the production environment explains the high amount of resistance seen in poultry environmental isolates.

Dr. Daniel G. McChesney, Ph.D., Acting Director, Office of Surveillance and Compliance, Center for Veterinary Medicine, United States Food and Drug Administration, next provided an update on FDA/CVM Regulatory Issues.

**Codex Alimentarius Ad Hoc Intergovernmental Task Force on Animal Feeding**

The Ad Hoc Intergovernmental Codex Task Force on Animal Feeding held its Second Session in Copenhagen, Denmark in March 2001. Prior to the meeting an open-ended meeting on the development of prohibited and undesirable list of substances in animal feed was held. The participants at this open-ended meeting considered information on positive, prohibited, and undesirable lists that had been submitted to the Task Force in response to a Circular Letter. The participants were of the opinion that the development and maintenance of comprehensive lists would be difficult. Instead, the participants proposed definitions for positive, prohibited, and undesirable lists. In a continuation of the meeting around the Task Force’s main meeting, a working group from the open-ended meeting proposed wording and criteria for inclusion in a revised draft of the conference document.

The participants in the general session meeting of the Task Force were updated on matters referred to the Task Force from the Codex Alimentarius Commission and Codex Committees on Pesticide Residues, Residues of Veterinary Drugs in Food, Food Hygiene, and Food Labeling. The Codex Secretariat reaffirmed that the principle mandate of the Codex Alimentarius Commission was protecting the health of the consumer and ensuring fair practices in the food trade, and that the primary purpose of the Task Force on Animal Feeding was the protection of consumer health, in particular as related to food safety issues. The Secretariat also noted that the Task Force was to take full account of and collaborate with work carried out by relevant Codex Committees, and other relevant international bodies.
The document the Task Force considered was at step 5 of an 8-step process. The participants were able to agree on the Sections relating to the Introduction, Purpose and Scope, Definitions, and portions of the section on General Principals and Requirements. The Task Force was unable to complete review and agreement on all sections of the document. Because agreement could not be reached on all sections of the conference document, the document was remanded to step 2. A small drafting group was established to prepare a redraft of the Code for consideration at the next meeting of the Task Force. This drafting group is lead by the United Kingdom and includes, Australia, Chile, Germany, Japan, United States, Consumers International, International Feed Industries Federation, and the COMISA. A second drafting group responsible for the on-farm production and use of feed on the farm was also established and was tasked with having a draft prepared for review by the next meeting. This group is lead by Australia, and includes Brazil, Bangladesh, Canada, Netherlands, Sudan, Thailand, Uganda, Food and Agriculture Organization, Association Latinoamericana de Avicultura, Consumers International, and International Feed Industries Federation. The next meeting of the Task Force will be held in Copenhagen, Denmark from 17 to 20 June 2002.

BSE

On October 30, 2001, FDA held a public meeting on the current BSE regulation. The purpose of this meeting was to obtain comments from interested parts on whether the rule should be changed and if so, what changes should be made. The meeting announcement provided seventeen questions for which FDA was seeking information. A complete copy of the announcement and questions can be found at: http://www.fda.gov/OHRMS/DOCKETS/98fr/100501b.htm

FDA's goal is to achieve 100% compliance with the feed regulation. To achieve this, FDA places a heavy emphasis on education in addition to inspections.

As of June 2001, FDA and State governments have inspected 9867 firms. Of these, 2653 (27%) handle prohibited protein. As of the most recent inspection, 591 (22%) of the firms handling prohibited material, or 6% of the total firms, were found to be out of compliance. Upon re-inspection, 106 firms were found to be out of compliance (4% of the firms handling prohibited material, or 1% of all firms).

The regulatory status of ruminants that consume prohibited protein is an issue that FDA has had to address since enforcement of the BSE regulation began in 1997. A feed is adulterated under section 409 of the Federal Food, Drug, and Cosmetic Act if it contains an unapproved food additive. Mammalian protein is considered an unapproved food additive for ruminant feed. While the regulatory status of the feed is clear, the regulatory status of the animal consuming the feed is less clear. A court has ruled that the animals exposed to an unapproved drug could be considered adulterated. Thus, an argument
could be made that ruminants consuming mammalian protein are adulterated.

To date, there have only been a few incidents in which cattle were inadvertently or intentionally fed prohibited proteins. These incidents involved a few hundred animals with the largest incident involving approximately 1500 animals. The disposition of the animals was decided on a case-by-case basis. FDA is working to develop a policy to address any future occurrences in which ruminants are fed feed containing prohibited protein. In addition, FDA and USDA continue to review the science associated with BSE and tissue infectivity as well as the policies used in Europe to determine which animals or animal tissue, if any, from animals fed prohibited material can be used for human food.

HACCP

The 2002 budget for CVM has approximately $300K for developing HACCP for the protein industries involved in feed manufacturing. The money is for writing the proposed rule, developing pilot programs with at least 2 firms, educating the industries involved and training Federal and State inspectors in the application of the program. The money in the 2002 budget is an increase in our base funding and will thus carry through in 2003 and beyond. In FY-2002 CVM intends to dedicate 0.5 of an FTE to the HACCP project.

Salmonella

With the increased awareness regarding food safety in general and in particular bacterial foodborne diseases there is again increased interest within CVM and especially within CDC for emphasizing Salmonella-negative feed. The revised Feed Contaminants Program asks the Field to collect feed and feed ingredients samples for Salmonella and EHEC E. coli (e.g. 0157H7) analysis.

CVM is currently working with a representative from our Atlanta District Office to develop a Compliance Program and enforcement strategy for salmonella-contaminated feed. To date FDA’s policy has largely been to inform/educate violators about relevant regulations through untitled letters. The notable exception to this approach was FDA actions in response to salmonella-contaminated pig-ears. Because of the high potential for exposing humans to salmonella, FDA issued Warning Letters, seized product, and worked with companies in recalling the product.

In the coming year, I would expect to see more traditional enforcement actions occurring when salmonella-positive feed, feed ingredients, or pet treats are found. I would also expect that prioritization for actions would still continue and that product with a potential for direct exposure to humans would continue as the highest priority.

Counter-Bioterrorism

CVM is currently working to identify and populate a database on the capabilities of the veterinary diagnostic laboratories and to develop a communication network that would enable the sharing of information from this
database by appropriate Federal and State authorities.

Dr. Richard Sellers, American Feed Industry Association, discussed the creation of the Facility Certification Institute (FCI). FCI is a non-profit corporation which developed a certified facility program. The first program within this type of operation is the restricted use protein program. FCI has certified 210 facilities for compliance with the FDA's prohibited protein in ruminant feed rule and is looking at developing programs in other areas as well.

Dr. Don Franco, National Renderers Association, then gave the Rendering Industry update.

Challenges continue for the rendering industry in the United States, predominantly associated with the bovine spongiform encephalopathy (BSE) complex, and other analogies relating to the disease. This persists regardless of the risk pertinence of the disease that includes the formal government position that the U.S. is free of BSE.

Perceptions of risk and varying interpretations of safety, including the media coverage of the Texas feedlot incident were highlighted out of context. This unfortunate occurrence coincided with an initial Food and Drug Administration (FDA) report on compliance with the feed ban to cattle and other ruminants. The cumulative impact of the two created a period of acute challenge for the rendering industry, because it amplified renewed concerns about feed safety in general, all in a country that has an excellent record of feed safety and had instituted at least 29 well defined preventive controls since 1986, the year the disease was initially reported in the United Kingdom.

This spring, cognizant of the concurrent concerns of feed-food safety, and as a response to the existing anxiety about the compliance status of rendering facilities throughout the country, the Animal Protein Producers Industry (APPI), the biosecurity arm of the rendering industry, contracted the services of Cook & Thurber. This internationally known organization was charged with conducting an inspection compliance audit based on the FDA criteria of plants producing animal proteins, whether the plants were members or not.

The inspection audit was a stunning success with a participation level of 98%. Plants that participated in the program were made public in trade publications.

APPI also administers the most comprehensive animal protein Salmonella testing program in the world, doing approximately 13,000 samples a year. Membership in the organization mandates that all plants submit samples weekly to our contract laboratory. Additionally, the organization does surveillance testing for Clostridium perfringens.

APPI, through its Institute for Continuing Education (ICE) offers courses in biosecurity/HACCP leading to certification. This interactive program has trained employees from just about every rendering facility in the United States and Canada.

On a motion duly made and seconded, the committee adopted Resolution #1 "USDA/APHIS Master Plan."
REPORT OF THE COMMITTEE ON FOOD SAFETY

Chairman: Dr. Richard E. Breitmeyer, Sacramento, CA
Vice Chairman: Dr. Bonnie J. Buntain, Gaithersburg, MD

Dr. Hatim Abdel Rahman, AL; Dr. Hafiz Ahmad, AL; Dr. Robin C. Anderson, TX; Dr. Lekan Ayanwale, AL; Dr. Marilyn F. Balmer, MD; Dr. Bonnie Bargstedt, NY; Dr. Bill F. Barnum, OK; Dr. Terry L. Beals, OK; Mr. John R. Behrmann, PA; Dr. Thomas G. Blaha, MN; Dr. Joseph L. Blair, VA; Dr. Dale D. Boyle, DC; Mr. Terry L. Burkhardt, WI; Dr. David M. Castellan, CA; Dr. H. Michael Chaddock, VA; Dr. W. Jan Charminski, WV; Dr. Andrew A. Clark, OR; Dr. Max E. Coats, Jr., TX; Dr. Chris S. Cmich, UT; Mr. Carl W. Cushing, VT; Dr. William H. Dubbert, VA; Dr. Elizabeth Enciso, MI; Ms. Barbara R. Fox, MD; Dr. John T. Fruin, FL; Dr. R. David Glauer, OH; Dr. James M. Glover, CA; Mr. L. Wayne Godwin, FL; Dr. Bert A. Gore, AK; Dr. Larry M. Granger, MI; Mr. Gene W. Gregory, GA; Dr. Tsehay Habtemariam, AL; Dr. Cheryl Hall, CA; Mr. Neil Hammerschmidt, VT; Dr. David R. Hermes, IN; Dr. Robert G. Hicks, VA; Dr. G. Thomas Holder, MD; Dr. Rex D. Holt, GA; Dr. David Hopson, MO; Mr. Danny R. Hughes, AR; Dr. John W. Hunt, Jr., MO; Dr. John P. Huntley, NY; Dr. Lee C. Jan, TX; Dr. Robert F. Kahrs, FL; Dr. Susan Keller, ND; Dr. Tari P. Kindred, VA; Mr. Kevin M. Kirk, MI; Dr. Spangler Klopp, DE; Dr. Glenn E. Kolb, WI; Dr. Jeffrey L. Kornacki, GA; Dr. 'Butch' Lyman L. Kruckenberg, KS; Dr. Elizabeth A. Krushinskie, VA; Dr. Daniel E. LaFontaine, SC; Dr. Elizabeth A. Lautner, IA; Dr. William F. Leese, VA; Dr. David J. Ligda, IN; Dr. Anne A. MacKenzie, CAN; Mr. Michael M. Mamminga, IA; Mr. Arthur P. Marquez, NM; Dr. Bret D. Marsh, IN; Dr. David T. Marshall, NC; Dr. James D. McKean, IA; Mr. Stephen L. Merkel, OH; Dr. Armando Miranda, GA; Dr. Bert A. Mitchell, MD; Dr. Harry E. Moore, TX; Dr. Harry C. Mussman, VA; Dr. Lee M. Myers, GA; Dr. David Nganwa, AL; Dr. Carol A. Olmstead, MT; Dr. Kenneth E. Olson, IL; Dr. James K. Payne, FL; Dr. Marshall Phillips, PA; Mr. Stephen Pretanik, DC; Dr. H. Graham Purchase, DE; Dr. David G. Pyburn, IA; Dr. Gerardo Quaassdorff, VT; Dr. John R. Ragan, MD; Dr. G. Donald Ritter, DE; Mr. Michael C. Robach, GA; Ms. Nancy J. Robinson, MO; Dr. Leon H. Russell, Jr., TX; Dr. John P. Sanders, WV; Dr. Charles R. Seagren, SD; Mr. Glenn N. Slack, KY; Dr. Harry Snelson, NC; Dr. Theron G. Snider, III, LA; Dr. Berhanu Tameru, AL; Dr. Manuel A. Thomas, Jr., TX; Dr. Kenneth L. Thomazin, CA; Mr. Daniel J. Vitiello, DC; Dr. Lyle P. Vogel, IL; Dr. Douglas L. Weiss, GA; Dr. Irene V. Wesley, IA; Dr. Richard D. Willer, AZ; Dr. Larry L. Williams, NE; Dr. Nora E. Wineland, CO; Dr. Richard R. Wood, IL; Mr. John F. Wortman, Jr., NM.

The Committee was called to order by Chairman, Dr. Richard Breitmeyer, Director and State Veterinarian, Animal Health and Food Safety Services, California Department of Food and Agriculture, and Vice Chairman, Dr. Bonnie

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Buntain, Chief Veterinary Medical Officer, FSIS-USDA, at 12:45 p.m. on November 4, 2001. The sign-up sheet recorded 24 members and 37 guests in attendance. However, at times, there were up to 100 participants present. Last year the Committee determined that it was appropriate to emphasize 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 national policies. Within USAHA, this Committee is the appropriate forum to discuss issues and formulate recommendations.

At the request of the Board of Directors, Dr. Breitmeyer presented a draft resolution to support complete funding of the USDA laboratory facilities at Ames, Iowa. The resolution was moved by Dr. Lyle Vogel, seconded by Dr. Dale Boyle and passed unanimously.

Proposed Resolution from the Food Safety Committee: The United States Animal Health Association strongly supports the United States Department of Agriculture’s Agriculture Research Service (ARS) - Animal and Plant Health Inspection Service (APHIS) Master Plan for Facility Consolidation and Modernization of the ARS National Animal Disease Center, the APHIS National Veterinary Services Laboratories, and the APHIS Center for Veterinary Biologics and recommends the immediate funding of all costs of construction, equipping, operation and maintenance of the Ames, Iowa National Animal Health facilities depicted in the United States Department of Agriculture six-year Master Plan. We applaud the recent support shown by both houses of Congress in appropriations for planning the facility, but that is not sufficient for the most rapid and efficient programming and construction of these critical facilities. These facilities are essential to protect and ensure our nation’s food safety and supply and its 120 billion-dollar animal industries. USAHA encourages Congress to provide mandatory funding for the Master Plan. This resolution shall be delivered to the Secretary of Agriculture, Congress, and the President of the United States of America.

Dr. Robin Anderson, ARS-USDA, provided an update on collaborative preharvest pathogen reduction research. The initial focus of the research was on competitive exclusion that was shown to reduce for a period of time Salmonella in early weaned pigs, E. coli disease in neonates and E. coli O157:H7 in beef cattle, especially neonatal swine mortality. For mature animals, complementary strategies were needed, so hypotheses were developed on chlorate supplementation, bacteriophage therapy, bacteriocidins (and other antagonists), plant compounds (Swainsonine inhibitors and Tasco seaweed extraction) and EL modulators. Experimentally, chlorate treatments prior to slaughter were successful in reducing foodborne pathogens in turkeys, beef cattle, market hogs and weaned pigs. Chlorate’s positive attributes are that it can be administered via feed or water and potentially timed-release supplementation. In addition, work is being conducted with the University of Mexico to search for naturally occurring immunization by...
studying cross protection of various E. colis against human pathogenic strains.

Dr. Scott Hurd, ARS-USDA, presented collaborative work in swine that supports the pre-slaughter period in holding pens at abattoirs as a Critical Control Point (CCP) for Salmonella contamination. International experts agree with the findings that peri-marketing control strategies offer great potential to reduce Salmonella contamination and infection in pigs at slaughter. The average on-farm prevalence of Salmonella is approximately 5.3%. At holding pens pre-slaughter, intestinal contamination occurred within one hour. After 2-3 hours, 40% of pigs had Salmonella in the gut and ilieo-cecal and mandibular lymph nodes and by 6 hours 100% of pigs were positive. The distribution of Salmonella serotypes differed from samples on-farm to those after exposure to holding pens. Meat trimmed from the mandibular area was 30% positive for Salmonella. In holding pen environmental studies, 100% of wet pens were positive for Salmonella. Peri-marketing control is not the farmers’ responsibility. More research is planned for control methods prior to slaughter.

Dr. William Wagner, CSREES-USDA, presented a summary of research recently funded in their food safety related programs. Approximately $5 million was awarded for Epidemiological Approaches for Food Safety led by Dr. Mary Torrence and $15 million for the National Integrated Food Safety Initiative, headed by Dr. Jan Singleton. To be announced soon will be the FY 2001 National Research Initiative Food Safety Program. Information can be found on the CSREES website at www.ree.usda.gov

Dr. Don Hanson, Chair of the AVMA Food Safety Advisory Committee, explained the mission of and subjects studied by the committee. The mission of the committee is to advise the Council on food safety positions and policies that involve domestic food animal production or products. The committee members include and representative from each of the following: AAAP, AASV, AASR, IAAAM, AABP and two from the Council on Public Health and Regulatory Veterinary Medicine. Issues studied by the committee include: antimicrobial resistance and product use guidelines; on-farm zoonotic pathogen reduction epidemiology, ecology and science-based risk management practices; residue avoidance; veterinary involvement in producer quality assurance programs and education/certiifying efforts; food safety articles for the JAVMA; TSE issues; and expanding roles of veterinarians in verifying/overseeing HACCP systems and in the Food Safety and Inspection Service (FSIS). New issues include seafood domestic and imported concerns especially regarding drug use and transgenic fish.

Dr. William James, FSIS-USDA, discussed new issues regarding FSIS residue control in a HACCP environment. Last year FSIS published a federal register notice to advise the public of its intent to adapt its approach to the control of chemical residues in meat and poultry now that slaughter plants are operating HACCP systems and are responsible for food safety control systems. FSIS is analyzing the results of a public meeting and is working
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on its strategic approach for residues under HACCP. On August 6, 2001, FSIS published notices informing the public that it will publish names of repeat chemical violators (determined by FDA) on the FSIS web site for one year. FSIS also will cease its policy of follow-up testing of livestock and poultry from producers that were found to supply residue violative animals to slaughter plants ("5/15 policy"). FSIS will also modify its residue policies with FDA by condemning whole carcasses with violative residues in target tissues when there is no FDA determined tolerance level in muscle tissue. The comment period on this proposal has been extended until December 2001. Information regarding these proposals can be found on the FSIS website: www.fsis.usda.gov/OPPDE/rdad/publications.htm

Dr. Kristin Holt, FSIS-USDA, discussed the application of epidemiology principles to the control of public health problems in FSIS. A public meeting will be held early in 2002 and the end of 2001 will publish a white paper. FSIS cooperates, through its field epidemiology-trained veterinarians located in various District offices, with State public health agencies and the CDC during outbreak investigations to determine if the implicated vehicle is a product regulated by FSIS. During epidemiological investigations, experts look for clues relating to illnesses that seem above the norm, try to determine infectious doses, conduct laboratory testing including PFGE genetic analyses of foodborne organisms, case control studies, and statistical analyses of the data to attempt to implicate certain vehicles of foodborne poisonings. If an FSIS regulated meat, poultry or egg processing product is implicated, field epidemiologists and headquarters experts conduct traceback investigations to the processing plant and various in-plant analyses of the HACCP systems may result. The public meeting in 2002 will discuss these procedures and the science of epidemiology in detail.

The Committee then discussed the proposed National Guidelines for Uniform Standards, Animal Production Food Safety, Beef and Dairy Model (see below). Dr. Breitmeyer presented an overview of the Guidelines; the intent is to help establish a national system for producer programs that meet marketing and regulatory requirements for residue prevention and exclusion of ruminant protein from feed. This system may improve producer educational efforts, provide a mechanism for certification and enhance credibility of quality assurance programs for the marketplace. Comments were received from the NCBA, NMPF, LMA, AMI, AABP, FSIS, FDA and APHIS. A lively discussion followed including concerns that a voluntary system may become regulatory sometime in the future, that the term "certification" needs clearer definition, and that further review and comment should be sought. Dr. Breitmeyer concluded that there was no consensus to proceed and took under consideration a recommendation to invite state and commodity organizations review and comment further on the proposal.

Under Old Business, Dr. John Ragan, FSIS-USDA, handed out a Draft Model Code for Animal Production Food Safety (see below) that could be
utilized by State veterinarians seeking additional authorities on-farm. He mentioned that the results of a survey of State agricultural authorities conducted by the Committee two years ago is on the FSIS Animal and Egg Production Food Safety website at www.fsis.usda.gov

The meeting was adjourned at 5:00 p.m.

Appendix

Attachment 1 - Proposed National Guidelines for Uniform Standards, Animal Production Food Safety, Beef and Dairy Model

DRAFT #2

NATIONAL GUIDELINES FOR UNIFORM STANDARDS
ANIMAL PRODUCTION FOOD SAFETY
BEEF AND DAIRY MODEL

I. Objectives
II. Development
III. Minimum Standards
   A. Partnerships
   B. Training and Education
   C. Agreements
   D. Herd Management Plans
   E. Certification Process (3rd Party Verification)
   F. Re-Certification
   G. Verification of State QA Program

Note: The United States Animal Health Association (USAHA) and the National Institute for Animal Agriculture (NIIA) are facilitating the development of these guidelines. This is a cooperative effort among industry, government and academia to develop a voluntary national certification system for animal production food safety. This is NOT a new QA program, but guidelines meant to complement and assist existing state QA programs in meeting new challenges.

Objectives
   A. The scope of these guidelines will be limited to 1) residue prevention and 2) exclusion of mammalian protein from ruminant feed:
   B. To provide a voluntary national system for producers, which recognizes existing state quality assurance programs, encourages development of additional programs and establishes recognizable national uniform standards.
   C. To provide uniform educational programs to ensure that participating producers have adequate information to be in full compliance with existing regulations and can readily document such compliance to
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buyers.

D. To provide a system to verify implementation of herd management plans.

E. To provide a national system for certification of beef and dairy producers in states with participating QA programs, which is recognized by state and federal regulatory authorities, packers, distributors, retailers and consumers.

F. To provide a method by which all participating producers can readily certify to buyers proof of compliance with 1) residue prevention and 2) exclusion of mammalian protein from ruminant feed requirements, at time of sale

G. To improve the nation's credibility of animal production food safety practices.

II. Development and Implementation

A. It is anticipated that national uniform standards will be achieved largely through existing QA programs.

1. The Committee on Food Safety of USAHA, in cooperation with the Animal Production and Food Safety Committee of NIAA, will facilitate development of these guidelines. FDA and USDA will recognize this model.

2. All stakeholders at each level of the food chain will be invited to participate (many had input into this draft).

3. Each State QA Committee is encouraged to incorporate these guidelines into their respective programs.

4. It is proposed that the Chief Livestock Health Official from each state will determine if the state QA program meets the national standards.

5. It is proposed that a responsible third party (accredited veterinarian, cooperative extension educator, or a determined by the State QA Committee) verify each participating producer's herd management plan meets the uniform standards.

III. Minimum Standards

A. Partnerships

1. Each state or regional QA program should include partnerships with multiple stakeholders as appropriate.

   a) Beef or dairy commodity organization(s)
   b) Cooperative Extension
   c) Chief State Livestock Health Official
   d) USDA/APHIS
   e) FSIS and/or state meat inspection
   f) FDA
   g) Others as appropriate

2. The QA program partnership in each state is responsible for development and oversight to ensure conformance with the
national standards.

B. Training and Education
1. All participating producers will be provided specific training and education necessary to be in compliance with 1) residue prevention and 2) exclusion of mammalian protein from ruminant feed.
2. FDA and USDA will assist in providing state program partnerships with educational information to be included in the educational components of QA programs to ensure that producers have adequate information to be in full compliance with existing regulations.
3. Producers will receive adequate information to implement adequate record keeping systems as required by the state QA program.

C. Agreements
1. Participating producers should have the following documentation:
   a) Completion of educational requirements
   b) Adequate records to demonstrate compliance with 1) residue prevention and 2) exclusion of mammalian protein from ruminant feed
   c) Agreement that they will not knowingly market an animal that is not in compliance with these regulations

D. Herd Management Plans
1. Each producer will complete a herd management plan to achieve 1) residue prevention and 2) exclusion of mammalian protein from ruminant feed
2. Specific herd plan requirements will be developed by each state's program partnership.

E. Certification Process (3rd Party Verification)
1. Upon application by a producer, the QA program partnership will certify that the producer is in compliance with the minimum standards outlined in this document; this certification will be based upon third party verification.
2. An accredited veterinarian, extension agent, or other party as approved by the state QA partnership, committee may complete the 3rd party verification, verifying that each participating producer has an adequate herd management plan implemented to 1) prevent residues and 2) exclude mammalian protein from ruminant feed.
3. Certification will be documented by the issuance of a pocket card evidencing:
   a) The producer's name and address and, if different, the address of the production unit.
   b) The two-letter postal code for the state of production unit
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4. Certification will be for ____ years

F. Re-Certification
1. Each state program partnership will be responsible for assisting certified producers in obtaining re-certification each ____ years through continued training and renewal of third party verification.

G. Verification of State QA Program
1. The State Veterinarian will provide verification that the state QA program is in compliance with the national guidelines.

Attachment 2
Model State Code, Animal Production Food Safety

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MODEL STATE CODE
ANIMAL PRODUCTION FOOD SAFETY

Background

The production, processing, distribution, and consumption of meat, milk, poultry, and eggs is a major economic, nutritional, and health issue to the citizens of ____ (state).

The safety of foods of animal origin is of increasing importance to food animal producers and consumers. Scientific and regulatory changes in the food processing industry make it critical that food animal and egg producers have appropriate information and assistance that allows them to utilize production practices which result in safe food products, meet regulatory food safety standards, and meet the needs of other segments of the human food chain.

Due to the rapidly changing technological environment in food animal production, producers need ongoing information on the latest innovations in production practices, which assure food safety.

Animal identification is essential to conducting and documenting animal health and food safety programs and activities. Animal identification systems developed to support animal disease eradication and control programs are being phased out as programs move closer to successful completion. There is no state or federal agency responsible for facilitating an animal identification program to assist producers in meeting food safety demands in marketing their animals.

Credible systems are needed to trace to origin and develop epidemiological studies and gather necessary data to properly deal with outbreaks of animal disease and food-borne human disease.

Food safety assurances are increasingly being needed at each step in food production, processing and distribution. Food animal producers need a mechanism to assure food processors and other purchasers that their ani-
mals were raised using specified production practices that have been verified by an independent third party. There is currently no state or federal agency with the responsibility for providing production control system verification to assist producers in marketing their products.

In the event of a foodborne disease outbreak, the chief state animal health official is the appropriate state official to coordinate assistance to food animal producers in responding to requests from federal and state public health agencies for information and data. Animal health authorities are experienced in providing animal health education, certification, and support to producers; and these activities are quite comparable to those needed to provide information and assistance to producers in production and marketing safe animals and food products.

The Animal Health Code of the State of _____ is amended by adding the following paragraphs:

Section _______ Definitions. is amended by adding the following:
(a) "Food animal" means an animal that is raised with the intent that it be consumed as human food. It shall include, but is not limited to, cattle, swine, horses, goats, sheep, and poultry.
(b) "Food animal producer" means one who produces, transports and/or markets food animals.

Section _______. Food Animal Producer Education.
(a) The Department is authorized to carry out programs to educate food animal producers on technical matters that improve the safety of the food supply. Programs should provide information on food animal production practices, which foster the elimination of illegal drug and chemical residues and the reduction of food-borne pathogens in animals being marketed as food.
(b) In carrying out such programs, the Department may enter contracts and cooperative agreements with state and federal agencies, and public and private universities located in this state to receive funding and/or assist in providing food safety education to food animal producers.

Section _______. Food Animal Identification System.
(a) The Department may develop and implement programs, consistent with other federal and state systems, for the identification of food animals at the production and marketing level.
(b) Funding for this food animal identification system may be accomplished through any combination of federal, state, and user funds.

Section _______. Support for Food Safety-related Tracebacks and Studies. The Department may assist Federal and State agencies and food animal producers in investigations and studies involving outbreaks of food-borne pathogens suspected of farm origin, food animal residue violations, and general studies involving human
pathogens in food animals. Such assistance may include participation in epidemiological studies of human pathogens suspected of farm origins, and record review of livestock transportation operations and livestock market/dealers.

Section 1. Verification of Food Animal Certification Programs.

(a) The Department may provide verification of production food safety certification program(s) to assist food animal producers in marketing animals. Such program(s) may involve one or more of the following components:

1) Standards for production facilities, which may include such elements as biosecurity, worker hygiene, feed and water safety, animal waste handling practices and rodent/pest control.

2) Animal or Premises identification systems

3) Record keeping requirements for production and treatment information

4) Audits and Evaluations of participating production facilities

5) Training and oversight of veterinarians and other certified auditors and evaluators

6) Special consumer or wholesale product labeling to be used to identify products produced under certification program(s).

(b) The Department is authorized to cooperate with federal, state, or industry, agencies and organizations in developing and carrying out food animal production programs which foster animal production food safety.
REPORT OF THE COMMITTEE ON
FOREIGN AND EMERGING DISEASES

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Vice Chairman: Dr. Corrie C. Brown, Athens, GA

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The meeting of the Foreign and Emerging Disease Committee was held 12:30-5:30 on November 5 and 6, 2001.

**Panel 1 – Prevention and Contingency Plans for the Introduction of Highly Contagious Diseases. Moderator: M. Salman**

Richard Breitmeyer gave an overview of his experience as a liaison between the Secretary of Agriculture and state organizations concerning FMD preparedness. A large issue was the need for consistent and rapid communications. A series of meetings to address concerns of commissioners of agriculture, state veterinarians, and industry were organized. Exclusion activities were audited, with significant input from local regulatory authorities. Traveler issues and cargo manifests were reviewed. Footbath efficacy was evaluated scientifically. Additional funding was obtained to increase regulatory forces.

Alfonso Torres reviewed APHIS VS activities during the FMD crisis. The Animal Health Protection Act is very close to passage and will help to consolidate many different agencies and clarify lines of authority in the event of an animal disease emergency. This year was an opportunity to update the “red books”, now referred to as the U.S. Emergency Management Plan books. The national animal health emergency management system (NAHEMS) was lauded for their efforts. A $1.8M fund was instituted for states to help them with upgrading emergency preparedness - 63 grants were submitted and 38 funded. With respect to training, there are plans to create new courses for area veterinarians in charge and partner state veterinarians for discussing and disseminating information on more detailed aspects of foreign animal diseases. The USDA/ARS Master Plan for laboratories in Ames, Iowa, has garnered considerable support. Public Law (PL)107-9 was introduced – Animal Disease Prevention and Control Act of 2001- that will provide better detection and enforcement for activities related to importation of animal diseases. The NASDA Animal Health Safeguarding Review has been completed and will be delivered to APHIS Veterinary Services November 15. He ended on a disparaging note – after the outbreak in the United Kingdom, USDA requested $35 million from the federal government and only $5 million was actually given to USDA.

Peter Mason reviewed promising FMD vaccine research at Plum Island, performed under the direction of Marvin Grubman. Inserting portions of the FMD capsid gene into a replication defective human adenovirus 5 has proved successful, with 100% protection within 7 days of a single inoculating dose in both cattle and pigs.

Dorothy Gaele talked about the North American FMD vaccine bank and
a tripartite decision tree. She explained the decision matrices and compared control procedures in UK and Netherlands outbreaks with how decisions would be made in North America.

Dorothy York described some experiences as a field veterinary officer in the UK outbreak. She presented a "laundry list" of issues for consideration, including hiring authority, garbage feeding, training of food inspectors, port controls, livestock movement ban, reliable tracking forms, cleaning and disinfection, carcass disposal, and media responses. She underscored the importance of considering all of the various aspects and development of action plans prior to an outbreak.

Peter Fernandez reviewed the international animal health information gathering by USDA, APHIS, International Services. Specifically, he addressed two basic issues raised by the VS Safeguarding Review - how to effectively gather reliable animal health information overseas and how to distribute this information to the appropriate APHIS headquarter staffs. In order to ensure effective collection of this information by APHIS overseas staffs, clear requirements will be included in the IS Reporting and Evaluation System which links weekly reporting with end of year evaluation. A feedback mechanism between APHIS VS and IS will assist in improving the quality of international animal health information gathering.

Panel 2 - Rapid Diagnostic for Foreign and Emerging Diseases Moderator—C. Brown

Tom McKenna reviewed the existing diagnostic techniques used at FADDL for FMD diagnosis — both for antibodies and antigen. He cited time involved and specificity for each test.

Sharon Hietala gave an overview of the current work being done with Lawrence Livermore Laboratory for rapid detection of all of the "FMD lookalikes."

Dave Huxsoll presented preliminary data from a PCR test that is being developed at Plum Island.

Discussion centered on test validation and the importance of developing a test that could be used "animal-side" for rapid rule-outs.

Tom Bates presented "An evaluation of potential FMD eradication strategies: preliminary simulation modeling for a 3-county region of California." Using a spatial/temporal stochastic epidemic simulation model, simulations were generated using various strategies for eradication, including those listed in the FMD "red book." There were four conclusions. Increased biosecurity, specifically fewer contacts, is essential. Increasing infected area from 10 to 20 km may decrease expected epidemic size by 23%. Vaccination may be effective, if used early and if >50% of herds are vaccinated. Preemptive ring slaughter may be effective under all scenarios - 1 km strategy has the best benefit/cost ration.

Beth Lautner gave an update from the NAHEMS Steering Committee and the Animal Health Safeguarding Review. She distributed brochures and reviewed the agencies and organizations involved in the NAHEMS. Key
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accomplishments include an Animal Health Emergency Management Model, a strategic plan, and Standards for State Animal Health Emergency Management Action. The Animal Health Safeguarding Review was undertaken in 2001 to provide evaluation and recommendations to APHIS concerning protecting health of U.S. livestock. The report has been submitted to APHIS and the Review Team is dedicated to facilitating implementation of the recommendations.

Norm Wills presented recommendations from the International Workshop on Animal Disposal Alternatives (IWADA), held in Winnipeg, in June 2000. The meeting included veterinary regulatory authorities from five countries—Australia, Canada, Mexico, New Zealand, and the United States. There was consensus that new approaches to large-scale animal depopulation and disposal must be developed. Recommendations from the workshop included: international collaboration on approaches; development of vaccines and diagnostic tests to differentiate natural infection from vaccinated animals; sharing of equipment and technological capacity; increased research on composting; development of meat hygiene research and principles to allow use of product from uninfected animals; and raising awareness in local governments of risks linked to large scale livestock enterprises. In order to be effective, any alternative to currently used mechanisms of large scale depopulation must: gain international acceptance; decrease waste; be more humane; be less destructive to the environment. An international steering committee on animal depopulation/disposal alternatives was proposed. Norm will chair the steering committee.

Panel 3. Educational Issues Regarding Foreign Animal Diseases

Moderator—C. Brown

Quita Bowman, Program Director for NVAP, reviewed the National Veterinary Accreditation Program, administered by Veterinary Services. Currently, veterinarians who successfully complete a core orientation are then accredited for life. There is a proposal to modify this program to allow for levels of accreditation and also recurring renewals. This program would allow for continuing education. The timeline is 2-3 years for implementation of these changes.

Lee Myers, as a member of the AVMA Council on Education, guided the membership through the accreditation process for colleges of veterinary medicine. The accreditation is an intensive examination of all aspects of education at a particular institution. The guidelines require that the COE evaluate methods of education but there are no specifics regarding special subject areas.

Sam Holland, State Veterinarian of South Dakota, discussed the need for better education of veterinary students regarding foreign animal diseases. In addition, he stated that practitioners see a need for continuing education in this area. He emphasized that state veterinarians can act as "live internet links" to help practitioners and industry understand increased risks of foreign
REPORT OF THE COMMITTEE

disease introduction.

Ed Mallinson reviewed a proposal for creating increased awareness of foot-and-mouth disease. This proposal involves creating magnetized cards describing clinical signs of foot-and-mouth disease and distributing these cards to every person in the nation involved with livestock.

Gordon Ward presented "Molecular Diagnosis of Classical Swine Fever in the Americas." For suspected cases, tonsil, spleen and lymph node are sent to FADDL where fluorescent antibody testing and immunohistochemistry is done. These techniques are followed by viral isolation. Validation of a PCR diagnostic test could shorten the timeframe for diagnosis. Eight published PCR methods for CSFV were tested; not all detected the New World isolates. The most promising methods were tested on 17 New World isolates, 3 vaccine strains and 3 BVDV isolates. In addition, sequenced portions of the CSFV genomes were compared to published sequences from other world regions.

Bruce Akey presented results from a recent AAVLD survey on bioterrorism diagnostic preparedness. Twenty-one laboratories responded to the survey that was delivered over the AAVLD listserv. When asked if a laboratory had capability of diagnosing BT agents, responses as follows: Bacillus anthracis 97%, Francisella tularensis 100%, Yersinia pestis 90%, Clostridium botulinum 61%. When asked if they had diagnosed one of these diseases within the last five years, responses were: Bacillus anthracis 35%, Francisella tularensis 74%, Yersinia pestis 26%, Clostridium botulinum 48%. The following laboratories had experience in diagnosing anthrax in animals within the 12 months preceding the survey: Minnesota, North Dakota, California, Texas, Canada.

Randy Crom reviewed the testing on the St. Croix cattle for Cowdria ruminantium. He emphasized that this was a joint presentation, with input from Lee Coffman, who was unable to attend the meeting. Last fall, Senepol cattle from St. Croix were exported to Florida. A few months after Senepol cattle were exported to Florida, Amblyomma variegatum were found on St. Croix. Dr. Coffman was advised. Retrospective analysis of export testing done on the Senepol cattle revealed that there were a number of positive IFA tests for heartwater. Dr. Coffman then sent samples from the cattle to a laboratory in Zimbabwe where numerous animals were positive by cELISA and also PCR. Subsequently NVSL personnel collaborated with the group in Zimbabwe – results on similar samples tested blindly had disparate results. A nested PCR is under development. In addition, an ELISA will be developed at NVSL.

Joe Corn presented work on wildlife surveillance for Amblyomma variegatum in St. Croix. There were very few deer found on the island. Density of deer was extremely low. Deer were collected and examined for ticks – all were infested with Boophilus microplus; half were infested with Dermacentor nitens. No Amblyomma variegatum were found. There were similar findings with
Paul Gibbs reviewed foot-and-mouth disease control in deer and policies for control and eradication of the disease. There was concern during the UK outbreak concerning spread of FMD by deer. Approximately 1,000 farmed deer were involved in the culls in the United Kingdom during the last year. What is our knowledge regarding deer? Do we have enough information to enable a risk assessment? Experimental observations in FMD-infected deer were reviewed. There is some variation among the different species. Disease in the “herding” species of deer was quite similar to that seen in sheep. In the roe and muntjac, disease was more severe and there was no persistence in these species. The U.S. has about 26 million deer.

Corrie Brown reviewed the strategic plan for the committee. She presented the internet version of the gray book, which was funded by Bayer, and distributed CD versions. Mass production of the CD’s will begin shortly with distribution through AAVLD, AAVMC, and the species specialty groups. A condensed version of the gray book will be available for palm digital assistants in early January.

Linda Logan presented a view on emergency preparedness from a state perspective. She reviewed the recent tripartite exercise and the participation of the Texas Emergency Response Team. She emphasized the importance of practicing emergency plans, involving producers, and all pertinent local agencies.

Jerry Callis and Frank Mulhern gave a historical overview of the FMD eradication efforts in Mexico 1946-1954. They applauded the past and continuing efforts of the joint US-Mexico Commission on vesicular diseases. There will be a 50-year celebration in 2004.

David Suarez presented his work on real-time PCR as a tool to study avian influenza from live bird markets. There is recurring concern about pathogenic isolates emerging from live bird markets. An epidemiology study using questionnaires and also viral isolation and PCR on tracheal, cloacal and environmental swabs was conducted. Fifty-seven percent of markets had avian influenza. The larger markets were more likely to be positive. A continuous hour of operation was a risk factor for markets being positive. Virus isolation was more sensitive.

Five resolutions were presented and discussed. All the five resolutions were unanimously passes. In brief the nature of these resolutions is described below:

1) The American Association of Veterinary Laboratory Diagnosticians (AAVLD) and the United States Animal Health Association (USAHA) strongly urge the USDA to provide standardized, validated, non-infectious diagnostic reagents for foreign animal diseases to state and university regulatory veterinary diagnostic laboratories for use in screening and surveillance with the understanding that any suspect or positive findings by those laboratories would be
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considered presumptive, maintained in confidence, immediately reported to USDA and specimens immediately forwarded to the appropriate USDA laboratory for confirmation.

2) The USAHA requests that the USDA:APHIS work with the USDA:NASS to design and implement surveys to collect and report sufficient demographic data for all US livestock populations, including equines, to facilitate appropriate animal health decision making by APHIS as well as State animal health officials.

3) It is strongly recommended that the USDA commit the necessary and appropriate resources for development and rigorous scientific validation of diagnostic assays, and, further, that in its validation and approval process, the USDA would include independent and broad participation and scientific assessment by various groups, agencies, and organizations, including, but not limited to federal agencies, industries, universities, and state and regional diagnostic laboratories.

4) The committee recommends that the president of the USAHA draft a letter to the Chief of Staff of the Office of Homeland Security expressing the need for the appointment of staff that are familiar with animal agriculture disease threat preparedness and response, specifically at the state and local level.

5) USAHA requests that APHIS, Veterinary Services in cooperation with the states develop an electronic certificate of veterinary inspection that, uses a USDA web based computer data base to document intrastate, interstate, and international movement of livestock and poultry.
The recent outbreak of foot-and-mouth disease (FMD) in the United Kingdom has identified the vulnerability of intensive livestock industries to the introduction of rapidly spreading disease, whether newly emerged such as porcine circovirus and Nipah, or traditional threats such as FMD and hog cholera. In many of the major producing countries, husbandry practices have concentrated the different stages of production into the hands of large companies, frequently localized in different geographical areas for each stage. Young pigs or calves may be bred in one country or state, and then moved to another for fattening and then another for breeding, milk production or slaughter. Superimposed on this is a reduction of government controlled disease surveillance, as privatisation and financial cutbacks reduce the veterinary field service.

At the time of writing (August 2001), there have been almost 2000 recorded outbreaks of FMD in the UK since February, over 4 million animals have been slaughtered, and the cost has exceeded 20 billion US dollars.

The United Kingdom had been free of FMD since 1981, when there had been a single outbreak in a dairy herd on the Isle of Wight, off the coast of southern England. On Feb 19th, this year, pigs waiting slaughter in an abattoir in southern Essex, to the north of London, were identified by the on duty veterinarian with feet lesions consistent with FMD, and this was confirmed positive the following day at the high security Institute for Animal Health laboratory, Pirbright. This laboratory is also the World Reference Laboratory for FMD, and apart from having the largest research group working on FMD, also maintains a library of FMD virus isolates collected from around the world during the last 60 years.

The virus strain was quickly identified by nucleotide sequencing to be the PanAsia strain of serotype O FMD virus, which was known to be present throughout most of Asia, and had recently caused new outbreaks in Japan (free since 1908), South Korea (free since 1934) and South Africa (this was the first outbreak of serotype O ever recorded), Mongolia and eastern Russia. The pigs affected in the abattoir had been held over the weekend before developing signs, and it was assumed that their farm of origin was the source of infection; however, tracing back showed no evidence of infection, and it was concluded that they had acquired infection in the abattoir. Other farms supplying pigs were then visited, and on the 23rd February, a farm in north east England, close to Newcastle was found with evidence of FMD; on 24th February a movement ban on all FMD susceptible species was applied to
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the whole of the UK, which included markets, but even affected race meetings and dog shows. The affected farm contained over 500 adult, mostly cull sows and boars, and following clinical examination it was apparent that disease had probably been introduced as early as the beginning of February, as most of the pigs had lesions of approximately 10 days old. The farmer fed almost exclusively a diet of waste food (swill), collected from nearby schools, hospitals and restaurants. Regulations relating to swill feeding make it compulsory to boil all waste food before feeding to pigs, but this is difficult to enforce. FMD transmits following the movement of infected animals, the feeding of animal products contaminated with FMD virus, by contact with mechanically carried FMD virus (on vehicles, clothes, hands, instruments, etc.) or as an aerosol produced by infected animals. Persistently infected (carrier) cattle can also precipitate new outbreaks, although this is rare. It is likely that the pigs had been infected from the swill feed, and subsequent seizure of illegally imported animal products by the customs authority supported the hypothesis that this farm was the index case. Infected pigs produce a large amount of aerosol virus, up to 3000 times more than infected sheep or bovines, and immediately neighbouring farms were examined for evidence of disease. A number of nearby farms had been exposed to virus, and one in particular, on which there were infected sheep and cattle, had earlier sold sheep through two markets to a farm in south west England, in Devon. When this farm was visited, it also was infected with FMD. Tracing back through the markets revealed a very large number of potential contacts, and visiting these contact premises quickly exhausted the veterinary resources of the Ministry of Agriculture (MAFF, now called DEFRA). Only 200 veterinarians were employed by MAFF, and vets that had once visited an infected farm could not, for disease security reasons, go on another farm for 3 days. However, the potential animal contacts from the markets, and their subsequent contacts, numbered many thousands, because of the methods of sheep trading used by the animal dealers, whereby some animals could change owner up to seven times in as many days.

FMD outbreaks then started appearing throughout the country, particularly in the west of England and southern Scotland and Wales. Disease had also spread by the movement of infected sheep to Northern Ireland, the Republic of Ireland, France and the Netherlands.

Control of the outbreaks was taken over from MAFF by the Chief Scientist, supported by four teams of mathematical modellers and other involved groups, who reported directly to the Prime Minister’s Office. The slaughter policy was extended to all neighbouring farms and those within a 3 km radius of the infected farm; slaughter of the infected farm was to be completed within 24 hours of diagnosis, and neighbouring farms within 48 hours, and this became the responsibility of the Army.

Clinical disease in cattle and pigs is relatively easy to diagnose, but FMD in sheep is frequently mild, and can easily be confused with other
common conditions, such as footrot, orf and non specific mouth ulcers. The majority of suspect cases were in sheep, and while samples were not collected from all of the suspect farms, of those that were submitted for laboratory confirmation, many were negative. The rate of transmission of FMD in sheep is also much lower than in cattle or pig herds, so that the potential for infected sheep flocks to transmit the virus as an aerosol to neighbouring farms is considerably lower (Alexandersen et al, 2000). Consequently many uninfected animals were slaughtered, which added to the problem of carcase disposal. The policy of slaughtering neighbouring farms and those within a 3 km radius was modified once it was shown that this particular strain of type O virus did not spread significantly as an aerosol (Donaldson et al, 2001), and that most transmission that occurred after the movement ban was a consequence of illegal movements, direct contacts, or farmers not applying strict disinfectant procedures when visiting other livestock - farmers in the north of England frequently have several livestock holdings on different premises.

Considerable discussion took place concerning the use of vaccination, and vaccine was formulated from the bank held in the UK for use in the north of England. The situation was different from that in the Netherlands where vaccination was used, because unlike the Dutch outbreak, which was focal, and could be surrounded by a barrier of vaccinated animals, the outbreak was well distributed around the UK before FMD was even recognized, making the choice of where to vaccinate impossible. The total sheep population exceeded 20 million, and cattle over 10 million, and because the distribution of the disease was not known, vaccination could have actually spread the disease. None of the animals in the UK had previously been vaccinated, and therefore would not have become protected for at least 5 days; if already infected animals were vaccinated, there was the danger of needle spread of the virus, as well as the danger that bringing the animals together for vaccination would encourage contact spread. Vaccination would not prevent disease in infected animals, and even those animals that were vaccinated would not be saved from infection should they have subsequently contacted active virus. It is a characteristic of FMD virus that it will persistently infect ruminants, following recovery from clinical disease, or even animals which have been protected by vaccination; cattle can remain carriers for up to 3 years, and sheep for up to 9 months. There is a small risk that these infected animals can precipitate new outbreaks of disease. Not only does vaccination not prevent infection, but the duration of immunity is generally less than 6 months, and it will not completely protect all vaccinated animals, depending on the level of live virus challenge they are exposed to. Pigs cannot be fully protected by vaccination, as if one of a group does develop disease, it will overwhelm the immunity of the others. One option was to vaccinate the cattle coming out of winter accommodation in the north of England, onto land on which there may have been infected sheep. If they had become infected,
they would have consumed considerable resources in their disposal. The idea was discarded after the Food Standards Agency insisted (although later changed its mind) that milk from vaccinated animals would have to be labelled; the farmers rightly said that this would reduce the value of the milk, and could even prevent its sale. They were also concerned that they would have to slaughter their animals because they were vaccinated, and if that was likely, they preferred to have the compensation paid at once.

The decision to slaughter vaccinated animals, as occurred in the Netherlands, was determined by the need to re-establish freedom from FMD so that trading in live animals and animal products could be resumed. Free status can be obtained 3 months after the slaughter of the last infected animal, or the last vaccinated animal, whichever is the later, in addition to a surveillance programme to show that the disease has been eradicated. The presence of vaccinated animals makes this more difficult, because of the possibility of carrier animals, and the problem of vaccinated animals having antibodies to FMD virus. If vaccinated animals are not slaughtered, a minimum of a year is required before the country can be recognized as disease free.

By the end of April, as the outbreak was expected to be coming to an end, emphasis moved from diagnosis to post outbreak surveillance, in anticipation of re-establishing FMD freedom. The surveillance programme was split into a number of objectives, such as revocation of an infected area, testing provisionally free areas, epidemiological investigation, restocking and resuming trade, and was driven initially by the need to open up parts of the countryside to tourism. A new serological test was introduced, the solid phase competition ELISA, which was similar to the Liquid Phase Blocking ELISA (the OIE recommended test), and used the same reagents, but which had been shown by collaborative studies with other European laboratories to be more specific, and produce fewer false positive results. But the test had not been fully validated to international standards, and this was one of the first requirements as it was set up. Teams of 20 people were responsible for testing up to 20,000 sera per week, and initially one and then two teams were set up at Pirbright; further teams have since been established on other sites with the intention of processing up to 160,000 sera a week, with an expectation of testing 1,300,000 samples.

Had vaccination been used in the UK, the post outbreak surveillance would have been complicated by the presence of possibly large numbers of sero-positive animals. European Union rules require that all vaccinated animals are marked, usually by an ear tag, so there should not have been a problem in identifying these sero-positive animals. There is also available a serum test for the presence of antibodies to the non-structural proteins (NSPs) of FMD virus, and this could be used to distinguish animals that had supported replicating live virus (replicating virus will express the NSPs and therefore a recovered animal will have antibodies to these proteins) from animals that had been vaccinated with a dead virus vaccine (as the vaccine is dead,
there would be no replication of virus and no expression of the NSPs, although some vaccine preparations do contain a limited amount of already produced NSP from the growth of the virus in tissue culture). However, the problem is to identify those vaccinated animals that have had contact with live virus, and become carriers without developing any clinical disease or supporting sufficient virus replication to develop antibodies to the NSPs. These animals, although probably rare, would be negative on the test for NSPs, but carrying live virus, and therefore a constraint to the re-establishment of freedom from infection. Even though the danger from these animals is very low, even their potential presence would prevent international trade, and probably even local trade within the UK between vaccinated and non-vaccinated regions.

The OIE Code chapter on FMD which provides guidelines on trade between countries in animals and animal products is currently under revision to accommodate the confusion which was caused when certain countries were not declaring outbreaks of FMD, even though there was evidence for the presence of the virus in their livestock. An outbreak had been defined as the appearance of clinical disease, and therefore if the virus was present, but no clinical disease was diagnosed (for instance, the virus had been found by collecting probang samples), the country could still claim to be FMD free. It is clearly important for trading partners to know each other's infection as well as their disease status.

The UK was fortunate in having available the resources of the World Reference Laboratory for FMD to support its initial diagnostic and post-outbreak surveillance programmes. However, even these were exceeded as large numbers of samples were submitted for diagnosis during the first few months of the outbreak, 24 hours a day, 7 days a week. As the diagnostic samples reduced in number, so the serological testing expanded. Help was recruited from other Institute for Animal Health laboratories, from the Veterinary Laboratory Agency, from other UK laboratories and from laboratories abroad. The reagent requirement was enormous, again almost exhausting what had been stockpiled before the outbreak. Equipment availability, storage facilities and databases for handling submissions and results were all stretched to their limits.

The size of the UK outbreak was never envisaged in any contingency planning that took place before it happened, and it would be unrealistic to expect any government to maintain the resources in manpower required in case of such an outbreak. However, the cost of the outbreak does justify some careful planning, and identification of what could be made available in an emergency. It is hoped that the lessons learned during the UK outbreak will be made public by way of an inquiry, so that other similarly placed countries can benefit and at least prepare themselves a little better. But it is not certain at this time whether such an inquiry will take place.
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The Government Relations Committee met February 12-15, 2001, in Washington, D.C. Forty-two people attended the meeting. In addition to the Committee, USAHA Committee Chairs and Vice Chairs and the AAVLD Executive Board members were present.

A wide array of topics were brought to the table from many government and non-government agencies all of whom are concerned with animal health.

Monday, February 12
FDA/CVM Update, Paul Raynes - Deputy Director

Discussed the Federal/State Relations Division, which has 20 professionals on staff to handle a variety of issues. These individuals are also available to serve on state association boards and currently do so in 21 states. The Eureka Disc is available as a free subscription to state officials. Contains 12,000 pertinent government documents and is updated every 4 to 6 weeks. To get this disc send email to praynes@ora.fda.gov. There are now 37 states with Food Safety Task Forces (see handout). Grants are available to fund activities of your task force. Several communication initiatives were discussed: broadcast fax list, broadcast email list, directory of state and local officials on the web, SAIL (State Action Information Letter) on the web. Under education efforts, a self-teaching CD on BSE is available upon request (no charge - contact Paul). Also efforts to develop a virtual university were mentioned.

Dan McChesney - FDA/CVM

Dan discussed BSE, first describing the events leading up to the current BSE crisis across Europe. The Texas meat and bone meal incident was described and discussed. BSE related feed regulations were recently evaluated. There are now between 7,500 and 9,500 renderer’s, and licensed or non-licensed feed mills in the U.S. Recently 5,429 facilities were inspected and a summary suggests an 83% compliance rate. Recent scientific studies related to TSE suggest: the species barrier may not be absolute; blood transfusion transmission is possible; CWD can be transmitted to cattle via intra cerebral inoculation; an ELISA test used on brain tissue can detect abnormal prions pre-distribution of food (see scientific articles for details).

Dr. Mike Chaddock mentioned that one major renderer in Michigan will stop dead animal pick up service on February 19. Dan also discussed Animal
Biotechnology. Biopharmaceuticals and bioagriculture are the major categories that FDA/CVM deals with. Issues include: natural selection versus engineered; how to conduct safety tests; product or by-product disposal; and legal and ethical considerations. Traditionally, FDA regulates by the product, not the process. For safety and disposal issues, the process may have to be evaluated as well in the future. To see a series of case studies relative to regulating biotech products, see: www.ostp.org.

Bert Mitchell - Deputy Administrator, FDA/CVM

Expressed support for the activities of the week and was encouraged that AAVLD executive board chose to join the meetings this year. Reminded group that NASDA was a very important partner with FDA. Discussed National Antimicrobial Resistance Monitoring (NARMS) System. Briefly discussed regionalization and bioterrorism.

Animal Agriculture Coalition Update, Leah Becker - NPPC

Overall, FY01 was a very good year for Ag related federal appropriations. FY02 is anticipated to be a year of cuts. Discussed the Ames Master plan for ARS/NVSL/CVB. Current projection is $420 - 446 M. Could be $320 M if done in one year. This is expected to be major uphill battle. It was suggested that a working group be established to support this effort (such as AAC, ARS, VS, USAHA, and AAVLD, others?). Issues for the Ames plan includes: some haggling over what state to place this in; some groups not listing it as their top priority, such as poultry; agency differences between VS and ARS; and the idea to put BL4 facilities in the state labs as an alternative.

John Adams - National Milk Producers

Discussed the National Animal Health Emergency Management (NAHEM) program. Draft of grants is due out very soon. States can receive up to $50,000 to enhance or build their NAHEM program at state level. A tripartite exercise with a mock FMD outbreak was conducted. It did uncover some communication issues. NAHEM program current issues: authority, compensation; and classification as local, national, or regional emergencies. Refer to handout “Authorities and Compensation Subcommittee of the NAHEM Steering Committee”. There was suggestion that we need a director to coordinate agriculture emergencies.

David Huxoll; Gary Osweiler - Bio-Terrorism

Biological Warfare or in peacetime Bioterrorism is a very real threat to the United States and other countries. There have been attempts to control the production of biological weapons on an international basis with little success. The Soviet Union developed an extensive arsenal of biological weapons. Some of the agents available for use as biological weapons are anthrax plaque, tularemia, glanders, small pox virus, marburg virus and VEE. These agents and the diseases they produce can cause catastrophic economic damage to livestock and other industries and are of great public health significance as well.

The U.S. Department of Justice has provided a grant to the L.S.U. School
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of Veterinary Medicine to set up an infrastructure for training and communication among the veterinary diagnostic labs which are associated with universities. This infrastructure is to provide contacts from local to Federal level and implement standardized rapid diagnostic capabilities.

The U.S. Department of Energy has awarded a grant to Iowa State University to develop a Bioterrorism Agent Search Engine that would allow procurement of rapid complete information on biologic weapons, bioterrorist agents, experts and diagnostic capabilities.

Patrick Atagi - National Association of State Departments of Agriculture

The Safeguarding Review is under way. It is not expected that a change of presidential administration will effect the progress of the review. Review procedures have begun. The goal is for the review to be completed by June and include the findings in the next NASDA Farm Bill proposal.

The Animal Health Protection Act (AHPA) is to be developed over time with input from all interested parties. No action will be taken before completion of the Safeguarding Review.

Tuesday, February 13

The Committee met at the APHIS offices in Riverdale, Maryland. A three hour discussion was held with APHIS and ARS concerning the status of establishing, funding, and maintaining new facilities in Ames, Iowa to meet urgent national needs for research, diagnosis, and product testing related to animal health.

The proposed facility will replace outdated and inefficient facilities currently used by the Animal Plant Health Inspection Service (APHIS) National Veterinary Services Laboratories (NVSL), the APHIS Center for Veterinary Biologics (CVB), and the Agriculture Research Services (ARS), National Animal Disease Center (NADC).

The Director of NADC, Dr. Keith Murray, explained the need during the 1950's and 60's when the facilities were constructed and the similarity of need today to reconstruct and modernize. Included in his discussion was a comprehensive overview of "The Mission of the Ames Animal Health Facilities", an explanation of planning processes originating from 1992, and an overview of four external review persons who gave a full endorsement of the Master Plan in early January. The review team used terms as "the need is urgent and should be considered an emergency", "ten years is too long", and "needs must include operating and maintenance funding".

The importance of the Master Plan to ARS and APHIS was punctuated with the fact that Dr. Floyd Horn of ARS had budgeted $500,000 for the Shive-Hattery engineering plan and Dr. Craig Reed of APHIS stated that the Master Plan is the number one priority and Plum Island is the number two priority of APHIS. The 106th Congress approved two million dollars to enable the Secretary of Agriculture to assess the scope and need for the project and report to the Committee on Appropriation by March 1, 2001 including current estimates of full costs and the proposed construction schedule for this project.
The Secretary’s report is to address the programmatic requirements and existing facilities, the role of animal health in livestock production, the mission of the Ames animal health facilities, a descriptions of USDA animal health program and options for restructuring USDA animal health.

USAHA feels the external review of the Master Plan needs to be made public along with Secretary’s report to Congress. There was agreement among the groups (ARS - APHIS - USAHA) that arranging a meeting with the Secretary to come to an understanding of need is a priority. Follow-up meetings on the hill with key groups are essential as soon as possible.

USAHA strongly urged that the Master Plan be implemented immediately. The project cost is nothing compared to the benefits the facilities will provide the nation. The devastation to agriculture and the ripple effect to the U.S. economy will be in the billions of dollars if the Ames facilities fail to provide protection to the nation as they have done since the 1950’s. The group was reminded that the International Standards Organization (ISO) accreditation is at stake in just a few years and the United States cannot meet those standards with the present conditions at the Ames Facilities.

USAHA reported that a Special Edition Newsletter featuring the ARS - APHIS Master Plan is being prepared and will be distributed as an educational report for the Secretary of Agriculture, Congress, the President of The United States, and agriculture stakeholders throughout the nation.

Seventeen USAHA committees assisted in shaping a Resolution regarding the Master Plan at the 104th Annual Meeting. The Resolution was passed unanimously in the General Assembly and the urgency of implementation of the Master Plan is the number one priority of USAHA.

Dr. Ron Horst reviewed the Plum Island facilities, current needs for upgrade, brief history, and the current controversy surrounding building a BL4 Unit. Currently USAMRID and CDC, have large BL4 units, and are in highly populated areas. So some of the local controversy is lack of understanding. ARS feels the BL4 should be at Plum Island as they have the most experience with high hazard agents. Areas of current work include African and Classical Swine Fever, VSV, and Foot and Mouth disease, rapid diagnostic tests and pathogenesis. There is a lot of work going on with sequencing genomes for molecular epidemiology of these agents.

Dr. Diana Whipple presented an update on NADC activities. She discussed tuberculosis and microbial genomics in animal health and why ARS is interested in this area. Microbial genomics provide potential new approaches for vaccines, diagnostic tests, antimicrobials, and new drug targets. Genomics also may help us understand why resistance develops, pathogenesis determines, unique metabolic pathways and biodiversity. Bioinformatics includes the field of sequence information: making sense of it, what does the gene do, where does it fit, comparison of the genome to other organisms to determine identification of virulence components, how does it cause disease, toxins the organism produces, and antigens that are not yet known, and how they
interact with the host.

Approximately 98% of the Mycobacterium avium subsp. paratuberculosis genome has been sequenced and some sequences are found only in *M. avium* subsp. paratuberculosis and not in *Mycobacterium avium*.

Microarray analysis is being used to compare infected macrophages in vitro to uninfected cells to look at how the cell changes in relation to infection. High throughput DNA sequencer, robotic colony pickers and robotic liquid handling equipment were briefly discussed. This equipment is expensive to purchase and maintain and requires highly skilled and knowledgeable technicians. Bioinformatics is becoming a new science and NADC is becoming a hub lab for microbial genomics of agricultural importance so ARS can provide rapid response to outbreaks and isolate, identify and sequence organisms in-house.

NADC is sequencing *Brucella abortus*, in collaboration with other laboratories primarily due to the bison problem in Yellowstone National Park and *Brucella suis*, related to concern of transmission from feral to domestic swine and development of vaccines to prevent infection of feral swine. These are funded via competitive USDA grants and some funds form UMN. USAHA helped support a report that recommended the animal agriculture stakeholders receive priority for pathogen genomic sequencing.

Dr. Don Knowles from ARS, Pullman, WA gave an update on TSE and scrapie. Type A is the primary type found in Europe, while Type C is seen in the U.S. Areas of research include genetics, pre-clinical and postmortem testing, and transmission studies. Scrapie is highly correlated with relative genetic susceptibility unlike BSE. Based on this, they are looking at whether genotyping for QR and RR could be a basis to eradicate the disease by eliminating the susceptible animals and encouraging breeding for resistance. Primary transmission occurs at lambing. PrP scrapie is distributed in the placentome and fetal fluid. A paper on this will soon be coming out. Projects include breeding infected ewes to rams with at least one R gene to see the outcome in the offspring. In Europe, Prionics Company is working with ARS-Pullman on monoclonal western blot testing and antigen capture ELISA from the obex is being looked at by a private company. Primary issue is deactivation of normal prion to prevent false positives. Alltagen has claimed they can detect anti-prion antibody, but there is no validity data at this point for their work. In the US sheep, the disease is controlled by a single gene. Gene 171 homology QQ sheep are susceptible while heterologous QR and homologous RR are resistant. In the UK, eradication efforts have focused on breeding resistant sheep with one R at the 171 locus and no V at the 136 to qualify. Monoclonal antibodies to a conserved region of the prion in all species (human, bovine, sheep, goat, elk, deer) works for slaughter surveillance. Extraneural preclinical diagnostics work is ongoing. Prions seem to occur one year earlier in lymphoid tissue compared to brain in sheep. Formic acid treatment and citrate heat retrieval creates a very sensitive and specific method
using two monoclonals on Peyer's patches, tonsil, retropharyngeal lymph node and 3rd eyelid and are looking at predicting progression to clinical disease. They have adopted the OIE validation criteria, developed feasibility studies, assay development and standardization is completed, determining assay performance characteristics and monitoring validity of the assay performance is currently ongoing. Information was presented on confirmed clinical and confirmed preclinical eyelid results. The tests estimated sensitivity is 87% (74-96% range) and specificity 99.2% (confidence interval 96-99%). They need to test 1,085 infected and 542 uninfected, but exposed, to get to stage 3 of the validation process. They will also be looking at the QR and RR genetic link.

Dr. David Swing gave a review of the programs and facilities related to poultry, indicating that all of the poultry labs located at various sites were fairly old and needed to be rebuilt, remodeled and improved. The Southeast poultry lab in Athens is a BL3 ag facility. 93% of poultry research is done at ARS labs other than NADC. Southeast lab primarily works on exotic and infectious diseases, including West Nile Virus, HPAI, Exotic Newcastle and Hong Kong H5N5 influenza. They have been working with Mount Sinai on a virus rescue system for vaccine development from aged materials. The avian oncology lab in Lansing, Michigan works with Marek's herpes, Avian Leukosis retroviruses, and has a large genomics program. Beltsville ARS has been working on parasite biology and coccidia control. NADC work in turkey health has been related to bacterial and fungal diseases including *Pasteurella multocida*, *Bordetella*, and ORT. Fayetteville, Arkansas work is on ascites and bone disease, Mississippi State is working on *Mycoplasma* and there is an animal welfare project at Purdue. A 2001 bill proposes to consolidate avian virus research at one location. ARS is looking at this. There has been some discussion of consolidation of exotic emerging viruses, SE, avian genomics and oncology programs at a National poultry health research center, which would require new facilities. Only 7% of poultry research is done at NADC, while greater than 60% of ARS research on livestock diseases is done at NADC.

Wednesday, February 14

Cooperative State Research Education and Extension Service (CSREES)

Drs. Peter J. Johnson and Bill Waggoner from the Cooperative State Research Education and Extension Service (CSREES) explained and detailed the importance of CSREES for funding the Colleges of Veterinary Medicine and animal science departments. CSREES was the first agency to support funding for genomic sequencing of veterinary pathogens. Sequencing of veterinary pathogens allows for a more complete understanding of the pathogens and leads to more effective treatments and biologicals.

In order to provide the USDA with recommendations for how to proceed in harnessing the tremendous opportunities provided by this new and excit-
The emerging field of microbial genomics, a workshop of well-organized scientists from throughout the world was brought together in an electronic conference. They prioritized a list of 15 animal health and food safety pathogens that would benefit from microbial genomics. This group also recommended to the USDA to provide leadership in microbial genomics in order to harness the tremendous opportunities afforded by technological and scientific advances in these areas of inquiry. USDA is currently not a significant player in sequencing veterinary pathogens but they understand the need to be more involved. Dr. Bill Waggoner explained the organizational structure of CSREES and how CSREES is the extramural funding agency of USDA. CSREES is a small agency with all personnel located in Washington, D.C. with a total staff of under 400 people. Dr. Waggoner explained that CSREES is currently funding numerous animal health special research grants including turkey poult enteritis, pre-harvest food safety, bovine tuberculosis, brucella vaccine for bison, and emerging diseases.

**American Veterinary Medical Association (AVMA)**

Drs. Niall Finnegan, Bernadette Dunham, Dean Goeldner, and Senator John Melcher discussed AVMA activities with the committee. Dr. Finnegan stressed that veterinary medicine must be well organized and speak with a single voice. He stated that USAHA could be very influential and politically strong if we were unified behind our issues. He asked that USAHA communicate with AVMA so that a unified message is developed and conveyed.

There are several animal health and veterinary medicine issues which AVMA is supporting and advancing on the Washington scene. Among them are working to get a “star” reinstated for the veterinary corps, obtaining permanent support for FARAD, student tuition relief, research on brucella vaccine for wildlife, and invasive species management plan.

Senator Melcher reminded the group of the importance of the work and resolutions that are adopted at the USAHA annual meeting. AVMA receives the resolutions and uses them when visiting with stakeholder groups, federal agencies, and members of Congress. Senator Melcher expressed the concern for urgently needed comprehensive legislation to enhance animal research funds. This bill would put animal health and research in perspective, enhance research on zoonotic diseases, food safety issues, emerging diseases, and include resources for the human/animal bond research.

Committee members heard a presentation from the Food Safety and Inspection Service (FSIS) of the USDA. Mr. Phil Derfler of the Policy Office of FSIS presented the latest information on the outcomes of the MegaRule of 1996. All US meat and poultry plants have been operating under the Hazard Analysis Critical Control Point (HACCP) program for over one year. FSIS considers the new rule to be a success, and data from the Centers for Disease Control (CDC) support this position. The CDC reports a reduction of foodborne illnesses nationally by 20% during the 1997-1999 period. Further, very few plants closed as a result of the implementation of the new rule.
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The FSIS is reevaluating the policy regarding the actions taken after a chemical residue is detected in meat. Currently, a producer who is identified with a residue must submit 5 animals to slaughter and an auction market must submit 15 animals to slaughter, and find all animals negative for residues, to be eligible to sell animals into the marketplace. FSIS proposes to eliminate this requirement and replace it with a requirement that any violators be entered into a national website where repeat violators can easily be identified.

Their are continuing efforts to enhance the communication among all stakeholders in the farm to table food safety initiatives. A newly established Federal/State/Local Government Relations Staff has been named to more effectively work with all parties to emphasize the importance of working together to produce wholesome meat and poultry products.

Dr. Alice Thaler reported on the Food Safety State Partnerships. Twenty-four states have participated in the program, and they have been considered a success. More emphasis is being placed on farm certification programs, and the trichinae program serves as a model. Continuing concerns of the public will advance the need for these programs including the issues of humane treatment of animals and the need to train veterinarians to conduct on-farm certification programs. She also discussed the actions taken to categorize and prioritize the findings in the report of the Blue Ribbon Panel on the future role of FSIS veterinarians. There is general agreement that this report will provide the impetus to seek changes that are essential to the success of FSIS veterinarians.

Dr. John Ragan spoke about the National Conference on Animal Production Food Safety held in St. Louis, MO in September 2000. He encouraged everyone to review the consensus recommendations from the Conference and offer any feedback deemed necessary. Also, he wants to further explore the Model Food Safety Legislation discussed at the USAHA meeting in Birmingham. Regional meetings of the USAHA and the National Assembly meetings were discussed as possible venues for further discussion of the Model.

Thursday, February 15

The final session of the Committee meeting was devoted to a review and critique of the past three days meetings, a review of the resolutions passed at the meeting in Birmingham and individual visits to members of Congress. The meeting adjourned at noon.
Tuesday, November 6, 2001, 12:30 – 5:30 p.m., Monarch E/G Conference Room Hershey Lodge and Convention Center, Hershey, PA

The committee was called to order at 12:30 pm with 17 members and 21 visitors present. The purpose of the committee as stated in the by-laws was read to the committee to reaffirm the reason of our meeting.

Dr. Angela James reported the status of the on going USDAAPHIS CEAH National Tick survey. The following is her report.

GEOGRAPHIC DISTRIBUTION OF TICKS IN THE UNITED STATES INJURIOUS TO LIVESTOCK, EQUINES, POULTRY, AND WILDLIFE

Angela James¹, Jerome Freier¹, James Keirans.², and Lance Durden²

¹ USDA, APHIS, VS, CEAH, Fort Collins, Colorado, USA
² Georgia Southern University, Statesboro, Georgia, USA

Ticks are considered to be the most important vectors of pathogens to
domesticated animals and only second to mosquitoes in number of pathogens transmitted to man. They can transmit a variety of agents including protozoa, bacteria, rickettsia, viruses, and paralytic toxins (5, 7). In addition, they can cause direct harm by blood loss, disturbance during foraging resulting in reduced weight or milk production and secondary infections.

The introduction of new tick species and tick-borne diseases into the United States has increased over time with modern transportation. The reduced travel time has increased the chances of ticks surviving on an imported host. In addition, importation of exotic animals by animal dealers, zoological gardens, and private citizens has increased (1). There have been approximately 99 exotic or invasive tick species recorded to date in the United States with seven species from the family Argasidae and 92 species from the family Ixodidae (3). Therefore, a National Tick Survey was initiated to assess the current distributions of tick species in the United States, the potential of the introduction and establishment of new tick species or tick-borne diseases, and to determine the environmental factors that might influence the survival and distribution of ticks in the United States.

Worldwide, there are approximately 838 tick species. We currently have 83 tick species established in the United States, with approximately 56 species that belong the family Ixodidae (hard ticks) and 27 that belong to the family Argasidae (soft ticks). There are approximately 32 tick species in the United States that are injurious to livestock, equids, or poultry. The first phase of this survey will be to update the distributions of the following tick species: *Dermacentor andersoni*, (Stiles) (Rocky Mountain Wood Tick), *Amblyomma maculatum* (Koch) (Gulf Coast Tick), *Amblyomma americanum* (L.) (Lone Star Tick), *Anocentor nitens* (Neumann) (Tropical Horse Tick), and *Otodius megnini* (Duges) (Spinose Ear Tick). They transmit a variety of disease agents including *Anaplasma*, *Babesia*, *Ehrlichia*, Q fever, heartwater, and tick paralysis to horses, cattle, sheep, pigs, dogs, and wildlife.

The distributions of ticks in the United States will be assessed initially by reviewing records from the US National Tick Collection (USNT). This dataset currently has over 120,000 tick records. We will also use the tick identification records from USDA’s National Veterinary Services Laboratories (NVSL). This information will be used to develop distribution maps for each tick species, and then integrated with environmental data on climate, vegetation, soil, elevation, and land use to determine what factors might affect each tick’s distribution, as well as model rate and direction of population expansion. Additionally, we will correlate tick distributions with wildlife and livestock distributions and population densities. We will also link the tick distribution information to other tick-borne disease and invasive species databases. Lastly, the tick distribution data collected and analyzed will be distributed via pamphlets, books, and CDs. We will also make the data available to the public via an Internet Map Server and Web page.

We have obtained copies of the USNT database as well as the USDA's
NVSL tick identification database. We have converted the USNT database into a new format and extracted records for the following five tick species: *D. andersoni*, *A. maculatum*, *A. americanum*, *A. nitens*, and *O. megnini*. Tabular references for each of the five tick species were also developed for spatial analysis. We are currently reformatting the NVSL's tick identification records for integration with the US National Tick Database.

Several preliminary county-level maps have been produced for *D. andersoni*, *A. maculatum*, *A. americanum*, *A. nitens*, and *O. megnini* using extracted records from the USNT database. Additionally, we have completed locale or point maps for *D. andersoni* and *A. maculatum*. There were approximately 5800 and 300 records used to produce county level maps for *D. andersoni* and *A. maculatum*, respectively. There were 5400 and 290 records used to develop locale level maps for *D. andersoni* and *A. maculatum*, respectively. The reported records for *D. andersoni* were from fourteen different states and 261 counties with the majority of the reported records from Ravalli County, Montana (~2500 records). *Dermacentor andersoni* was reported from approximately 75 different hosts such as horses, cattle, sheep, pigs, goats, dogs, rodents, bison, bears, deer, and humans. *Amblyomma maculatum* was reported from thirteen states and 104 counties. *Amblyomma maculatum* was reported from approximately 42 different hosts such as horses, cattle, pig, goats, dogs, bear, birds, bobcats, coyotes, rabbits, rodents, deer, and humans. Although, the presence or absence of each tick species can be estimated from reported records, the abundance in each state or county is more difficult to accurately determine since hosts represent only a subset of the total tick population in an area. The vegetation data collected for each tick species is more representative of the presence and abundance of tick species in a region; however, there were few records reported from the database of ticks from vegetation, thus host and vegetation were both included our analyses. Moreover, the reported data are limited and random due to collector's bias.

An increasing number of vector-borne disease studies have used Geographic Information System (GIS) and spatial analysis tools and methods for monitoring, surveillance, control, or risk mapping. They have been used to examine the distributions of several ixodid ticks such as *Rhipicephalus appendiculatus* (Neumann), *Ixodes scapularis* (Say), and *I. ricinus* (L.) (8, 9, 2, 6, 4). We also used GIS as a tool to determine what ecological factors might be influence the distributions of *D. andersoni*, Rocky Mountain wood tick and *A. maculatum*, Gulf Coast tick. Initial spatial analyses of the distributions of *D. andersoni* and *A. maculatum* included overlays of their distributions with annual average precipitation over a 30-year period and with national ecoregions. The Rocky Mountain wood tick appears to inhabit drier regions of the country with an average precipitation from 16.8 to 50.7 mm. The Gulf Coast tick appears to inhabit a moist region with an average precipitation of 79 to 148.7 mm. Preliminary analyses of ecoregion overlays with
each tick distribution indicated that *D. andersoni* may inhabit a dry domain that is a semi-arid and mountainous. These regions usually have cold, dry winters and warm, hot summers. Vegetation includes short prairie grasses with few trees and soil that is exposed and rich in bases with little organic material. *Amblyomma maculatum* may well be adapted to a more humid temperate domain where there are strong annual cycles of precipitation and temperature. These regions do not have really cold winters or a dry season and soils are moist and rich in iron and aluminum. Dominant vegetation in this region usually consists of secondary growth of longleaf, loblolly, and slash pine. Statistical analyses of the data will be performed for each species to more accurately define tick habitat characteristics. In addition, we will examine other base layers of data such vegetation, elevation, and soils to further determine if other environmental factors influence the distributions of these tick species.

Portions of this research were conducted under the National Institute of Allergy and Infectious Diseases Grant AI 40729 to JEK and LAD

Literature Cited:

Discussion highlighted that following further analysis this information may be able to predict areas of survival and development of specific tick species in the US. Furthermore it may be able to identify potential areas of introduction and subsequent establishment of invasive species. There is a need for current field tick data. Anyone with tick information for their geographical area is encouraged to contact CEAH.

Dr. Ralph C. Knowles (Vero Beach, FL) introduced Dr. Carter Black (State Veterinarian of Georgia, and Dr. Jim Watson (State Veterinarian of Mississippi) who expressed concern over a lack of advanced notice of animals coming to their respective states upon release from federal quarantine stations. They suggested that a system be put in place for electronic notification (facsimile or e-mail) to alert the state of destination of impending shipment of imported livestock just prior to their release from quarantine.

Dr. Knowles then presented a historical perspective on the introduction and potential risks associated with exotic tick introductions via wildlife species. It served as a reminder of the serious threat exotic ticks can pose to domestic livestock, companion animals, and wildlife species of the US. This report was also presented to the Infectious Diseases of Horses Committee. For full details see that committee’s report.

Dr. Conley Byrd, (State Veterinarian, Arkansas Livestock & Poultry Commission) presented a proposal for an “Electronic Certificate of Veterinary Inspection”. He stated that recent emergency program exercises in the US indicate that an improved method of tracking and analyzing the commercial movements of livestock would be crucial in responding to a foreign animal disease outbreak. To optimize response to a foreign animal disease outbreak, movement information must be available within a few minutes, to at most a couple of hours, to guide implementation of quarantines, surveillance, and epidemiological tracing of exposed or potentially exposed animals during the first critical 24 hour period after disease is detected.

Using the current paper system, it could take days or even weeks to process and analyze movements. The current interstate movement documentation system has many weaknesses: 1) The certificates are mailed to the state of origin which may take up to 30 days after the inspection and shipment of the animals; 2) Most originating states, because of shortages of personnel, conduct only limited review; 3) Once received by the state of destination they are processed in various ways, usually not involving data entry; 4) If information is needed and has not been previously recorded in some electronic format, it must be pulled manually from the filing system and compiled for analysis. The vast majority of international shipments present similar problems of processing and retrieval. An additional benefit for electronic certificates of veterinary inspection would be the ability to immediately determine whether the livestock in question meet the entry requirements for the state or country of destination prior to shipment.

Dr. Barbara A. Bischoff (USDA APHIS VS National Center for Import and
REPORT OF THE COMMITTEE

Export) reported on the status of U.S. import requirements concerning contagious equine metritis (CEM).

Background on CEM:

Contagious equine Metritis is a venereal disease of horses, discovered in 1977. It is categorized as List B disease by OIE. The causal organism is Taylorella equigenitalis. Countries Considered to be Affected by CEM include, Austria, Belgium, Bosnia/Herzegovina, Croatia, Czech Republic, Denmark, Finland, France, Germany, Guinea-Bissau, Ireland, Italy, Japan, Member States of the European Union, The Netherlands, Norway, Sweden, Switzerland, The Former Yugoslav Republic of Macedonia, The United Kingdom and the non-recognized areas of the former Yugoslavia (Montenegro and Serbia).

Actions taken by USDAAPHIS VS to improve detection of CEM positive horses include the establishment of a CEM Working group with State and industry representatives to provide information and advice related to proposed regulation changes to improve detection of CEM-positive horses. Also APHIS proposed regulation changes for horses imported from CEM-affected countries and temporarily suspended acceptance of horses tested through specific laboratories with evidence of questionable results. Furthermore APHIS implemented a revision of VS Memorandum No. 558.2, Approval of Laboratories (in the U.S.) to Conduct Diagnostic Procedures for Contagious Equine Metritis and established minimal standards for laboratories conducting pre-entry testing. In addition to these actions, in an effort for trilateral harmonization, APHIS and Canadian officials (CFIA) have been sharing information and holding discussions to harmonize, as much as possible, import regulations for CEM. Future meetings will also include Mexico. Dr. Bischoff presented the proposed requirements for the pre-entry testing of horses.

The ensuing discussion suggested a need for the inclusion of test breeding in the pre-entry testing protocols.

Dr. Larry Samples (Hummelstown, PA) of the Livestock Exporter’s Association, presented background information on a resolution to eliminate USDA APHIS VS User Fees on import and export veterinary inspections. He stated that since the USDA APHIS VS started collecting user fees, they have become a major contributing factor to the inflation of U.S. Import and Export prices and our inability to remain competitive in the World Market. It is inconsistent and contrary to the interest of U.S. Agriculture to have one part of the USDA (FAS) to spend money to promote U.S. livestock and germplasm exports and at the same time have another part of USDA (APHIS) tax livestock and germplasm exports sales with user fees. U.S. livestock and germplasm are one of America’s most important exports because they build markets for continual sales of other U.S. agricultural commodities, like grain and soy products. Dr. Samples further stated that it is in the best interest of U.S. agriculture and the U.S. economy the USDA APHIS VS user fees for livestock and germplasm exports be eliminated. That the funds needed to
provide those services be appropriated from other areas.

Discussion followed on the spectrum of user fees assessed by USDA and the need for more specific and direct language.

Dr. Najam Faizi, (USDA APHIS VS National Center for Import and Export) Reported on embryo movement involving the US. Dr. Faizi also commented on EU directive 999/2001 modified, which indicates that starting on October 1, 2001, ova and embryo imports from third countries are only possible upon an official veterinary certificate stating that no feed including animal derived protein was given to ruminant donor animals. He also indicated that this point had been discussed in the recent International Embryo Transfer Society (IETS) Health and Science Advisory committee (HASAC) meeting.

Dr. Reed Holyoak (Oklahoma State University, Stillwater, OK) presented more embryo movement related information coming out of the IETS. The following statement from the Health and Safety Advisory Committee of the International Embryo Transfer Society was issued concerning in vivo produced bovine embryos: Information from the trial involving embryos collected from Bovine Spongiform Encephalopathy (BSE) infected cattle which is in preparation for publication, strongly indicates that transmission of BSE by embryo transfer does not occur.

IETS encourages regulatory personnel to quickly adopt guidelines for the international movement of bovine embryos reflecting this information.

Other Import / Export Issues arising from the IETS HASAC Committee meeting relative to embryo movement: 1) Scrapie should now be moved to a Category 2 level disease, 2) Bovine Immunodeficiency virus should be moved to a Category 3 level disease, 3) and Porcine Reproductive and Respiratory Syndrome virus and Neospora caninum should be moved to Category 4 level diseases. Finally, Dr. Michel Thibier, IETS HASAC Chairman reported that over 540,000 bovine embryos were transferred and recorded worldwide in the year 2000.

Dr. Susan Tellez (Beaumont, TX) reported the U.S. import and export activities of I lamoids. She stated that activity has been steady in most respects. Alpaca imports have diminished due to the closure of the U.S. registries. However, alpaca exports have increased. Due to the nature of I lamoid embryos and the lack of research relating to disease transmission, there has been no international movement of germplasm.

The annual report to the USAHA from USDA APHIS VS and PPQ was presented by Drs. Lisa Ferguson, Barbara Bischoff and LeAnn Thomas. Their report follows:
(1) ANIMAL IMPORT ACTIVITIES

Overall, the number of imports was up over the previous year. The changes were slight, and would probably reflect a normal increase of commercial activity. The importation of equine semen is no doubt dramatically increased. Our figures indicate a modest increase, however, when we take into account the deregulation of equine semen as of October, 2000, from our largest trading partner, Canada, we have to conclude that much imported semen was not counted. Consequently, the actual increase must be much greater even than is reflected in this report.

The National Center for Import-Export (NCIE) is in the early phase of a major restructuring effort, and the past year has been one of transitioning and repositioning. Despite these challenges, and the confusion of changing responsibilities, we are adapting rapidly, and the new system continues to improve.

The previous years' import activity was dominated by concerns of foot-and-mouth-disease (FMD) affecting many of our trading partners. FMD incursions in Uruguay, Brazil, and Argentina compromised trade and protocol development in the southern regions of South America during the entire year. Outbreaks of FMD in the United Kingdom, Ireland, France and The Netherlands caused much concern in the early months; certainly March through June were dominated by FMD related activities. For a period of six weeks, a special force of 12 to 18 technical workers were dedicated to the sole activity of answering telephone and electronic mail regarding the status of FMD in other countries and USDA efforts in preventing incursions of FMD into the U.S. FMD concerns generated a number of policy changes aimed at prevention of inadvertent incursion via such fomite materials as the tack accompanying imported horses, and semen or embryo containers. In addition, existing policy was clarified and reinforced regarding external treatment of horses from FMD countries, and prohibition of offloading those transiting horses which had originated or transited FMD affected countries.

There has been much activity directed at upgrading equine import policy. A work plan is going forward to propose revisions in the contagious equine metritis (CEM) regulation with intention to strengthen our import requirements. A policy statement is in development, which will clarify the procedures for handling horses in-transit. Of particular significance will be the prohibition of offloading of horses transiting the U.S. The current decision tree, outlining step-by-step the procedures for isolating, handling and retesting exposed
IMPORT-EXPORT

horses is being revised to align the protocol with the most current science of testing methodology and incubation periods. The policy regarding private quarantine for special event participating horses is being restated and clarified. Two regulation changes are in the process of comment review; the regulation regarding importation of Spanish Pure Breed Horse importations, and the screwworm interim rule. We anticipate publication of a final ruling on both of these issues shortly. During last year, it was necessary to suspend the approval of an overseas laboratory vested with the responsibility of testing horses for CEM prior to shipment. New laboratory protocol has been established, NVSL and the suspended laboratory have agreed on procedures, and the laboratory has achieved reinstatement.

An Interim Rule regarding tuberculosis greatly impacts cattle imports from Mexico. Part of the new regulation is to recognize those Mexican States that have made satisfactory progress toward tuberculosis eradication, and to relax U.S. import requirements for such States. At the same time, the new regulation reinforces the obligation of each Mexican State to control their State Borders and to protect and improve their health status. Several States have made application for status recognition, and site visits are underway to verify the tuberculosis status in each of the Mexican States that requested recognition. States of intermediate tuberculosis status will only be allowed to import cattle of confirmed test status, and each shipment will require a permit. States of lowest or undetermined status will be prohibited from exporting cattle to the U.S.

There is an ongoing working group effort to harmonize the import requirements for animals entering North America. The group is currently examining the equine import requirements for Mexico, U.S. and Canada.

Standardization of animal import protocols is progressing, and we anticipate posting a number of import protocols on the World Wide Web in the near future.

Aquaculture activity continues to increase, presenting a unique array of challenges regarding oversight, approval and certification endorsement, to say nothing of unfamiliar diseases, treatment options and husbandry methods.

Table 1: Animal Imports FY 1998, 1999, 2000, and 2001

<table>
<thead>
<tr>
<th>LIVESTOCK IMPORTED</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine</td>
<td>2,075,492</td>
<td>1,199,125</td>
<td>2,128,208</td>
<td>2,558,641</td>
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<tr>
<td>Swine</td>
<td>4,174,399</td>
<td>2,832,770</td>
<td>4,183,077</td>
<td>5,069,951</td>
</tr>
<tr>
<td>Camelids</td>
<td>661</td>
<td>482</td>
<td>267</td>
<td>229</td>
</tr>
<tr>
<td>Cervids</td>
<td>469</td>
<td>1,714</td>
<td>1,592</td>
<td>2,610</td>
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<tr>
<td>Equine</td>
<td>38,786</td>
<td>25,964</td>
<td>42,325</td>
<td>43,295</td>
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</table>
REPORT OF THE COMMITTEE

LIVESTOCK IMPORTED

<table>
<thead>
<tr>
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<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
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<tbody>
<tr>
<td>Poultry</td>
<td>11,357,831</td>
<td>7,341,200</td>
<td>10,051,731</td>
<td>10,594,935</td>
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<tr>
<td>Sheep and goats</td>
<td>55,066</td>
<td>41,432</td>
<td>53,025</td>
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<tr>
<td>Other</td>
<td>155,860</td>
<td>1,065</td>
<td>9,288</td>
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<td>Zoo Animals</td>
<td>81</td>
<td>98</td>
<td>45</td>
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<tr>
<td>Total</td>
<td>17,858,645</td>
<td>11,443,850</td>
<td>16,469,558</td>
<td>18,372,114</td>
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Embryos (waiting info)

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<tr>
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<tbody>
<tr>
<td>Bovine</td>
<td>488</td>
<td>493</td>
<td>1,253</td>
<td>1,221</td>
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<tr>
<td>Equine</td>
<td>0</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Caprine</td>
<td>0</td>
<td>0</td>
<td>134</td>
<td>Pending</td>
</tr>
<tr>
<td>Ovine</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>Pending</td>
</tr>
<tr>
<td>Deer</td>
<td>89</td>
<td>0</td>
<td>0</td>
<td>Pending</td>
</tr>
<tr>
<td>Total</td>
<td>577</td>
<td>594</td>
<td>1,390</td>
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Semen

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<tr>
<td>Bovine</td>
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<td>2,137,416</td>
<td>2,894,307</td>
<td>2,507,740</td>
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<td>Equine</td>
<td>2,966</td>
<td>4,687</td>
<td>13,653</td>
<td>17,012</td>
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<tr>
<td>Porcine</td>
<td>3,361</td>
<td>7,653</td>
<td>12,556</td>
<td>19,548</td>
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<tr>
<td>Ovine</td>
<td>970</td>
<td>45</td>
<td>1,871</td>
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<tr>
<td>Elk</td>
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<td>3,316</td>
<td>5,007</td>
<td>1,297</td>
</tr>
<tr>
<td>Deer</td>
<td>250</td>
<td>0</td>
<td>1,245</td>
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<tr>
<td>Canine</td>
<td></td>
<td></td>
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<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>2,169,527</td>
<td>2,153,117</td>
<td>2,928,639</td>
<td>2,546,429</td>
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Bovine Imports by Port of Entry

<table>
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<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Ports</td>
<td>1,369,353</td>
<td>737,887</td>
<td>944,798</td>
<td>1,296,135</td>
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<tr>
<td>Mexican Ports</td>
<td>703,412</td>
<td>458,188</td>
<td>1,183,227</td>
<td>1,259,801</td>
</tr>
<tr>
<td>Total</td>
<td>2,072,765</td>
<td>1,196,075</td>
<td>2,128,025</td>
<td>2,555,936</td>
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</table>

Swine Imports by Port of Entry

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<th>1999</th>
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<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Ports</td>
<td>4,173,635</td>
<td>2,832,509</td>
<td>4,182,214</td>
<td>5,069,154</td>
</tr>
<tr>
<td>Mexican Ports</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>4,173,635</td>
<td>2,832,509</td>
<td>4,182,214</td>
<td>5,069,154</td>
</tr>
</tbody>
</table>

(II) AVIAN IMPORT ACTIVITIES

A) Poultry and Hatching Eggs

There were 15,566,300 poultry, including day old chicks, and 11,259,075 poultry hatching eggs imported into the United States during fiscal year (FY) 2001.

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 1,920 birds released from USDA-operated commercial bird quarantine facilities in FY 2001. There were 187,860 commercial birds released from USDA—supervised private bird quarantine facilities.

C) Pet Bird Program
There were 300 pet birds imported into the United States and quarantined at a USDA-operated animal import center during FY 2001.

D) Smuggled/Confiscated Birds
There were 559 birds seized by the USDA, U.S. Fish and Wildlife Service, or the U.S. Customs Service for illegally entering the United States in FY 2001.

E) Ratite Importations
During FY 2001, 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 importation costs.

In addition to the above report, a comprehensive policy statement is being drafted, which will clearly articulate the requirements and owner obligations for in-home quarantine of pet birds.

A proposal is in draft to provide regulation of microchip identification for birds. As the procedure is currently a common practice, USDA has acquired 11 electronic readers, capable of reading the more commonly used microchips, and will distribute them to the ports of entry having the most activity in this area.

(III) ANIMAL EXPORT ACTIVITIES
The Canadian restricted feeder program continues to improve, and has been modified to allow South Dakota cattle to participate. We are working toward year-around access to Canadian feeder cattle market, if we can resolve issues involving bluetongue and anaplasmosis.

Restricted Feeder Cattle exports to Canada, 2000/2001 season

<table>
<thead>
<tr>
<th></th>
<th>AK</th>
<th>HI</th>
<th>ID</th>
<th>MT</th>
<th>ND</th>
<th>NY</th>
<th>WA</th>
<th>SD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>4529</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13750</td>
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<tr>
<td>Alberta</td>
<td>1278</td>
<td>25626</td>
<td>127608</td>
<td>7926</td>
<td></td>
<td>8642</td>
<td></td>
<td></td>
<td>171080</td>
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<tr>
<td>Sask.</td>
<td>20253</td>
<td>969</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21222</td>
</tr>
<tr>
<td>Manitoba</td>
<td>88</td>
<td>2733</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2821</td>
</tr>
<tr>
<td>Ontario</td>
<td></td>
<td></td>
<td>607</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>607</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>5807</td>
<td>25626</td>
<td>148028</td>
<td>11628</td>
<td>607</td>
<td>17784</td>
<td></td>
<td>209480</td>
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</table>

During the past year, NCIE resolved import differences with Turkey and Egypt, and developed new export protocols with Poland and Romania. China’s team inspected some 40 potential exporters including bovine and swine semen collection centers and embryo centers in 14 U.S. States. For the first time, the U.S. exported more bovine embryos derived from beef breeds than
REPORT OF THE COMMITTEE

from dairy breeds.

NCIE negotiated 10 protocols with the Dominican Republic. Protocols were also negotiated with Trinidad-Tobago (goats), British Virgin Islands (swine), Peru (bovine semen and day-old chicks), Ecuador (day-old chicks and hatching eggs), and Mexico (show horses). NCIE staff accompanied a Chilean delegation that came to inspect and approve swine installations that sell swine and swine semen to Chile. NCIE is negotiating with the Andean Pact countries in South America the modification to regulations that affect the exportation of poultry products, live sheep and goats and their products, emu and ostriches, and the use of Rispens vaccine in chicks to control Marek’s disease. NCIE is still negotiating with Brazil and Argentina concerning protocols for horses and chicks in relation to the West Nile Virus (WNV). A telephone presentation about WNV was made for SENASA, the animal health department of the Government of Argentina. We gained access to the market for pork in Argentina, and salmon eggs in Chile in recent months.

Major export challenges include those of keeping negotiations science based in some highly political environments; working to influence multi-country/regional standard setting organizations including the European Union, OIE, Andean Community, and OIRSA in Central America; and unlinking of unrelated trade issues.


<table>
<thead>
<tr>
<th>LIVESTOCK EXPORTS</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine</td>
<td>165,022</td>
<td>148,269</td>
<td>110,228*</td>
<td>238,753*</td>
</tr>
<tr>
<td>Equine</td>
<td>33,803</td>
<td>53,510</td>
<td>50,118</td>
<td>98,919</td>
</tr>
<tr>
<td>Ovine</td>
<td>319,370</td>
<td>359,781</td>
<td>371,507</td>
<td>397,697**</td>
</tr>
<tr>
<td>Caprine</td>
<td>112,499</td>
<td>91,276</td>
<td>58,096</td>
<td></td>
</tr>
<tr>
<td>Swine</td>
<td>141,798</td>
<td>390,069</td>
<td>77,185</td>
<td>20,921</td>
</tr>
<tr>
<td>TOTAL LIVESTOCK</td>
<td>772,492</td>
<td>1,043,355</td>
<td>667,134</td>
<td>756,290</td>
</tr>
</tbody>
</table>

| POULTRY EXPORTS |
|-----------------|---------|---------|---------|---------|
| Day-Old Chicks  | 32,217,388| 40,643,722| 38,643,599| Pending |
| Hatching eggs (doz) | 81,769,832| 74,929,827| 65,521,644| Pending |
| Other live poultry/birds | 56,305,836| 56,624,321| 59,932,817| Pending |
| Ostrich         | 9,412   | 10,448  | 4,954   | Pending |

| GERMLASM EXPORTS |
|-------------------|---------|---------|---------|---------|
| Bovine semen      | 7,669,310| 10,225,784| 10,795,065| 60,407,413***|
| Equine semen      | 9,213   | 5,225   | 6,349   | 13,520  |
| Porcine semen     | 6,297   | 7,448   | 7,419   | 5,380   |
| Caprine/Ovine semen| 1,802   | 1,022   | 1,980   | 750     |
**IMPORT-EXPORT**

<table>
<thead>
<tr>
<th></th>
<th>1,318</th>
<th>2,765</th>
<th>3,712</th>
<th>1,275</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervine semen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bovine Embryos</td>
<td>18,370</td>
<td>16,383</td>
<td>22,846</td>
<td>15,246</td>
</tr>
</tbody>
</table>

* note number of live exports does not include restricted feeder cattle exports to Canada, which totaled 180,314 in FY 2000, and 209,480 in FY 2001

** this number includes both ovine and caprine exports

*** the accuracy of this number is being verified

(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. There continues to be a lot of activity in this area. The following paragraphs summarize most of these activities over the past year.

FMD outbreaks have led to many regulatory changes over the past year. In response to the situation in Europe, interim rules have been published which imposed restrictions due to FMD on the United Kingdom (including Northern Ireland), France, Ireland and the Netherlands. The situations in France, Ireland, northern Ireland, and the Netherlands have been reviewed and additional regulatory changes will be made as necessary based on these evaluations.

Because of continuing concerns regarding FMD risk in Argentina, VS initially published an interim rule requiring certification that Argentinean beef did not originate from animals that have ever been in specified areas along borders with Paraguay, Brazil, Bolivia, and Uruguay. Subsequently, however, FMD outbreaks were confirmed in Argentina and this rule was amended again to prohibit beef imports from Argentina.

Both Uruguay and a region of South Africa had previously been recognized as free of FMD. However, each of these countries had confirmed outbreaks of FMD and therefore interim rules were published which removed this recognition, thereby restricting imports.

VS completed an evaluation of the previous FMD outbreak in Japan, and published a rule proposing to reinstate the FMD free status (with restrictions) of Japan based on this evaluation.

VS completed an evaluation of the animal health status of Iceland in regard to dourine, glanders, equine piroplasmosis, and equine infectious anemia. As a result of this evaluation, a rule has recently been published removing the test requirements for these diseases for horses originating in Iceland.

VS proposed removing test requirements for tuberculosis and/or brucellosis for cattle from Australia and New Zealand.

The confirmation of cases of BSE in various countries has led to additional regulatory changes. Regulatory changes were published which moved various European countries – Germany, Italy, Spain, and Greece – to another category in 9 CFR Part 94.18. Import restrictions were previously applied to
these countries due to high risk factors for BSE, but after cases were con-
firmed the regulatory change was published to accurately reflect the fact that
the disease had been identified in these countries. In addition, Japan identi-
fied a case of BSE and was therefore added to the restricted list in Part
94.18, thereby prohibiting the import of live ruminants and most ruminant
products.

VS has ongoing evaluations of classical swine fever (CSF), Newcastle
disease, tuberculosis, and brucellosis in various Mexican states. It has
received requests for review of the animal health status of African Horse
Sickness in Saudi Arabia; Newcastle disease in Panama; FMD in Peru (spe-
cific to camelids); and FMD in Korea, Namibia, and Lithuania.

(V) VETERINARY MEDICAL OFFICE, PLANT PROTECTION AND
QUARANTINE

The past year has seen a substantial increase in activities due to the
outbreak of foot-and-mouth disease in the United Kingdom, Europe, Argen-
tine, and Uruguay and a number of significant regulatory changes pertaining
to bovine spongiform encephalopathy. One of the most significant changes
was the planned addition of 18 veterinarians to Plant Protection and
Quarantine’s infrastructure. These veterinarians will become an integral part
of PPQ’s agriculture quarantine inspection (AQI) program. Positions are
expected to be filled by January 2002 and will be located in Hawaii, Washin-
gton, California (2 positions), Arizona, Texas (2 positions), Florida (2 posi-
tions), Georgia, Virginia, New Jersey, Pennsylvania, New York (2 positions),
Michigan, Illinois, and Puerto Rico. These AQI veterinarians will provide guid-
ance and training on handling animal products, animal by-products, and in-
ternational garbage; conduct port reviews; and will work closely with state
agriculture officials.

With the approval of the Plant Protection Act (2000), PPQ’s civil penalty
authority was significantly increased. A Civil Penalties Action Team was
established to develop new guidelines for applying the increased penalty
authority and developed a comprehensive strategy for training, revision of
forms, regulations, and manuals, tracking of penalties, public education and
other related activities. This new penalties will have significant impact on
parties that are found to be in noncompliance with international garbage regu-
lations. For instance, maximum penalties can be as high as $500,000. Full
implementation of the new penalties is anticipated over the next several
months.

PPQ continues to increase the number of dog teams. In June 2001,
there were a total of 99 dog teams that were located in a total of 19 states.
There are additional plans to add another 24 teams in FY 2002. An additional
$3 million has been allocated in FY 2003 to fund, hiring, training, and deploy-
ment of 30 additional dog teams. This will increase the number of dog teams
to 153.
IMPORT-EXPORT

ACTIVITIES  
September 2000 - August 31, 2001

Vessels and Aircraft Arrivals

- 62,868 Vessels arrived
- 50,104 Vessels boarded
- 7,286 Vessels monitored for garbage violations
- 8,703 Lots consisting of 12,663,328 kg of garbage were removed from these vessels
- 544,523 Aircraft arrived from foreign locations
- 48,784,657 Garbage removed from foreign arrival aircraft (kg)

Meat and Other Animal Products Confiscated/Refused Entry

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of Lots</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime</td>
<td>4,608</td>
<td>870,293</td>
</tr>
<tr>
<td>Aircraft</td>
<td>240,368</td>
<td>255,381</td>
</tr>
<tr>
<td>Border crossing</td>
<td>55,983</td>
<td>129,129</td>
</tr>
<tr>
<td>Post Office</td>
<td>8,543</td>
<td>14,956</td>
</tr>
</tbody>
</table>

Miscellaneous Categories

- Footwear cleaned and disinfected 224,724
- Maritime civil penalties* 140 totaling $21,900
- Baggage civil penalties* 13,405 totaling $738,078
- Notification violations* 58 totaling 16,500

* Partial data for FY 2001
REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES OF CATTLE, BISON AND LAMA

Chairman: Dr. James J. England, Caldwell, ID
Vice Chairman: Dr. Howard D. Lehmkuhl, Ames, IA

Dr. Helen M. Acland, PA; Mr. Sam Albrecht, CO; Dr. Bob H. Bokma, MD; Dr. Carole A. Bolin, MI; Dr. Steven R. Bolin, MI; Dr. Bruce L. Branscomb, NV; Dr. H. Michael Chaddock, VA; Dr. Wilber W. Clark, MT; Dr. Thomas F. Conner, IN; Dr. George M. Crenshaw, CA; Dr. A. A. Cuthbertson, NV; Dr. Allan L. Dewald, SD; Dr. Julie Drier, MN; Dr. Murray E. Fowler, CA; Mr. Bob Frost, CA; Dr. John E. George, TX; Dr. Michael J. Gilsdorf, MD; Mr. Daniel M. Goodyear, PA; 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. David L. Hunter, MT; Dr. Julie Ann Jarvinen, IA; Dr. Robert F. Kahrs, FL; Dr. Arthur J. Kennel, MN; Dr. John D. Kopec, MD; Dr. William W. Laegreid, NE; Dr. Donald H. Lein, NY; Ms. Janet Maass, CO; Dr. Donald E. Mattson, OR; Dr. Patrick L. McDonough, NY; Dr. Robert M. Meyer, CO; Dr. Janice M. Miller, IA; Dr. Michael W. Miller, CO; Dr. Donald R. Monke, OH; Dr. Raymond L. Morter, IN; Dr. Louis E. Newman, NC; Dr. Phillip A. O’Berry, IA; Dr. Bennie I. Osburn, CA; Dr. Robert J. Pollard, CA; Dr. John A. Schmitz, NE; Mr. C. Marbury Seaman, Jr., VA; Dr. Lynne M. Siegfried, PA; Dr. Clarence J. Siroky, WI; Dr. Susan M. Stehman, NY; 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. Cheryl B. Tillman, OR.

Minutes of Committee on Infectious Diseases of Cattle, Bison and Lama

Hershey, PA
James J. England, Chair
Howard D. Lehmkuhl, Vice-Chair

The Committee meeting was opened at 12:30p, November 5, 2001. It was announced by the Chairman that the committee would meet only on Monday afternoon. Attendance ranged from 35-45 during the afternoon. Seven invited speakers presented on timely topics relative to diseases or situations affecting cattle, bison and llamas. The summaries follow.

Ms. Susan Tellez addressed the Committee regarding an apparent increase in the occurrence of enterotoxemia in llamas and she suggested that llama and alpaca owners be watchful. It was suggested that we consider a presentation on this disease during the 2002 meeting.

Several attendees requested to be named to the Committee membership and their names were submitted to the President.

The Committee unanimously supports the USAHA Resolution No. 1.
The incidence of naturally occurring anthrax in livestock has been sporadic in various locations in the United States during the 20th Century. In the predominant endemic area in Texas (a five county area in the southwestern part of the state along the border with Mexico) generally one or two culture confirmed cases per year have occurred. However, in the summer of 2001, an unusually high number anthrax cases were clustered in the aforementioned five county area. A total of 11 cases were laboratory confirmed, and an estimated 71 properties (preliminary data from the CDC survey team) experienced death losses (in either domestic livestock, exotic livestock, or free ranging cervids) due to the disease. The live avirulent Sterne strain vaccine (available through Colorado Serum Co.) has been proven to be safe and efficacious in livestock. Since the occurrence of the disease cannot be anticipated, producers in the endemic area are encouraged to vaccinate their livestock annually to prevent possible infection. All unusual death losses (regardless of presumed etiology) should be reported to private or public veterinary officials in order to achieve a rapid specific diagnosis to minimize the spread of an emerging or exotic disease.
FMD and South American Camelids

Bob Frost, Lincoln, CA

Foot and mouth disease (FMD) is a virus that is present or has been present on most continents of the world (except Australia and Antarctica) for centuries. The United States has not had an outbreak since the 1920’s. Canada and Mexico have had outbreaks in the 1950’s. The events of this past year have focused attention by governments, governmental agencies, livestock industries, agribusiness and world trade leaders on the magnitude of the emotional and financial impact of FMD.

Llamas and alpacas are highly resistant to FMD virus infection. Experimental research conducted at the Plum Island Research Center in New York and in Argentina concluded that llamas are highly resistant to the virus and that even when experimentally infected, the animals do not carry the virus for longer than 14 days. However, FMD virus was isolated from at least one alpaca from a herd of alpacas cohabitating with cattle during an FMD outbreak in Peru.

South American Camelids (SAC) are not considered to be potential carriers by federal regulatory officials. It would be incorrect to say that llamas and alpacas could not, under any circumstance, develop FMD during an outbreak in other livestock. While government officials understand that llamas and alpacas are highly resistant to FMD virus, no one can say with finality that infection couldn’t happen.

There are vesicular diseases that must be readily distinguishable in SAC from the FMD virus. Vesicular stomatitis virus (VS), bluetongue virus (BTV), epizootic hemorrhagic disease virus (EHDV) and rinderpest are of concern to regulators because the clinical signs are indistinguishable from FMD. Only one case of VS in a llama has been confirmed. No animal reservoir has been identified. VS has a broad host range and since it periodically occurs in the United States, must always be considered in the differential diagnosis of any vesicular disease. BTV positive serological responses have been reported in SAC, but there is no evidence that clinical disease occurs. The challenge to producers and regulators is to determine through research the viremia of BTV and EHDV in llamas and alpacas and to validate diagnostic tests specifically for SAC.

Vaccination against FMD is currently not allowed in the United States by order of the USDA.

Recommendation currently being made to llama and alpaca owners in the unfortunate event that FMD is diagnosed in the United States.

a. Do not bring any new animals onto your farm during the crisis.
b. Avoid transporting your animals anywhere
c. Make no visits to farms with cattle, sheep or swine.
d. Discourage visitation to your farm.
e. Avoid mixing llamas and alpacas with other livestock species on the farm.
f. Follow a policy of strict adherence to policies and procedures instituted by government officials.
ACARICIDE-RESISTANT *BOOPHILUS MICROPLUS* AND THE PROTECTION OF U.S. CATTLE AGAINST CATTLE FEVER TICKS AND BABESIOSIS

John George

The occurrence in Mexico of multiple forms of resistance of the southern cattle tick, *Boophilus microplus*, to acaricides threatens to compromise the ability of the Cattle Fever Tick Eradication Program of APHIS, VS to prevent the re-infestation of the southern U.S. by this vector of the agents of bovine babesiosis. Organophosphate- (OP), pyrethroid- (P), and, recently, amitraz-resistant *B. microplus* have been removed from animals in groups of Mexican cattle presented at a VS Import facilities for export to the U.S. In an efficacy trial in which groups of cattle infested with all three parasitic stages of a P-resistant strain of ticks were dipped in permethrin at a concentration that kills >99% of a susceptible tick strain, about 65% of the ticks, including individuals that were engorging females, nymphs, and larvae at the time their hosts were treated, survived the treatment. In a similar efficacy trial with one OP-resistant strain of *B. microplus* dipped the 0.3% active ingredient (AI) concentration of coumaphos used in the vats at Import Facilities, some engorging females of survived the treatment, but no ticks that were nymphs or larvae survived. Appreciable survival of larvae, nymphs, and engorging females of another OP-resistant *B. microplus* strain was observed when cattle infested with this strain were dipped in 0.03% AI coumaphos. These alarming results indicate that if tick inspectors at an Import Facility overlook immature ticks on an animal, some OP resistant ticks could survive the official dip, complete their development, and detach from the host in the U.S. An efficacy trial with amitraz-resistant ticks is planned. In view of the presence of the resistant ticks in Mexico and the demonstrated ineffectiveness of coumaphos and permethrin, and, probably, amitraz as the means of protecting against introduction of acaricide-resistant *B. microplus* to the U.S., there is a need for an assessment of procedures employed at cattle import facilities and the associated risks. Even though the discovery of the first acaricide-resistant ticks in the U.S. involved A resistance in two outbreaks in Zapata Co., TX, the possibility of the occurrence of OP or P resistance is real. Research to create improved tools for the diagnosis and control of acaricide-resistant ticks, continuous assessment of the problem, and revisions of the strategies and regulations of the eradication program must be an ongoing process.
LEPTOSPIRA SUMMARY

During the period of October 1, 2000 through September 30, 2001, the National Veterinary Services Laboratories Leptospira Reference Center received a total of 1923 sera submitted for Leptospira microscopic agglutination test (MAT). Of these, 947 were for diagnostic and 976 were for export purposes; total number of tests performed were 11,620. During this same period, clients requested and were provided 192,670 milliliters of polysorbate 80-bovine albumin medium, 425 Leptospira reference cultures, 348 vials of Leptospira reference antiserum, 100 vials of Leptospira multivalent fluorescent antibody conjugate, and 22 vials of flazo orange counterstain. Six people from ten states (AR, FL, IA, MA, and WI) participated in a two day Leptospira MAT training. Leptospira MAT training schools will also be offered in 2001 to meet incoming training requests. A total of 38 Leptospira microscopic agglutination check tests were also requested.
REPORT OF THE COMMITTEE ON INFECTIONOUS 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. Ed Corrigan, WI; Dr. Anthony G. Frazier, AL; Dr. E. Paul J. Gibbs, FL; Dr. Mary H. Giddens, OR; Dr. Chester A. Gipson, VA; Dr. Steven L. Halstead, MI; Dr. Robert M. Harbison, AR; Dr. Sharon K. Hietala, CA; Dr. Robert B. Hillman, NY; 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, DC; 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. Vail, 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, November 4, 2001 from 12:30 – 3:30 p.m. in the Monarch I Conference Room of the Hershey Lodge and Convention Center, Hershey, Pennsylvania. Forty-eight attendees were recorded on roll. A variety of pertinent topics were presented, including a half hour scientific paper on West Nile Virus Outbreak Among Horses in New York State, 1999 & 2000.

A business meeting followed the scientific session. The Equine Infectious Anemia Subcommittee report was accepted, although the following three areas were vigorously discussed and should be explored further: (1) equine infectious anemia testing requirements for interstate movement of horses, (2) permanent equine identification, and (3) the approval process and training provisions for testing laboratories.

The following resolutions were approved at the business meeting:
(1) Subject Matter: USDA ARS/APHIS Master Plan
Background Information: The United States Department of Agriculture (USDA) has identified the need to establish, fund and maintain a new facility in Ames, Iowa, to meet urgent national needs for research, diagnosis and product evaluation related to animal health. The proposed facility will replace outdated and inefficient facilities currently used by the Animal and Plant Health Inspection Service (APHIS) National Veterinary Services Laboratories (NVSL), the APHIS Center for Veterinary Biologics (CVB), and the Agriculture Research Service (ARS), National Animal Disease Center (NADC).
In 2000, the USAHA passed a resolution supporting the construction of the Master Plan for Facilities Construction and Modernization, and both Houses of Congress responded by appropriating $40 million for planning.

USDA’s ARS-APHIS Master Plan for facility consolidation and modernization is of vital concern to the USAHA. The United States presently cannot meet the standards we require of our trading partners, nor will we be able to continue to meet the requirements established by the Office of International Epizootics (OIE). The deplorable condition of these laboratories jeopardizes the health of the nation’s vast animal populations including its animal industries, and places our country in a position of reliance on foreign laboratories and foreign diagnostic procedures.

The 120 billion dollar* animal industry is second to none in the world and it contributes greatly to the positive side of our trade balance. This nation’s livestock stakeholders and citizens must have modern, updated diagnostic, research and reference laboratory facilities if they are to compete in the international marketplace. These updated facilities are critical to detect and prevent the incursion of devastating and deadly foreign animal or emerging diseases into the United States.

The USAHA and other national stakeholders must inform their memberships and their government representatives of the urgency to implement the USDA’s Master Plan. The recent outbreak of Foot and Mouth Disease in the United Kingdom and terrorist acts including the deliberate exposure of humans to anthrax demonstrate the necessity of the United States having increased and improved capacity to respond. Such action is necessary to safeguard this nation’s animal health and trade, and to protect the citizens of the United States of America from food-borne diseases, bioterrorism, and emerging and foreign animal disease.

Resolution: The United States Animal Health Association strongly supports the United States Department of Agriculture’s Agriculture Research Service (ARS) - Animal and Plant Health Inspection Service (APHIS) Master Plan for Facility Consolidation and Modernization of the ARS National Animal Disease Center, the APHIS National Veterinary Services Laboratories, and the APHIS Center for Veterinary Biologics and recommends the immediate funding of all costs of construction, equipping, operation and maintenance of the Ames, Iowa National Animal Health facilities depicted in the United States Department of Agriculture six-year Master Plan. We applaud the recent support shown by both houses of Congress in appropriations for planning the facility, but that is not sufficient for the most rapid and efficient programming and construction of these critical facilities. These facilities are essential to protect and ensure our nation’s food safety and supply and its 120 billion dollar* animal industries.

USAHA encourages Congress to provide mandatory funding for the Master Plan.

This resolution shall be delivered to the Secretary of Agriculture, Con-
REPORT OF THE COMMITTEE

gress, and the President of the United States of America.

* Note: The estimated valuation of the animal industry of a 120 billion was considered a significant underestimation. It is strongly recommended that the figure be revised to more accurately reflect the current value of this industry to the national U. S. economy.

(2) Subject Matter: West Nile Virus Research

Background Information: Whereas West Nile Virus (WNV) is an inadequately understood arboviral infection of equids, humans, birds, and other species,

And whereas more information is urgently required about the major vectors involved in the spread of the virus to equids,

Resolution: USAHA resolves that USDA, APHIS, ARS facilitate research to better understand the epidemiology of WNV infection in equids,

(3) Subject Matter: West Nile Virus Program Support

Background Information: Whereas WNV was first discovered in the U. S. in 1999 and is now in an increasing number of eastern and midwestern states, and

Whereas the funding and resources dedicated to the WNV national program have been inadequate to meet the needs associated with this emerging disease in equids and wildlife, and

Whereas laboratory support from NVSL has been severely compromised by lack of adequate resources,

Resolution: Be it resolved that USDA, APHIS, VS:
1. No longer consider WNV as a foreign pathogen to the U. S.,
2. Provide the necessary resources to assist states with field activities, standardized data collection, analysis and reporting, and
3. Enable NVSL to provide both laboratory testing capability and antigen supply to meet demand.

(4) Subject Matter: Contagious Equine Metritis Testing Procedures for Stallions

Background Information: Whereas Contagious Equine Metritis (CEM) is a contagious venereal disease of equids of continued significance with respect to international trade, and

Whereas CEM is a foreign animal disease to the U. S., and

Whereas a significant number of CEM carrier stallions imported into North America since 1997 were only detected by test breeding and not bacteriological examination, and

Whereas the CEM procedures referenced in the 2001 OIE Chapter on CEM only specifies laboratory testing as the screening method for the detection of CEM carrier stallions and mares,

Resolution: Be it resolved that USDA, APHIS, VS request the OIE Animal Health Code Commission review and amend the 2001 OIE Chapter on CEM Articles 2.5.1.2 and 2.5.1.3, to include pre- and post-entry test breeding of stallions as an essential requirement for importation from known
An outbreak of arboviral encephalitis attributable to West Nile virus (WNV) was first recognized in the United States in 1999. WNV is primarily transmitted between mosquitoes and birds, but transmission to mammals can occur when infection occurs in mosquito species that feed on birds and mammals. During 1999, 20 equine cases of WNV encephalitis were confirmed in the US, all in New York. In 2000, 23 equine cases were identified in New York, with more equine cases identified in New Jersey, Delaware, Rhode Island, Massachusetts, Connecticut, and Pennsylvania. Cases continue to be reported in New York in 2001 and additionally have been diagnosed in Florida, Georgia, Kentucky and other southern and mid-western States.

1999 Investigations

Veterinarians with New York State Dept of Agriculture and Markets (NYSDAM) and USDA investigated reports of an unusual cluster of such illness occurring among horses residing on Long Island. The investigations were initiated by reports from practitioners who treated the cases. A single practitioner reported most of the cases and active case finding was initiated by contacting other veterinary practitioners to determine whether similar cases of equine neurologic illness had been observed in the area. Tissue and blood samples were collected when available and submitted to the National Veterinary Services Laboratories (NVSL) for testing and forwarded to the Centers for Disease Control and Prevention (CDC) for confirmation, as necessary.

There were 20 cases (one pony and 19 horses) of equine neurologic illness laboratory confirmed as WNV, all residing on Long Island. Five addi-
tional horses were probable cases. These five horses had clinical onset early in the outbreak between August 28 and September 24, before the cluster was reported. They were included as probable based upon 1) clinical signs consistent with WN infection, 2) all died or were euthanized less than 72 hours after onset, 3) resided in the local area where other equine cases were laboratory confirmed, 4) had surviving stablemates which were seropositive for WN and 5) did not have tissues collected or sera available for WN testing. The illness, characterized by an acute onset of rear limb ataxia, included muscle tremors, knuckling over at the fetlocks and in some instances the horses were found recumbent and unable to rise. The first case-horse became ill on August 26 and the last case onset was October 23 (Figure 1).

Four of the 20 cases died or were euthanized. All survived for three or four days before euthanasia. Necropsy samples collected from three of these horses yielded WNV from brain or spinal cord tissue. The fourth horse demonstrated a WNV titer (>1:320) from a sample collected three days after clinical onset. The four dead horses ranged in age from four to 21 years old (average = 11.0). Sixteen of the case-horses recovered fully and had neutralizing antibody titers to WNV ranging from ≥ 1:100 (NVSL) to ≥ 1:1280 (CDC). The 20 case-horses ranged in age from two to 28 years old (average = 13.2). There were 13 mares, three geldings and four stallions.

The 20 cases and five probable cases resided on 18 different premises in Nassau or Suffolk Counties at the time of onset of illness. Stable mates were identified on 15 of the 18 premises. Samples were collected from 69 asymptomatic stable mates. Of these, 20 (29%) were found to have titers ranging from 1:160 to ≥ 1:1280 to WNV. Although these horses ranged in age from one to 37 years old (average = 11.2), there was no statistically significant difference when compared to the case-horse ages. There were 27 mares, 32 geldings and eight stallions.

2000 Investigations

In 2000, there were 23 WNV encephalitis cases confirmed in horses in New York State. Diagnostic samples were submitted to the New York State Animal Disease Diagnostic Laboratory (NYSADDL) in Ithaca, NY. All positive diagnoses were made based on the presence of IgM antibody and positive WNV neutralization, a demonstrated 4-fold rise in virus neutralization titer from paired serum samples or the detection of viral sequence by reverse transcriptase-polymerase chain reaction (RT-PCR) performed at the NVSL. One horse was diagnosed by real-time RT-PCR testing at the Arbovirus Laboratory of the Wadsworth Center, NYS Department of Health. Although no infectious virus was grown in VERO cell culture, the brain sample was also positive using two sets of primers/probes (1160 set and 3111 set).

The first New York case-horse had clinical onset on August 18 and resided on Staten Island. The last case-horse had onset of clinical signs on November 1 (Figure 2). Date of onset of clinical illness could not be deter-
mined or approximated for one horse based upon the owner’s recall.

The index horse had positive titers (IgM 1:1000 and PRNT ≥1:100) for WN virus. Six other case-horses had the same titers as the index horse. Nine cases presented with IgM titers of 1:10 and PRNT titers of ≥1:1000. Six horses had various combinations of IgM (1:10 – 1:100) and/or PRNT (≥1:100) titers. One horse, with negative serology, was diagnosed by RT-PRC by the NYSDOH Arbovirus Laboratory. This brain sample was also positive using two sets of primers/probes.

Horses presented with ataxia (95.7%), primarily rear limb (90.5%) and muscle fasciculations or trembling (55%). Many had acute onset (90.5%). Other case-horses presented down; some were able to rise with assistance while others could not stand. Only 32% of the horses presented with elevated temperatures (Table 1). Eight of the case-horses died or were euthanized; seven died within three to four days of clinical onset. One horse was euthanized 14 days after onset of illness. The average age of the horses that died was 14.4 years, similar to the age of surviving horses of 14.7 years. No significant differences among gender and no breed predisposition for the development of clinical disease was detected. Equine-cases occurred in Suffolk (8), Orange (6), Nassau (5), Bronx (2) and Richmond (2) Counties.

Duration of Titers

In an effort to determine the duration of WN titers we requested samples from previously infected horses. During January 2001, serologic samples were collected from 35 of the 1999 WN positive adult horses. Detectable titers were found in all 35 of these horses.

Case – Control Efforts, 2000

Samples were submitted the NYSADDL from many horses across New York State. Attempts were made to contact veterinarians who submitted samples requesting WNV testing on equine sera. When the veterinarian could be reached they were interviewed to determine if the submission was for diagnostic purposes. Veterinarians were asked to provide the clinical picture presented by the ill horse. Only horses which were described with a primarily neurologic component were included in the study (e.g. lameness was excluded). Comparison of the clinical findings of the 23 case-horses to 19 non-case horses presenting with similar clinical signs but with no laboratory evidence of WNV infection was compiled (Table 1). No statistically significant difference could be found when comparing the two groups. The average age of the non-case horses was 14.4 years (range: 2-28). The results indicate that WNV cannot be diagnosed on the basis of clinical signs alone.

Staten Island Surveys (mosquito, horse and wild bird)

A serosurvey of horses on Staten Island was conducted during September 2000. Ninety-one (91) clinically normal horses from seven stables located within three miles of the index case-horse were sampled. The number of horses per location varied between one and 36. Seven seropositive horses
were identified at three stables, including the stable mate of the index horse. At one stable five of six horses sampled evidenced titers to WNV. One of the five horses had a positive IgM capture ELISA (1:100) and PRNT positive at 1:10. Sera from the other four horses were negative via the IgM capture ELISA test, but positive at $\geq 1:100$ with the PRNT at NVSL. Sera from the two other positive horses at the other two stables was negative to the IgM capture ELISA test, but positive at 1:10 via the PRNT.

Mosquito surveillance conducted by the New York City Department of Health (NYCDOH) within a two-mile radius of the three positive premises from July to November resulted in 44 WNV positive pools. These included *Culex pipiens* that feed only on birds, *Cx. salinarius* which feeds on both birds and mammals, *Aedes vexans, Ae. triseriatus* and *Psorophora ferox* which feed mainly on mammals. In July, *Cx. salinarius* was the only positive mosquito pool in this radius. One week after the index horse become ill, the NYCDOH began trapping mosquitoes at his stable. WNV was identified in a pool of *Aedes vexans* trapped on the premises of the index-horse 10 days after this horse became ill. The finding of an infected *A. vexans* pool in the stable area of the index horse was the first identification of this mosquito, a known mammal feeder, as positive for WNV in New York.

There were two case-horse on Staten Island where 10 human cases occurred. The first horse-case had clinical onset on August 17. During the 10 days prior to August 17, on Staten Island, there were 41 positive mosquito pools, nine positive wild birds and four human cases within 10 miles of the stable. The second horse-case on Staten Island had clinical onset on September 8. Within 10 days before that date and within 10 miles in New York, there were 15 positive mosquito pools, seven positive birds and another human case reported on Staten Island. No other counties in New York with horse cases reported human cases in 1999 or 2000.

Sampling of stable mates of the ill horses identified infection in asymptomatic horses. The number of positive horses per premises varied between one and most of the horses in the herd. Level of infection in local mosquitoes, whether the infected mosquito species is likely, or has the opportunity, to feed on horses will determine whether or not horses become infected.

Summary

West Nile infection in horses may cause an acute, fatal neurologic disease, but many horses do not develop clinical disease. Moderate to severe ataxia, weakness and rear limb incoordination were the most consistent presenting signs among case-horses, however the presence of fever, a component of the human case definition, was not. Although treatment varied, it was primarily directed to relieving clinical signs. In some instances where the horses were only mildly affected, no treatment was given and clinical signs resolved in two to seven days. In all but one instance, horses that were most severely ill did not survive beyond four days post-onset. Horses that survived, although taking a variable length of time to recover, did recover fully.
The epidemiologic curve of the equine outbreak in 1999 is similar to the equine cases in 2000. During both years, equine cases occurred after the human and wild bird cases in the area. In each instance where equine cases occurred, virus activity in wild birds and/or mosquitoes had already been identified in the local area.

Unlike human cases, veterinarians cannot rely on the presence of fever to aid in diagnosing WNV in horses. Although many horses in New York presented with similar clinical signs, the overwhelming majority tested negative for evidence of WNV. Equine herpes virus, equine protozoal myelitis and lead intoxication are among the other differentials to consider for horses presenting with neurologic signs. Unfortunately clinical presentation of WNV horses is non-specific. In other NY counties, the presence of equine cases did not precede WN findings in mosquitoes and wild birds, nor did it predict human cases.

Hopefully, the advent of an efficacious vaccine will minimize the effect of this virus on equine health and the horse owning public.

Table. Horses presenting with neurologic illness New York, 2000

<table>
<thead>
<tr>
<th>Sign</th>
<th>Number of Case-horses*</th>
<th>Number of Non-case horses**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ataxia</td>
<td>22/23 (95.7%)</td>
<td>16/19 (84.2%)</td>
</tr>
<tr>
<td>Rear</td>
<td>19/21 (90.5%)</td>
<td>15/19 (78.9%)</td>
</tr>
<tr>
<td>Quad</td>
<td>15/20 (75%)</td>
<td>9/19 (47.4%)</td>
</tr>
<tr>
<td>Acute onset</td>
<td>19/21 (90.5%)</td>
<td>12/18 (66.7%)</td>
</tr>
<tr>
<td>Fever (&gt;101)</td>
<td>7/22 (31.8%)</td>
<td>8/15 (60%)</td>
</tr>
<tr>
<td>Fever</td>
<td>102.4°F</td>
<td>104°F</td>
</tr>
<tr>
<td>Range</td>
<td>101.4 – 103</td>
<td>102 – 106</td>
</tr>
<tr>
<td>Muscle fasciculation</td>
<td>11/20 (55%)</td>
<td>5/19 (26.3%)</td>
</tr>
<tr>
<td>Almost fall'</td>
<td>8/17 (47.1%)</td>
<td>6/18 (33.3%)</td>
</tr>
<tr>
<td>Down</td>
<td>9/22 (40.9%)</td>
<td>4/17 (23.5%)</td>
</tr>
<tr>
<td>Rise with assist</td>
<td>6/21 (28.6%)</td>
<td>5/18 (27.8%)</td>
</tr>
<tr>
<td>Died</td>
<td>8/23 (34.8%)</td>
<td>8/19 (42.1%)</td>
</tr>
<tr>
<td>Dull, lethargic</td>
<td>5/19 (26.3%)</td>
<td>10/19 (52.6%)</td>
</tr>
<tr>
<td>Hypermetric</td>
<td>4/16 (25%)</td>
<td>4/19 (21.1%)</td>
</tr>
<tr>
<td>Agitated</td>
<td>3/19 (15.8%)</td>
<td>2/18 (11.1%)</td>
</tr>
</tbody>
</table>

* WNV confirmed via laboratory testing
** WNV negative via laboratory testing
'Private practitioners reporting that circling the horse would cause it to fall.
REPORT OF THE COMMITTEE

Figure 1 Onset Date of Horses Presenting with Neurologic Signs, Suffolk & Nassau Co., 1999*

Figure 2 Onset Date of West Nile Case-Horses, New York, 2000

*Includes presumptive & confirmed cases

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The spread of West Nile virus (WNV) through North America is continuing. Twenty-seven states and the District of Columbia have found evidence of the virus this year. Virus activity has been found as far west as Iowa and Louisiana, as far south as the Florida Keys, and as far north as Maine. More than 5,400 WNV-positive wild birds have been detected through October. Fifteen states have found WNV positive mosquitoes and there have been 44 human cases of illness in 8 states, including one death.

As of October 31, 347 ill horses were classified as having had a confirmed or probable clinical case of WNV infection. Fifty-nine of those horses died or were euthanatized. Since 1999, at least 91 horses have been lost in the U.S. due to WNV infection. Cases of WNV illness in horses have been detected in 18 states, including 11 where WNV had not been seen prior to 2001: Alabama, Florida, Georgia, Illinois, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Tennessee, and Virginia. Most of the equine cases have been in Florida (252) and Georgia (30), although a cluster of at least 8 equine cases was detected in one county in Massachusetts. One horse residing in the “bluegrass region” of Kentucky was confirmed with WNV illness but recovered. The first onset of illness in a horse this year was June 25. At least 85 horses became ill prior to August 17, the date that had previously been the earliest known onset of WNV illness in a U.S. horse.

The good news is that progress has been made in preventing WNV illness in horses. VS’ Center for Veterinary Biologics granted a one-year conditional license for a WNV vaccine for horses on August 1. The killed virus product, produced by Fort Dodge Animal Health (American Home Products), has been shown to be safe and pure, and to have a reasonable expectation of efficacy against WNV infection in horses. Over one million doses of vaccine have been distributed to veterinary practitioners so far. Testing of serum from vaccinated horses indicates that IgM antibody to WNV is not likely to be found in a vaccinated horse. High levels of WNV neutralizing antibody are present after the second dose of vaccine is given, but may not be present in protective levels prior to that time.

CEAH released results of a case-control and spatial data analysis of WNV in horses in the year 2000. The study was done in collaboration with seven states that had equine cases of WNV infection in 2000. Results indicate that housing horses in stalls at night may slightly decrease their risk of infection, but also that within regions of WNV activity the infection of individual horses appears to be a chance event. This suggests that vaccination may be one of the most practical means of preventing WNV infection in horses. Results of the study can be found at: http://www.aphis.usda.gov/vs/ceah.
REPORT OF THE COMMITTEE

SUMMARY OF WEST NILE VIRUS PLANNING SESSION FOR STATE VETERINARIANS

By Ernest W. Zirkle, DVM

The WNV Planning session for State Veterinarians was held in Trenton, New Jersey on August 28, 2001, with 9 states in attendance in person and 10 states on conference call for the entire meeting. The meeting was called by Dr. Ernest Zirkle, the State Veterinarian of New Jersey, when it was announced by USDA, Veterinary Services that they would not be facilitating any kind of collection and/or epidemiological study this year. It was felt that it was critical that the states with WNV exposure should meet to discuss a coordinated system of survey and sampling that would produce meaningful results for future reference and study.

A list of issues that need to be addressed further was developed and submitted to USDA, VS for comment. The following list was submitted to Veterinary Services September 10, and to this date there has been no response.

1. Disease status issues:
   a. When can we expect an official statement on whether WNV is a FAD? The consensus of the group was that it is endemic and should be classified as such.
      > Ft. Dodge claims this designation directly impacts their ability to perform challenge studies.
      > Who can designate official positive cases? If it is endemic then State Laboratories should be official.
   b. We need research on WNV (ARS). There are now 17 known species of mosquitoes carrying the virus. Which are vectors for the horse? How is the virus spread from area to area? We strongly believe that research on the equine may provide keys to the spread of the disease among the human population. Sources of funding could be similar to the large amounts going to state health departments.
   c. Most states in attendance reported an alarming number of neurological cases that are WNV negative. Most are tested for EEE, rabies, EHV and sometimes EPM. They are still negative and are dropped as unknown etiology. These should also be studied.
   d. While we agree that WNV is an endemic disease, it is still an emerging disease with human health significance. We request that VS reconsider their stance of not facilitating epidemiological studies. If it is a matter of funding then we will assist with approaching the proper legislators to provide needed resources.
   e. It was determined that FL, GA, NY, and NJ have very similar
case report questionnaires. Most states are using different databases to record the data. If GDB could be set up to record these data and all states used this system then there would be similar data collected and recorded for ease of analysis. This needs to be accessible to states although their data collection systems may be somewhat different. Discussions with CEAH data people indicated this system could be established with minimal amount of resources. We would like to discuss this further.

f. If WNV is classified as endemic, then the responsibility for collecting data and facilitate epidemiological studies would not fall in Emergency Programs and Randy Crom would not be responsible. We would then request that Tim Cordes or some other appropriate person be assigned this responsibility.

g. Due to other commitments, USDA is unable to provide epidemiologic assistance for WNV this year. Can we (the states) get a commitment from CEAH to provide analysis and a report of the data that we (the states) collect this year?

2. Vaccination issues:
   a. What will be the effect of vaccination on international travel of horses?
   b. Challenge studies are not allowed outside of Plum Island until USDA reclassifies WNV as an endemic disease. When is this likely to occur? Are plans underway for WNV vaccine testing at Plum?

3. Testing issues:
   a. Will NVSL continue funding the testing at NVSL after this year? Chester assured us that funding will not change this year.
   b. We (State Laboratories) need assurances of a consistent source of antigen from NVSL.
   c. There needs to be a consistent protocol for reporting all cases back to the State Veterinarian. Because of the human health significance we have reporting responsibilities to the health departments and mosquito commissions. If the practitioner submits a sample directly to NVSL, we cannot report to the other agencies in a timely manner unless NVSL reports submissions upon arrival.
REPORT OF THE COMMITTEE

STATUS REPORT OF EASTERN EQUINE ENCEPHALITIS IN THE U.S.

By Eileen N. Ostlund, DVM, PhD
Head of Equine & Ovine Viruses Section
USDA, APHIS, VS, NVSL

Dr. Eileen Ostlund presented a brief report on the national status of eastern equine encephalitis based upon preliminary data from the National Veterinary Services Laboratory in Ames, Iowa.

EQUINE INFECTIOUS ANEMIA
SUBCOMMITTEE REPORT

By Timothy R. Cordes, DVM
USDA-APHIS, Veterinary Services

The Subcommittee on Equine Infectious Anemia (EIA) of the Infectious Diseases of Horses Committee offers the following recommendations to be reviewed and moved forward through the appropriate channels:

1. The subcommittee recommends that USDA-APHIS VS develop a cooperative program and write a proposed rule, based on the most current information contained in the EIA UM&R and VS Memoranda # 555.7 and # 555.8, to include permanent identification of equids. This recommendation has three major components:
   (A) The subcommittee recommends that specific elements of the EIA UM&R regarding EIA testing requirements for interstate movement of horses be incorporated into the CFR, title 9, part 75. The CFR currently regulates the movement of EIA reactors, and there is a need for a federal requirement to have a negative EIA testing status for horses moving interstate. Thus, the sections 2 through 5 and 7 through 10 would be added to part 75.4 as follows:

   Part 75-Communicable diseases in horses, asses, ponies, mules, and zebras Equine Infectious Anemia (Swamp Fever) 75.4
   1. Definitions
   2. General restrictions
   3. Certificates and permits for interstate movement of equids
   4. Handling in transit of equids moved interstate
   5. Restrictions on interstate movement of equids because of EIA
   6. EIA reactor equids
   7. EIA exposed equids
   8. Other interstate movements
9. Testing procedures for EIA in equids
10. Official EIA tests
11. Approval of laboratories, and diagnostic or research facilities
12. Denial and withdrawal of approval of laboratories and diagnostic or research facilities

(Sections 1, 6, 11, and 12 are currently part of 75.4.)

(B) The subcommittee recommends strengthening interstate movement testing and laboratory standards. Thus VS Memoranda # 555.7 and # 555.8 will be updated in the near future.

(C) The subcommittee unanimously agrees that the need for permanent and unique forms of identification of horses for EIA testing is obvious and inevitable. The subcommittee therefore recommends that permanent and unique forms of equine identification should include, but not be limited to, the following: (a) radio frequency implantable devices (RFID), known also as "transponders" or "microchips", (b) biometric applications of iris or facial anatomy, (c) alpha-angle freeze mark, and (d) lip tattoo of a breed registry. Each of these could be linked to a database or integrated circuitry (IC) card, known also as "smart card".

2. The subcommittee endorses the USDAAPHIS VS moratorium on initiating new EIA testing laboratories for the period from October 1, 2001 through September 30, 2002, provided USDA pursues additional resources and other options to address the needs of the industry after this period. Additionally, the subcommittee wishes to reconvene at the end of the moratorium to reevaluate this action and make recommendations for the future. The following important background material is provided: Since 1994 there has been a 65% increase in the number of laboratories approved by USDA to conduct EIA testing. As of the end of 2000, 388 laboratories were approved. The number of approved laboratories varies among states (from one to >70) depending on the number of private laboratories permitted by the State Veterinarian and AVIC. To accommodate the increased demand for training of individuals to conduct EIA testing, NVSL increased the number of training courses offered yearly from 5 in 1994 and 1995 to 12 in 2000 and 2001. Most aspects of the EIA approved laboratory system are conducted by personnel (Section Head, microbiologists, technicians and clerical staff) in the equine/ovine section of the Diagnostic Virology Laboratory (DVL). The activities include all correspondence, record keeping of laboratory and technician information, preparing, shipping, scoring annual proficiency tests for each approved laboratory, and running training courses. The mushrooming number of laboratories severely impinges on the DVL's limited resources and no dedicated staff has been
funded for the EIA program. Additional concerns arise with maintaining quality oversight of approved laboratories as the number of laboratories rises. NVSL is noting, with increasing frequency, that laboratories and states are not adhering to the requirements in VS Memo 555.8 regarding responsibilities and expectations for approved laboratories. To allow for time to reassess the goals of the EIA approved laboratory system and to plan how to best meet the needs of the equine industry and USDA, a moratorium on NVSL training for approval of new testing laboratories will be enacted during the fiscal year 2002. We will, during this moratorium, conduct limited training for additional personnel at existing EIA approved laboratories.

3. The subcommittee endorses USDAAPHIS VS offering courses for inspection of laboratories for EIA testing. These courses will be offered on a fee-recovery basis. The subcommittee further encourages states to train their own inspectors based on guidelines written by USDA.

4. The subcommittee encourages states to develop quality assurance programs for its EIA laboratories in addition to the USDA proficiency testing. Where states believe more oversight is needed, they could supplement, not replace, existing protocols with additional blind samples or check tests and/or laboratory inspections.

5. The subcommittee encourages the University of Kentucky, Gluck Equine Research Center to conduct a voluntary, confidential study to monitor the overall accuracy of routine EIA testing provided that the results of this study will not be used for regulatory purposes. This proposal by Dr. Chuck Issel receives full support of the subcommittee. For a copy of the proposal or to discuss the survey protocol, please contact Dr. Issel at the University of Kentucky (859-257-1710 or cissel@uky.edu).

6. With the cooperation of the industry, the subcommittee recommends that information about the number of EIA kits sold to each lab will be sent to the USDA APHIS VS Senior Staff Veterinarian for Equine Programs quarterly for the purpose of monitoring EIA laboratories. This protected information will be available only to the State Veterinarians and AVICs for their states only.

Respectfully submitted by Subcommittee members Tim Cordes, Debbie Cox, Lee Efinger, Jerry Freier, John Irby, Chuck Issel, Ralph Knowles, Don Notter, Eileen Ostlund, Bev Schmitt, Mike Slayter, Ernie Zirkle
INFECTIOUS DISEASES OF HORSES

EIA SUBCOMMITTEE REPORT AND RECOMMENDATIONS
WORKING DRAFT OF VS MEMORANDUM 555.8

By Eileen N. Ostlund, DVM, PhD
Head of Equine & Ovine Viruses Section
USDA, APHIS, VS, NVSL

Dr. Eileen Ostlund presented major points of revision under consideration for Veterinary Services Memorandum 555.8, Approval of Laboratories to Conduct the Official Tests for Bluetongue, Bovine Leukosis, and Equine Infectious Anemia.

KENTUCKY EQUINE ABORTION STORM AND RELATED CONDITIONS

By L.R. Harrison, VMD
Livestock Disease Diagnostic Center, Department of Veterinary Science
College of Agriculture, University of Kentucky

An abortion storm that affected the equine population in central Kentucky and surrounding regions commenced in late April and extended through the month of May. Since there was no immediate explanation for the abortion outbreak, the condition has been referred to as Mare Reproductive Loss Syndrome (MRLS). At least 17 breeds of horses were affected. Mares in early gestation (bred to foal in 2002) and late gestation aborted. Veterinary practitioners identified increased incidences of epicarditis and eye problems that now are considered conditions associated with the syndrome. The MRLS and associated conditions occurred during the same span of time that the Central Kentucky area experienced a remarkably heavy eruption of the eastern tent caterpillar, *Malacosoma americanum*. A survey of 133 large horse farms identified moderate to heavy numbers of eastern tent caterpillar and the presence of wild cherry trees as the significant risk factors. An economic survey done by Dr. Richard Thalheimer and Dr. Robert G. Lawrence, University of Louisville shows a total economic loss to Kentucky’s equine breeding industry in the range of $336 million.

During the outbreak, aborted equine fetuses from 32 counties were delivered to the Livestock Disease Diagnostic Center for diagnostic testing. The information generated from the laboratory testing is still being collated and analyzed. Significant laboratory findings include lesions observed in late term aborted fetuses and placentas and results of cultures of late term aborted fetuses for bacteria. Most late term aborted fetuses have a prenatal pneumonia, which is characterized by infiltrates of inflammatory cells in bronchioles
and alveoli, colonies of bacteria in bronchioles and alveoli, engorged pulmonary vasculature and presence of abundant squames. Placental lesions are characterized by a funisitis which is inflammation of the umbilical cord and interstitial placentitis which is inflammation following the coelomic mesoderm. Cultures of 400 + fetuses and placentas have yielded *Streptococcus species* (51%) and *Actinobacillus species* (17%). Attempts to isolate a virus from the tissues of the fetuses have all been negative. Also the fluorescent antibody tests for EHV-1 have been negative. All fetuses tested have been negative for leptospira. It is now generally accepted that an environmental toxin is the cause of MRLS. Toxicological assays have primarily been to
determine the presence of nitrates/nitrites, conium alkaloids and organic cyanide. All fetuses tested have been negative for nitrates and nitrites. No conium alkaloids have been detected. Assays for organic cyanide have neither confirmed nor ruled out this toxin.

At this time, the cause of MRLS has not been firmly identified. Organic cyanide, delivered to the immediate environment by eastern tent caterpillars is the prime suspect. Further diagnostic investigations and research are planned. At least five epidemiological research projects are currently underway. At this time the principal factors considered the possible etiologic toxins, in addition to organic cyanide, are ergopeptides of fescue and other grasses and mycotoxins, primarily zearalanone.

THE DEVELOPMENT OF A PROPOSED VOLUNTARY CONTROL PROGRAM FOR EQUINE VIRAL ARTERITIS

By Timothy R. Cordes, DVM
USDA-APHIS, Veterinary Services

A joint resolution of the United States Animal Health Association (USAHA) Infectious Diseases of Horses and Import-Export Committees requested the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), to work with the horse industry and the States to develop and implement regulations for equine viral arteritis (EVA) testing and classification of stallions and semen presented for entry into the United States.

USDA, APHIS, Veterinary Services (VS) has stated that this can be accomplished by working with and (1) through State Veterinarians, the American Horse Council (AHC), and the State Horse Councils and (2) through the proposed rulemaking process. The AHC formed an EVA Working Group that developed a vaccination protocol and produced a video/brochure educational packet with USDA. VS formed an EVA Review Committee which examined the legal, regulatory, world trade, and import-export issues surrounding EVA. Members of both groups participated in a USDA-sponsored, national, educational videoteleconference on EVA with State Veterinarians and Area Veterinarians in Charge.

Both groups met on several occasions and decided that while they had a good understanding of the science of EVA, they could not be certain what kind of program the diverse equine industry might want. The solution was an advanced notice of proposed rulemaking (ANPR) which described a spectrum of possible programs from least to most regulated.

The ANPR was published on September 20, 2000, with a 60-day comment period. The results of the ANPR were clear-cut: 72 of the 79 commenters choose the _EVA Voluntary Control Program_. This promoted the following: (1) The U.S. horse industry develop, manage, and monitor this program. (2) Education for producers and practitioners on EVA be a signifi-
REPORT OF THE COMMITTEE

cant element of this program. (3) USDA/APHIS/VS require import testing of all stallions and semen for identification purposes only. (4) The element of an UM&R or code of practice be developed in the future.

It would only be speculation to predict the exact contents of the final rule, but as the proposed rule is developed, the experts in both VS and the industry working groups will concentrate on the issues of (1) testing stallions and (2) testing semen. First, the ANPR stated that APHIS would quarantine imported stallions at the time of arrival and test them to determine whether they are serologically positive for EVA. This might mean that testing at animal import centers would now include EVA along with the standard testing for EIA, dourine, glanders, and equine piroplasmosis. Second, the ANPR stated that APHIS would also test imported equine semen for EVA at the time of arrival. This might mean APHIS would monitor imported equine semen through (a) certification in the country of origin of the serologic status of the stallion, if negative, (b) certification in the country of origin of the virologic status of the semen, if the stallion is serologically positive, and (c) aliquot testing of shipments of semen on a random basis to monitor certification.

APHIS would note the test results on the import permit accompanying the stallion or semen, release the stallion or semen, and notify animal health regulatory officials in the State of destination of any that were positive. APHIS would recommend that each State determine whether to conduct further testing of positive stallions upon entry into the State.

Contagious Equine Metritis: Status of U.S. Importation and Testing Requirements

By Barbara Bischoff, DVM
Veterinary Services, National Center for Import and Export
Animal and Plant Health Inspection Service
U.S. Department of Agriculture

From September 1997 to November 2001, 15 horses imported into the United States were detected during post-entry testing to be infected with *Taylorella equigenitalis*, the causative agent of contagious equine metritis (CEM), despite having negative pre-entry culture results. To strengthen measures to prevent the introduction of CEM into the United States, APHIS has worked with a CEM Working Group comprised of industry, State and Federal representatives. The CEM Working Group has recommended changes in pre-entry and post-entry testing of horses. Those recommendations are being included in a proposed rule that is being developed. In light of the detection of these 15 horses that were infected with *T. equigenitalis*, APHIS also is proposing minimal standards and more oversight for laboratories conducting pre-entry CEM testing.

It is important to note that test breeding of stallions to mares is an impor-
tant component of the screening program for CEM. Of the 15 horses confirmed by post-entry testing to be infected with *T. equigenitalis*, 11 were stallions. Of those 11, only four were detected by culture; test-breeding mares detected the other seven. Five of the seven stallions that transmitted the infection to test mares only infected one of the two mares.

As the proposed regulation changes are being developed, APHIS is continuing to work with animal health officials from Canada and Mexico to harmonize, as much as possible, import regulations for horses from countries affected by CEM.

### 2001 ANTHRAX OUTBREAK IN TEXAS

**By John R. Irby, DVM**  
Texas Animal Health Commission

I will begin with a short review of anthrax since our awareness should be heightened in this day and time.

Anthrax is an acute, usually fatal infectious disease caused by the spore-forming bacterium, *Bacillus anthracis*. It is now found world-wide with some countries considered endemic due to the presence of spores in the soil, which are resistant to heat, drying and chemical disinfectants. When affected soil is disturbed, spores are released. The first signs of anthrax may be finding an animal dead with blood oozing from body openings. Usually 3 – 7 days following ingestion of spores, animals show signs such as fever, anorexia and diarrhea progressing rapidly to muscle tremors, respiratory distress and death. There are 4 clinical presentations, peracute (1 – 2 hours) in ruminants, acute (24 – 48 hours) in ruminants and horses, subacute (3 - 4 days) and chronic (weeks to subclinical) in swine, dogs and cats. Post mortem signs include rapid bloating, a lack of rigor mortis and the presence of blood, which does not clot. Horses, which become infected by ingesting spores may show signs of septicemia and colic. If infected by insect bite, there may be localized inflammation at the site of the bite. If anthrax is suspected, the carcass should not be opened, since this exposes vegetative cells to oxygen, which results in sporulation. Gross pathological changes are an enlarged spleen-referred to as "blackberry jam", dark tar-like unclotted blood, edematous tissue in the cervical area of horses. Swine frequently show extensive edema around the cervical lymph nodes. Animal disease outbreaks have occurred in several states since 1990. Since 1935, there have been 75 human cases in Texas. The most recent animal outbreak began in June of this year. The disease has been sporadic since 1993 and most cases occur annually from April to November. This corresponds to the usual fly season in Texas.

In this year’s epidemic, the most severely affected were game ranches with deer-proof fences that were overpopulated with deer. Since 1993, deer,
cattle and sheep have constituted most of the confirmed cases. The estimated population of white-tailed deer in the 5 counties involved in this year's episode is estimated at 50 - 100,000. At least 1,200 are believed to have died from anthrax. The Texas Veterinary Medical Diagnostic Laboratory cultured Bacillus anthracis from 11 of 65 samples submitted from dead animals suspected to have died from anthrax. The number of samples submitted for anthrax confirmation decreased markedly after the first quarantines were issued. To effectively manage the outbreak, the Texas Animal Health Commission began to issue quarantines in the 5 county area based on either culture confirmation or clinical diagnosis by a private veterinarian. Movement of all domestic livestock from affected premises was halted until either 14 days after all domestic livestock were vaccinated or 21 days after the last mortality. The first case was confirmed on June 7 in a fallow deer in Val Verde County, followed by those in white-tailed deer and cattle. On June 26, there were confirmed equine cases in Edwards and Val Verde counties. The last case was on September 20 in a goat in Kinney County. Mortality rates reported by CDC (Centers for Disease Control) were 69 cattle, 29 horses and 222 exotics on 71 premises. According to the TDH (Texas Department of Health) and CDC there were 112 known human anthrax exposures - with the only clinical case being a case of the cutaneous form in a ranch employee in Edwards County who skinned a buffalo that died suddenly on June 20, 2001. Humans are at risk when coming in direct contact with an infected carcass and when consuming contaminated meat, as was the case in Minnesota in 2000. Of 71 Texas premises believed to have had anthrax this year, 15.4% were confirmed by culture, 23.8% diagnosed clinically, 4.8% reported by CDC and 56% based on observations by ranch personnel. The number of domestic animals vaccinated for anthrax increased dramatically after the first case was confirmed.

Recommendations during anthrax epidemic include vaccination of all domestic livestock in the area and refraining from handling carcasses. The approved vaccine is a nonencapsulated live variant Sterne strain of Bacillus anthracis. An initial 1 cc dose should be followed by a booster 2 - 3 weeks later with an annual booster 4 weeks before the infectious cycle the following Spring. It is not recommended for use on pregnant animals or within 6 weeks of slaughter. An effective way to vaccinate free-ranging cervids is still needed. Although feeding of grain mixed with regular injectable vaccines has been employed by some ranchers since 1977, the efficacy of this procedure has not been proven. Other recommendations are to:

* burn carcasses
* keep dogs away
* do not collect antlers from carcasses as spores can survive in sun-bleached bones
* don’t harvest feral swine during an epidemic

Preventive measures include:
* maintaining good ground cover
* vaccinating domestic livestock
* maintaining proper stocking rates

Carcass management of 63 premises surveyed revealed that:

- 60% burned all carcasses
- 23.8% burned some carcasses
- 12.7% burned no carcasses
- 9.5% put lime on some carcasses
- 6.4% buried carcasses
- 3.4% no response

In closing, I wish to recognize the cooperative efforts of agencies working to control the disease:

- Texas Animal Health Commission
- Texas USDA/APHIS/Veterinary Services
- Center for Disease Control
- Center for Epidemiology and Animal Health
- Texas Department of Health
- Texas Parks & Wildlife
- Texas A & M University, College of Veterinary Medicine
- Louisiana State University
- Texas Veterinary Medical Diagnostic Lab
- U S Navy and Air Force
- Food and Drug Safety
- Texas Agricultural Extension Service
- Biology Defenses Research

I also wish to recognize these individuals who personally assisted in responding to the 2001 Anthrax outbreak:

George Keilmann, Carla Everett and other field personnel - Texas Animal Health Commission
Dr. Tom Reagan – USDA/APHIS/VS
Drs. Craig Carter and Melissa Libel – Texas Veterinary Medical Diagnostic Lab
Dr. Jane Kelly – Centers for Disease Control
Dr. Donald Davis – Texas A & M College of Veterinary Medicine

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Ticks are considered to be the most important vectors of diseases to domesticated animals and only second to mosquitoes in number of diseases transmitted to man. They can transmit a variety of agents including protozoa, bacteria, rickettsia, viruses, and paralytic toxins (5, 7). In addition, they can do direct harm by blood loss, disturbance during foraging resulting in reduced weight or milk production and secondary infections.

The introduction of new tick species and tick-borne diseases into the United States has increased over time with modern transportation. The reduced travel time has increased the chances of ticks surviving on an imported host. In addition, importation of exotic animals by animal dealers, zoological gardens, and private citizens has increased (1). There have been approximately 99 exotic or invasive tick species recorded to date in the United States with seven species from the family Argasidae and 92 species from the family Ixodidae (3). Therefore, a National Tick Survey was initiated to assess the current distributions of tick species in the United States, the potential of the introduction and establishment of new tick species or tick-borne diseases, and to determine the environmental factors that might influence the survival and distribution of ticks in the United States.

There are approximately 838 tick species distributed throughout the world. We currently have 83 tick species established in the United States, with approximately 56 species that belong the family Ixodidae (hard ticks) and 27 that belong to the family Argasidae (soft ticks). There are approximately 32 tick species in the United States that are injurious to livestock, equids, or poultry. The first phase of this survey will be to update the distributions of the following tick species: Dermacentor andersoni (Rocky Mountain Wood Tick), Amblyomma maculatum (Gulf Coast Tick), Amblyomma americanum (Lone Star Tick), Anocentor nitens (Tropical Horse Tick), and Otobius megnini (Spinose Ear Tick). They transmit a variety of diseases or disease agents including Anaplasma, Babesia, Ehrlichia, Q fever, heartwater, and tick paralysis to horses, cattle, sheep, pigs, dogs, and wildlife.

The distributions of ticks in the United States will be assessed initially by reviewing records from the US National Tick Collection. This dataset currently has over 100,000 tick records. We will also use the tick identifica-
This information will be used to develop distribution maps for each tick species, and then integrated with environmental data on climate, vegetation, soil, elevation, and land use to determine what factors might affect each tick's distribution, as well as model rate and direction of population expansion. Additionally, we will correlate tick distributions with wildlife and livestock distributions and population densities. We will also link the tick distribution information to other tick-borne disease and invasive species databases. Lastly, the tick distribution data collected and analyzed will be distributed via pamphlets, books, and CDs. We will also make the data available to the public via an Internet Map Server and Web page.

We have obtained copies of the US National Tick database as well as the USDA's National Veterinary Services Laboratory tick identification database. We have converted the US National Tick Database into a new format and extracted records for the following five tick species: Dermacentor andersoni, Amblyomma maculatum, A. americanum, Anocentor nitens, and Otobius megnini. Tabular references for each of the five tick species were also developed for spatial analysis. We are currently reformatting the NVSL's tick identification records for integration with the US National Tick Database.

Several preliminary county-level maps have been produced for Dermacentor andersoni, Amblyomma maculatum, A. americanum, Anocentor nitens, and Otobius megnini using extracted records from the US National Tick Database. Additionally, we have completed locale or point maps for Dermacentor andersoni and Amblyomma maculatum. There were approximately 5800 and 300 records used to produce county level maps for Dermacentor andersoni and Amblyomma maculatum, respectively. There were 5400 and 290 records used to develop locale level maps for Dermacentor andersoni and Amblyomma maculatum, respectively. The reported records for Dermacentor andersoni were from fourteen different states and 261 counties with the majority of the reported records from Ravalli County, Montana (~2500 records). Dermacentor andersoni was reported from approximately 75 different hosts such as horses, cattle, sheep, pigs, goats, dogs, rodents, bison, bears, deer, and humans. Amblyomma maculatum was reported from thirteen states and 104 counties. Amblyomma maculatum was reported from approximately 42 different hosts such as horses, cattle, pig, goats, dogs, bear, birds, bobcats, coyotes, rabbits, rodents, deer, and humans. Although, the presence or absence of each these tick species can be estimated from reported records, the abundance in each state or county is more difficult to accurately determine since hosts represent only subset of the total tick population in an area. The vegetation data collected for each tick species is more representative of the presence and abundance of tick species in a region; however, there were few records reported from the database of ticks from vegetation, thus host and vegetation were both included our analyses. Moreover, the reported data are limited and random due to collector's bias.
An increasing number of vector-borne disease studies have used Geographic Information System (GIS) and spatial analysis tools and methods for monitoring, surveillance, control, or risk mapping. They have been used to examine the distributions of several ixodid ticks such as *Rhipicephalus appendiculatus*, *Ixodes scapularis*, and *I. ricinus* (8, 9, 2, 6, 4). We also used GIS as a tool to determine what ecological factors might be influence the distributions of *Dermacentor andersoni*, Rocky Mountain Wood tick and *Amblyomma maculatum*, Gulf Coast tick. Initial spatial analyses of the distributions of *Dermacentor andersoni* and *Amblyomma maculatum* included overlays of their distributions with annual average precipitation over a 30-year period and with national ecoregions. Rocky Mountain Wood tick appears to prefer drier regions of the country with average precipitation from 16.8 to 50.7 mm. Gulf Coast tick appears to prefer a moist region with an average precipitation of 79 to 148.7 mm. Preliminary analyses of ecoregion overlays with each tick distribution indicated that *Dermacentor andersoni* may prefer a dry domain that is a semi-arid and mountainous. These regions usually have cold, dry winters and warm, hot summers. Vegetation includes short prairie grasses with few trees and soil that is exposed and rich in bases with little organic material. *Amblyomma maculatum* may prefer a more humid temperate domain where there are strong annual cycles of precipitation and temperature. These regions do not have really cold winters or a dry season and soils are moist and rich in iron and aluminum. Vegetation in this region usually consists of secondary growth of longleaf, loblolly, and slash pine. Statistical analyses of the data will be performed for each species to more accurately defined tick preferences. In addition, we will examine other base layers of data such vegetation, elevation, and soils to further determine if other environmental factors influence the distributions of these tick species.

Literature Cited:

EXOTIC TICKS: THEY CAN INVADE THE UNITED STATES

By Ralph C. Knowles, DVM

Africa, U.S.A., was a wild animal compound in Boca Raton, Florida. The red tick *Rhipicephalus evertsi* was found in Africa, U.S.A. in 1960.

The State of Florida with the U.S. Department of Agriculture in a cooperative role, took bold measures to eradicate this tick.

*Rhipicephalus evertsi* infestations are well known on the African continent. *R. evertsi* (the red tick) is a two host tick (with larval and nymphal stages "hosting" on one animal, and the adult stage will "host" on a second animal).

This tick is known to transmit *Babesia bigemina* (Texas Fever); *Theileria parva*, *Theileria mutans* (formally known as *T. ovis*) and *Babesia equi*.

The eradication of the red legged tick (*R. evertsi*) from Africa, U.S.A., is an historical event that serves as a reminder of the serious threat that exotic ticks can pose to domestic livestock, companion animals, and wildlife species of the U.S.A.

The author narrated a slide series that documents this tick eradication effort.

DEVELOPMENT OF REGIONALIZATION STRATEGIES FOR THE INTERNATIONAL TRADE OF LIVE ANIMALS

Application of Methods to Equine Infectious Anemia

John W. Green and Jerome E. Freier

USDA-APHIS, Veterinary Services
Centers for Epidemiology and Animal Health
Fort Collins, Colorado

The goal is to develop a regionalization methodology for the US that
supports Office International Des Epizooties (OIE) Sanitary and Phytosanitary (SPS) measures and that is consistent with US expectations of trading partners. Before developing a methodology, data needs must be assessed. Cooperative state, VS, and CEAH procedures and data sharing boundaries will be defined to support development of regionalization methodologies using equine infectious diseases as a model.

The objectives of the project are to

1. Identify existing information currently collected that will facilitate the regionalization of a disease similar to Equine Infectious Anemia (EIA).
2. Develop processes for surveillance, data collection, and data analysis to support dynamic regionalization as disease controls are employed and as equids move from region to region.
3. Demonstrate the benefit of additional information that, if collected, would assist in the more precise regionalization of a disease similar to EIA.

The proposed project will assess data needs for developing a methodology for regionalization of EIA. This project will be approached as though the United States is responding to a foreign country’s information needs for a release risk assessment. The APHIS regionalization policy set forth in 9 CFR 92.2 will serve as the source of information requirements. More specific data requirements to perform release risk assessments will be developed from these information requirements.

APHIS has established procedures regarding information needed to evaluate the risk of introducing a disease into the US from foreign countries. This procedure is commonly referred to as a release assessment. APHIS should be prepared to provide the same information to our international trading partners. This proposal defines the data necessary to develop a regionalization methodology to satisfy a release risk assessment request from a foreign country and begins the process of defining a more general approach to regionalization. The release assessment information request procedure is established in the Federal Register, Volume 62, No. 208.

"Procedures for Requesting Recognition of Regions and Risk Assessment"

As set forth in Sec. 92.2 of this final rule, we will, in general, process applications for regionalization and risk assessment according to the following procedures.

The official of the national government of any country who has the authority in that country to request such a change may submit a request to the Administrator that all or part of the country be recognized as a region, be included within an adjacent previously recognized region, or be made part of a region larger than the country.

Each request for approval to export a particular type of animal or animal product commodity to the United States from a foreign region must be made
to the Administrator, and must include, in English, the following information about the region:

1. The authority, organization, and infrastructure of the veterinary services organization in the region.
2. Disease status—i.e., is the restricted disease agent known to exist in the region? If “yes,” at what prevalence? If “no,” when was the most recent diagnosis?
3. The status of adjacent regions with respect to the agent.
4. The extent of an active disease control program, if any, if the agent is known to exist in the region.
5. The vaccination status of the region. When was the last vaccination? What is the extent of vaccination if it is currently used, and what vaccine is being used?
6. The degree to which the region is separated from regions of higher risk through physical or other barriers.
7. The extent to which movement of animals and animal products is controlled from regions of higher risk, and the level of biosecurity regarding such movements.
8. Livestock demographics and marketing practices in the region.
9. The type and extent of disease surveillance in the region—e.g., is it passive and/or active; what is the quantity and quality of sampling and testing?
10. Diagnostic laboratory capabilities.
11. Policies and infrastructure for animal disease control in the region—i.e., emergency response capacity.”

APHIS recognizes that there are identifiable and measurable gradations in the degree of risk presented by exported equids and that these gradations are often tied more to human, regulatory, climatological, geographical and biological factors than to national political boundaries. APHIS will use the above 11 factors to define data needs and to develop standard procedures for regionalization of EIA in the US.

The three key data elements that must be developed are

- Epidemiologic, spatial, and environmental analyses of sites where reactors reside
- Specific, accurate, and permanent methods of animal identification
- Movement controls
- Accurate equine population estimates

The first phase of release assessment, analysis, and regionalization is a determination of data that are necessary to accomplish an effective and accurate methodology. When it is determined what data is available or which can be collected, the development of methodology can proceed.

The release risk assessment process for EIA has four basic elements:

1. Field staff, veterinarians, epidemiologists and state partners will be contacted to assist with sampling, collecting data, building
databases and carrying out the information needs assessment deemed necessary for effective regionalization.

2. Epidemiologists and statisticians will provide the parameters needed for risk analysis.

3. Economic data will be collected and analyses performed to provide benefit/cost ratios for control programs, assess impacts of trade disruptions, define consumer costs and benefits, and provide other information for decision-makers, including estimating the cost of additional data if current data proves to be inadequate to regionalize.

4. The political feasibility of control programs and decision alternatives will be presented to decision-makers to assess if there is increased benefit to their animal health programs through the routine collection of necessary data or the implementation of additional control measures.

State and APHIS staff will gather the data and analyses required for an EIA release assessment. Collaboration will be necessary for the successful regionalization of EIA in the US.
REPORT OF THE COMMITTEE ON JOHNE'S DISEASE

Chairman: Dr. William L. Hartmann, St. Paul, MN
Vice Chairman: Dr. Scott J. Wells, St. Paul, MN

Mr. John B. Adams, VA; Mr. J. Bruce Addison, MO; Dr. Robert D. Angus, ID; Dr. Marilyn F. Balmer, MD; Mr. Nathan James Boehm, ND; Dr. William W. Buisch, IA; Dr. Michael A. Carter, MD; Dr. H. Michael Chaddock, VA; Dr. Yung Fu Chang, NY; Dr. Michael T. Collins, WI; Dr. Thomas F. Conner, IN; Dr. Robert A. Cook, NY; Dr. James J. Corbett, CA; Mr. Ed Corrigan, WI; Dr. John C. Doyle, OK; Dr. Robert J. Eisner, NJ; Dr. Kendal G. Eyre, ID; Dr. William H. Fales, MO; Dr. James M. Foppoli, HI; Dr. Thomas W. Freas, IN; Mr. Bob Frost, CA; Dr. Franklyn B. Garry, CO; Dr. Michael J. Gilsdorf, MD; Mr. L. Wayne Godwin, FL; Dr. Louise M. Henderson, IA; Mr. Steven G. Hennager, IA; Dr. Sharon K. Hietala, CA; Dr. Sam D. Holland, SD; Dr. David L. Hunter, MT; Dr. John P. Huntley, NY; Dr. Sarah B. S. Hurley, WI; Dr. Jeffrey J. Huse, NY; Dr. Richard H. Jacobson, OR; Dr. Todd Johnson, VT; Dr. William T. Jolly, DC; Dr. Bretaigne Jones, MO; Dr. Arthur J. Kennel, MN; Mr. John C. Lawrence, ME; Mr. Hank M. Lefler, CA; Dr. Donald H. Lein, NY; Dr. Thomas F. T. Linfield, MT; Dr. Mary Jane Lis, CT; Ms. Sharon L. Lombardi, NM; Dr. Charles E. Massengill, MO; Dr. Clifford W. McGinnis, NH; Dr. A. R. McLaughlin, WI; Dr. I. Lee McPhail, OH; Dr. Kenneth E. Olson, IL; Dr. Roger E. Olson, MD; Dr. James E. Oosterhuis, CA; Mr. Mark J. Owens, IA; Dr. Janet B. Payeur, IA; Dr. John R. Ragan, MD; Dr. Mark A. Remick, MI; Mr. Paul E. Rodgers, WV; Dr. Ronald F. Rohde, WI; Dr. Christine A. Rossiter, VT; Dr. Harvey L. Rubin, FL; Dr. John J. Schiltz, IA; Dr. David M. Sherman, MA; Dr. Sang J. Shin, NY; Dr. William P. Shulaw, OH; Dr. Shri N. Singh, KY; Dr. Ralph E. Slaughter, NE; Dr. Jerry W. Smith, MI; Dr. Theron G. Snider, III, LA; Dr. Judith R. Stabel, IA; Dr. Susan M. Stehman, NY; Dr. William D. Stouder, ID; Mr. Les C. Stutzman, NC; Dr. Deepanker Tewari, PA; Dr. Charles O. Thoen, IA; Dr. Kenneth L. Thomazin, CA; Dr. J. Bradley Thurston, IN; Dr. Cheryl B. Tillman, OR; Dr. Max A. Van Buskirk, PA; Dr. Gary M. Weber, DC; Mr. Maurice H. Wessel, Jr., TX; Ms. Diana L. Whipple, IA; Dr. Howard W. Whitford, TX; Dr. Robert H. Whitlock, PA; Dr. Ronald B. Wilson, TN; Dr. Ching-Ching Wu, IN.

Introduction

The Committee on Johne’s Disease met on Monday November 5 and Tuesday November 6, 2001, from 12:30 to 5:30 p.m. 117 people attended including 52 committee members. Six resolutions were passed by the committee and forwarded on to the Resolutions Committee. The following is a report of the activities of the committee meeting.
Chairman’s Report
William Hartmann, Chairman of the USAHA Committee on Johne’s Disease

The chairman reported that the committee meeting is being expanded from one afternoon to two afternoons to allow more time for discussion of important issues and to resolve controversial resolutions. He suggested that the committee consider appointing a Scientific Advisory Subcommittee to advise the committee on issues of a technical nature. A motion was made, seconded and all voted aye to establish this committee. The following committee members were assigned to the subcommittee: Judith Stabel (Chair), Michael Collins, Michael Carter, Janet Payeur and Sang Shin. The chairman reported that the committee now has 87 members and asked the committee for input on the composition of the committee. The consensus of the committee was that the composition of the committee was as it should be. The chairman reported on the history of the committee, it’s written purpose and goals. It was the consensus of the committee that the written purpose and goals of the committee were still valid.

USDA:APHIS:Veterinary Services Report
William Buisch, Eastern Regional Director and Michael Carter, National Johne’s Disease Coordinator

USDA:APHIS:Veterinary Services has continued to work on developing uniform program standards and after several reviews and many comments has the “Uniform Program Standards for the Voluntary Bovine Johne’s Disease Control Program”. The purpose of the document is to establish uniformity among the many State programs and to provide a foundation on which to expand the Johne’s control effort in the future. The basic program is administered by a State Designated Johne’s disease Coordinator with assistance from a State Johne’s group. Three elements of the program include an education element; to instruct producers about the disease, a management element; to create standards and give guidelines for developing herd management plans to prevent and control Johne’s disease, and a herd classification element which includes a test positive and test negative component. The test positive component would be a foundation for future control efforts supported by APHIS-VS. The test-negative component is composed mainly of the Voluntary Herd Status program endorsed by USAHA.

The updated responses to the four USAHA resolutions submitted by the Johne’s disease committee last year are as follows:

#15 - Quality Assurance of Johne’s Diagnostic Procedures -VS has been working with members of the National Johne’s working group to develop and analyze data for a pilot project for serological testing to help identify quality control methods in the laboratory for Johne’s
JOHNE'S DISEASE

disease testing. A preliminary report and recommendations were given to the Working group on Friday Nov. 2.

#17 - USDA-APHIS Johne's Disease Budget -Veterinary Services will work to establish a separate line item for Johne's disease as a basis for new appropriations. A separate line item budget has been requested for Fiscal Year 2003.

#19 - Voluntary Johne's Disease Indemnity Program for cattle -The APHIS-VS has a new full-time staff officer dedicated to creating program standards and developing a national plan for Johne's disease. Draft program standards were presented for comment at Colorado Springs, CO in April 2001 and at Hershey, PA in November 2001.

#21 - National Johne's Disease Pilot Project - A group has been brought together and has drafted a pilot project aimed at addressing the concerns. The pilot project is expected to start using herds identified by the National Animal Health Monitoring System dairy study 2002.

National Johne’s Working Group Report
Robert Whitlock, John Adams and Gary Weber, Co-chairs of the NJWG

Currently, 64 persons are listed as members of the NJWG, with 14 others serve on subcommittees of the NJWG and 10 officers of the USAHA who are included on the mailing list of the NJWG. Thus, more than 88 people participate in activities of the NJWG. Sub-committees of the NJWG and the respective chairs include: Research & Advisory, Judy Stabel; State programs, Mike Carter; Validation of Check tests, Ray Sweeney; Education, Don Hansen; Small Ruminants, Sue Stehman & Bill Shulaw; Economics, Ken Olson; Certificate of Veterinary Inspection, Larry Williams; Laboratory Certification, Janet Payeur and Serology QC, Rich Jacobson.

The NJWG met on Sunday April 1, 2001 at the Antler’s Adams Mark Hotel, 4 South Cascade Avenue, Colorado Springs, CO. in conjunction with the National Institutes of Animal Agriculture (NIAA). 57 persons attended this meeting. The major points of this meeting are listed below:

Report # 1. Bill Hartmann provided an overview from the USAHA Johne’s Committee. Scott Wells has agreed to serve as Co-chair of the Johne’s Committee. The USAHA Board of Directors has approved two half day meetings for the Johne’s Committee’s deliberations for the upcoming fall USAHA meeting. Resolutions will be presented and discussed the first day with voting to occur on Tuesday, the second day. A Scientific Advisory Committee for the JD Committee will be established, Judy Stabel has agreed to chair that Committee.

During the Birmingham USAHA meeting 17 resolutions were brought forward by the Johne’s Committee; 3 were disapproved, 10 were combined into 1 and with 4 others were accepted by USAHA. Final resolution # 17 recommended a specific line item for Johne’s Disease; which may be sepa-
REPORT OF THE COMMITTEE

rated for FY 2003. $2.5 million for Johne's was included in the budget for FY 2002. Final resolution # 19 requested USDA-APHIS to develop program standards and the necessary infrastructure to implement a National voluntary Johne’s Disease Indemnity program for cattle. Final resolution # 21 concerned the development of a national Johne’s Disease Pilot project to validate the status program and to assess the use of pooled fecal cultures. Currently the Johne’s committee has 94 members. An intranet web site will be established for the Johne’s Committee.

Report # 2. John Adams presented the current status of the proposed Johne’s Indemnity plan. The proposed plan had been reviewed by the National Farmers Union, American Farm Bureau, the Holstein Association, the Western States Dairymen and the National Grange. The program would be administered at the state level with emphasis on the Johne’s Status program and accountability at the federal level. The current proposal will emphasize ELISA testing but confirmed by fecal culture. Culture positive cattle will be destined for rendering. The issue of rendering resulted in much comment. This will be a voluntary program and not mandatory. A research component will emphasize development of a better vaccine and better diagnostic tests.

The proposed indemnity program engendered much discussion, especially the issue of rendering and the impact it may have on the public. Some states do not have rendering facilities, ie Missouri. In order to receive any indemnity funds, the producer must have a written approved herd management plan in place and on file in the state office. In order for a producer to participate in the indemnity program all adult cattle in an infected herd must be tested. Discussion also focused on the diagnostic tests that may be required. The use of the “J” punch was discussed at some length.

Motion: by John Adams and seconded by Mark Remick that: The NJWG supports the concept of the proposed National Johne’s Indemnity program for cattle. Motion passed.

Report # 3. Mike Carter presented the latest version of the “Draft-Uniform Program Standards for the Voluntary Bovine Johne’s Disease Control Program- Draft” updated 3-28-01 pm. A significant amount of time was spent reviewing this 34 page document. Definitions, administration, herd management plans, state advisory committees, animal identification, and laboratory procedures were discussed in detail.

Motion: by Mike Collins and seconded by John Lawrence that: “Only USDA licensed Johne’s Elisa Kits be approved for use in the proposed Johne’s Program” Motion passed.

Motion: by Ken Olson and seconded by Bill Hartmann that “The Program Standards be re-organized into three categories instead of the four as presented” (see page 2, index) Motion passed. The education and management sections will be combined into one step or stage.

Volunteers for the Program Standards Committee included: Drs. Brignole, Carter, M (Chair), Hargrove, Hartmann, Johnson, Remick, Thomazin, Watson, Williams & J. Adams.
Report # 4. Ken Olson presented the treasurer’s report. The current balance in our account is $29,381.33.

Report # 5. Don Hansen for the education committee presented an outline of the proposed training (3 days) to be given to the State Johne’s Epidemiologists in the near future. Don will discuss this further with Mike Carter, national Johne’s Coordinator. Don Hansen has agreed to coordinate the development of a C/D ROM for Johne’s Educational uses.

Report # 6. Mike Collins provided an overview of the new updated Johne’s Disease web site in Madison, Wisconsin, “Johnes.org” The domain name is now registered. The web sites has numerous linked sites in addition to many educational features.

Report # 7. Mike Carter presented an update for the State Programs Committee. 35 states now have a Johne’s Advisory Committees, 20 states have a Johne’s Control program and 25 states have adapted the Johne’s Status program. Monthly conference phone calls seem to help encourage further development of JD Committees and to disseminate information concerning Johne’s Disease. A USDA web site for Johne’s Disease is being developed. One aspect will include a listing of all herds in various levels of the Johne’s Status Program. This will utilize a generic database to facilitate states to enter their herds, so qualified.

Report # 8. Clarence Siroky provided an overview of the Wisconsin Johne’s Advisory Committee. The Wisconsin Johne’s program was initiated in 1969 with 125 herds enrolled in a Johne’s program. A Johne’s Disease advisory board was created in 1982. The board includes legislators, veterinarians and producers. The board has addressed critical issues such as the “the black list”, vaccination issues, legislation, federal requirements and most recently educational issues with an emphasis on the Johne’s web site. Currently, their board is called “Bovine Health Advisory Committee. The board has developed a Johne’s fact sheet, has reviewed serologic tests and the implied warranty law.

Report # 9. Brian McClusky reported on the 2002 Dairy NAHMS needs assessment. A 3 page questionnaire was distributed to all those in attendance. The 2002 Dairy NAHMS study may include Biosecurity issues, cost of production, food safety, infectious diseases, nutrition, and manure management. Specific Johne’s issues may include pooled fecal samples, slurry samples, environmental samples, and some assessment of Johne’s prevalence.

Report # 10. Rich Jacobson, chair of the Serology Quality Control Committee indicated a protocol had been developed for a pilot project for monitoring Johne’s ELISA testing by a few laboratories. The objectives would include assessment of variation between runs, day to day variation, variation between labs, variation between kit lots and within plate variation. Three QC sera (neg, low pos & high positive) would be included in duplicate on each ELISA plate. Rich indicated that OIE will also be requiring three sera for each plate. He reminded the group of the need to develop guidelines for the inter-
pretation of ELISA test results for the veterinarian and producer. The original charge to this Committee and membership was outlined in a 3 page memo dated September 8, 2000.

Report # 11. Janet Payeur, chair of the Laboratory Certification Committee provided a detailed report including a copy of her powerpoint slides. 16 laboratories were approved for the fecal culture and two labs for PCR testing for the year 2000. A list of approved laboratories was provided to all in attendance. Steve Hennager presented the data on the serology check tests. 82 sets of sera were sent out to state labs, 7 labs in Canada, and one each for the Netherlands and Switzerland. 64 labs were approved. A listing of those approved labs was distributed. Participation in the check test is as follows: 28 labs in 97, 40 labs in 1998, 62 labs in 1999 and 64 labs in 2000 were approved. In 2000, 58 labs were approved with the IDEXX test, 1 with BioCor, 3 labs with both IDEXX & BioCor and 2 labs with "in-house" ELISA tests. Three labs used the Tip-Test. Steve is working with Sue Stehman and others to develop a sheep serology reference panel of sera.

Report # 12. Ray Sweeney, Chair of Committee on Validation of Check Tests provided a written report. In essence, this committee recommended no changes in the criteria used for passing either check test (fecal culture or ELISA serology).

Report # 13. Small Ruminant committee, no report.
Report # 16. Tina Rouse provided a one page report (3-31-01) for the National Academy of Sciences on the planned Johne's Study. 75% of the funding has been obtained.

Report # 17. The Cast report on Johne's Disease is near the final edition and will be published in the near future.

Meeting adjourned about 6:00 pm.

The second NJWG meeting was held at Hershey, PA on Friday, November 2, 2001 for a full day meeting with more than 110 persons in attendance. The highlights of that meeting included:

1. Larry Hutchinson provided an overview of the Johne's Disease study by the National Research Council, Board of Agriculture and Natural Resources. A statement of task for the study was reviewed, along with committee membership and The time-line to complete the project is very tight. The opportunity for public comment will end January 15, 2002. A draft document will be available in March, 2002 with a final publication due for release in July 2002.

An open meeting of the NRC for the Johne's project was held in the afternoon of November 4, 2001 with 12 invited speakers. Dr. Bruce Rideout, pathologists from the San Diego chairs the study panel.

2. A special session at the NJWG Hershey meeting, chaired by Scott Wells focused on Johne's disease diagnostic tests, ELISA testing
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and fecal culture using liquid media. Speakers for this panel discussion included John Adaska, Mike Collins, Scott Wells, Todd Byrem, Sang Shin, and Sue Stehman. John Adaska presented data on sample variation S/P ratios with repeat testing, especially sera near the "cut-point". Mike Collins presented a new diagnostic approach using likelihood ratios at various cut-points which would indicate the probability of the animal being infected. Scott Wells presented data on ELISA sampling options in nearly 55 herds, ELISA testing alone did not detect many low prevalence herds, additionally ELISA if not followed by fecal culture misclassified many negative herds as positive. Use of pooled fecal samples seemed to provide an alternative economic method to detect infected low prevalence herds. Todd Byrem presented data on the milk ELISA indicating a similar diagnostic sensitivity to serum ELISA. Sang Shin presented updated data concerning the validity of liquid culture which reduces the culture time from 16 weeks to 45 days. Liquid culture seemed to have better sensitivity than traditional culture on HEYM. Some samples were never recorded as positive, yet were AFB positive. Are these organisms examples of new biotypes? Contamination of the liquid culture media still remains a challenge.

The need for a comprehensive document providing guidelines for interpretation of various ELISA testing for a variety of purposes including low (0.1 -4.9%), medium (5 - 9.9%) and high prevalence (>10%) herds in addition to status herds. Alternative testing methods including the use of pooled fecal cultures, Gamma Interferon, milk ELISA and PCR testing of pooled fecal samples should be included in these guidelines.

3. National Voluntary Johne's Management, Testing, Research & Indemnity Program for Dairy Cattle was presented by John Adams. Copies of the latest draft (6 pages) dated October 25, 2001 were provided. This draft document has been revised substantially from the draft presented at the Colorado Springs meeting. Some of the major changes include: any producer that elects to participate in the program must test monthly all pregnant cattle on a "rolling" monthly basis. ELISA positive animals must be confirmed by fecal culture. Heavily infected cattle (TNTC) must identified by an R-punch and removed from the herd for rendering. Other fecal culture positive cattle will be identified with an J-punch in the left ear and removed from the herd for slaughter. All fecal culture positive cows must be culled from the herd prior to dry-off. An indemnity ($1,340) would be paid to those cattle with less than TNTC colony counts.

Three major areas of concern included lack of indemnity payment for the high shedders (TNTC), lack of inclusion for beef cattle and the issue of indemnity. Several states indicated their State Johnne's Advisory committees could not support the current
draft plan due to inclusion of an indemnity payment (Florida, California and Texas, among others) while some states (PA, OH & NY) indicated indemnity payments would enhance greater participation by producers. John Adams said the proposed program has been included in the next farm bill by the House of Representatives and would be introduced by several senators in the Senate version of the farm bill.

4. A draft copy of the “Uniform Program Standards for the Voluntary Bovine Johne’s Disease Control Program” dated October 31, 2001 (29 page document) was presented by Mike Carter. This document will serve as an evolving format of Program Standards for a National Johne’s Disease Control program. One major discussion point was the USDA licensed ELISA test listed under “2. Approved Program tests, section B”. Motion: Sweeney & Callihan, That “USDA licensed” be changed to “USDA approved”. Passed. For clarification, the USDA, CVB licenses ELISA kits, other agencies “approve” their use. Laboratories using non-licensed ELISA kits or milk ELISA may be “approved” by USDA-APHIS which is a different process than with USDA-CVB licensing of packaged kits. Motion: NJWG endorses the “Uniform Program Standards for the Voluntary Bovine Johne’s Disease Control Program” dated October 31, 2001 (29 page document). Passed.

Training for Designated Johne’s Epidemiologist will be held March 19-21, 2002 in Pennsylvania and May 7-9, 2002 in Colorado or California. This will be an intensive three day educational program focused on the preparation of Herd risk assessments and development of herd management plans for both beef and dairy herds. Each trained state designated Johne’s epidemiologist or Johne’s coordinator will be expected to offer training for veterinarians in their states to do risk assessments and develop herd management plans for cattle herds.

5. Research SC, chair, Judy Stabel: The diagnostic tests for Johne’s disease were reviewed including the antibody based tests, the cell-mediated based tests. Cell mediated tests may provide diagnostic sensitivity to detect infected cattle prior to fecal shedding or to detectable antibody response. PCR testing of fecal samples has been improved with the recent release of the new IDEXX PCR test for Johne’s Disease. Nested PCR and another specific probe (HsX protein) has been identified as being specific for Johne’s Disease. The M. paratuberculosis genome (5,817,000 BPs) has been 98% sequenced with nearly 60% of the contiguous BP been identified. Completion of this important work by Drs. Kapur & Banantine should result in the identification of new diagnostic probes and potential candidate genes for improved vaccines. Milk pasteurization studies are continuing with a large project at the
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Moffet center in Chicago that will use Dubos media enrichment of samples 6 months followed by culture methods by culture methods for another 6 months.

6. Education committee report, chair, Don Hansen: Progress with the CD-ROM project is progressing with more than 300 slides available presently.

7. Dairy NAHMS 2002-Johne's Disease will be a major component indicated Brian McClusky, the Dairy 2002 NAHMS coordinator. Training of the VMO's to help collect the data will be held in January 2002. Approximately 21 states will participate with 5 herds per state being selected as herds to do a more extensive evaluation with whole herd fecal cultures, environmental monitoring and serologic evaluation. These herds will not be randomly selected.

8. Laboratory Certification, Chair Janet Payeur. 45 laboratories were approved on the fecal culture check test and 8 laboratories were approved for fecal PCR test. ELISA-92 sets

9. Economics committee, Chair, Ken Olson: Ken presented a written report listing committee objectives; membership with a listing of recent publications concerning Johne’s Disease.

10. Laboratory Quality Control, Chair, Rich Jacobson: Five laboratories have participated in a pilot project to collect data from three QC sera included on each ELISA plate in duplicate. Once the details are worked out, each laboratory participating in Johne’s ELISA testing will be expected to participate in the QC program. The laboratory QC committee will be meeting on Saturday morning to determine the path forward.

11. Small Ruminant, Co-chairs, Sue Stehman & Bill Shulaw: Nora Wineland presented data about the sheep NAHMS 2001 project.

12. State Programs: Nearly 28 states now have Johne’s Advisory committees, more states have accepted the Status program and the monthly phone calls to state veterinarians are continuing.

Treasurer’s report, Ken Olson: The current balance for the NJWG is $30,194.23.

National Voluntary Johne’s Disease Management, Testing, Research, and Indemnity Program for Dairy Cattle
Donald Lein, Cornell University; John Adams, National Milk Producers Federation; Gary Weber, National Cattleman’s Beef Association
Donald Lein led a discussion of this proposed program. John Adams described the latest “Draft National Voluntary Johne’s Management, Testing, Research and Indemnity Program” dated October 25, 2001 that was updated with comments received from the National Johne's Working Group (NJWG) and others from an original proposal discussed at the NJWG meeting in
Colorado Springs in the Spring of 2001. The primary goal of the proposed program is to encourage dairy herd owners to be practically free of Johne's disease in 5 years. This program is designed to provide a necessary comprehensive Johne's herd risk assessment and Johne's herd management plan as important prerequisites that accompany the testing and indemnity incentives that are provided to encourage voluntary participation. The testing and indemnity incentives will encourage producers to conduct necessary herd risk assessments and utilize best management practices to develop appropriate Johne's herd management plans to remove fecal culture confirmed infected animals and prevent further introduction and spread of the disease within their herds. The program is designed to encourage more testing between buyers and sellers, thereby helping to overcome the stigma that has always been associated with Johne's disease. This, in turn, will greatly assist the U.S. cattle industry in controlling the spread of this costly and insidious disease, and improve the competitive position of the U.S. with regard to exports of milk and meat products.

Gary Weber outlined the National Cattleman's Beef Association's position on this proposed program. The organization supports funding many of the elements of the proposed National Voluntary Johne's Management, Testing, Research and Indemnity Program for Dairy Cattle. However, these resources should also be used to expand Johne's disease control programs for beef cattle producers. Prior to indemnity being part of the program they recommend the development of pilot projects that would evaluate the need and effectiveness of indemnity as part of this program.

Evaluation of a New Fecal PCR test for detection of Mycobacterium paratuberculosis

J. R. Stabel\textsuperscript{1}, Trudy Bosworth\textsuperscript{1}, Tiffany Kirkbride\textsuperscript{2}, Richard Forde\textsuperscript{2}, R. H. Whitlock\textsuperscript{3}

Paper follows this report.

M. paratuberculosis isolated from market cows at slaughter

Dr. Chris Rossiter, Cornell University

The objective of this study was to evaluate the prevalence of M. paratuberculosis in cull dairy and beef cows at slaughter. Popliteal lymph nodes, ileocecal lymph nodes, and fecal samples were collected from 539 thin, sound, cull cows. From 135 cows, culture of liver, superficial cervical and popliteal lymph nodes was also performed. Maximum CFU counts from fecal culture and ileocecal lymph nodes indicated disseminated infection. The prevalence of M. paratuberculosis in thin, sound, market cows was 34% in dairy cows and 2.6% in beef cows. In summary, control strategies must focus on identifying high risk cattle.
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Response to the National Johne's Working Group (NJWG)
Five Year Review with Path Forward
Dr. William Hartmann, Chair of the Johne's Disease Committee

The Co-Chairs of the NJWG were asked to conduct a five year review and to outline a path forward by the United States Animal Health Association (USAHA) president 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 the Johne’s Committee of the USAHA. This report was completed and presented at the 2000 Johne’s Disease Committee meeting. The chairman provided a response to this report and praised the committee for its considerable accomplishments. Letters were received from the President of USAHA and the Animal Agriculture Liaison Committee of the AVMA praising the accomplishments of the NJWG. A resolution was received from the North Central USAHA recommending that the President of USAHA and the Chairman of the Committee on Johne’s Disease re-evaluate the need for the NJWG, relative to its mission. A resolution was passed by the committee instructing the chairman to appoint an ad hoc steering committee to recommend priorities that will promote continued progress toward achieving implementation of a comprehensive national Johne’s control and eradication program. Once the priorities are in place, the Steering Committee will establish a Strategic Plan for implementation of the priorities. The Steering Committee will also adjust the mission statement and goals of the National Johne’s Working Group, as required, in order to assure continued progress.

Session on Control of Johne’s Disease
Moderator: Dr. Scott Wells, University of Minnesota

Premise: Many states are developing programs to control Johne’s Disease in cattle operations, in some cases using public funding. The central question addressed in this session is: What are the essential components to control of Johne’s disease in infected herds?

Hubert Groenendaal presented results from a simulation model he and others at the University of Pennsylvania developed to evaluate the cost-effectiveness of various Johne’s disease control programs. These results showed that use of test-and-cull control programs with currently available tests is not cost-effective for dairy herds, but instead that use of control programs to reduce exposure of replacement heifers to the pathogen (maternity pen management, feeding colostrum from dam only, feeding milk replacer, and segregated heifer rearing) can be a cost-effective and successful control approach.

This was followed by presentations from three states indicating the status of these Johne’s disease programs and focusing on essential compo-
nents to herd control of Johne’s disease.

Minnesota Approach
Scott Wells

Johne’s disease is increasingly recognized as an important cause of animal disease in dairy cattle throughout the world, with increasing recognition in beef cattle and other ruminant livestock species. The causative agent is the intracellular bacterium Mycobacterium paratuberculosis (M. avium subspecies paratuberculosis). After initial infection in young calves, the disease progresses slowly, with clinical signs of diarrhea and weight loss most frequently appearing in cows from three to six years of age. There is no effective approved treatment for Johne’s disease; clinically affected cattle are usually sold for slaughter purposes. The National Animal Health Monitoring System (NAHMS) has estimated that the annual cost to infected U.S. dairy operations is over $100 per cow in inventory, with higher costs of more than $200 per cow in inventory per year in herds with high infection levels (Ott et al., 1999). With at least 22% of U.S. dairy cattle herds and 8% of U.S. beef cattle herds infected with M. paratuberculosis (CEAH, 1997) and continuing expansion of dairy herds and movement of cattle, implementation of Johne’s disease control strategies are critically needed.

Control of Johne’s disease on the farm requires an understanding of the clinical course of disease, routes of transmission, and current use of specific herd management practices. Control measures often recommended to cattle producers include 1) identification of infected cattle and removal from the herd to prevent further transmission, 2) prevention of calf ingestion of the organism from adult cow manure, milk or colostrum, or water, and 3) decrease of environmental contamination to reduce overall exposure to the organism, and 4) screening of purchased cattle to avoid introduction of infection to the herd. Because of diagnostic test inability to detect young cattle incubating the disease and lack of desired sensitivity and specificity in adult cows, test and cull control programs are often not currently economically feasible (Van Groenendaal and Galligan, 1999). In addition, individual cattle intended as herd replacements cannot be effectively screened prior to introduction to a herd. Because of these reasons, pathogen eradication is not currently a realistic goal on most dairy cattle operations.

Instead, control strategies on infected farms should be preferentially focused at reducing potential of transmission of infection. Studies have shown the highest risk of transmission is early in calf life, especially during the calving period and early calf life (Goodger et al., 1996; Johnson-Ifearu协同发展 et al., 1998; Wells et al., 2000). Researchers at the University of Pennsylvania have modeled Johne’s disease control using herd management strategies focusing on reduction of infection to the newborn calf and growing heifer (Van Groenendaal and Galligan, 1999) and shown that this disease can be controlled cost-effectively, over a period of several years.
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The Minnesota Board of Animal Health (www.bah.state.mn.us), in collaboration with faculty from the University of Minnesota, has developed a risk assessment-based Johne's disease control program. The Minnesota Johne's disease control program starts with completion of a herd risk assessment by a state or federal district veterinarian to evaluate the past history of Johne's disease and identify the most important routes of transmission of Johne's disease on the farm. Emphasis is placed upon the young calf in control efforts, as young cattle are at highest risk for infection and disease (and future transmission to other cattle). The risk assessment tool currently in use in Minnesota (www.cvm.umn.edu/dairycenter/johnes) is a modification of the original endorsed by the U.S. Animal Health Association's National Johne's Working Group (www.usaha.org/njwg/njwg.html). Herd testing is initiated using serum antibody tests to serve as a baseline from which to measure progress as well as identify test-positive cows at highest risk of disease transmission to calves. Then, after a careful review of available information, a herd management plan is developed jointly by the producer, herd veterinarian, and district veterinarian consistent with herd goals and objectives.

Several Minnesota dairy and beef cattle herds are currently participating in a demonstration Johne's disease herd control program that will model the changes in herd infection subsequent to management changes (www.cvm.umn.edu/dairycenter/johnes). While too early in the project to see results, we believe the control of Johne's disease using a herd management plan developed from a herd risk assessment approach is scientifically valid and economically feasible for dairy producers.

New York Approach
Pepi Leids

New York State Approach to Johne's Disease Prevention and Control

New York State's Johne's Disease Prevention and Control program is incorporated into the NYS Cattle Health Assurance Program (NYSCHAP) through the Johne's Disease module. Within the module producer's can participate in three different ways:

1. Participating Stage – enrollment in NYSCHAP core and Johne's module. Incorporate best management practices and prioritized intervention strategies into a farm specific herd plan to reduce the risk of acquiring and spreading the disease.
2. Enhanced Stage – same as above, plus strategic testing designed to enhance disease management and control and evaluation of progress.
3. Test Negative Herd Status – above, plus adherence to testing regimes complimentary to the US Johne's Herd Status Program.

NYSCHAP utilizes an in-on-off holistic approach to farm risk assessment, examining disease entry, disease spread, food safety and environ-
mental stewardship. The core module accomplishes this regardless of management area or disease issue. The disease modules, such as Johne’s disease, examine risks and management practices specific to that disease.

The flow of the NYSCHAP program begins with an enrollment meeting encompassing the regional state veterinarian or certified NYSCHAP Herd Planner, attending veterinarian, producer, consultants and any key employees. Baseline information is gathered and a walk-through risk assessment is completed. During the walk through there is a negotiation amongst the members of the team, looking at what are priority issues and what are feasible intervention tactics that fit with the goals and resources of the operation. The important risk areas that are examined include maternity pen, neonatal management, calf management, feed handling, manure management, general biosecurity, integrated test strategy and evaluation of purchased additions. From the activities conducted on the farm the state veterinarian or certified NYSCHAP herd planner prepares a herd plan, which includes intervention tactics assigned to specific herd employees with a frequency or duration. The herd plan is reviewed quarterly between the producer and attending veterinarian. At the end of year, an annual review is performed by the original team. Progress is determined and the herd plan is updated. The annual review includes subjective (i.e. clean and dry maternity pen) and objective (i.e. clinical cull rate due to Johne’s) measures. After completion of the annual review farms are awarded a certificate that indicates the number of years the farm has been successful in participating in modules in which the farm has enrolled.

Evaluation of the program is becoming a critical issue to ensure future funding. As NYSCHAP does not have pilot farms that have been followed over the fours years to look at disease prevalence and economics, there is a need to document and critically evaluate the program’s approach and success.

As the program grows, limited labor resources have become an issue in program implementation. NY has initiated a certification program for veterinarians to become Certified NYSCHAP Herd Planners. This process requires education in the background and best management practices of biosecurity and disease specific issues, as well as risk assessment. Three herd plans reviewed by the regional state veterinarian are required, including one virtual herd (on the NYSCHAP web site, http://nyschap.vet.cornell.edu) and two real herds. All plans are submitted through the NYSCHAP coordinator for verification. After completing certification, practitioners are required to complete 12 hours of NYSCHAP approved continuing education.

The strengths of the program include farm specific planning and education of producers and farm workers. An evaluation of 30 farms enrolled since 1999 for which several annual reviews were available, showed a 70% implementation of suggested management changes (Wapenaar, W., Leids, P. et al, submitted). These preliminary results suggest that the NYSCHAP ap-
proach is successful in changing farm management to address Johne's and other disease and biosecurity risks.

California Approach

Ken Thomazin

Ken Thomazin from the California Department of Food and Agriculture presented information from the developing voluntary California program. In this model, initial phases of herd participation focus on education, followed by management emphasis. Testing is brought into the program at the third phase of the program. Again, heavy emphasis is placed upon herd management and education, with testing used to support the herd control plan.

Session on the Association between Mycobacterium Paratuberculosis and Crohn's Disease

The moderator of this session, Dr. Mike Collins, provided an introduction to the subject. He referred persons interested in more information to the most recent review of literature in this field. The review, written by Eileen Rubery, CB, MB, PhD, FRCR, FCRPath, FFPHM, Senior Research Associate, University of Cambridge, can be found in the Internet at: http://www.foodstandards.gov.uk/committees/acmsf/intro_mapcrohn.htm

Dr. Collins highlighted the continuing rise in incidence of Crohn's disease in the U.S., Denmark, Israel, and Canada as well as other countries. He then described the various modes by which *M. paratuberculosis* can leave dairy herds and expose humans. This then provided the rationale for subjects addressed by subsequent speakers on the program.

Dr. John Gay described the task of the Committee on the Diagnosis and Control of Johne's Disease, of which he is a member, a committee of the Board of Agriculture and Natural Resources of the National Academy of Sciences. Dr. Gay started with a description of the administrative structure of the National Academy of Science. He reviewed the task assigned to the Committee which is focused on animal health but includes the issue of public health as well and listed the membership of the Committee. Dr. Gay outlined the short timetable that the Committee was given to complete its work. He concluded with a request that anyone and everyone who wishes to have input to the Committee’s deliberations and final report please provide written documentation to the Program Officer for the Committee, Dr. Tina Rouse (trouse@nsa.org) before January 15, 2002.

Dr. Subbarao Rava presented a discussion of the USDA western regional laboratory’s work on microbial pathogens in manure. He outlined the nature of the problem and gave some preliminary information on strategies to study movement of *M. paratuberculosis* off of farms and into the environment and potentially water ingested by humans.

Ms. Cheryl Miller, representing the Paratuberculosis Awareness and
Research Association (PARA) described Crohn’s disease and its impact on afflicted people as well as PARA’s history of interaction with the USAHA Johne’s Disease Committee. She made a strong plea that the Johne’s Disease Committee support the NMPF resolution to create an indemnity program for dairy cattle with Johne’s disease as originally proposed by the National Milk Producer’s Federation.

Dr. Collins made some concluding remarks emphasizing that the question of zoonotic potential of *M. paratuberculosis* is pivotal to decisions on how aggressively and by what methods we control this disease. Collins then introduced a resolution directing NIH to determine if *M. paratuberculosis* is a zoonotic pathogen.
EVALUATION OF A NEW FECAL PCR TEST
FOR DETECTION OF
MYCOBACTERIUM PARATUBERCULOSIS

J. R. Stabel¹, Trudy Bosworth¹, Tiffany Kirkbride²,
Richard Forde², R. H. Whitlock³

¹USDA-ARS-NADC, Ames, IA; ²Colorado Department of Agriculture, Denver,
CO; ³University of Pennsylvania, New Bolton Center, Kennett Square, PA.

Paratuberculosis is widely distributed both nationally and internationally in domestic ruminants such as cattle, sheep, and goats, as well as wildlife, such as deer, antelope, and bison. The prevalence of the disease in the US is difficult to ascertain because comprehensive studies have not been conducted to date. In 1996, the National Animal Health Monitoring System conducted a survey of dairy farms in the US using serologic analysis and estimated 20-40% of these herds have some level of paratuberculosis (14). The accuracy of prevalence estimates from this and other studies is limited by the sensitivity of the diagnostic test used, accurate recognition and reporting of the disease and number of animals sampled. It is estimated that annual losses in the US from paratuberculosis in cattle herds may exceed $220 million. This figure is extrapolated from estimated prevalence values as well as computation of financial losses due to culling or death of clinically infected cows, and reduced reproductive efficiency, feed efficiency and decreased milk production in subclinically infected animals. The significance of subclinical infection on economic losses to the producer are detailed in a recent review (8) with a 15-16% reduction in milk production accounting for the major portion of net monetary loss (1, 3). Mycobacterium paratuberculosis-infected cows beyond the second lactation have demonstrated losses of 1300 to 2800 pounds of milk per lactation (16).

Diagnosis of paratuberculosis is difficult because of the fastidious growth pattern of the microorganism and because of the paradoxical immune response of the host animal to infection. In the early subclinical stages of infection, the microorganism elicits a cell-mediated response by the host which can be characterized by strong delayed-type IV hypersensitivity reactions, lymphocyte proliferative responses to mitogens and production of cytokines by stimulated T lymphocytes. As disease progresses from subclinical to clinical stages, the cell-mediated immune response wanes and a strong humoral response predominates. The presence of antibody to M. paratuberculosis does not protect the host against the disease; indeed, active cell-mediated immunity appears to be essential to keep the infection in check. In the final stages of disease, lack of antigen-specific cell-mediated immune response or complete anergy may result allowing for rapid dissemination of the infection throughout the host (2).
Bacteriologic culture is the most definitive method of diagnosis since it can be used during both subclinical and clinical stages of disease, but it is time consuming, requiring up to 12 wk of incubation, and is also labor intensive (4). Contamination is often a problem when *M. paratuberculosis* is being cultured from fecal specimens, and the National Animal Disease Center has recently incorporated a two-step decontamination procedure to reduce the amount of fungal and bacterial microorganisms significantly (12). Since subclinical animals may shed organisms intermittently in their feces, use of fecal culture alone as a diagnostic test may result in misrepresentation of infection in the herd; only about 50% of infected animals are detected by fecal culture (10).

Methods of detection for *M. paratuberculosis* infection have also been developed using nucleic acid probes combined with the polymerase chain reaction. One specific probe is based upon partial sequence of an insertion element of *M. paratuberculosis*, IS900 (13). Other genetic sequences for *M. paratuberculosis* have been identified but have not been successfully incorporated into any diagnostic tests at this point primarily because of their low copy number. Another gene probe that is specific for *M. paratuberculosis* is recombinant clone F57, which is currently being used in some laboratories (9). A new genetic sequence specific for *M. paratuberculosis* was recently identified in our laboratory (6). The single-copy gene has been cloned and sequenced and found to be homologous to a heat-shock protein (hspX). A dinucleotide hybridization assay system was developed using oligonucleotides derived from this hspX gene to detect *M. paratuberculosis* and a recA gene conserved among mycobacterial species. The hspX oligonucleotide was able to distinguish all *M. paratuberculosis* isolates from related mycobacteria, including all closely related *M. avium* and *M. intracellulare* strains tested. Use of this single-copy gene sequence for detection of *M. paratuberculosis* in fecal samples yielded a lower sensitivity threshold than the IS900 multiple-copy gene sequence.

A DNA probe test kit based upon the IS900 sequence for diagnosis of *M. paratuberculosis* infection was developed and licensed for sale in the US (IDEXX, Westbrook, ME). Early studies (15) done in our laboratory to compare the DNA probe test kit with three different fecal culture procedures indicate that only about 60% of infected cattle detected by fecal culture can be detected using the DNA probe. Therefore, although highly specific for *M. paratuberculosis*, the DNA probe was unable to detect infected cattle that are shedding low numbers of organisms. However, this test has recently been improved to increase sensitivity of detection of low level shedders and may prove to be a useful tool for control of Johne’s disease. Laboratories such as South Dakota State are currently incorporating the IDEXX test into their laboratory regime for Johne’s disease testing.

Other researchers have attempted modification of the fecal PCR method to enhance sensitivity. A modification of the PCR test to include two con-
secutive amplification reactions using nested primers markedly increased the sensitivity of this assay (5). This method (nested PCR) was able to detect 50 organisms per gram of feces compared to $10^4$ organisms per gram for the previous IDEXX test. One diagnostic laboratory in US (South Dakota State) has successfully implemented use of the nested PCR technique into their laboratory regime. In addition, other modifications to the PCR method include the accelerated culture PCR (ACE-PCR) that was developed at the Purdue University Diagnostic Laboratory (11). Fecal samples are processed for culture on HEYM, however, after 2 weeks of incubation material is collected from the slant for DNA extraction followed by PCR. Sensitivity of detection was improved about 8% using the ACE-PCR method compared to standard culture. In addition, the ACE-PCR method expedites detection of positive animals from 12 weeks for standard culture to 2 weeks.

Further modification to the *M. paratuberculosis* DNA extraction procedure from fecal samples was recently developed by our laboratory. This method can identify infected animals actively shedding the microorganism in their feces at a level as low as 1 CFU/gm of feces. An evaluation of 200 well-characterized fecal samples demonstrated at sensitivity of detection of known fecal culture positive samples of 78%. In addition, 10% of the samples were PCR+ and culture negative at the time of processing but samples had previously been culture positive. Negative controls included in the evaluation were consistently negative in this sample set. Samples were blocked out according to their culture results to assess the sensitivity of detection of low shedders, middle shedders and high shedders. This PCR test accurately identified 91% (31/34) of samples with $> 70$ cfu/g of feces; 100% (8/8) of samples with $30-70$ cfu/g feces; 73% (8/11) of samples with $8-30$ cfu/g feces; 69% (11/16) of samples with $1-8$ cfu/g feces; and 33% (3/9) of samples with 1 colony on one tube. Therefore, this method shows great promise in accurately detecting animals in the early stages of disease that are shedding very low levels of the bacterium. A diagnostic tool that can detect both subclinically and clinically affected animals is an essential element for a control program designed to allay the spread of this disease.

References:

EVALUATION OF A NEW FECAL PCR TEST FOR DETECTION OF *MYCOBACTERIUM PARATUBERCULOSIS*


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CONTROL OF JOHNE'S DISEASE ON DAIRY OPERATIONS – THE MINNESOTA MODEL

Scott J. Wells
University of Minnesota
St. Paul, MN

Johne’s disease is increasingly recognized as an important cause of animal disease in dairy cattle throughout the world, with increasing recognition in beef cattle and other ruminant livestock species. The causative agent is the intracellular bacterium *Mycobacterium paratuberculosis* (*M. avium* subspecies *paratuberculosis*). After initial infection in young calves, the disease progresses slowly, with clinical signs of diarrhea and weight loss most frequently appearing in cows from three to six years of age. There is no effective approved treatment for Johne’s disease; clinically affected cattle are usually sold for slaughter purposes. The National Animal Health Monitoring System (NAHMS) has estimated that the annual cost to infected U.S. dairy operations is over $100 per cow in inventory, with higher costs of more than $200 per cow in inventory per year in herds with high infection levels (Ott et al, 1999). With at least 22% of U.S. dairy cattle herds and 8% of U.S. beef cattle herds infected with *M. paratuberculosis* (CEAH, 1997) and continuing expansion of dairy herds and movement of cattle, implementation of Johne’s disease control strategies are critically needed.

Control of Johne’s disease on the farm requires an understanding of the clinical course of disease, routes of transmission, and current use of specific herd management practices. Control measures often recommended to cattle producers include 1) identification of infected cattle and removal from the herd to prevent further transmission, 2) prevention of calf ingestion of the organism from adult cow manure, milk or colostrum, or water, and 3) decrease of environmental contamination to reduce overall exposure to the organism, and 4) screening of purchased cattle to avoid introduction of infection to the herd. Because of diagnostic test inability to detect young cattle incubating the disease and lack of desired sensitivity and specificity in adult cows, test and cull control programs are often not currently economically feasible (Van Groenendaal and Galligan, 1999). In addition, individual cattle intended as herd replacements cannot be effectively screened prior to introduction to a herd. Because of these reasons, pathogen eradication is not currently a realistic goal on most dairy cattle operations.

Instead, control strategies on infected farms should be preferentially focused at reducing potential of transmission of infection. Studies have shown the highest risk of transmission is early in calf life, especially during the calving period and early calf life (Goodger et al, 1996; Johnson-Ifearulundu et al, 1998; Wells et al, 2000). Researchers at the University of Pennsylvania have modeled Johne’s disease control using herd management strategies...
focusing on reduction of infection to the newborn calf and growing heifer (Van Groenendaal and Galligan, 1999) and shown that this disease can be controlled cost-effectively, over a period of several years.

The Minnesota Board of Animal Health (www.bah.state.mn.us), in collaboration with faculty from the University of Minnesota, has developed a risk assessment-based Johne’s disease control program. The Minnesota Johne’s disease control program starts with completion of a herd risk assessment by a state or federal district veterinarian to evaluate the past history of Johne’s disease and identify the most important routes of transmission of Johne’s disease on the farm. Emphasis is placed upon the young calf in control efforts, as young cattle are at highest risk for infection and disease (and future transmission to other cattle). The risk assessment tool currently in use in Minnesota (www.cvm.umn.edu/dairycenter/johnes) is a modification of the original endorsed by the U.S. Animal Health Association’s National Johne’s Working Group (www.usaha.org/rjwgrjw.html). Herd testing is initiated using serum antibody tests to serve as a baseline from which to measure progress as well as identify test-positive cows at highest risk of disease transmission to calves. Then, after a careful review of available information, a herd management plan is developed jointly by the producer, herd veterinarian, and district veterinarian consistent with herd goals and objectives.

Several Minnesota dairy and beef cattle herds are currently participating in a demonstration Johne’s disease herd control program that will model the changes in herd infection subsequent to management changes (www.cvm.umn.edu/dairycenter/johnes). While too early in the project to see results, we believe the control of Johne’s disease using a herd management plan developed from a herd risk assessment approach is scientifically valid and economically feasible for dairy producers.

References:


REPORT OF THE COMMITTEE ON LIVESTOCK IDENTIFICATION

Chairman: Dr. John W. Hunt, Jr., Jefferson City, MO
Vice Chairman: Mr. Kevin D. Maher, Ames, IA

Dr. David T. Bechtol, TX; Mr. John R. Behrmann, PA; Dr. Donald R. Bridgewater, CO; Ms. J. Amelita Facchiano-Donald, TX; Mr. Jim Fraley, IL; Dr. Anthony G. Frazier, AL; Dr. Larry M. Granger, MI; Dr. Steven L. Halstead, MI; Mr. Neil Hammerschmidt, VT; Dr. E. Ray Hinshaw, AZ; Mr. Joe N. Huff, CO; Dr. Jeffry J. Huse, NY; 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; Ms. Nancy J. Robinson, MO; Dr. E. C. Roukema, VA; Mr. J. Gary Shoun, CO; Mr. John Todd, FL; Mr. Daniel J. Vitiello, DC; Mr. Maurice H. Wessel, Jr., TX; Mr. John F. Wortman, Jr., NM.

Chairman: Kevin Maher (in place of Dr. John Hunt)
Vice-Chair: (same)

Meeting Agenda:
Opening remarks – Kevin Maher, Chairman

Dr. Dianne Sutton, APHIS-VS
Topic: National Scrapie Education Program

Dr. Cindy Wolf - University of Minnesota
Topic: Scrapie Education Program ID Issues

Dr. Robert Ehlenfeldt (in place of Clarence Siroky) Assistant State Veterinarian (WI)
Topic: State of Wisconsin Producer Input Sessions

Dr. Conley Byrd, State Veterinarian (AK) Topic: Electronic Certificate Resolution (see below)

Dr. Larry Granger, Michigan Department of Agriculture and Neil Hammerschmidt, Holstein Association USA. Topic: An electronic information system using RFID for animal health programs and the utilization of the National F.A.I.R. System

3:00 to 3:15 Break
Dr. Bob Meyer/Dr. John Green (VS, CEAH). Topic: The cost of tracing TB cases with and without individual animal ID
LIVESTOCK IDENTIFICATION

Gary Wilson, Chairman, NCBA Committee on Cattle Health and Well-being. Topic: National Animal Identification: A producer’s perspective

Dr. John Wiemers, USDA-VS. Topic: National Animal Identification Update

Business Meeting –

There were 49 people that signed the committee register, with at least 3 people that have requested to join our committee.

Resolution #1 subject matter: “USDA ARS/APHIS Master Plan” (see attached)

The Chairman presented this resolution and a motion was made from Dr. Steve Halstead for committee support of the resolution, seconded by Dr. Susan Keller, and carried unanimously.

Resolution #2 subject matter: “Electronic Certificate of Veterinary Inspection” (see attached). Dr. Conley Byrd presented this resolution. A motion was made by Dr. Irby to support the resolution, seconded by Dr. Halstead. Discussion produced a suggested wording modification suggestion by Dr. Ralph Knowles to insert the words “utilize or” in the second line of the resolution ahead of the word “develop.” The motion passed unanimously with that modification.

Motion #1 for the establishment of an equine ID subcommittee was submitted by Steve Halstead, seconded by Amelita Facchiano and carried unanimously.

Motion #1: The United States Animal Health Association Livestock Identification committee should establish an equine ID sub-committee… with the initial membership composed of the group of members meeting in conjunction with USAHA general meetings over the past several years but not formally affiliated with any standing committee, known most recently by its participants as the equine passport and ID working group, and currently working to bring the equine industry together for an equine specific National ID symposium.

There was no new business other than suggestions of next year topics:
• Update on MI /FAIR Program
• Pork Traceability Program – NPPC
• Scrapie Eradication/Education Program Update

NIAA- ID Symposium Equine and Livestock update.

Meeting concluded at 5:40pm.
Scrapie Contact Information:
Coordination of Scrapie Slaughter Surveillance
Denise.E.Hall@aphis.USDA.gov 970-490-7985

Identification Requirements for Interstate Movement Official Identification System

What is the Purpose of Identifying Sheep and Goats?
- To enable traceback of scrapie-positive animals to their flock or herd of origin, and
- Trace out of animals from infected and source flocks

Classes of Animals That Must Be Identified in Interstate Commerce
- All breeding sheep regardless of age
- All sheep over 18 months
- All exposed, suspect, and high risk animals
- Breeding goats except low risk commercial goats

What types of Official Identification may be used?
- Official Eartags
- USDA provided eartags
- USDA approved eartags
- Electronic implants (SFCP)
- Registry Tattoos (certificate needed)
- Official premises ID number tattoos
- Official backtags for animals moving directly to slaughter

What types of tags can be used?
- Premises Based Individual Identification Tags
- APHIS provided or owner purchased tags produced by APHIS approved tag companies

Individual Identification Tags?
- USDA provided serial number tags
- Premises Based Tags
- Serial Number Tags
- Premises/Serial Number Tags

When can premises only ID be used?
- Premises only Identification such as registered brands and ear notches are limited to low-risk commercial flocks.

Who Must Apply Identification and When?
- The owner of a flock is responsible for the identification of the animal prior to commingling it in interstate commerce.

Can I move an animal intrastate without ID?
- States determine intrastate requirements; however, all States have
agreed to implement intrastate ID within 2 years. Also if an animal has changed hands in intrastate commerce such that it cannot be identified to its flock of origin and in some cases birth, it cannot be moved interstate with some exceptions.

Who will be held responsible for unidentified animals under the federal regulations?

- Any person who delivers or receives an unidentified animal that is required to be identified at a place where it will be commingled with animals in interstate commerce.
- Any person who removes an unidentified animal that is required to be identified from a site were commingling has occurred with animals in interstate commerce.

Sheep and Goat Identification Tutorial

- How to Comply with the Identification Requirements
- How to Comply with the Identification Requirements
- Do your animals need ID to move interstate?

Step 1 - Determine which animals need ID

- Breeding Ewes or Rams
  - If going to show: Official ID required
  - If going to sale: Official ID required
  - If staying at home: No official ID required

(A show/exhibition is considered interstate commerce if out of State animals are allowed at the show).

- Lambs under 18 months of age going to slaughter: No Official ID required
- Ewe lambs under 18 months of age leaving slaughter channels: Official ID required
- Culled sheep
- Culled Ewes or Rams: Official ID required
- Cull sheep defined as greater than 18 months of age

Step 2 - Request Premises Identification Number

If Identification is needed-Call local area office or 1-866-USDA-TAG (866-873-2824) and request a flock or herd ID number. Premises numbers will be assigned by the Area VS office and/or the State Veterinarian's office in each State.

Step 3 - Obtaining Ear Tags

You can request official USDA tags free from your local APHIS office 1-866-USDA-TAG. APHIS provided tags will ship direct to the producer by the tag company or distributed by the office. Sorry free tags come only in white L

You can purchase a variety of ear tag styles and colors from an approved
tag company

If you are interested in these tags please request the list of approved tag companies when requesting your premises ID number.

*Note: Yellow and red metal tags are reserved for scrapie-exposed and scrapie-positive animals respectively.

Step 4- Record Keeping

Set up a method to record the eartags or other official ID you applied. When an animal is sold you must provide the buyer with flock of origin information.

Record Keeping Sellers For Animals with flock of origin ID
- Record number of animals sold and their premises identification number(s) or their individual numbers
- Record the date of sale
- Record name, address and phone number of buyer

Record Keeping Buyer For Animals with flock of origin ID
- Record number of animals purchased and their premises of origin identification number(s) or their individual numbers
- Record the date of purchase
- Record name, address and phone number of the seller

Flock of origin owners who apply official identification
- Date officially identified
- Number of sheep and number of goats identified
- Premises number or serial numbers applied
- If born after January 1, 2002 in another flock and not already identified to flock of birth, the name, address, and phone number of the owner of the flock of birth.

Non-Flock of origin owners- Identifying animals with official ID
- Date tagged;
- Number of sheep and number of goats identified;
- Serial numbers applied;
- Flock of origin owner’s name, address, and phone number and premises number if known and if different the person requesting identification.

Non-Flock of origin owners - Identifying animals without official ID
- Date tagged;
- Number of sheep and number of goats identified;
- Serial numbers applied;
- Flock of origin owner’s name, address, and phone number and premises number if known and if different the person requesting identification.
- Animals born after 1/1/2002 - Flock of birth owner’s name, address, and phone number and premises number if known and if different from the flock of origin.

Record Keeping
LIVESTOCK IDENTIFICATION

A sample record form is available that includes the minimum requirements.

Step 5 - Apply ID tags

Apply tags to the animals before they leave your farm.

Step 6 – Certificate of Veterinary Inspection (Health Certificate)

Prior to interstate shipment or sale in interstate commerce of breeding or exhibition animals you must obtain a certificate of veterinary inspection (health certificate) from an accredited veterinarian. Certificate must be dated no more than 30 days prior to the movement or sale.

Step 7 - Retain Records

You must keep records for at least 5 years from the time the animals are transported or sold.

Step 8 – Questions?

Call 1-866-USDA-TAG (866-873-2824) for any questions

- Interstate Movement Restrictions
- Prohibited Movement
- Prohibited Movement
- Scrapie-positive and suspect animals
- Sexually Intact high-risk animals for breeding or exhibition
- Non-high-risk animals from infected or source flocks/herds for breeding
- Breeding animals from noncompliant flocks or herds

*Note: Most animals that are prohibited movement are eligible for indemnity

Restricted Movement

*High Risk Animals

Sexually Intact high-risk animals to slaughter

- Official individual ID and a permit or
- A permit and an indelible “S” on left jaw or
- A sealed conveyance and a permit

*Note: This includes sexually intact animals from infected or source flocks that are not scrapie-positive or suspect

For Breeding

- Official individual ID and a permit and
- For any female, the result of an official genotype test must be included or attached to the permit Must be QR or RR at codon 171
- If born after 1/1/2001, permit must include flock of birth or origin

For Exhibition

- Same as for breeding
- An owner and veterinarian statement that animal not lambed or aborted within 30 days of exhibition and animal is not due to lamb within 30 days
- No visible vaginal discharge

For Slaughter (under 18 months)

- Official individual ID for any animal not moving direct to slaughter or
terminal feedlot.
For slaughter (over 18 months of age)
  · Official individual ID
For Grazing
  · Official individual ID and a permit
  · For any female sheep the result of an official genotype test must be attached
  · Must be QR or RR at codon 171
SUCCESS DEPENDS on All of US!

Scrapie Education Program ID Issues
Dr. Cindy Wolf - University of Minnesota

Cindy discussed the issues related to the producer, markets and regulatory officials. The markets perception of the program, participation and record keeping have been considered. The intent of the program was to minimize the burden on the markets and to inform them of the records to keep. The importance of producer ID and the ancillary tools related to ID was discussed and presented via slides. Cindy indicated the perfect ID would be permanent, low cost, one per animal, one time application, non-irritating, adequate read range (if EID) and ID for the lifetime of the animal.

State of Wisconsin Producer Input Sessions
Dr. Robert Ehlenfeldt Assistant State Veterinarian, WI
(representing Dr. Clarence Siroky)

The department has conducted producer meetings in the field at 6 different meeting locations that represented approximately 39 producers. The concern was aimed at the consumer protection program and the on farm HACCP program.
The consensus was that an ID system that would be most acceptable is an inexpensive ID that would be used on animals leaving the farm of origin. The ID would contain the farm of origin (premise ID), freeze brand, American ID number, or some other form of ID. They felt that a successful ID system would need to be simple and cheap for the markets to accept- that would be market driven with incentives of reducing their liability.
They are forming and looking for partnerships for the voluntary program with regulatory agency oversight. A 1-2 year pilot is in need of national leadership.

Electronic Certificate of Veterinary Inspection Resolution
Dr. Conley Byrd, State Veterinarian (AK)

Dr. Byrd presented the resolution to the committee to consider during
LIVESTOCK IDENTIFICATION

the business meeting session:

SUBJECT MATTER: ELECTRONIC CERTIFICATE OF VETERINARY INSPECTION which was approved by the resolution committee and became RESOLUTION NUMBER: 12, also supported by the following committees:

COMMITTEE ON FOREIGN AND EMERGING DISEASES
Committee on Import / Export
COMMITTEE ON LIVESTOCK IDENTIFICATION

Dr. Larry Granger, Michigan Department of Agriculture and Neil Hammerschmidt, Holstein Association USA. Topic: An electronic information system using RFID for animal health programs and the utilization of the National F.A.I.R. System

The following is text from the slide presentation of Larry Granger and Neil Hammerschmidt:

Partnerships!

- Do it for the long haul!
- Do not reinvent the "same wheel"

Individual Animal Identification

- Administration of TB Testing
- Herd Inventories
- Animal Tracking
- Administration of TB Testing
- Herd Inventories
- Animal Tracking

Added Value Opportunities to Producers

- Administration of TB Testing
- Herd Inventories
- Animal Tracking

Information system
GDB
Test data
Herd status F.A.I.R.
Individual Animal ID
Tracking
Premises Identification:
Re-issued new numbers
- St. abbreviation plus 5 alpha numeric
- Example MID3415
- Allows for 7,000,000 plus premises IDs per state

Animal Identification Numbers
- American ID
- USA plus 12 alpha numeric

ISO RFID Code
- Mfr Code plus 12 numeric
REPORT OF THE COMMITTEE

- Maintain previous IDs (USDA numbers, etc.)

Identification Methods
- Electronic ID
  - AIN number
  - State abbr.
  - EID indicator
  - RFID Ear Tag
  - Visible Tags
    - (Producer's preference)

Michigan Bovine TB Eradication Program Identification of Cattle - High Risk area Accredited Herds

Two main processes - producer tags new animals at time of Whole Herd TB Test.

Information system-
- Populate F.A.I.R. from the GDB- with Premise ID and Last Test Inventory

Steps -
- Prepare for TB Test
  - MDA-Fair - PC - Load into Psion Workabout
RFID ISO reader attached

Functions:
- Use Herd Inventory
- Record CFT/CCT data
- Record Market data
- Result Validation

All existing ID numbers are recorded. Then the animal is scanned to "marry" the EID code to the animal's ID record on the FAIR system.

Each animal's ID confirmed at CFT examine.

Tremendous efficiency is gained with RFID and the F.A.I.R. Handheld when the test results are recorded.

The F.A.I.R. System replaces the paper based CCT Scattergraph.

The FAIR Handheld is an important component of the identification process as well as the data collection of the TB test results. Transfer of Test Data occurs from the handheld to the PC.

Herd Test Record Printed for Producer's
- ID Data is send to FAIR
- Test Data is sent to GDB
- At participating markets and processing plants will have stationary readers and handheld readers to record IDs.

The animal tracking will connect buyers and sellers (Producer/Rancher) during a sales transaction.

Seller Login (Premises ID required)
- System checks herd test status
- If okay, issues permit number
- Seller enters ID of cattle being sold and Premises ID of buyer

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LIVESTOCK IDENTIFICATION

- Confirms inventory and validates ID
- System checks herd test status
- If okay, issues permit number
- Seller enters ID of cattle being sold and Premises ID of buyer
- Confirms inventory and validates ID
- Issues movement permit (Sale PENDING)

Buyer Logs on (Premises ID required)
- Received cattle and Permit Number
- System validates Premises ID
- Confirms cattle IDs received
- System "moves" cattle to new premises.

You may log into FAIR online and bring up:
- Animal or premise reports,
- Animal summary reports,
- Premise profile,
- Animal profile,
- Movement summaries

The Cost of Tracing TB Cases With and Without Individual Animal ID

Dr. Bob Meyer/Dr. John Green (VS, CEAH)

This report was presented by Dr. Bob Meyer and the following report contains excerpts from his slide presentation.

U.S. total TB Program expenditures by year from 1990 to 1999. Started at $16 million and has dropped to about $13 million. It could easily increase to over $14 million if we have to do a lot more testing.

Six States were Involved in 2001 in the Kansas Slaughter Plant Traceback. Expenditures in just the six states involved in this traceback are about $600,000, down from over $1.4 million in 1991.

Expenditures in each of the six states have been similar, ranging from less than $100,000 in Arkansas to about $150,000 in Tennessee and Missouri. Why was there a big spike in Missouri in 1991? Did they have an outbreak or did they have to test a large number of additional cattle? Missouri in 1991 is a good example of how fast expenditures can increase if there's an episode.

A graph example was presented to demonstrate how much more it costing in Texas and Michigan than in our six states. If it gets out-of-control in our six states, expenditures can increase rapidly, as we can see from Michigan and Texas. Expenditures in each of our six states can go from $100,000/year to $1.5 million/year very quickly.

If we want to put this on a per cow basis, we can divide total expenditures by NASS's estimate of total cattle and calves in each state on January

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1. If we have to do addition testing, it’s going to cost 5 cents/head. This cost/head will be at least matched by industry costs. So, the question to ask is: Can we put an animal identification system in place for less that 10-15 cents/head?

This is not really a valid comparison, but if we want to test just the heifers in each of our six states, the cost will vary from 20 cents/head to nearly a dollar/head.

ID is needed for traceback as we found that between 30-50% are untraceable.

**National Animal Identification: A producer’s perspective**

Gary Wilson, Chairman, NCBA Committee on Cattle Health and Well-being.

Gary participated in a Canadian trip to study their cattle industry derived ID system, along with John Wiemers and others.

NCBA is not in support of a U.S. national ID system but will support research on an adequate and effective ID system. The brucellosis tags in heifers aid in traceback in the past. There must be a method to record changes in ownership.

NCBA has formed a working group to study tracing of chemical residues. A committee is being formed with representation from FSIS, breed associations and others in this imitative. They want to look at all possibilities including technology for identity at slaughter. The target that seems most appropriate is the breeding herd (beef and dairy), interstate shipment, imported cattle, etc.

We have experienced a “Teachable Moment” on all levels of animal health regarding surveillance and monitoring.

Management of the information system will facilitate decision-making. Standards are needed for software and hardware. The beef industry wants a “Frictionless ID System.”

**Sheep Scrapie Eradication Program**

Dr. Wayne Cunningham- CO

The database management was discussed and the need for a uniform system for animal health and production use. Their proposal for an ID system involves eartags and EID eartags with inline readers. The most reliable and practical method is electronic, and Colorado supports the plan to comply with ID requirements for interstate shipment.

**National Animal Identification Update**

Dr. John Wiemers, USDA-VS
LIVESTOCK IDENTIFICATION

Discussed the Canadian Cattle ID program and his visit with Julie Stitt. In the beginning of the Canadian ID program, there were vocal opponents. Now, there are more strong proponents.

The phases of an ID program in the US are:

- Set standards – number, device, premise ID,
- Associate Standards through out the system.
- Attaching animal information- species, age, gender, breed, etc.
- Animal health events- date, vaccination, test, certification, etc.
- Track animal movement- premise to premise to slaughter

ID Priorities:
1. Adult – all species
2. Other high risk animals
3. Animals tested for USDA programs
4. Animals targeted by risk

Group: Topics suggested for next year’s meeting
- Update on the Michigan/FAIR program progress
- Pork Traceability
- Mandatory ID of Sheep
- Follow up on NIAA ID Symposium

End of Report
REPORT OF THE COMMITTEE ON NOMINATIONS AND RESOLUTIONS

Chairman: Dr. Ernest W. Zirkle, Trenton, NJ

Dr. J. Lee Alley, AL; Dr. Jones W. Bryan, SC; Dr. Leroy M. Coffman, FL; Dr. Arnold A. Gertonson, MT; Ms. Amy W. Mann, DC; Dr. Michael R. Marshall, UT; Dr. Larry A. Schuler, ND; Mr. Samuel J. Serata, NJ; Dr. H. Wesley Towers, DE; Dr. Larry L. Williams, NE.

PRESIDENT ......................................................... M. Lea, Louisiana
PRESIDENT-ELECT ............................................. R. E. Frost, California
FIRST VICE-PRESIDENT ................................. D. H. Lein, New York
SECOND VICE-PRESIDENT ......................... R. Willer, Arizona
THIRD VICE-PRESIDENT ................................. B. D. Marsh, Indiana
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

UNITED STATES ANIMAL HEALTH ASSOCIATION - 2001

RESOLUTION NUMBER: 1
SOURCE: Joint Committee on Animal Health Information Systems
Committee on Animal Welfare
Joint Committee on Aquaculture
Committee on Biologics and Biotechnology
Committee on Bluetongue and Bovine Retroviruses
Committee on Brucellosis
Committee on Captive Wildlife and Alternative Livestock
Committee on Environmental Residues
Committee on Feed Safety
Committee on Food Safety
Committee on Foreign and Emerging Diseases
Committee on Import/Export
Committee on Infectious Diseases of Cattle, Bison and Lama
NOMINATIONS AND RESOLUTIONS

Committee on Infectious Diseases of Horses
Committee on Johne’s Disease
Committee on Livestock Identification
Committee on Parasitic Diseases
Committee on Pharmaceuticals
Committee on Pseudorabies
Committee on Public Health and Environmental Quality
Committee on Public Relations and Information Technology
Committee on Rabies
Committee on Salmonella
Committee on Salmonella Enteritidis in Eggs
Committee on Sheep and Goats
Committee on Transmissible Diseases of Poultry
Committee on Transmissible Diseases of Swine
Committee on Tuberculosis
Committee on Wildlife Diseases

SUBJECT MATTER: USDAARS/APHIS MASTER PLAN

RESOLUTION:

The United States Animal Health Association (USAHA) strongly supports the United States Department of Agriculture’s (USDA), Agriculture Research Service (ARS), Animal and Plant Health Inspection Service (APHIS), Master Plan for Facility Consolidation and Modernization of the ARS National Animal Disease Center (NADC), the APHIS National Veterinary Services Laboratories (NVSL), and the Center for Veterinary Biologics (CVB) and recommends the immediate funding of all costs of construction, equipping, operation and maintenance of the Ames, Iowa national animal health facilities depicted in the USDA six-year Master Plan. We applaud the recent support shown by both houses of Congress in appropriations for planning the facility, but that is not sufficient for the most rapid and efficient programming and construction of these critical facilities. These facilities are essential to protect and ensure our nation’s food safety and supply and its 120 billion dollar animal industries.

USAHA encourages Congress to provide mandatory (earmarked) funding for the Master Plan.

This resolution shall be delivered to the President, the Secretary of Agriculture and Congress.

RESOLUTION NUMBER: 2
SOURCE: AQUACULTURE COMMITTEE
SUBJECT MATTER: SIGNIFICANCE OF AQUATIC ANIMAL PATHOGENS IN AQUACULTURE EFFLUENTS

RESOLUTION:

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal and Plant Health Inspect-
tion Service (APHIS), Veterinary Services (VS) to immediately develop and publish agency guidelines providing for electronic signatures, confidentiality, integrity, and availability of electronic submissions. This will enable the Center for Veterinary Biologics (CVB) to develop guidelines and procedures for the electronic submission of veterinary biologics program documents in a timely manner in accordance with the requirements of the Government Paperwork Elimination Act.

RESOLUTION NUMBER: 6
SOURCE: COMMITTEE ON BRUCELLOSIS
COMMITTEE ON PSEUDORABIES
SUBJECT MATTER: FERAL/WILD SWINE
RESOLUTION:
The United States Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) and Veterinary Services (VS), Agriculture Research Service (ARS) and Cooperative State Research, Extension and Education Service (CSREES) to recognize the feral/wild swine threat as a high priority to fund research, program support and field studies.

In particular, funding is necessary to:

1. Conduct population studies needed to support the development of disease threat management strategies.
2. Define the role of Brucella strain RB51 and/or VTRS-1 for use as a dual vaccine and conduct field trials to determine their efficacy.
3. Conduct field trials and studies in relation to swine brucellosis and pseudorabies infection in feral swine and their transmission to domestic swine.

RESOLUTION NUMBER: 7
SOURCE: COMMITTEE ON INFECTIOUS DISEASES OF HORSES
SUBJECT MATTER: WEST NILE VIRUS RESEARCH
RESOLUTION:
United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Service (VS) and Agriculture Research Service (ARS) facilitate research to better understand the epidemiology of West Nile Virus (WNV) infection in equids.

RESOLUTION NUMBER: 8
SOURCE: COMMITTEE ON INFECTIOUS DISEASES OF HORSES
SUBJECT MATTER: WEST NILE VIRUS PROGRAM SUPPORT
RESOLUTION:
The United States Animal Health Association (USAHA) requests the United States Department of Agriculture (USDA), Animal and Plant Health Inspe-
tion Service (APHIS), Veterinary Services (VS):

1. Consider West Nile Virus (WNV) as an endemic disease.
2. Provide resources to assist states with field activities, standardized data collection, analysis and reporting.
3. Fund National Veterinary Services Laboratories (NVSL) in order to provide testing capability and to supply antigen to meet demand.

RESOLUTION NUMBER: 9
SOURCE: COMMITTEE ON INFECTIOUS DISEASES OF HORSES
SUBJECT MATTER: CONTAGIOUS EQUINE METRITIS TESTING PROCEDURES FOR STALLIONS

RESOLUTION:

The United States Animal Health Association (USAHA) requests the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) petition the Office of International Epizootics (OIE), Animal Health Code Commission to review and amend the 2001 OIE Chapter on Contagious Equine Metritis (CEM) Articles 2.5.1.2 and 2.5.1.3 to include pre- and post-entry test breeding of stallions as an essential requirement for importation from known CEM affected countries.

RESOLUTION NUMBER: 10
SOURCE: COMMITTEE ON TRANSMISSIBLE DISEASES OF SWINE
COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY
COMMITTEE ON FOREIGN AND EMERGING DISEASES
SUBJECT MATTER: FOREIGN ANIMAL DISEASE (FAD) DIAGNOSTIC CAPABILITY AT THE STATE AND LOCAL LEVEL.

RESOLUTION:

United State Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS), Veterinary Services (VS) to implement a program to train, equip and encourage state veterinary diagnostic laboratories to perform tests and enhance surveillance for diseases that are foreign to the United States.

RESOLUTION NUMBER: 11
SOURCE: COMMITTEE ON FOREIGN AND EMERGING DISEASES
SUBJECT MATTER: PROVISION OF FOREIGN ANIMAL DISEASE DIAGNOSTIC REAGENTS TO STATE LABS

RESOLUTION:

The United States Animal Health Association (USAHA) strongly urges the United States Department of Agriculture (USDA), Animal and Plant Inspection Services (APHIS, Veterinary Services (VS) to provide standardized, validated, non-infectious diagnostic reagents for foreign animal diseases to state and university regulatory veterinary diagnostic laboratories. These re-
agents would be used for screening and surveillance with the understanding that any suspect or positive findings by those laboratories would be considered presumptive, maintained in confidence, and immediately reported to USDA and the State Veterinarian with the specimens being immediately forwarded to the appropriate USDA laboratory for confirmation.

USAHA strongly supports USDA in seeking funds for and to provide validated methods, standardized operating procedures, appropriate training and proficiency testing to the state and university regulatory veterinary diagnostic laboratories for the proper use of the foreign animal disease (FAD) diagnostic reagents and the communication of results to USDA.

RESOLUTION NUMBER: 12
SOURCE: COMMITTEE ON FOREIGN AND EMERGING DISEASES
COMMITTEE ON IMPORT / EXPORT
COMMITTEE ON LIVESTOCK IDENTIFICATION
SUBJECT MATTER: ELECTRONIC CERTIFICATE OF VETERINARY INSPECTION

RESOLUTION:
The United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Inspection Services (APHIS), Veterinary Services (VS) in cooperation with the states, develop and utilize an electronic certificate of veterinary inspection that uses a USDA web based computer database to document intrastate, interstate and international movement of livestock and poultry.

RESOLUTION NUMBER: 13
SOURCE: COMMITTEE ON FOREIGN AND EMERGING DISEASES
SUBJECT MATTER: US LIVESTOCK DEMOGRAPHIC DATA

RESOLUTION:
The United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Health Inspection (APHIS), Veterinary Services (VS) work with the National Agriculture Statistics Service (NASS) to design and implement surveys to collect and report sufficient demographic data for all United States livestock populations, including equids, to facilitate appropriate animal health decision making by APHIS as well as by state animal health officials.

RESOLUTION NUMBER: 14
SOURCE: COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES
SUBJECT MATTER: POTENTIAL IMPACT OF FMD AND OTHER O.I.E LIST A DISEASES ON POULTRY OPERATIONS

RESOLUTION:
The United States Animal Health Association (USAHA) encourages the
United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) to make the preservation of non-susceptible species enterprises a primary consideration in designing control programs for emergency animal diseases. Specific areas of concern include the following.

1. Control programs for foot-and-mouth disease (FMD) and other Offices of International des Epizooties (O.I.E.) List A diseases should include provisions allowing access to, care and feeding of, and timely marketing or movement (including intra- and interstate movement) of poultry and poultry products, to the maximum extent consistent with rapid control of the disease.

2. USDA, APHIS, VS should promote harmonization of state control plans, and develop national standard operating procedures (SOP) for management of non-susceptible species involved in outbreaks of emergency diseases. The attached draft provisions, developed cooperatively with input from several poultry-producing states, are offered as an example.

3. Non-susceptible species, which must be destroyed or are severely compromised economically due to disease controls in susceptible species, should be indemnified.

USAHA further urges USDA, APHIS, VS to convene a cooperative industry-state-federal working group, under the auspices of the USAHA Committee on Transmissible Diseases of Poultry and Other Avian Species and the Committee on Foreign and Emerging Animal Disease to develop a national model Standard of Operating Procedures (SOP) for managing poultry during outbreaks of emergency animal diseases affecting other species.

RESOLUTION NUMBER: 15
SOURCE: COMMITTEE ON TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES
SUBJECT MATTER: CONGRESSIONAL FEASIBILITY STUDY ON AVIAN VIRAL DISEASE RESEARCH
RESOLUTION:

The United States Animal Health Association (USAHA) encourages United States Department of Agriculture (USDA), Agriculture Research Service (ARS) to complete and release the 2001 congressionally mandated feasibility study to consolidate avian viral disease research in Athens, Georgia.

RESOLUTION NUMBER: 16
SOURCE: COMMITTEE ON TUBERCULOSIS
SUBJECT MATTER: APPROVAL OF TB PCR ASSAY AS OFFICIAL TEST
RESOLUTION:

The United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Health
Inspection Service (APHIS), Veterinary Services (VS) approve the tuberculosis polymerase chain reaction (PCR) assay as an official USDA laboratory procedure for the diagnosis of tuberculosis in livestock. The assay should be used only in series with samples of formalin-fixed, paraffin-embedded tissues that have lesions characteristic of tuberculosis with acid-fast organisms. Applicable program standards need to be amended to allow designated tuberculosis epidemiologists to establish a diagnosis of bovine tuberculosis and immediately initiate an official disease investigation based on a positive PCR result. Results of the PCR assay should be used in conjunction with other test results and epidemiological information to determine appropriate regulatory action.

RESOLUTION NUMBER: 17  Not approved
SOURCE: COMMITTEE ON TUBERCULOSIS
SUBJECT MATTER: TUBERCULIN TESTING REINDEER
RESOLUTION:
The United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS), Veterinary Services (VS) exempt reindeer from the testing requirements placed on other cervidae for interstate movement.

RESOLUTION NUMBER: 18
SOURCE: COMMITTEE ON JOHNE'S DISEASE
SUBJECT MATTER: USDA FUNDING FOR JOHNE'S DISEASE STEERING COMMITTEE AND PRIORITY ACTION
RESOLUTION:
The President of the United States Animal Health Association (USAHA) requests that the chairman of the Committee on Johne's Disease appoint an ad hoc Steering Committee to recommend priorities that will promote continued progress toward achieving implementation of a comprehensive voluntary national Johne's control program.

The USAHA requests financial support from United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS), Veterinary Services (VS) to convene a meeting(s) of this ad hoc steering committee. Recommendations of the Steering Committee shall be presented to the Committee on Johne's for approval. Once the priorities are in place, the Steering Committee will establish a Strategic Plan for implementation of the priorities. The Steering Committee will also adjust the mission statement and goals of the National Johne's Working Group (NJWG), as required, in order to assure continued progress.
RESOLUTION NUMBER: 19
SOURCE: COMMITTEE ON JOHNE'S DISEASE
SUBJECT MATTER: NATIONAL VOLUNTARY JOHNE'S MANAGEMENT, TESTING, RESEARCH, AND INDEMNITY PROGRAM FOR DAIRY CATTLE.

RESOLUTION:
That United States Animal Health Association (USAHA) endorses funding many of the elements of the proposed National Voluntary Johne's Management, Testing, Research and Indemnity Program for Dairy Cattle. These resources should also be used to expand Johne's disease control programs for beef cattle producers. In addition, USAHA recommends the development of pilot projects that would evaluate the need and effectiveness of indemnity as part of this program.

RESOLUTION NUMBER: 20
SOURCE: COMMITTEE ON JOHNE'S DISEASE
SUBJECT MATTER: UNIFORM PROGRAM STANDARDS FOR THE VOLUNTARY BOVINE JOHNE'S DISEASE CONTROL PROGRAM (LAST UPDATED OCTOBER 18, 2001)

RESOLUTION:
That United States Animal Health Association (USAHA) endorses, in concept, the Uniform Program Standards for the Voluntary Bovine Johne's Disease Control Program.

RESOLUTION NUMBER: 21
SOURCE: COMMITTEE ON JOHNE'S DISEASE
SUBJECT MATTER: ZOONOTIC POTENTIAL OF M. PARATUBERCULOSIS

RESOLUTION:
United States Animal Health Association (USAHA) requests that the National Institutes of Health (NIH) make a definitive determination on the zoonotic potential of M. paratuberculosis and inform the USAHA, the United States Department of Agriculture (USDA), the Food and Drug Administration (FDA), Center for Disease Control and Prevention, American Veterinary Medical Association (AVMA), and affected food producer organizations of their decision. If this cannot be done based on existing scientific data, NIH should carry out intra- and/or extramural research to arrive at a definitive conclusion on this important scientific question.
REPORT OF THE COMMITTEE

RESOLUTION NUMBER: 22
SOURCE: COMMITTEE ON JOHNE’S DISEASE
SUBJECT MATTER: SYMPOSIUM ON EFFICACY AND MANAGEMENT CRITERIA FOR USE OF IMMUNOLOGIC ASSAYS FOR FIELD APPLICATION FOR JOHNE’S DISEASE TESTING

RESOLUTION:
United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Inspection Services (APHIS), Veterinary Services (VS) and any interested commercial companies fund a one-day symposium on the performance of immunologic assays for practical use in Johne’s disease control.

RESOLUTION NUMBER: 23
SOURCE: COMMITTEE ON IMPORT/EXPORT
SUBJECT MATTER: USER FEES
RESOLUTION:
The United States Animal Health Association (USAHA) actively pursue liaison with the Animal Agriculture Coalition to develop alternative means to fund the United States Department of Agriculture (USDA), Animal and Plant Inspection Services (APHIS), Veterinary Services (VS) Import – Export activities related to live animals and germplasm with the intent of asking Congress to act on the issue.

RESOLUTION NUMBER: 24
SOURCE: COMMITTEE ON IMPORT/EXPORT
SUBJECT MATTER: PRE-SHIPMENT NOTIFICATION OF IMPORTED LIVESTOCK AND WILDLIFE
RESOLUTION:
The United States Animal Health Association (USAHA) requests that the United States Department of Agriculture (USDA), Animal and Plant Inspection Service (APHIS), Veterinary Services (VS) take action to measurably improve the notification of states that receives shipments of livestock and wildlife that enter the United States from other countries.

RESOLUTION NUMBER: 25
SOURCE: COMMITTEE ON CAPTIVE WILDLIFE & ALTERNATIVE LIVESTOCK
SUBJECT MATTER: REINDEER INTERSTATE MOVEMENT REQUIREMENTS
RESOLUTION:
The United States Animal Health Association (USAHA) requests the United States Department of Agriculture (USDA), Animal and Plant Inspection Services (APHIS), Veterinary Services (VS) immediately make necessary pro-
gram changes to provide the following for interstate and intrastate movement requirements for reindeer and caribou:

- any suspect[s] or reactor[s] on the comparative cervical tuberculin (CCT) from a qualified or accredited-free herd must be isolated from the remainder of the herd and quarantined, pending further evaluation.
- until the status of the suspect[s] or reactor[s] is determined, reindeer and caribou can be moved from such herds to shows and exhibits only, must be returned to the originating herd, must not come into contact with other livestock, and must move under permit from the state animal health authority of both the originating and receiving states.

USAHA also encourages state animal health officials to allow for reindeer and caribou movement under these program changes.

RESOLUTION NUMBER: 26
SOURCE: COMMITTEE ON CAPTIVE WILDLIFE AND ALTERNATIVE LIVESTOCK
COMMITTEE ON WILDLIFE DISEASES
SUBJECT MATTER: CHRONIC WASTING DISEASE PROGRAM
RESOLUTION:

The United States Animal Health Association (USAHA) requests the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) to continue to develop and implement the state/federal cooperative program for eradication of Chronic Wasting Disease in domestic elk with line item funding that includes sufficient funding for indemnity.

RESOLUTION NUMBER: 27
SOURCE: COMMITTEE ON RABIES
SUBJECT MATTER: A NATIONAL PLAN FOR RABIES CONTROL IN WILDLIFE
RESOLUTION:

The United States Animal Health Association (USAHA) urges the United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS), Wildlife Services (WS) to continue to seek additional new funding for terrestrial wildlife rabies control programs. The USAHA 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 and Prevention, to allocate appropriated funding and resources to assist states and local agencies in the development, maintenance and expansion of coordinated regional wildlife rabies control and vaccination programs.
REPORT OF THE COMMITTEE

RESOLUTION NUMBER: 28
SOURCE: COMMITTEE ON SHEEP AND GOATS
SUBJECT MATTER: NATIONAL SCRAPIE STATUS BOARD
RESOLUTION:

The United States Animal Health Association (USAHA) encourages the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS), Veterinary Services (VS) to recognize the establishment of a National Scrapie Status Board. The Board should be composed of six (6) members representing the following:

Two (2) members representing the sheep industry to be named by the American Sheep Industry Association;

Two (2) members representing the USAHA to be named by the President of USAHA;

Two (2) members representing the National Institute for Animal Agriculture (NIAA) to be named by the Chairperson of NIAA.

The Chairman of the Board will be elected by the members of the Board. The original members of the Board will be granted staggered terms and thereafter a Board member may serve for a period not to exceed four (4) years.

The Board’s primary duty is to determine the status of states to achieve the goals of the eradication program. Applications for state status must be presented to the Board for consideration. Actions taken by the Board must be reported to the Committee on Sheep and Goats. Further, actions taken by the Board will be recommended to USDA, APHIS, VS for national recognition.
The 2001 meeting of the Parasitic Diseases Committee continued discussion that began in 2000 on the increasing vulnerability to acaricide resistant *Boophilus* ticks from Mexico that can transmit babesiosis (Texas fever, or redwater), and tropical bont (*Amblyomma*) ticks from the Caribbean that can transmit heartwater. The 2000 meeting highlighted current information on the tropical bont tick and heartwater, and Texas fever ticks and babesiosis. The 2001 meeting was organized as a forum to consider the information needed to develop accurate risk assessments, and appropriate containment and elimination plans. The meeting opened with a brief review of the 2000 meeting, specifically the need 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.

One hour into the session, there were 24 people in attendance. The list of attendees included eight current members (out of 30) and sixteen visitors, several of whom expressed an interest in joining the committee. The following papers were presented:

"Redwater & Heartwater - Two Sinking Scenarios"

Opening remarks: What we think we know (and what we know we don't) in order to do risk assessments. John George, USDA, ARS, Kerrville, and Gale Wagner, Texas A&M University, College Station.

The livestock industry in the United States is increasingly vulnerable to two tick-borne diseases, heartwater and babesiosis (redwater). Heartwater
is an acute disease of domestic and wild ruminants in sub-Saharan Africa and the eastern Caribbean, caused by *Cowdria ruminantium* and transmitted by *Amblyomma* ticks. Babesiosis in cattle is a terrible problem in tropical and most sub-tropical areas of the world, caused by the hemoprotozoans *Babesia bovis* and *B. bigemina*, and transmitted in the western hemisphere by *Boophilus* ticks. The potential problem of *Boophilus* ticks in the U.S. is exacerbated by widespread acaricide resistance in Mexico.

The problems with babesiosis and heartwater have been repeatedly highlighted in recent meetings of the National Cattlemen’s Beef Association, the National Institute of Animal Agriculture, the FAO and the coalition of donors in the Caribbean Amblyomma Program (CAP). A risk assessment on heartwater was done in 1993, and an economic analysis of an outbreak of *Boophilus* ticks in central Texas was prepared in 1999 and published in 2000. The need to promote a science-based framework for more accurate risk assessment of heartwater and babesiosis, and the *Amblyomma* and *Boophilus* ticks that transmit them was reiterated. The risk is defined as the likelihood of tick introduction times the magnitude of the consequences associated with disease establishment (Aphis, 1993).

**Diagnosis and management of heartwater (Cowdria ruminantium infection) and redwater (Babesia bovis infection).** Corrie Brown, University of Georgia, Athens (presented by Gale Wagner, Texas A&M University, College Station).

The discussion opened with a review of the proposed nomenclature of the ehrlichias, which will likely result in changing the genus-species name from *Cowdria ruminantium* to *Ehrlichia ruminantium*.

Clinical disease in both cases is usually (but not always) characterized by fever, fatigue and anorexia. Anemia, with hemoglobinuria is common in babesiosis, while nervous signs, circling, convulsions are noted in heartwater. Laboratory diagnosis usually includes evaluation of blood (PCV and Giemsa stained thin blood smears), serology (IFA and ELISA), possibly genomics (signature nucleic acid sequences), perhaps cell culture, and, in some instances, examination of tick tissues.

Diagnosis is complicated in many ways. Clinical signs may be due to multiple hemoparasite infections. The incubation period varies, from 6-10 days with *Babesia* and 10-20 days with *Cowdria*. The anemia, if present, may last only a few days, and, like nervous behavior, can have many causes. Blood smear examination is problematic, usually because parasitemias with both infections tend to be very low and short-lived. Serologic tests for antibody activity is difficult to interpret without a good history. These problems were discussed in detail at the 2000 meeting. The IFA test works well for *Babesia* antigens, but not *Cowdria (Ehrlichia) ruminantium* antigens due to cross reactions with antibody activity to the many other *Ehrlichia* organisms. Genomic tests are ok for *Babesia* but also problematic for *Cowdria (Ehrlichia)* because of the cross-hybridization with sequences from the many closely
related (some previously unrecognized) ehrlichias. Culture tests are possible and specific, but time consuming and expensive. Infections with organisms other that Babesia or Cowdria (Ehrlichia) complicate the use of cell culture. Finally, cell culture can prove a positive, but not necessarily a negative. Non-specific fluorescent probes are useful but may be difficult to interpret.

The management of these diseases must be based on risk assessments, recognizing the effects of changes in food animal health and production, wildlife and diversity in rural areas, the transmission of exotic disease agents by native ticks and vice-versa, and the increasing opportunities for exposure brought about by wildlife translocation, habitat modification, travel, mixed production systems, and other changes.

The Cattle Fever Tick Eradication Program - The rancher's viewpoint. Joe Finley, Callahan Ranch, Cotulla, Texas (presented by Pete Teel, Texas A&M University, College Station).

A brief history of the state-federal fever tick eradication campaign from about 1907 through the 1940s was presented. Now, 60 years since the end of the campaign, which was marked by the establishment of a permanent quarantine zone along the Texas-Mexico border, we are almost 3 generations removed from the problem. As a consequence, the impact of the introduction of Boophilus ticks from Mexico is not well known, much less understood. Ranchers may now have many cattle on several different properties, often involving multiple owners. The quarantine procedure that is mandated when Boophilus ticks are detected on U.S. cattle involves concentric levels of containment, control and surveillance, and therefore may involve livestock on hundreds of thousands of acres for 6-9 months or even years. The potential for wildlife and cattle involvement in the dissemination of these ticks is reflected in the dramatic rise in the number of infestations both within and outside the quarantine area, and by the increase in the percentage of apprehended (strays or smuggled) Mexican cattle (about 10% in 1970, but 90% today).

Mr. Finley particularly wanted to ask the audience when they thought the last Boophilus tick outbreak was? He asked Dr. Tell to tell them that it was three weeks ago, on one of his ranches, and that he was busy gathering cattle and “scratching” for ticks! He feels that few of today’s ranchers have a reference point or any experience with ticks, and may not realize the impact of changes such as the recent establishment of a wildlife conservation area that just about eliminates the quarantine zone, including the ability to survey and apprehend cattle.

The tropical bont tick - Wildlife implications Joe Corn, Southeastern Cooperative Wildlife Disease Study, Athens.

Amblyomma ticks in Africa feed on a variety of mammals and birds, with the adult stages generally found on large species. By contrast, all life stages of Amblyomma variegatum in the Caribbean are found on small mammals.
and birds, plus introduced species such as deer (introduced in the 18th century), rats, mice, mongooses, and feral cattle and cats. It is clear that in the absence of cattle, the life cycle could span 4 years. Although rumored, the Senepol cattle imported into Florida from St. Croix were not associated with the concurrent report of *Amblyomma variegatum* ticks on feral cattle found near the ranch of origin. There were also a few deer in the vicinity, but not deer with ticks.

Historic records indicate that *Amblyomma variegatum* were confined to a few islands until the 1950s, when they started appearing on other islands. Coincidently, cattle egrets were introduced to the eastern Caribbean at about the same time. Over time, migration of the egrets south to north resulted in the general distribution in the islands and then into the southeastern U.S. and north eastern South America. The work (Corn et al) in the Caribbean the early 1980's clearly established the role of migrating egrets in the distribution of *Amblyomma variegatum* throughout the Caribbean islands, and, potentially, into North and South America. The 1993 APHIS risk assessment used those results to suggest that egrets carrying infected ticks could play an important role in the introduction of heartwater into the U.S. It is interesting that while bont ticks are widespread throughout the islands, heartwater apparently is not. The conclusion is that usually larvae and nymphs are found on egrets, but not many adult ticks that are mainly responsible for disease introduction. On the other hand, there have not been any large scale epidemiological investigations into the prevalence of heartwater, even though local lore suggests that the disease is potentially widespread. With the constant movement of cattle from the Caribbean into the U.S., it is clear that the tick is not necessarily needed for the introduction of the disease into the U.S.

The potential distribution of *Amblyomma variegatum* in the U.S. overlaps the historic distribution of *Boophilus microplus*, and the spreading distribution of *Amblyomma maculatum* (see below). Within this Gulf coast savannah, there are numerous wildlife hosts for the tick, including white-tailed deer. Some questions that need to be answered in a risk assessment include the length of time it would take to detect an infestation of *Amblyomma variegatum* in wildlife, and how long it would take to detect heartwater in deer. Deer are known to be fully susceptible to needle infection with blood containing cells infected with the Gardel (Caribbean) strain of *Cowdria (Ehrlichia) ruminantium*. Nothing is known about whether or how long it would take to eliminate the tick and/or heartwater from deer.

The Gulf Coast tick; another candidate for the transmission heartwater in the U.S. - Pete Tell, Texas A&M University, College Station.

Work in the 1980s by Uilenberg and colleagues in the Netherlands, and confirmed by Mahan and colleagues in Zimbabwe in the 90s, established *Amblyomma maculatum*, the Gulf Coast tick, as a competent transtadial vector of *Cowdria (Ehrlichia) ruminantium*. The findings are of concern due to the presence of the heartwater agent (vectored by *A. variegatum*, the tropi-
The recent discovery of the tropical bont tick on cattle on St. Croix, a U.S. territory, has increased the concern.

The traditional distribution of the Gulf Coast tick has been in the southern states, usually 100 to 150 miles inland along the Gulf of Mexico coast. Through the late 1960s and into the 70s, however, the tick was also found in Oklahoma and Kansas. Then, beginning about 10 or 15 years ago, Gulf Coast ticks became well established in these states, and have been moving northward from Georgia as well. Clearly, these ticks have been moving, perhaps because of the proliferation of white-tailed deer, and have adapted to environmental conditions in the more northern latitudes. This is illustrated by the fact that, in Texas, the life stages of the tick are fairly discrete, with the adult peak in late August, the larvae in December, and the nymphs in March. In Oklahoma and Kansas however, the life stages overlap, with immatures active in the summer, and adults from late summer into late fall. Preliminary studies suggest that *Amblyomma maculatum* may be establishing in Nebraska, eastern Colorado and the panhandle of Texas, and could infest eastward to Virginia.

The consequence of this adaptation means that *Amblyomma maculatum* may become an important consideration to risk assessment. The more the life stages of a three host tick overlap in an annual cycle, the more opportunities there will be for transmission to occur. What isn’t well understood is whether all populations of the Gulf coast tick are equally competent as a vector of the heartwater agent. Also, if *Amblyomma variegatum* became established in the U.S. mainland, what effect would that tick have on the existing Gulf Coast tick population?

Clearly, the Gulf Coast tick has been established as a vector of the heartwater agent. Therefore, the heartwater risk assessment 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.

The issues and challenges of organizing a national emergency response plan against ticks and tick-borne diseases. Randy Crom, USDA, APHIS, Washington.

APHIS is in the process of developing response plans for highly contagious diseases, for non- or not-highly contagious diseases, and for vector-borne diseases. The outcome will likely clarify new partnerships between APHIS and ARS, with stakeholder groups and state and local governments, and with allied wildlife and conservation agencies and organizations. The new planning process intends to use the lessons learned in other countries that have successfully dealt with disease outbreaks, including FMD in Taiwan and the U.K., CSF in the Netherlands, and Nipah virus infections in Malaysia. The READEO process remains at the core of the plans, but new tools are going to be needed and will be developed to deal with disease outbreaks that might be national in scope.

The planning process has revealed the importance of USAHA commit-
tees. An example is the need to develop an inventory of current acaricides (especially pour-ons) and the regulations that need to be in place in order to use them in an emergency.

The issues and challenges of organizing a state emergency response plan against ticks and tick-borne diseases. Linda Logan, Texas Animal Health Commission, Austin.

The history of Texas fever, and the maintenance of the current quarantine zone along the Texas-Mexico border was used to describe how the state has developed a series of emergency plans. Factors that impact the emergency planning include the largest number of livestock and exotics, 20 land ports of entry, 9 seaports, 4 international airports, and a 1200 mile international border. The state has responded with the a concept called the Texas Emergency Response Team (TERT), which coordinates several key stakeholder groups with 31 state agencies including the Red Cross, the Departments of Health, Agriculture, Parks and Wildlife, and Public Safety, the Animal Health Commission and the state veterinary and medical diagnostic laboratories. The plans have been tested (a simulated FMD outbreak on the border), and the results used to further refine security and containment procedures, public information channels, and mitigation of community impact.

Acaricide resistance and how it changes the paradigm for tick control and elimination. John George, USDA, ARS, Kerrville.

The oft-overlooked prerequisites for any tick elimination/eradication program were described, including education and a public conviction that the program is needed, the legal infrastructure with clear lines of authority and responsibility, continuous adequate funding, and a science-based strategy using effective acaricides. The Cattle Fever Tick Eradication Program along the Texas-Mexico border was used as an example of how the original program met all the prerequisites but cannot continue to be successful in the current milieu of dwindling funding and public support, increasing problems with acaricide resistance, and increasing numbers of white-tailed deer and exotics. A major complication is the nearly complete wildlife conservation area along the border, superimposed on the quarantine zone. While the conservation area is popular and undoubtedly beneficial in many respects, it will severely limit, and in some cases negate, the ability to intercept illegal and incidental introductions of livestock and products that can transport ticks.

The U.S. is in a holding pattern of crisis management, with increasing vulnerability to ticks and tick-borne diseases. Our national plan relies on strategies developed 100 years ago. Rapid, sensitive methods for the detection of acaricide resistance are needed now if we are to develop much needed information on existing and evolving forms of acaricide resistance. While acaricide resistance is unlikely to be a problem with two and three-host ticks like *Amblyomma*, the relative lack of host-specificity of these ticks will pose far greater problems of containment, control and elimination than the one-host ticks like *Boophilus*. We need change the regulations, procedures and
PUBLIC PERCEPTIONS NOW IF WE ARE TO AVOID SERIOUS PROBLEMS IN THE FUTURE.

Roundtable Discussion - Randy Crom, USDA; Linda Logan, Texas Animal Health Commission; Aida Bogassian, USDA; Kelly Preston, USDA; Joe Corn, Southeastern Cooperative Wildlife Disease Study; Sherri Wainwright, USDA; and Corrie Brown, University of Georgia and Moderator.

The roundtable participants discussed the available information and what is needed in order to facilitate risk assessments on the tropical bont tick and heartwater, and Texas fever ticks and babesiosis. The currently available documents, a 1993 risk assessment on heartwater, and a 2000 risk assessment on acaricide resistant *Boophilus* ticks should be reviewed by the committee. Acaricide-based control strategies, current research programs, perceptions of problems by regulatory agencies, animal and food importation industries, and ranchers and the public were also discussed. The current situation in countries such as Mexico and Australia, and how those countries have dealt with the problems were highlighted.

Discussion centered on the issues that will most directly influence new risk assessments. These were:

1. Diagnosis of the diseases and identification of the pathogens;
2. Knowledge of possible routes and means of introduction of both the disease agents and the tick vectors;
3. Likely epidemiological scenarios and the potential geographic scope of tick infestations and disease outbreaks;
4. Approaches, tools (both available and needed), problems, and confounding factors that will affect efforts to detect, control and elimination of the ticks and diseases;
5. Perspectives on the preparedness and likely responses of stakeholder, commodity groups, and state and federal agencies; and
6. Education needed to develop new perspectives, approaches and regulations to support the conclusions.

Subcommittees for each issue were discussed and names of members suggested. A time line for developing a report was also discussed. It is anticipated that the subcommittee members will be named by January, that preliminary outlines of information needed will be produced by April, and that a final document on the information needed for the risk assessments will be available in August. The outcome of the report, including supporting resolutions, will be discussed at the USAHA meeting in mid-October, 2002 in St. Louis.

Finally, the roundtable participants discussed the need to attend meetings of other stakeholder groups and allied organizations during the next year, especially the regional USAHA meetings. More information and dates of meetings will be available by January.
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. Tom Burkgren, IA; Dr. Eric J. Bush, CO; Mr. John Caspers, IA; Dr. William H. Fales, MO; Dr. James E. Fox, GA; Dr. R.A. Gessert, FL; Dr. Eric Gonder, NC; Dr. Richard E. Hill, IA; Dr. John P. Honstead, MN; Dr. G. Dean Lindsey, IN; Dr. Vader Loomis, PA; 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. M.G. Scroggs, TX; Dr. Paul Sundberg, IA; Dr. Deepanker Tewari, PA; Dr. Lyle P. Vogel, IL; Dr. Phillip W. Widel, MO; Dr. Teddi Wolff, MO.

The Pharmaceutical Committee met at 12:30 on Monday, November 5, 2001 in the Monarch 1 Room of the Hershey Lodge and Convention Center, Hershey, PA.

Thirty-one participants were present with 14 committee members.

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. Steve Sundloff, CVM, led off the Pharmaceutical Committee meeting with a presentation entitled "Antibiotic Resistance Issues & CVM Update". Speaking about the antibiotic resistance issues, he presented some information from the New England Journal of Medicine, where in 1998 200 retail samples of ground beef, pork, chicken and turkey were cultured for resistant Salmonella. The study included a screen of 17 antibiotics (same as NARMS screen). 6% of beef samples had Salmonella, 13% of pork and 33% of the poultry. 84% of the samples were resistant to 1 antibiotic. 53% were resistant to 3 antibiotics. 16% of the samples were resistant to ceftrioxine (fluoroquinolone used in children for Salmonella infections). He did note that this data may not reflect the current situation in that it was 1998 data (before current HACCP measures were put in place).

On a related issue, Dr. Sundloff talked about the status of CVM's announced intent to withdraw enrofloxacin from the market in poultry (sulafloxacin has been already voluntarily withdrawn by Abbott, and Bayer is asking for a hearing regarding enrofloxacin in poultry). All the data for the review has been received. The Commissioner of FDA will make the decision whether the drug will be withdrawn, continue to be approved, or there will be a hearing.
Dr. Sundloff also spoke on illegal drug compounding (a serious and increasing problem in FDA’s eyes). FDA intends to take some investigative and regulatory action. The issue of most concern is imported bulk drugs (primarily from China and India).

Dr. Sundloff acknowledged that his original goal when he took his position with CVM (timely and accurate review of new animal drugs) has not been accomplished. He went on to say that CVM has employed a management firm to review its internal structure and business and recommend improvements to increase efficiencies. The contractor is supposed to be finished with this by March 2002. This should provide a 5 year plan for the agency.

The next speaker on the agenda was Dr. Richard Carnevale (AHI). The title of his presentation was “Antibiotic Resistance and Other Pertinent Issues”. Five key points presented were: 1. Fluoroquinolone resistance has been stable and low in chicken slaughter plant isolates. 2. In humans, fluoroquinolone-resistant campylobacter are low (6.4%) unless related to foreign travel or therapy. 3. AHI believes that FDA’s risk assessment is flawed in that it doesn’t follow the NAS model. 4. The clinical impact of campylobacter resistance is highly uncertain in that no NCCLS clinical breakpoint has been established. 5. Patients with resistant campylobacter infections DO respond to treatment by fluoroquinolones. He also noted that the antibiotic of choice for campylobacter is erythromycin and that resistance has actually been decreasing over the past 3 years for erythromycin.

Dr. Carnevale also discussed results from an AHI/Bayer sponsored risk assessment contracted with Cox Associates. According to this assessment, chicken consumption at home was not a key factor for campylobacter infections. Instead, restaurant consumption was a bigger risk. The study postulated that the risk may be coming from migrant restaurant workers who have a greater incidence of campylobacter-associated illness than the regular population. Reducing pathogen load in chickens would be 100% more effective in reducing campylobacter infections in humans than a ban on fluoroquinolone use. The study concluded that excess human health risks attributed to fluoroquinolone resistance are primarily imaginary.

Dr. Carnevale went on to say that >50% of the antibiotics used in animals have no relation to those used in humans. He questioned whether FDA should continue to monitor ALL drug use in animals vs. those drugs that have use in both humans and animals. Only 13% of the drugs used in animals are used as growth promotants. He also cited a study from IMS Health showing that 3200 metric tons of drugs are used in humans each year vs. 9300 metric tons (3 times) in animals, yet the biomass of animals is 5 times that of the human population in the U.S.

Dr. Carnevale talked about the results from a recent survey of the pharmaceutical industry. 88% of original NADA applications are overdue. The longest was overdue by 717 days! In contrast, the administrative NADA’s
have an average of 199 days to final approval (law says 180 days). 66% of the technical sections (formulations, etc.) of the NADA's were overdue. The average review process has been delayed by about 2 years.

Next speaker was Dr. Eric Bush, APHIS. The title of his presentation was "Use of Antibiotics and Feed Additives by U.S. Pork Producers". This was a summarization in part of the 2000 National Animal Health Monitoring Service survey which represents 92% of the U.S. swine population and 92% of swine operations. He concluded that antibiotics are an integral part of swine production being used in all production phases, by all size groups, through various routes of administration, and for various reasons. More information on the survey results can be found on the APHIS website.

Dr. Sandy Flick (Alpharma) next gave a presentation entitled "Public Perception of Antibiotic Resistance". She spoke about a number of myths put forth by public interest groups and gave rebuttals and facts concerning many of these myths. Some key points: 1. myth: there are more antimicrobials used in animals than in humans (fact: less on a percentage basis since there are more animals than humans). 2. myth: a subtherapeutic drug ban will fix the drug resistance issue (fact: no science-based information exists to tie drug resistance in humans with drug use in animals; in fact most resistance in humans is due to overuse of drugs in humans). 3. fact: the vast majority of drugs used in animal feed and water are not related to those used in human medicine. 4. fact: subtherapeutic antimicrobial use in animals reduces subclinical infections in animals (this point was borne out later when Dr. Schultz presented a paper prepared by Dr. Isabelle Moreau, who was unable to attend the meeting). Concluding point: healthy animals are needed to feed the U.S. and world populations.

Dr. Paul Sundberg was next on the agenda. He gave a brief overview of what happened this past weekend at the New Mexico Colloquium sponsored by the American Academy of Microbiology. The colloquium was aimed at focusing on events early in the food chain that can select for antimicrobial resistance in food-borne bacteria, transmission via food products, and intervention strategies. The final report will be out in May 2002. Thirty different groups were represented at this colloquium.

Next speaker was Dr. Tom Burkgren (AASV). He gave an update on the Veterinary Feed Directive (VFD) which at this time only is being applied to one feed pharmaceutical (Pulmotil, Elanco). He discussed some early issues that were resolved and said that overall the VFD has been working very well. He was particularly complimentary of FDA/CVM concerning the original development of the VFD rules and regulations. He said that this was an excellent model of a collaborative effort by all stakeholders and voiced the hope that further VFD drugs would be approved.

Final speaker was Dr. Roy Schultz who presented a paper prepared by Dr. Isabelle Moreau, Quebec, CAN, who was unable to attend the meeting. The title of the talk was "Extra Costs Associated with Antibiotic-Free Pigs:"
Can This Industry be Competitive in Other than Niche Markets?”. Dr. Schultz applied some economics to the production numbers shown, and estimated a 19-20% increase in the cost of production (higher mortality, reduced daily gains, poorer feed efficiencies) in these antibiotic-free herds. Dr. Schultz also voiced concern about welfare issues in that there was more death loss and illness in the antibiotic-free pigs.

The final topic on the agenda was to review Resolution Number 1 supporting funding for the construction of facilities for the National Animal Disease Center. The resolution passed unanimously.

The meeting was adjourned.
USE OF ANTIBIOTICS AND FEED ADDITIVES BY U.S. PORK PRODUCERS

Eric Bush
USDA:APHIS:VS
LeRoy Biehl
University of IL
USAHA
Hershey, PA
November 5, 2001

Goals for measuring antibiotic use in Swine 2000

• Estimate the frequency of antibiotic use in weaned market pigs and determine trends.
• Describe the on-farm implementation of PQA good production practices.
• Identify primary decision makers influencing selection of antibiotics used on farm.

Swine 2000 study design*

• NASS General Swine Farm Report
  • June 1 – July 14, 2000
  • n=2499 respondents
• VS Initial VMO visit
  • August 21 – November 3, 2000
  • n=895 respondents
• VS Second VMO visit
  • December 1, 2000 – March 16, 2001


NAHMS Swine 2002 States

94% US hog inventory
92% US hog operations
with 100+ total inventory

298
Number of operations with hogs and total inventory by size group

http://www.usda.gov/nass
Swine 2000

Grow/Finish Pigs: Percent sites that used antibiotics by route and reason

List of injectable antibiotics

- Ampicillin
- Amoxicillin
- Ceftiofur
- Erythromycin
- Florfenicol
- Gentamicin
- Lincomycin
- Oxytetracycline
- Procaine Penicillin
- Penicillin Benzathine
- Spectinomycin
NAHMS STUDY ON ANTIBIOTIC USAGE

- Tylosin
- Other:

Grow/Finish Pigs: Use of injectable antibiotics by primary reason given

![Graph showing the use of injectable antibiotics by primary reason.]

Grow/Finish Pigs: Use of injectable antibiotics to treat respiratory disease

![Graph showing the use of injectable antibiotics for respiratory disease.]

Grow/Finish Pigs: Use of injectable antibiotics

![Graph showing the use of injectable antibiotics for any reason.]

300
But how does this vary by herd size?

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>&lt;2000</th>
<th>2000-9999</th>
<th>10,000 +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any antibiotic</td>
<td>58.5</td>
<td>90.6</td>
<td>97.5</td>
</tr>
<tr>
<td>Tylosin</td>
<td>27.5</td>
<td>44.5</td>
<td>51.7</td>
</tr>
<tr>
<td>Procaine-Pen</td>
<td>33.7</td>
<td>66.6</td>
<td>83.9</td>
</tr>
<tr>
<td>Ceftiofur</td>
<td>12.8</td>
<td>39.4</td>
<td>74.9</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>5.3</td>
<td>10.7</td>
<td>3.9</td>
</tr>
<tr>
<td>Pen-Ben</td>
<td>15.4</td>
<td>16.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Florfenicol</td>
<td>3.1</td>
<td>3.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

List of water antibiotics

- Apramycin
- Bacitracin
- Chlortetracycline
- Lincomycin & Spectinomycin
- Neomycin
- Oxytetracycline
- Penicillin G Potassium
- Spectinomycin
- Sulfachlorpyridazine
- Sulfadimethoxine
- Sulfamethazine
- Tetracycline
- Tiamulin
- Tylosin
- Other:

Grow/Finish Pigs: Use of water antibiotics by primary reason given

- Growth promotion: 0.0
- Disease prevention: 4.0
- Treat enteric: 7.5
- Treat respiratory: 25.2
- Treat other: 1.0
- Any reason: 31.2

Percent sites
NAHMS STUDY ON ANTIBIOTIC USAGE

Grow/Finish Pigs: Use of water antibiotics to treat respiratory disease

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>&lt;2000</th>
<th>2000-9999</th>
<th>10,000 +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any antibiotic</td>
<td>23.7</td>
<td>63.4</td>
<td>75.5</td>
</tr>
<tr>
<td>Tylosin</td>
<td>1.3</td>
<td>15.4</td>
<td>30.9</td>
</tr>
<tr>
<td>Oxytetracycline</td>
<td>6.1</td>
<td>19.9</td>
<td>32.5</td>
</tr>
<tr>
<td>Sulfadimethoxine</td>
<td>5.6</td>
<td>5.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Spectinomycin</td>
<td>1.9</td>
<td>0.8</td>
<td>0.0</td>
</tr>
</tbody>
</table>

But how does use of water antibiotics vary by herd size?

Total inventory
Grow/Finish Pigs: Number of days antibiotics are in water

List of feed antibiotics and additives

- Apramycin
- Arsanilic acid
- Bacitracin
- Bacitracin zinc
- Bambermycins
- Carbadox
- Chlortetracycline
- CSP
- ASP
- Lincomycin
- Neomycin & Terramycin
- Oxytetracycline
- Ractopamine
- Roxarsone
- Tiamulin
- Tilmicosin
- Tylosin
- Tylosin & Sulfa
- Virginiamycin
NAHMS STUDY ON ANTIBIOTIC USAGE

Grow/Finish Pigs: Use of feed antibiotics by primary reason given

- Growth promotion: 63.7%
- Disease prevention: 37.9%
- Treat enteric: 15.2%
- Treat respiratory: 27.4%
- Treat other: 0.2%
- Any reason: 88.5%

Grow/Finish Pigs: Use of feed antibiotics to promote growth

- Bacitracin: 29.9%
- Carbadox: 11.4%
- Chlortetracycline: 7.9%
- Lincomycin: 12.0%
- Tiamulin: 0.2%
- Tylosin: 31.3%
- Any: 63.7%

Grow/Finish Pigs: Use of feed antibiotics

- Growth promotion
- Prevention
- Treatment
Grow/Finish Pigs: Number of days antibiotics are in feed for any reason.

- Bacitracin: 67.7 days
- Carbadox: 22.6 days
- Chlortetracycline: 31.7 days
- Lincomycin: 31.6 days
- Tiamulin: 16.9 days
- Tylosin: 62.3 days

Grow/Finish Pigs: Number of days antibiotics are in feed by primary reason given:

- Promotion
- Prevention
- Treatment (Resp)

Grow/Finish Pigs: Use of feed antibiotics:

- Any Antibiotic
- Bacitracin
- Carbadox
- Chlortetracycline
- Lincomycin
- Tiamulin
- Tylosin

Total inventory:
- <2000
- 2000-9999
- 10,000+
Concluding remarks

- There are many ways to measure and describe the use of antibiotics; none of which precisely reflect the concept of "selection pressure".
- Antibiotics are an integral part of swine production being used in all production phases, by all size groups, through various routes for differing reasons.

Concluding remarks

- Feed is the primary vehicle used for antibiotics intended to promote growth and prevent disease. Injection is the route of choice for using antibiotics to treat disease.
- Policy dilemma: Is the dominant concern overall antibiotic use or is it extra-label use.

Acknowledgments

- National Agricultural Statistics Service (NASS)
- NAHMS Design and Implementation team
- State and Federal Veterinary Medical Officers, VS field
- APHIS: National Veterinary Services Laboratory (NVS)
- ARS: Russel Research Center
- ARS: Eastern Regional Research Center
- ARS: National Animal Disease Center
- U.S. Food and Drug Administration (FDA-CVM)
- National Pork Board
- American Association of Swine Veterinarians (AASV)
- Pfizer
- Boehringer Ingelheim Vetmedica
- IDEXX Laboratories, Inc.
- Schering-Plough
- Iowa State University
- The Ohio State University
- University of Illinois
- University of Tennessee
- University of Wisconsin – Madison

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Or search for "NAHMS swine" on the web.
USE OF ANTIBIOTICS AND FEED ADDITIVES BY U.S. PORK PRODUCERS

Eric J Bush; LeRoy G Biehl

A plethora of benefits and risks are associated with antibiotic use on farms. To offset the risks, principles for prudent use have been identified. As part of the NAHMS Swine 2000 national study, a questionnaire was used to gather antibiotic use data in order to describe level and pattern of use, particularly in weaned market pigs. A second goal was to estimate the adoption of good production practices regarding appropriate use of antibiotics. This information will assist industry and animal health officials in establishing prudent use campaigns and benefit public health by decreasing the risks from misuse of antibiotics.

The pork industry continues to undergo radical developments in the structure and nature of relationships throughout the chain. Of particular concern in relation to antibiotics are changes in suppliers and farm inputs and decision making process. A third goal, therefore, was to describe the various decision making arrangements on swine production sites and determine those with the greatest influence regarding use of drugs and medications.

These goals for the Swine 2000 study regarding antibiotic use were developed by gathering input from pork producers, swine practitioners, the U.S. Food and Drug Administration (FDA), from the Pharmaceutical Issues Task Force (PITF), and others with final input and approval from the National Pork Board’s Pork Safety committee.

The purpose of this paper is to present the initial summary of the antibiotic use data collected in the NAHMS Swine 2000 study. A complete description of the study design can be found in the Methodology section of Part I: Reference of Swine Health and Management in the United States, 2000. This report was published by USDA:APHIS:VS in August, 2001. Briefly, producers in the top 17 swine States with at least 100 total inventory on March 1, 2000 were randomly selected to participate in the study. A total of 2499 producers completed the first interview, conducted by NASS between June 1 – July 14, 2000. Two subsequent interviews were conducted by State and Federal VMO’s on 895 producers between August – October, 2000 and December, 2000 – March, 2001. Estimates from this study are weighted and represent 92% of U.S. hog operations with 100+ total inventory.

For sites with nursery age pigs, 82.7% placed antibiotics in the feed for growth promotion or disease prevention. The three most common antibiotics were chlortetracycline (30.1% of sites), tylosin (23.2%), and carbadox (22.9%). These were placed in the feed for an average of 24.4, 26.7, and 23.5 days respectively. On average, pigs are in the nursery 35-45 days, depending on herd size. Other antibiotics were placed in nursery feed for 21-28 days except for tiamulin which was fed for an average of 16.9 days.
Antibiotic use data for grower/finisher pigs was assessed by route (injectable, water, feed). For each antibiotic used, producers were queried about the primary intent of its use (promotion, prevention, treatment) and for water and feed antibiotics, the number of days administered. Results are summarized in Figure 1.

About 2/3 of sites administered injectable antibiotics to grower/finisher pigs, primarily to treat respiratory disease. Only 1/3 of sites included antibiotics in water. The main reason for doing so was to treat respiratory disease. No antibiotics are injected or placed in water by producers for growth promotion. Almost all sites included antibiotics in feed, primarily for growth promotion of disease prevention, and to a lesser degree, to treat respiratory or enteric conditions.

Almost 90% of the sites that use injectable antibiotics in grower/finisher pigs did so to treat respiratory disease (57.2 / 64.5). The most common antibiotic used was procaine-penicillin (30.2% of sites with grower/finishers). Others commonly used were oxytetracycline (16.1%), ceftiofur (14.5%), tylosin (13.8%), and penicillin benzathine (15.5%). The latter is not approved for use in swine. Those used less frequently were ampicillin, lincomycin, and spectinomycin. The latter is for use in swine less than 4 weeks old.
Penicillin benzathine is used by a greater number of small farms and spectinomycin is not used on large farms at all. However, overall use of injectable antibiotics, as well as use of tylosin, procaine-penicillin, and ceftiofur, are more common on larger sites.

Overall, one third of sites with grower/finisher pigs used antibiotics in water. However this varied by herd size from 23% of small sites to over 75% of large sites. A little over 80% of the sites that included antibiotics in water did so to respiratory disease (25.2 / 31.2). The three most common antibiotics used were oxytetracycline (8.3% of sites with grower/finishers), chlortetracycline (6.2%), and sulfamethoxine (5.1%). Neomycin and tylosin were included in the water primarily to treat enteric conditions. However, some small sites indicated they used neomycin, as well as spectinomycin, to treat respiratory disease even though they are not absorbed by the gut and are therefore ineffective in treating respiratory disease. All antibiotics were placed in the water for an average of approximately 5 days.

Almost 2/3 of sites with grower/finisher pigs included antibiotics in the feed for growth promotion and more than 1/3 (37.9%) did so for disease prevention. The two antibiotics that accounted for almost all growth promotion use were tylosin (31.3% of sites with grower/finisher pigs) and bacitracin (29.9%). Chlortetracycline was used on about 8% of sites for growth promotion and used on more sites for disease prevention (17.6%) or treatment (22.5%). Tylosin was also used on a lot of sites for disease prevention (13.1%) or treatment (11.9%). Antibiotics included in the feed only for disease prevention or treatment include CSP, tiamulin, and Tylosin/Sulfamethazine. The number of days antibiotics were included in the feed varied for each antibiotic and also depended on the primary intent for including that antibiotic in the feed. In general, an antibiotic was in the feed longer for growth promotion and shorter for disease treatment. For example, tylosin was included in the feed an average of 72.5 days for growth promotion, 58.4 days for disease prevention, and 39.1 days when in the feed primarily to treat disease.

Some concluding thoughts from this initial look at the antibiotic use data from the Swine 2000 study include:

- There are many ways to measure and describe the use of antibiotics (percent swine, percent sites, total grams sold nationally, etc). None of them accurately reflect the concept of ‘selection pressure’.
- Antibiotics are an integral part of swine production being used in all production phases, by all size groups, through various routes for various reasons.
- Feed is the primary vehicle used for antibiotics intended to promote growth and prevent disease. Injection is the route of choice (of producers) for using antibiotics to treat disease.
- In general, large farms were more likely to use antibiotics. However, misuse of antibiotics was more likely to occur on small farms.
REPORT OF THE PROGRAM COMMITTEE

Chairman: Dr. Maxwell A. Lea, Jr., Baton Rouge, LA
Vice Chairman: Mr. Bob Frost, Lincoln, CA

Dr. Bruce L. Akey, VA; Dr. J. Lee Alley, AL; Dr. Paul L. Anderson, MN; Dr. Richard E. Breitmeyer, CA; Dr. H. Michael Chaddock, VA; Dr. Robert J. Eckroade, PA; Dr. Francois C. Elvinger, VA; Dr. James J. England, ID; Dr. David A. Espeseth, PA; Dr. Malcomb G. Fearnghough, TX; Dr. William L. Hartmann, MN; Dr. Bob R. Hillman, ID; Dr. Charles L. Hofacree, GA; Dr. Sam D. Holland, SD; Dr. G. Reed Holyoak, OK; Dr. John W. Hunt, Jr., MO; Dr. David C. Kradel, PA; Dr. Donald H. Lein, NY; Dr. Bret D. Marsh, IN; Dr. Charles E. Massengill, MO; Dr. James O. Mecham, WY; Dr. Michael W. Miller, CO; Dr. Lee M. Myers, GA; Dr. Kakambi V. Nagaraja, MN; Dr. John C. Reagor, TX; Mr. Paul E. Rodgers, WV; Dr. Mo D. Salman, CO; Dr. Roy A. Schultz, IA; Dr. Carolyn L. Stull, CA; Dr. Robert M. S. Temple, OH; Dr. H. Wesley Towers, DE; Dr. Lyle P. Vogel, IL; Dr. G. Gale Wagner, TX; Dr. Ernest W. Zirkle, NJ.

The Program Committee for the 2001 Annual Meeting Program met at 6:00 pm Saturday, November 3, 2001. Twenty of the thirty-two permanent committees were represented at the meeting.

Procedures for conducting committee meetings and submission of committee reports were discussed.

The following reports on ongoing activities were given:

1. Consolidation for committees and shortening the length of the annual meeting – Dr. Bret Marsh
2. Standard operating procedures for committees – Dr. Francois Elvinger
3. The status of the Master Plan – Mr. Bob Frost
4. Procedures and deadlines for submission of Committee Resolutions – Dr. Ernie Zirkle

President Bob Hillman thanked the committee chairs for their work. The meeting adjourned at 8:30 PM.
REPORT OF THE COMMITTEE ON
PSEUDORABIES

Chairman: Dr. Bret D. Marsh, Indianapolis, IN
Vice Chairman: Mr. James W. Leafstedt, Alcester, SD

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Mr. Neal F. Black, MN; Mr. Philip E. Bradshaw, IL; Dr. Donald R. Bridgewater,
CO; Dr. Max E. Coats, Jr., TX; Dr. Gene A. Erickson, NC; Dr. Thomas W.
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J. Hagerty, MN; Dr. Edwin C. Hahn, IL; Dr. J. Mark Hammer, IA; Dr. Robert
M. Harbison, AR; Dr. Howard T. Hill, IA; Dr. Sam D. Holland, SD; Dr. Richard
D. Hull, IL; Dr. John W. Hunt, Jr., MO; Dr. John P. Huntley, NY; Dr. John A.
Johnston, IN; Dr. Charles L. Kanitz, IN; Dr. Charles F. Kirkland, NC; Dr. John
P. Kluge, IA; Dr. David T. Marshall, NC; Dr. Charles E. Massengill, MO; Dr.
Thomas J. McGinn, III, NC; Dr. James D. McKeen, IA; Dr. I. Lee McPhail,
OH; Dr. F. J. Mulhern, CA; Ms. Nancy J. Robinson, MO; Dr. John J. Schiltz,
IA; Mr. Jeff Schnell, IA; Dr. George P. Shibley, KS; Dr. Michael T. Staton, Sr.,
WY; Mr. James E. Stocker, NC; Dr. Paul L. Sundberg, IA; Dr. Arnold C. Taft,
MD; Dr. Paul O. Ugstad, CA; Mr. Willard H. Waldo, NE; Dr. Larry L. Williams,
NE.

Dr. Marsh called the meeting to order at 12:30 PM on Monday, November
5, 2001. Approximately 34 people attended the meeting on November 5 and
also on November 6. The meeting was adjourned at 3:00 PM on November
6, 2001. Dr. Marsh reviewed the Resolutions from the 2000 meeting in
Birmingham, AL, and the responses from the specified agencies.

USDA Report - Dr. Arnold Taft reported that on October 1, 2000 the
United States had 434 quarantined herds. By October 1, 2001 the number of
quarantined herds had dropped to 12, and by November 5, 2001 the number
had dropped to 8. These eight quarantines are in the states of Iowa (5) and
Nebraska (3). Currently there are 41 states and territories in Stage 5, four
states in Stage 4, three states in Stage 3/4, three states in Stage 3, and one
state in Stage 2/3. The national goals are to have 45 states in Stage 5 by the
end of FY02, 51 states in Stage 5 by the end of FY03, and 52 states and
territories in Stage 5 by the end of CY03. He also reported that $9,806,598
were spent for indemnity in the Accelerated Pseudorabies Eradication
Program (APEP) in 213 herds representing 127,754 head of swine. Further,
APEP funds totaling $5,761,593 were spent to enhance surveillance. There
are 36 states utilizing major packer surveillance. Slaughter surveillance
improved by over 2% during FY01, although greater than 50% of the cull sows
and boars are not identified and not all slaughter plants are collecting samples.
Dr. Taft also gave an update on the status of the PRV End Game Plan,
proposed revisions to the CFR Part 85, Interstate Movement of Swine within
a Production System, and the status of electronic certificates for the movement of swine.

National Veterinary Services Laboratory - Dr. Sabrina Swenson reported on the status of the PRV proficiency serology tests. Seventy-nine laboratories participated in the panel test of 20 samples. Sixty-six laboratories passed the tests on the first attempt, seven laboratories passed on the second attempt, and six laboratories failed. She reported that there are fewer laboratories running the tests and some of the sites have reduced the number of tests they now offer. Laboratories had the greatest difficulty with subjective tests (i.e., Latex and Serum Neutralization). Effective October 2001 IDEXX has discontinued the GPX test. It was suggested that the list of approved laboratories be made available through the web.

National Safeguarding Review - Mr. Jim Leafstedt gave a report on the National Safeguarding Review. He had participated on the Domestic Surveillance committee of the Review team. He indicated there were many people involved in the study, and over 100 recommendations will be a part of the final report. This comprehensive review was requested by USDA and NASDA was identified to accomplish the Review task. The final report should be available very soon, and Veterinary Services has already begun to identify teams to accomplish the goals outlined in the Review.

State Reports - The following states gave reports on eradication progress.

Minnesota - Dr. Paul Anderson reported that there are no quarantined in Minnesota, and the last case was in Mower county in March 2001. He believes Minnesota is well positioned for the winter of 2002. There plans for the 2001-2002 winter are to keep vaccinating, continue retesting Stage 2 imports, continue testing farms in high risk areas, and be prepared to react to an outbreak.

Nebraska - Dr. Larry Williams reported on the recent outbreak of PRV in Nebraska. In Northeast Nebraska 47 quarantines were written to contain the infection. Three counties were reverted to Stage 3 status. The cause of the break is not known, although poor biosecurity and the lack of vaccine in the herds contributed to its spread throughout the area. He reported that only three premises are still quarantined and no infection is known to exist on any of the sites.

Iowa - Dr. John Schiltz reported that Iowa has made significant progress in the eradication effort. Only 5 premises are under quarantine. He indicated the legislation passed in the 2000 Iowa Legislature coupled with funds from APEP had made the progress possible. He also applauded the efforts of Iowa's pork producers and veterinarians. He encouraged changes to the APEP funding formula for the purchase of swine to further accelerate the removal of infected swine from quarantined premises. Iowa's plan is to continue their program until they are ready to apply for statewide Stage 4 status.

Texas - Dr. Max Coats reported that Texas plans to move the state into Stage 4 pending approval from the National PRV Control Board. He further
PSEUDORABIES

reported that Texas has an estimated 2 million feral swine, and they have worked to protect the domestic swine population from PRV known to exist in the feral swine populations. Eleven of the 12 cases they identified during FY00 could be traced to feral sources. All of the seven herds identified as PRV infected in FY01 were associated with feral swine exposure. Their last domestic swine case of PRV was over 5 years ago. Further, the Texas legislature has passed a law to prohibit the feeding of garbage to swine, effective September 2001.

Louisiana - Dr. Debbie Cox reported that only 2 infected herds were identified in FY01. Both of these herds were disclosed through market testing. She indicated that they have established a new policy to determine if new infected herds are domestic or feral/feral-associated. This effort should assist the state in determining if an infected herd will affect their state status. She reported 58 qualified herds in Louisiana.

Florida - Dr. Taft gave a brief update on Florida since there were no representatives present. Florida is challenged with their feral swine population, and unless there is a concerted effort to address the feral swine issue the state will not be able to advance. Considerable effort has been given to the issue, but there continues to be challenges to the advancement of the state. It is reported there are only 20 commercial producers in Florida, and Dr. Taft is proposing to them procedures to permit them to move in interstate commerce.

Program Standards - The Committee discussed the requirement that an infected herd in a state in the countdown to Stage 3 or identified in a Stage 4 or 5 state must be depopulated within 15 days to preserve status. After considerable discussion, it was decided to leave the existing language in place.

Meat Juice Study - Dr. James McKean, Iowa State University, gave a report on the status of the Meat Juice Study to detect PRV in finishing swine presented for slaughter. The project is funded through enhanced surveillance money from the USDA, and the collaborators in the project include the Iowa Department of Agriculture, the Iowa State University and the packing industry. Phase I of the project identified three large Iowa packing plants where 50 grams of muscle tissue (hanging tender) were collected from 10 head of swine from each lot. The samples are frozen overnight at the plant and then shipped to the Iowa State University for analysis. The samples are thawed and the juices drained into a tube. This exudate is run on the GI test for PRV. If a sample is positive twice on the GI test, it is reported to the State Veterinarian for traceback purposes. Within the first 5 months of the study the project identified 15 new, infected sites in Iowa. Phase II of the project will expand to eight packing plants which will represent about 25% of the national harvest. Currently, the study costs about $5.18 per sample.

Feral Swine Working Group Report - The Feral Swine Working Group met on Saturday afternoon from 1:00 to 4:00 PM. with 30 participants present.
There were representatives from industry, state and federal agencies and one international participant. Dr. Arnold Taft presented a view of the feral swine situation from the National Level. He shared his vision that what is needed at the national level includes a national budget to study population dynamics, implement disease management strategies; aid state programs; provide staff to coordinate program; set minimum guidelines for state programs; and provide education material and training as needed.

His view of the minimum components needed for a state level program included:

1. Advisory Committee
2. Authority established for any and all management plans
3. Have population studies in place
4. Disease surveillance in place
5. A separate marketing system in place
6. Education program in place

A total of $147,000 was provided this past year to three Colleges to support feral swine research activities.

- LSU - $60,000
- U. Of Georgia - $50,000
- U. of Illinois - $37,000

Martin Mendoza from USDA Wildlife Services provided some information on some of the capabilities that his agency could bring to bear on the feral/wild swine issue. His agency has a mandate to conduct research and field operations relating to animal disease and damage control. He reported that feral swine have been documented in at least 30 states and that his agency conducts operations in 9 states involving feral swine. The agency conducts research activities related to. Capture, control, enumeration, and disease control in wildlife. Dr. Ned Hahn presented information detailing some of the pertinent characteristics of feral swine PRV vs. domestic PRV in feral swine.

A summary of these characteristics is:

- Feral isolates are attenuated
- Primarily transmission is by venereal and/or cannibalistic means
- Age distribution – positive serology increases with age while positive by PCR is relatively constant at all ages

He suggested that perhaps the better strategy option is "Wait and see - be prepared determine where virus originated, corrective measures can be taken". He suggested that molecular epidemiology should be used to determine if the inciting organism is residual domestic virus, altered vaccine, or feral pig virus. He has developed a procedure that may employ virus isolation and/or PCR that can be evaluated against a database containing information related to isolates from over 12 locations including several feral isolates.

Dr. Hahn also provided an update on what is happening with feral swine PRV in some parts of Europe. He made a plea for anyone that can, to send him materials that might serve to expand his reference database.
Dr David Stallknecht gave a brief report on projects that address the questions ‘How often it is necessary to conduct surveys of disease status in feral swine populations to have valid data, and ‘Will feral swine actually self clear themselves of either PRV or swine brucellosis?’

Dr Carter Black provided information about his experience with barriers to feral swine incursion that were proven to work in his native GA. The premise described was adjacent to a hunting preserve in an area populated with feral swine. The successful arrange included a combination of two electrified fences with one woven wire fence.

Dr Phil Elzer reported on Promising Vaccines for Diseases of Feral Swine. His projects were conducted using feral swine and included experiments on the efficacy of Brucella strain RB-51 using an oral delivery system that included the use of pecan shells to scarify the oral mucosa. He also described the development of a rough strain of B suis type 1 (VTRS-1). The VTRS-1 based product was found to be exceptionally effective in these preliminary experiments. He also described additional proposed projects.

Last years resolution from this subcommittee through the parent committee was reviewed discussed and modified. The working group unanimously supported forwarding a modified resolution to the parent committee with a recommendation for adoption. This resolution has been presented at yesterday’s session of this committee.

Molecular Markers for PRV Re-emergence - Dr. Ned Hahn, University of Illinois, reported on his efforts to type various PRV virus isolates. He is particularly interested in identifying isolates from around the country that are feral virus isolates. His research will provide valuable information to the effort to declare the country free of PRV.

Wildlife Services - Mr. Noel Myers, USDA, APHIS, Wildlife Services, reported on the activities of Wildlife Services. He reported specifically on how his agency could support the efforts of the national eradication program. The research capabilities of his agency could be utilized to conduct research to further the goals of the PRV program provided adequate funding is secured.

National PRV Control Board - Mr. Phil Bradshaw, Chairman of the Board, reported on the actions of the Board. Texas presented their recent experience with feral swine, and they reported on the challenges they face in determining the status of swine herds in their state. Illinois was granted Stage 5 status effective January 1, 2002. Minnesota was approved to move an additional 25 counties into Stage 4 status leaving only 10 counties in Stage 3. Michigan was reapproved for Stage 5. Nebraska had requested to move 2 of their 3 Stage 3 counties into Stage 4. The Board decided not to approve the Nebraska application until additional testing is conducted. Indiana was approved for Stage 4 status. Florida will be sent a letter encouraging a reemphasis on their PRV program.
MOLECULAR MARKERS FOR PRV RE-EMERGENCE

Edwin C. Hahn
College of Veterinary Medicine
University of Illinois at Urbana-Champaign

For the last ten years, the United States has been made marvelous advances in the detection and clearing of PRV infections from all of the states. We can be very proud of what we have accomplished toward the goal of complete eradication of the virus. As expected at the end of the eradication program, many states did have transient bursts of re-infection and some transmission occurred from residual pockets of infection. In particular, North Carolina, Indiana, Minnesota, Illinois and Nebraska have seen sequentially re-emerging outbreaks just as the last herds were being released. The risk of the virus re-appearing from domestic herds will certainly decrease as the last states are freed of residual virus.

The problem of re-emerging domestic infection from the feral swine reservoir of PRV, however, is not going to go away quite so readily and presents continuing difficulties. Feral swine are free roaming and are present in over one-half of our states. Large proportions of these pigs are infected with PRV. Viral transmission among feral swine occurs by mechanisms that are different from what we understand from study of the disease in domestic animals. Moreover, the virus from wild pigs is extremely attenuated compared to isolates in the mid-western states from domestic pigs. From several lines of research, we now know that issues of feral pig virus will present difficulties for diagnosis, surveillance and detection by clinical signs if an infection of domestic swine occurs.

A question for diagnosis is the relative sensitivity of detecting viral DNA by PCR compared with conventional serodiagnosis. In a study with collaborator, Dr. David Stallknecht at the University of Georgia, feral swine were tested for anti-PRV antibody and presence of PRV DNA in their tonsils. Age of the pigs was determined by tooth development. Figure 1 shows the age distribution of detected infection in the feral pigs by both techniques. The dark bars show the increase in seroprevalence over time from young animals that are 8-14 months of age to those over 24 months of age that are approximately 50% positive for PRV antibodies. When we looked at those very same pigs in terms of whether we could detect viral DNA in the tonsils (gray bars), we found in all age groups, regardless of age, that almost two-thirds of those pigs had detectible viral DNA in their tonsils. Other similar experiments with independent populations of feral pigs showed the same higher fraction of pigs with detectible DNA than with antibody, suggesting that the virus may be present in seronegative pigs.
Viral DNA was detected by PCR for the gene for gC. Age of pigs was determined by tooth development.

So how can there be seronegative, PCR positive feral pigs? One factor I alluded to is the low virulence of the infecting virus. Pigs are slow to seroconvert and the virus is being transmitted by different mechanisms (e.g., venereal transmission, respiratory transmission, cannibalism and perhaps wildlife). All of these factors may effect how animals seroconvert. So what is the nation to do about the threat of infection from both earlier domestic virus infections and the presence of virus in our feral pig populations? I think that we have two options.

Option 1: We can wait and do nothing. In this case, if reinfection does occur in domestic pigs, the source of these new outbreaks will remain unknown. We will have no way of knowing what direction it came from, so we will have to maintain preparedness against all fronts.

Option 2: We can wait but be prepared. If we are prepared and assemble markers for remaining virus is out there, it will be possible to determine from where re-emerging virus originated. If the source is known, corrective measures can be focused and directed quickly at the particular breach.

Our research concerns finding methods and molecular markers for the residual virus that is in both domestic and feral populations. We have been gathering viral isolates from the last few domestic pig outbreaks and have been obtaining viral DNA markers for PRV from feral/wild swine. This collec-
tion then puts us in a posture where we are prepared to investigate any new unknown virus and relate that to previous infections and origins. If it is possible to obtain infectious virus from a new outbreak, we will be able to replicate it and do restriction fragment length polymorphism (RFLP) analysis, using either single or multiple enzymes. With appropriate analysis it is possible to accurately determine similarities and the degree of differences among strains of viruses, both unknown and known. We can also use polymerase chain reaction (PCR) to amplify segments of the viral genome from latently infected tissues and study the genetically variable regions of individual viral genes as a marker for a particular virus. Thus, even when we have an infection where it is not possible to isolate infectious virus, we can still analyze the virus that is latent within those pigs. Amplified DNA regions with specific restriction sites that are unique to domestic or feral pig virus can be used to compare gene origin.

So, our approach is in the area of molecular epidemiology. We wish to determine the markers of the recent domestic outbreaks and a representation of what virus is in feral swine so that they can be entered into a database and used to compare with virus from any new outbreaks. We will be able to ask the important questions of any new infection. (1) Is it from residual domestic swine virus that we were unable to completely eliminate? (2) Is it altered vaccine or a recombinant? (3) Or, is it feral pig virus that somehow found its way into domestic stock? This the approach we have been taking.

I now want to give you a little more detail on the particular genes that we are looking at and examples of how our approach is working. The gene that we have been looking at in the most detail is the gene for the glycoprotein C (gC). The reason that we chose this particular gene is because the protein product is a rather important molecule for the virus both immunologically and

Figure 2. Functional features of PRV glycoprotein C.
functionally. It is the protein that assists the initial events in viral absorption, playing a role in cell tropism and viral pathogenesis. It has been shown to be highly immunogenic, stimulating both antibody and cell-mediated immunity. The gene for this protein is also quite variable in response to immune pressure and its role in viral defenses against the immune system; therefore, it offers both genetic variation as a marker and some interest, in and of itself, because of its function. The gene for gC, shown in Figure 2, has certain features that are rather important.

1. The black areas show the three heparan sulfate binding domains. In the folded molecule, these present one outer-most portion of the molecule and make a binding site.
2. The labeled boxes represent B-cell and T-cell epitopes that are highly important because this is where selective pressure from the immune system is put on the virus. We anticipate and expect that this pressure can cause genetic change if directed at these epitopes.
3. The vertical bars, which you see clustered in various areas, are areas where mutations have occurred. This is the variation that we use as markers.

A PCR product from virus or latently infected tissue can be used to do RNA cleavage assays to compare individual viral genomes. With a little more effort and expense, we can completely sequence the region and then use that sequence, together with other sequences that are in our database, to align DNA fragments and use phylogeny to determine relationships among the viruses.

Figure 3 shows the location of feral pig samples and the recent domestic pig (circles) PRV samples.
MOLECULAR MARKERS FOR PRV RE-EMERGENCE

outbreaks that are in our database.

1. The pyramids show feral pig virus obtained from various parts of the country.

2. The circles with dates show the most recent outbreaks of PRV in the Midwest. We have samples from these outbreaks that can be used as a record of each particular source of infection.

I want to focus on two particular examples that illustrate the type of analysis that is feasible. The first one is an infection that was detected in Mississippi earlier this year. A pig farm containing about sixty or seventy domestic pigs was tested for PRV antibody. Two old sows turned out to be serologically positive and were removed. These were killed and tonsil and mandibular lymph node tissue was sent to me for PCR and genetic analysis. We were able to isolate viral DNA from both of those pigs. When we compared the gC genetic sequences, they were almost identical, differing in only one base pair out of 564. We also were able to obtain tissue samples from feral pigs, both from northern Mississippi, 150 miles away from this particular herd, and also from down the river to the south. When we analyzed tissues from these three pigs we found that we readily were able to obtain the PRV DNA. Comparison the viral DNA from the feral pigs to the viral sequences from the two domestic pigs, showed they were all identical in sequence to one of the two domestic pig samples, suggesting that even though these feral pigs lived 150 miles away, the virus was similar enough to suggest that it was feral in origin.

Now I want to tell you the other story about a virus that was transmitted by truck along with feral pigs that were loaded somewhere in the south central part of our country. They ended up, oddly enough, in upper New York State. The pigs tested positive for PRV and were killed. Tissues were sent to me for analysis. The results of the Mississippi and New York analyses are summarized in Figure 4 along with some other points that I want to make. The data are shown as a dendrogram of some of the ongoing work that we have been doing. The arrows show how several DNA sequences group into clades. The Mississippi domestic pig samples (MS3lymph-1U and M5tonsil-1U) are within the same clade as the feral pig viruses and also clustering with some South Carolina feral pig viruses that were also submitted for analysis. At the top, you can see that we have a separate clade of Indiana domestic isolates from the outbreak in 1998. These appear grouped with the Becker strain, a previous Indiana domestic isolate.

Feral pig viruses from the southeastern states are similar to each other. These are clustering because of their close genetic similarity. There is also one Ohio wild pig isolate which falls into that group, and then further away, somewhat distant, are the sequences of virus from Florida, Georgia and Hawaiian feral pigs. As you can begin to see, we have a cross-section of what we can obtain. These results indicate that grouping is good enough that we could show identity when that occurs. We are prepared, depending on what
Figure 4. Cladogram of sequences for a portion of the gene for gC. Numbers for interior branches represent the percent bootstrap values from 20,000 replications.
comes, to be able to trace and show similarities to these viruses.

Some curious observations remain and need to be followed. The New York virus is very similar to a viral DNA sequence that we got out of a feral pig in southern Ohio. I would like to get some viral DNA from the South Central states, where people think that this particular New York virus originated.

In general, the situation in the United States is a little bit muddled because both pigs and viruses have done a lot of moving around. This situation is quite different from what is seen in Europe, where our analysis shows that geographically, pig viruses are very nicely grouped. We can distinguish viruses from France, Germany and Italy. Even though we have difficulties with the United States samples, it is possible to show identity and similarity. It should be possible, therefore, to demonstrate that a virus came from one particular source or another, providing that the reference viruses are known. We have begun to build our database, although by no means have we covered the entire country and are in a position to be able to say that we know what is out there. We have, over the years, been collecting isolates from feral swine from Florida, Georgia, Texas, California and Hawaii. Those are now well established and I think that we are fairly confident in what viruses are circulating in that area. We have been working with collaborators in Germany to look at isolates from Germany, France, Italy and Slovakia, and those have all been genetically mapped and segregate very nicely. In recent years we have started to recover DNA from feral swine tissues from Georgia, Mississippi, South Carolina, Ohio, and even the virus which was moved and trucked into New York State.

There are some yet unanswered questions. I would like to solicit help from the various state and federal agencies that are concerned about domestic reemergence of wild pig virus. They could contribute material so that we can answer some persisting questions, such as, what is the genotype of PRV in the parts of the country that have not been sampled? I would like to get the domestic and feral pig viruses from some of the areas that were lacking. Another question, if we do find similarity between a feral pig isolate and domestic pig isolate, is whether the virus necessarily moved from feral to domestic, or if it has been transmitted from domestic to feral? We can determine similarity or differences, but we cannot determine directional movement. Another burning question concerns the significance of all the PCR positive, serologically negative pigs? There are two possible hypotheses that explain this: 1) The PCR positive pigs are due to infection in very young pigs, where the virus immediately becomes latent in the presence of maternal antibody. The maternal antibody decreases over time and the virus persists until the animal is older, sexually active, or stressed, and then reacts, causing serological conversion. 2) Alternatively, there may be, in any population, a number of animals that are infected with incomplete virus. These defective virus particles do not produce a whole antigenic complement, and they are not able to reactivate. Short sequences of viral DNA may be just
sitting there. We are in the process of trying to unravel this issue.

In conclusion, I would invite any states that are concerned about what they might have in their feral pigs to submit some samples so that we can add to the database, because I think in that way we will have the best chance of preventing and addressing any new virus that re-emerges. I will be happy to answer any questions that you might have.

Acknowledgements: This research would not have been possible without the skilled laboratory contributions of Lisa Preston Hsu and Brian Paszkiet. Tissue samples were provided by Dr. C. P. Nettles, Mississippi and Dr. Jack Wheeler, South Carolina. Virus isolates were provided by Dr. Chuck Kanitz, Purdue University, and Dr. David Stallknecht, University of Georgia. Phylogenetic analyses was conducted using MEGA version 2.1 (Sudhir Kumar, Koichiro Tamura, Ingrid B. Jakobsen, and Masatoshi Nei (2001) MEGA2: Molecular Evolutionary Genetics Analysis software, Arizona State University, Tempe, Arizona, USA.)

QUESTIONS

1. You mentioned that transmission is predominantly by venereal and cannibalism routes. Does that mean that it does not occur at all by respiratory infection as in domestic swine?

ANS: I can only give you the current state of factual knowledge to help formulate a conclusion.

* Over 3000 nasal swabs have been taken in this country from feral swine in an attempt to isolate PRV. None have yielded virus over more than 20 year period.
* prepuceal, vaginal and tonsillar swabs have yielded virus.
* Feral swine that have been experimentally infected by the oronasal route have shed virus orally.
* We can detect viral DNA in tonsils and trigeminal ganglia of feral swine, suggesting anterior infection is possible.

2. Can this technology be used to determine the source of a new infection?

ANS: If we have or can get previous domestic virus samples from the area and feral pig PRV DNA from the area, we can determine the source of infection.

3. How can you be sure that a new isolate is of feral or domestic origin?
If a new virus genotype is unlike all feral pig PRV, does that mean it is domestic?

ANS: If we know what is in the feral swine in the area and have analyzed past domestic pig virus, the answer should be easy. From the analysis so far of viruses from feral swine, it looks like the feral pig viruses are very similar. If a new virus outbreak looks unlike existing feral pig viruses, it does not mean that the virus is of domestic origin. The gene we are looking at is stable if not subjected to selective pressure. That means that in a constant environment, the sequence will not change much. By increasing the number of known samples, this problem of matching an unknown will be reduced.
Dr. Eric J. Bush, Veterinary Epidemiologist, Centers for Epidemiology and Animal Health, USDA, Fort Collins, Colorado reported on the Environmental Practices in Swine Production Sites in the United States. The study was part of Swine 2000, a National Animal Health Monitoring System report. The goals for the environmental practices portion of Swine 2000 were:

- Estimate the frequency of good environmental practices on U.S. swine production sites.
- Determine the extent to which odor control methods have been adopted.
- Assess exposure potential of swine to suspected sources of dioxin.
- Cooperate with NASS to conduct a chemical use survey in conjunction with GSFR interviews.

Most of the environmental data were collected during a visit by Veterinary Medical Officers in spring 2001. The selection criteria for the study were: 1) Respondents that owned or operated pork production sites located in the top 17 swine producing states, and 2) Respondents that had a total inventory of at least 100 hogs. Over one-half of the pork industry is made up of sites that have fewer than 100 hogs. Less than 2% of the hogs in the U.S. are on these sites. These sites were not included in the study. Conversely, almost half of all U.S. swine are on operations with 5000 or more swine. These comprise 2% of the sites.

The environmental good production practices portion of the study examined manure storage and handling; manure application; nutrient manage-
ment plans; testing of manure, water, soil, and air; and carcass disposal. Comparisons were made among three regions—southern, east central and west central. The types of waste management varied among regions. In the gestation phase, a mechanical scraper was the most common method used, particularly in the northern and east central regions, where half the sites used open buildings with outside access. During the farrowing phase, holding pit and hand cleaning were the most commonly used waste management systems. In southern states, flush under slats predominated. In the nursery, a holding pit was the predominant waste management system in all but the southern region, where flush under slats was the most commonly used method. For the grower/finisher phase, the most common waste management used was pit-holding.

For waste storage, deep pits are most common. Lagoons are also used for storage but they are a manure treatment facility as well. Other systems include separation of solids from liquids and slurry storage. Lagoon systems result in a decrease of nitrogen-phosphorus of 70-80%. Solid systems have NPK losses of 15-30% for daily scrape and haul systems.

Two competing basic approaches to managing manure are utilization for fertilizer versus reducing volume (treatment). Treatment attempts to reduce the amount of nutrients in the manure through handling and storage treatments. Producers who take a utilization approach attempt to maximize the natural fertilizer value of the manure to enhance crop yields and reduce synthetic fertilizer cost. Over 90% of the sites with 10,000 or more hogs had formal, written nutrient management plans. The goal of a nutrient management plan is to balance nutrients using diet manipulation, proper storage, handling and application of manure, and to reduce synthetic fertilizer use. Four methods of applying manure were used—irrigation, broadcast, surface, and subsurface. Irrigation is used mostly in the south and to a lesser degree in west central states. Broadcast is used a lot in all regions but the south. Surface application and subsurface injection is used mostly in east central states but neither is used as much on large farms. Irrigation results in a 30-40% loss of nitrogen compared to 1-5% for the other methods.

Death losses in preweaned or grower/finisher pigs can create a logistics problem as well as a disease risk. Disposal methods include composting, burial, burning, or pickup by a renderer. Nearly one-fourth of sites composted dead preweaned pigs. Burial (38%) and rendering (46%) were the most common method of carcass disposal for larger pigs.

The objective of the odor reduction portion of the study was to determine the extent to which odor control technologies have been tried or adopted. The technologies include diet manipulation, manure treatment, facility modifications, and air quality management. Of these four, diet manipulation is the most common. Diet manipulation involves reducing crude protein and supplementing with amino acids to reduce the amount of nitrogen in the manure. Increasing the fineness of the grain and pelleting will also reduce nitrogen.
Strategies to reduce odor through direct management of the manure have been tried or used very infrequently by producers. These methods include the addition of biological products to break down the solids, composting, covering the manure, and addition of chemicals. Air quality management aims to reduce dust by various techniques such as using a vegetative windbreak or a windbreak wall outside of exhaust fan.

The chemical use portion of the report provides insecticide use information that estimates on-farm use to control mange, mites, lice, flies, and other pests. Piperonyl butoxide, amitraz and malathion accounted for 75% of the total pounds applied to swine. Much smaller quantities were applied to swine facilities. The products used were malathion, permethrin, and piperonyl butoxide, in that order.

The dioxin objective was to assess the exposure potential of swine to dioxin through exposure to PCB treated wood, selected feed ingredients, or smoke. The results have not yet been summarized.

Fonda Munroe, DVM, MBA, Msc, Canadian Food Inspection Agency, Ottawa, Ontario, Canada presented a Summary of the Report on The International Workshop on Animal Disposal Alternatives. The International Workshop on Animal Disposal Alternatives (IWADA) was held at the National Center for Foreign Animal Disease in Winnipeg, Manitoba in June 2000. It was organized to address the global problems associated with destruction and disposal of large numbers of domestic animals. At the end of the workshop there was strong consensus on two points. The first was that change was required. The second was that change could only be effected through international collaboration.

Many factors are forcing the need for change. These include:

- logistic and economic considerations
- social pressures
- existence of viable disease control alternatives
- limitations of some currently mandated approaches
- need for balance and flexibility in control programs
- animal welfare considerations
- environmental considerations
- more effective use of resources

The workshop process was designed to provide significant information and to stimulate discussion, interaction and synergy. Lectures were presented on the main four themes of the workshop. These were: social, ethical and cultural values; international trade and finance considerations; disease control and eradication (epidemiology); and, the environment. Recent disease outbreak scenarios were also presented. There scenarios were: BSE in the United Kingdom; classical swine fever in the Netherlands; anthrax in Australia; and Nipah virus in pigs in Malaysia.
Many recommendations were brought forward. These included:

- develop vaccines and diagnostic tests to differentiate infection from vaccination
- share equipment and technology capacity internationally
- perform more research on composting
- share international expertise
- develop a mechanism to address unknowns
- gain international acceptance of technology / methodology in advance to maintain international trade
- develop meat hygiene research and principles to allow use of product from uninfected animals
- raise awareness in local governments of risks linked to large scale livestock enterprises

It was agreed that any alternative must meet specific criteria. Therefore any alternative:

- must be at least equal to current disease control methods
- must gain international acceptance
- must decrease waste
- must be more humane
- must be less destructive to the environment

The recommendations of the workshop also included a mechanism to promote the alternatives that were suggested. This mechanism was for the Chief Veterinary Officers (CVOs) of Australia, Mexico, New Zealand, the United States and Canada to appoint members from each respective country or invite participation from other countries on an International Steering Committee. The chair of this committee would report directly to the CVOs. There would be four standing committees reporting to the Steering Committee. Each of these committees would be responsible for a specific aspect of this very complex and multi-factorial process. These committees would address the main concerns that were expressed at the IWADA in terms of what changes needed to be made and how to overcome the barrier to these changes and ultimately obtain international acceptance for the changes.

The Committees and their major functions would be:

1. An International Response Committee (IRC) which would have two major functions.
   - to act as a depopulation/disposal consultation team at the time of a significant disease outbreak. This committee would follow the principles which were developed at the IWADA in their consultations. The team’s expertise would grow as it had more opportunities to take part in actual outbreak situations using newly developed alternatives to depopulation or disposal.
   - to identify the areas where new research is required

This committee would be well positioned to identify scientific and technology development needs. They would communicate these
needs to the Technical / Epidemiology Committee.

2. Technology / Epidemiology Committee (TEC). The International Response Committee would identify the scientific and technology development needs and communicate these needs to the Technology / Epidemiology Committee. The Technology / Epidemiology Committee would work through the Steering Committee members to determine who, where, and how the technologies would be resourced and developed. This collaboration could result in new research, field trials, information/expertise sharing, equipment sharing etc.

3. A Standards and Quality Assurance Committee (SQAC). Any alternative approaches must be acceptable to the international community and to organizations such as the OIE, Codex Alimentarius, and the WTO. This committee would take into account factors such as social acceptance and environmental concerns. All standards must meet sanitary requirements. This committee would be responsible for putting scientifically sound alternatives in a format which could be presented to international standard setting organizations.

4. An International Trade and Liaison Committee (ITLC). The purpose of this committee would be to champion the proposed alternatives, using the information and technical information from the Standards and Quality Assurance Committee. The ITLC would then negotiate the changes with the international community.

Internationally accepted alternatives could be used by all countries. The International Response Committee would incorporate these alternatives into their consultative role. They would be able: to assure that they were being implemented properly; to evaluate the alternatives in practice; and, to feed back any comments to the Technology / Epidemiology Committee for further “fine-tuning”. Thus there would be a mechanism for audit and continuous improvement of alternatives.

During the Committee business meeting, the chair informed the membership that his five-year term as chair was completed and a new chair needs to be appointed. Volunteers were solicited but none were identified.

There being no further business, the Committee adjourned at 2:30 pm.
REPORT OF THE COMMITTEE ON PUBLIC RELATIONS AND INFORMATION TECHNOLOGY

Chairman: Dr. Donald H. Lein, Ithaca, NY
Vice Chairman: Dr. Roger E. Olson, Annapolis, MD

Mr. Neal F. Black, MN; Ms. Barbara R. Fox, MD; Dr. Thomas J. Hagerty, MN; Mr. Larry D. Mark, VA; Dr. H. Wesley Towers, DE; Mrs. Michele C. Turner, CA; Dr. Gary M. Weber, DC; Dr. Ernest W. Zirkle, NJ.

The USAHA Committee on Public Relations and Information Technology met at 3:00 p.m. on Saturday, November 3, 2001, in the Tower 3 Room, of the Hershey Lodge in Hershey, Pennsylvania.

After roll call, Chairman Lein invited Ms. Madeline Fletcher, from the office of Communications Services, USDA/APHIS/VS, to become a member of the Committee. Mr. Larry Mark, USAHA Public Information Officer (PIO) and Webmaster, gave his report. A full-page list of the web page and the number of visitors was presented and discussed. Since the initiation of this web page, 44,905 visitors have used the web page. Key links, species specific pages, committees, meetings, directory, FMD in the UK and NAHEM were the most frequent used pages. Several web sites of other groups were discussed for a possible link: Emergency programs, Pro-Med, and a possible restricted site for the National Assembly of Chief Livestock Health Officials, the new Grey Book on FAD will be available for the web and our proceedings of the Annual Meeting.

A discussion concerning the use of the web for the Newsletter was initiated. The National Association of State Departments of Agriculture went electronic and quadrupled the use of communicating to their offices. Dr. Bret Marsh, editor of the USAHANewsletter, did not attend the meeting, but should be asked about studying to change completely to the web. A questionnaire survey for membership comment needs to be conducted before instituting this format.

Dr. Bret Marsh was congratulated on his newsletter, especially the special issues on the National Laboratory Needs and the Wildlife Issue.

NIAA weekly news bulletin was used as an example of an excellent communication forum for their members.

Mr. Mark is looking at incorporating the newsletters into the web, like the NVSL, Master Plan, updating membership and the need to place the proceedings on the web, if required. The Committee appreciates the region meeting news, notification of upcoming meetings and meeting notes, and encourages the regional presidents to continue sending in their items.

The Committee commended Mr. Larry Mark for the great job he is doing on our web page.

Madeline Fletcher talked about the USDA/APHIS/VS News Alerts for State Veterinarians which is done by Legislative Affairs every two months. This could be linked to our web site.

Meeting was adjourned by the Chair at 4:30 p.m.
REPORT OF THE COMMITTEE ON RABIES

Chairman: Dr. Malcomb G. Fearneyhough, Dripping Springs, TX
Vice Chairman: Dr. Robert B. Miller, Buchanan, VA

Dr. H. Michael Chaddock, VA; Dr. Donald S. Davis, TX; Dr. James J. England, ID; Dr. Nancy A. Frank, MI; Dr. Keith N. Haffer, SD; Dr. Cathleen Hanlon, GA; Dr. Richard E. Hill, IA; Dr. Donald H. Lein, NY; Dr. Jorge W. Lopez, ; Dr. Calvin W. S. Lum, HI; Dr. John C. New, TN; Dr. Sandra K. Norman, IN; Dr. Leon H. Russell, Jr., TX; Dr. F. T. Satalowich, MO; Dr. Cheryl B. Tillman, OR; Dr. Lyle P. Vogel, IL; Dr. James C. Wright, AL.

The Committee on Rabies met on Wednesday, November 07, 2001, from 7:00 AM – 12:00 PM.

Dr. C. A. Hanlon, The Centers for Disease Control and Prevention

With advances in wildlife rabies control through expanding oral vaccination efforts, there has been an increasing strain on the infrastructure of traditional rabies control from the local to the federal level. Local responses involve maintenance of public health staff to address inquiries about potential exposure situations, responding on-site to rabies-suspect animals with sanitarians, animal control, and law enforcement officers, among others, and preparing carcasses for rabies testing often using private veterinary practitioners. Core state responses require: 1) augmentation of available public health professionals to assist local staff, 2) facilitation of the submission of specimens through financial support to localities, 3) achievement of rapid, accurate primary diagnostic services under increased demands, 4) implementation of new diagnostic methods, 4) further characterization of positive samples to provide critical epizootiologic information, and 5) compilation and interpretation of laboratory data. Federal responsibilities by the Centers for Disease Control and Prevention include a broad range of diagnostic services consisting of rabies virus antibody determinations, confirmation of unclear rabies testing results on brain tissue, characterization of unusual animal samples as part of epizootiologic surveillance for unprecedented outbreaks or geographical translocation, ante- and post-mortem human rabies diagnostic testing, design of new tests and diagnostic training, and consultation regarding potential exposure scenarios, as well as compilation and analysis of rabies surveillance data nationwide, and responding to state requests for assistance as needed. With the allocation of funding to USDA, APHIS, Wildlife Services for the purchase of oral vaccine-laden baits and services for aerial distribution, new activities related to this novel rabies control method are a critical part of the execution and follow up to bait distribution. These include the need for increased rabies surveillance at orders of magnitude (i.e., 5-20 fold higher) above baseline passive public health submissions. The conduct
of educational outreach for the public and targeted groups most likely to be affected by the activities in the baited area. Participation in baits distribution efforts and follow up live trapping. The compilation and evaluation of assessment data and program planning for the future. Financial support is necessary for additional duties falling to local public health personnel and locally incurred expenses and at the state rabies diagnostic laboratory for increased surveillance needs. A methodical surveillance system for tracking bait and vaccine contact needs to be implemented as a follow up to bait distribution. This is especially true in light of the recent human infection with the vaccinia-rabies glycoprotein recombinant vaccine contained in the baits, and current concerns about cutaneous lesions (i.e., rashes, vesicles) of unknown origin associated with systemic illness. Collaborative teams with public health, agriculture, and wildlife agency representatives at the state level, academicians, and relevant federal representatives need to be functional to provide general and specific oversight of oral vaccination projects. Finally, overall planning and assessment of oral vaccination efforts should be closely coordinated among the international, federal, state and local levels.

Rick Rosatte, Ontario Ministry of Natural Resources, Rabies Research and Development Unit

The raccoon variant of rabies was first reported in Ontario, Canada, during July 1999. Since that time, Ontario Ministry of Natural Resources (OMNR) staff have attempted to halt the spread of the disease using 3 different tactics: population reduction of the vector species, intramuscularly vaccination using trap vaccinate release (TVR), and oral vaccination with baits. To date more than 6,500 raccoons and 1,100 skunks have been euthanized in the epizootic area. In addition, more than 7,000 raccoons have been vaccinated during TVR programs since 1999. About 1.5 million baits containing Vaccinia-Rabies Glycoprotein (V-RG) oral rabies vaccine have been aerially distributed in an 8,000 sq km area of eastern Ontario to contain the outbreak. Raccoon acceptance of baits has varied between 27% and 64% depending on the month and year of distribution. Rabies neutralizing antibody levels have varied between 5% and 17% in raccoons sampled from the baited areas. To date (October 24 2001) 86 cases of raccoon rabies have been reported in eastern Ontario since July 1999. The epizootic is currently contained in a 400 sq km area near Brockville Ontario.

Dr. Albino Belotto, Pan American Health Organization

Dr. Belotto reported on Regional 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. Even with successful programs over one half of the human cases are still attributed to dog rabies. Twenty per cent of the cases in humans are from bat rabies. There are 50-60 million dogs in Latin America with a vaccination rate of 68%. Since 1991 human and canine cases have reduced dramati-
Bats continue to be important source of rabies in humans. Monkeys, skunks and fox are other important sources for human cases. The region is making progress in testing for rabies and developing capabilities for virus characterization. Keys to elimination of dog-human rabies transmission involves 1. Sustained political commitment, 2. Focus on the main areas of transmission and study of wildlife, 3. Use new technology for diagnosis, 4. Study dog and wildlife dynamics, 5. Improve intersectorial cooperation.

Dr. Kathy Smith, Ohio Department of Health

The raccoon-strain of the rabies virus was detected in northeast Ohio in early 1997. By the end of May 1997, 42 rabid raccoons were confirmed in three counties bordering Pennsylvania, with the majority of the cases centered in major residential areas of Mahoning County. To stop further spread into the rest of the state, the Ohio Department of Health, with the support of other state and federal agencies, implemented an oral rabies vaccination (ORV) program for wild raccoons using Raboral V-RG (Merial, Ltd).

Ohio’s ORV baiting strategy is based on the following:

- Bait density at 75 baits/square kilometer (approximately one bait per 3.3 acres)
- Baiting 10 miles ahead of the epizootic front
- Two baitings per year until raccoon rabies is under control; annual baiting will begin in 2002

The current rabies immune barrier is 25 miles (40 kilometers) wide and extends from Lake Erie southward along the Ohio-Pennsylvania and Ohio-West Virginia borders to the area east of Charleston, West Virginia. In Ohio, the ORV immune barrier is now 3,271 square miles (8,518 square kilometers). Almost five million baits have been used during the past five years.

In the four counties bordering Pennsylvania, active surveillance detected 59 raccoons positive raccoons in 1997, 20 in 1998, 5 positive in 1999, and none positive in 2000 or 2001 (as of October 24, 2001). Total raccoon-strain rabies cases have decreased from 62 raccoon-strain cases in 1997 (59 raccoons, 2 cats, 1 skunk), to 26 in 1998 (20 raccoons, 2 cats, 3 skunks, 1 fox), to 6 in 1999 (5 raccoons, 1 chipmunk), and no cases in 2000 or to date in 2001. The last raccoon case documented was in November 1999 in Columbiana County. Mahoning County, which was the initial and most severely infected county in Ohio, has been rabies-free for over 32 months.

Jane Rooney – West Virginia Department of Health

West Virginia and Ohio’s joint aerial baiting was scheduled to begin September 10 and be completed by September 21. A small number of baits were dropped the morning of September 11, but the events in New York and Washington grounded operations and delayed aerial baiting until September 15. Flights were conducted during the following days despite bad weather and continued grounding of agricultural flights. Aerial baiting was completed on September 25. A total of 72 flights and 195 hours of flight time were accrued. West Virginia received 896,634 air-dropped baits. Twenty-two West
Virginia counties fell in the bait drop area, which included 11,649 square kilometers (4,582 square miles) of territory. ORV baits were distributed at a density of 75 baits per square kilometer. Ground baiting was conducted in 14 of the 22 counties. Approximately 60,840 baits were distributed in urban areas and along key roadways located in the 14 counties.

Personnel from the USDA Wildlife Services are conducting post-baiting surveillance to determine the effectiveness of the bait drop. Active surveillance will be expanded to include all counties within the aerial drop zone, as well as those that conducted surveillance prior to the September bait drop. A total of 29 counties will participate in active surveillance during the coming year.

Dr. Bruce Schmucker, Dr. Marshall Deasy - Pennsylvania Department of Health and Department of Agriculture

The raccoon rabies virus that has become widespread in the northeastern United States entered south central Pennsylvania in 1984 and ten years later had become enzootic throughout the Commonwealth’s 67 counties. Since 1995, approximately 400 wild and domestic animals are diagnosed positive for rabies annually. This represents a ten-fold increase over the two decades prior to 1984. This epizootic has placed a heavy burden on the diagnostic, epidemiological and public health resources of the Pennsylvania Department of Health and the Pennsylvania Department of Agriculture. Additionally, the Pennsylvania Game Commission has shared in the increased resource workload associated with terrestrial rabies in wildlife. In the early summer of this year, the United States Department of Agriculture Wildlife Services contacted the Pennsylvania Department of Agriculture, Pennsylvania Department of Health and Pennsylvania Game Commission seeking their participation in an oral rabies vaccine initiative designed to connect the vaccine baited counties in southwestern New York with similarly baited counties in northeastern Ohio. During the week of October 2nd through October 6th, personnel from the four agencies mentioned above were joined by Erie County Department of Health personnel in distributing 136,500 baits by hand over a twenty mile wide swath connecting Pennsylvania’s Lake Erie shoreline with the baited areas in adjacent New York and Ohio. The original two-day aerial baiting planned for this project in late September was changed to the more labor-intensive hand baiting due to concerns for low flying aircraft following the terrorist attacks of September 11. Post baiting surveillance to determine the rate of seroconversion by raccoons in the area is scheduled for November. A similar interagency oral vaccine-baiting project for Pennsylvania counties bordering Ohio and West Virginia is under consideration for the fall of 2002 with a goal of creating a barrier to the westward expansion of raccoon rabies from eastern Canada to the Gulf of Mexico.

Dr. Laura Bigler - Cornell University

Laura Bigler provided program description for the New York and Vermont Oral Rabies Vaccination Programs including bait comparisons and surveil-
lance tools. Natural background rabies is evaluated to be at 1-4% without vaccination programs. Dr. Bigler described program development stressing the distribution processes and raccoon density.

Dr. Donald - Cornell University

Dr. Lein provided an update on the efforts to gain political support for increased funding allocation for individual state program. Bobby Accord has been assigned to the leadership position in APHIS and has expressed support for continuation of programs at the current funding level with the potential for funding increases. Funding allocations are being decided this week in both the US House of Representatives and Senate.

Dr. Dennis Slate - USDA/APHIS/Wildlife Services

Dr. Slate provided an update of the status of funding for the development and planning for a National Oral Rabies Vaccination Program. Assessment was made that raccoon rabies has not caused human death but, due to the public health threat and high cost of living with an expanding rabies epizootic, there has been increased political support for funding programs. Evaluation of the future rabies control efforts will include application of site-specific management tools, population suppression, contraception, and vaccination of wildlife. The development of future programs will depend on the ability to complete economic analysis and cost effectiveness studies. It was stressed that success will depend on an interdisciplinary approach.

Business Meeting.

One resolution was adopted for presentation to the Resolutions Committee.
REPORT OF THE COMMITTEE ON SALMONELLA

Chairman: Dr. Kakambi V. Nagaraja, St. Paul, MN
Vice Chairman: Dr. Bradford P. Smith, Davis, CA

Dr. Robin C. Anderson, TX; Dr. David H. Baum, IA; Dr. Charles W. Beard, GA; Dr. Fred D. Bisplinghoff, FL; Dr. Thomas G. Blaha, MN; Mr. Kevin G. Custer, GA; Dr. Dave Dargatz, CO; Dr. Nicholas M. Dorko, Jr., CT; Dr. Robert J. Eckroade, PA; Ms. Kathleen E. Ferris, IA; Ms. Rose Foster, MO; Dr. Don A. Franco, VA; Dr. Leonard W. Fussell, AR; Dr. Richard K. Gast, GA; Dr. G. Yan Ghazikhanian, CA; Dr. Hashim M. Ghori, AR; Dr. Robert D. Glock, AZ; Dr. Thomas J. Hagerty, MN; Dr. Cheryl Hall, CA; Dr. David A. Halvorson, MN; Dr. Michael Hellwig, AR; Dr. William W. Hewat, NC; Dr. G. Thomas Holder, MD; Dr. Peter S. Holt, GA; Dr. John K. House, CA; Dr. William O. James, VA; Ms. Sandra M. Kelly-Aehle, MO; Dr. Hailu Kinde, CA; Dr. Glenn E. Kolb, WI; Dr. Elizabeth A. Lautner, IA; Dr. Joan Leonard, KS; Dr. Patrick L. McDonough, NY; Dr. Gordon P. Miller, Sr., NC; Mr. Donald S. Munro, PA; Dr. Robert L. Owen, NC; Dr. Gary G. Pearl, IL; Dr. Jean Petter, GA; Mr. Ronald E. Plylar, KS; Dr. Benjamin S. Pomeroy, MN; Dr. David G. Pyburn, IA; Dr. G. Donald Ritter, DE; Dr. H. L. Shivaprasad, CA; Dr. William M. Sischo, CA; Dr. Thomas J. Stabel, IA; Dr. David E. Swayne, GA; Dr. Lee Ann Thomas, MD; Dr. Stanley A. Vezey, GA; Dr. W. Douglas Waltman, GA; Dr. Gary L. Waters, MT; Dr. Scott J. Wells, MN; Dr. David H. Willoughby, CA; Dr. Richard R. Wood, IL; Dr. Ching-Ching Wu, IN.

The USAHA Committee on Salmonella met from 12:30 p.m. to 5:30 p.m. on November 4, 2001 with 32 members and guests. There was 1 resolution discussed: One recommended that USAHA encourage congress to provide mandatory funding for the Master Plan for facility consolidation and modernization of facilities at Ames, Iowa.

The USAHA Committee on Salmonella met from 12:30 p.m. to 5:30 p.m. on November 4, 2001 with 32 members and guests. There was 1 resolution discussed: One recommended that USAHA encourage congress to provide mandatory funding for the Master Plan for facility consolidation and modernization of facilities at Ames, Iowa.

K.E. Ferris and her coworkers from the National Veterinary Services Laboratory in Ames, Iowa presented serotyping results for 18,923 Salmonella isolates from animals and epidemiologically related sources reported during July 1, 2000, through June 30, 2001. A total of 262 serotypes were identified from isolates recovered from animals, their environment, or feed in 43 states and the District of Columbia. The 10 most common serotypes account for 68% of the total isolates reported. Although S. typhimurium continued to be the most common serotype, the number of times it was...
identified decreased for the first time since 1997. The most frequently identified serotypes were *Salmonella typhimurium*, *S. heidelberg*, *S. newport*, *S. agona*, and *S. kentucky*. *Salmonella newport* was included among the ten most common serotypes for the first time. Although *S. newport* was isolated from all sources except feed, the majority of isolates were from cattle and horses. The most common serotype isolated from sheep was 61:1,5 (Arizona) with 24 of 48 isolates identified as this serotype.

The percentage of isolates identified as *S. typhimurium* dropped to 20% this year from 23% last year. *S. typhimurium* continues to be among the 5 most frequently identified serotypes from cattle, chickens, horses, swine, and turkeys. Of the total isolates of bovine origin, 28% were identified as *S. typhimurium* compared to 52% last year. *S. typhimurium* was identified in 32% of the swine isolates, 26% of the horse isolates, 11% of the turkey isolates, and 6% of the chicken isolates. The percentage of *S. typhimurium* isolates identified as *S. typhimurium* var. copenhagen increased to 53% from 51% last year. In swine, 80% of the *S. typhimurium* isolates were var. copenhagen compared to 68% last year; while in horses only 21% were *S. typhimurium* var. copenhagen compared to 35% last year.

Andrew R. Rhorer, the Senior Coordinator of the National Poultry Improvement Plan - USDA-APHIS, provided the "National Plan's Status Report" on pullorum-typhoid status. In Calendar year 2000, there were four isolation/outbreaks of *S. pullorum* reported to the Poultry Improvement Staff. There was one isolation of *Salmonella pullorum* reported during Calendar year 2001 from January to October 1, 2001. There have been no isolations of *S. gallinarum* since 1988 in any type of poultry.

Dr. Michael Jolly from Diachemix Corp. presented on detection of *Salmonella enteritidis* (SE) and *Salmonella typhimurium* (ST) cells by Fluorescence Polarization Immunoassay. The assay used three antisera and four fluorescein-labeled preparations of the OPSs (tracers) from SE (SE.1 and SE.5) and ST (ST.01 and ST.1). A bovine anti-ST antiserum (AB1) recognized all tracers. A specific rabbit anti-*Salmonella* Group D1 antiserum (AB2) recognized the SE tracers but did not react with the ST tracers. Conversely, a specific rabbit anti-*Salmonella* Group B antiserum (AB3) recognized the ST tracers but not the SE tracers. The FPIAs showed great promise for the very rapid and specific detection of SE and ST cells after culture.

Dr. Richard Gast from USDA-ARS Southeast Poultry Research Laboratory in Athens, GA reported on detection of antibodies to *Salmonella enteritidis* in Serum and Egg Yolks from experimentally infected laying hens by Fluorescence Polarization. They evaluated the sensitivity and specificity of detection of specific antibodies in sera and eggs yolks from experimentally infected chickens by an FP assay using tracers prepared from the O-polysaccharide of SE and an enzyme immunoassay (ELISA) using an SE flagellin antigen. In 2 trials, groups of specific-pathogen-free laying hens were infected orally with either $10^6$ or $10^8$ cfu of SE (phage type 13a) or with $10^8$ cfu
of *S. typhimurium*. Serum and egg yolk samples were collected during the
first 5 weeks after inoculation. Both assays detected a high percentage of
hens infected with SE but also identified a substantial number of hens in-
fected with *S. typhimurium* as antibody-positive. The FP test often demon-
strated both superior sensitivity and specificity in comparison to the ELISA.

Dr. Armando Mirandé, from Biomune Company reported on reduction of
the prevalence of salmonella enteritidis in the commercial egg industry through
vaccination: The pennsylvania experience. Of the 317 flocks enrolled in the
Pennsylvania Egg Quality Assurance Program (PEQAP) in the year 2000,
224 flocks were not vaccinated and 71 were vaccinated with Layermune SE®.
Data he PEQAP-participating flocks that were vaccinated in full with an SE
bacterin, Layermune SE®, from January 1997 to December 2000, and its
comparison with contemporary data from the rest of PEQAP participating,
non-vaccinated flocks was presented. The non-vaccinated group of flocks
showed 2.1%, 2.47%, 1.62% and 2.45% of all manure samples positive to
SE during 1997, 1998, 1999 and 2000, respectively. The number of SE posi-
tive manure samples in the vaccinated group of flocks is 0%, 0.19%, 0.29%
and 0.23%, respectively, for the same time period. The number of non-vacci-
nated flocks with SE positive manure was 10.9%, 14.6%, 12.7% and 12.1%
during 1997, 1998, 1999 and 2000, respectively. The number of vaccinated
flocks with SE positive manure during the same time period is 0%, 4.8%,
3.4% and 2.8%, respectively. In conclusion, analysis of PEQAP data from
January, 1997 to December 2000, showed an 89% reduction in environmen-
tal samples (manure swabs) and a 93% reduction in eggs in SE bacterin
vaccinated flocks when compared to contemporary, non-vaccinated flocks.

Dr. Sandra Kelly-Aehle and co-workers from Megan Health, Inc. reported
on Protection of laying hens against wild type Salmonella enteritidis follow-
ing vaccination with a modified live Salmonella typhimurium vaccine. She
reported that recent clinical studies have shown that laying hens vaccinated
with a higher dose of Megan Vac 1 were protected from internal organ infec-
tion and had significantly reduced GI tract, ceca and egg contamination after
challenge with wild-type S. enteritidis. Three doses administered to pullets
through coarse spray or drinking water application protected birds through a
full lay cycle.

Drs. Doug Waltman and Chuck Hofacre from Georgia, presented data on
Protection of a live, attenuated Salmonella vaccine to a challenge of Salmo-
nella enteritidis in commercial layers. They vaccinated commercial layer
pullets 3 times as recommended by the producer with the Megan Vaccine.
The environment was monitored on both the pullet and layer farms where
these birds were housed. At transfer to the layer house and at 30 weeks of
age birds were removed and transferred to houses where they were chal-
lenged with a strain of S. enteritidis. The birds were cultured over a 4 week
period for the presence and shedding of SE as well as egg production. In
conclusion, there was no complete elimination of challenged *Salmonella*
enteritidis from vaccinated birds.

Dr. Hurd and his coworkers from National Animal Disease Center USDA:ARS, Ames, Iowa presented results of their studies on holding pens as a critical control point for Salmonella in Market Swine. They conducted a follow-up study to isolate the effects of long-term holding (lairage) in clean disinfected facilities. The stressful effects of 18 hours lairage, mixing of groups, and fasting did not increase *Salmonella* isolation rates. A comparison of isolation rates for lairaged and control animals showed lower isolation rates in the lairaged pigs when comparing ileocecal lymph nodes (35.6% vs. 50.7%), distal colon contents (44.4% vs. 59.4%), and positive on any sample (65.2% vs. 78.3%) samples (*P* < 0.05). This finding suggests that stress is not the sole source of increased isolation rates after pigs leave the farm. They found more evidence that the holding pens were a significant source of *Salmonella* infection. They tested the effect of holding pens on *Salmonella* isolation rates. For abattoir necropsied pigs, the average *Salmonella* prevalence was five times (39.9%) higher than on-farm collected samples (5.3%) (*p* < 0.001). They demonstrated that market swine can become infected in the ileocecal lymph nodes and gastrointestinal tract after only 2 hours of exposure to a *Salmonella* contaminated floor. Their studies strongly suggested that the abattoir holding pen is a significant source for perimarketing *Salmonella* infection of swine.

Dr. Ed Mallinson made comments on perspectives of Salmonella control and research. His comments included the following: Farm building designs and operational procedures (e.g., uniform litter / manure surface airflow, water leakage control, etc.) now reported to suppress the multiplication of *Salmonella* in accumulated litter / manure appear central to true farm — level HACCP. This perspective is consistent with long-established health principles for concentrated populations of humans. Future food safety research should continue to explore / validate the value of house / pen design and management changes in Salmonella risk reduction / neutralization.
SALMONELLA SEROTYPES FROM ANIMALS AND RELATED SOURCES REPORTED DURING JULY 2000 - JUNE 2001

K.E. Ferris, B.S., M.S.
J.M. Timm, B.S.
A.M. Aalsburg, B.S.
M. Munoz, B.S.

Summary

Serotyping results for 18,923 Salmonella isolates from animals and epidemiologically related sources are reported for July 1, 2000, through June 30, 2001. The most frequently identified serotypes were *Salmonella typhimurium*, *S. heidelberg*, *S. newport*, *S. agona*, and *S. kentucky*.

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. Information provided by other laboratories serotyping *Salmonella* was not included in this year’s summary, but is listed in Table 4. This information will be integrated into next year’s report.

For the first time, data generated from the serotyping of research isolates is not included in this report. Also, for the first time, there are two tables presenting serotype information by source. Table 2 reports serotypes by species from clinical disease, monitor samples, environmental samples, and feed. Serotypes by species from cases of clinical disease (listing primary or secondary infection as the clinical role of the *Salmonella*) are reported in Table 3.

Discussion

Serotyping results are presented for 18,923 isolates; an 18% decrease from the 22,967 cases reported last year. The decrease is due to the exclusion of research isolates this year. A total of 262 serotypes were identified from isolates recovered from animals, their environment, or feed in 43 states and the District of Columbia. The 10 most common serotypes (Table 1) account for 68% of the total isolates reported. Although *S. typhimurium* continued to be the most common serotype, the number of times it was identified decreased for the first time since 1997.

*Salmonella newport* was included among the ten most common serotypes for the first time (Table 1). Although *S. newport* was isolated from all sources except feed (Table 2), the majority of isolates were from cattle and
horses. Over half (555 of 978) were of bovine origin and 211 were recovered from horses. *S. newport* accounted for 15% of all cattle isolates and 20% of those associated with cases of clinical disease. Isolates of *S. newport* increased 240% this year over the 405 cases reported last year, 313% over 1999, and 579% over 1998.

The percentage of isolates identified as *S. typhimurium* dropped to 20% this year from 23% last year.¹ *S. typhimurium* continues to be among the 5 most frequently identified serotypes from cattle, chickens, horses, swine, and turkeys (Tables 5-9). Of the total isolates of bovine origin, 28% were identified as *S. typhimurium* compared to 52% last year. *S. typhimurium* was identified in 32% of the swine isolates, 26% of the horse isolates, 11% of the turkey isolates, and 6% of the chicken isolates.

The percentage of *S. typhimurium* isolates identified as *S. typhimurium* var. copenhagen increased to 53% from 51% last year. In swine, 80% of the *S. typhimurium* isolates were var. copenhagen compared to 68% last year; while in horses only 21% were *S. typhimurium* var. copenhagen compared to 35% last year.

The most common serotype isolated from sheep was 61:1,5 (Arizona) with 24 of 48 isolates identified as this serotype.

References
Table 1.  
Salmonella Serotypes Identified Most Frequently from 
July 1, 2000 through June 30, 2001 with Comparison Data for 5 years  
(All sources)

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* includes s. typhimurium and s. typhimurium var copenhagen  
** number of times serotype was identified
### Table 2 - Serotype by Species from All Clinical Roles

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*Note: Numbers indicate the frequency of isolation.*

**Total**:
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- Chick: 1
- Dog/Cat: 1
- Envir: 1
- Feed: 1
- Horse: 1
- Mixed: 1
- Reptil: 1
- Sheep: 1
- Swine: 1
- Turkey: 1
- Un: 1
- Wild: 1
- Zoo: 1
- Total: 2
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TABLE 5
CATTLE—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 07/00 THROUGH 06/01

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TABLE 6
CHICKEN—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 07/00 THROUGH 06/01

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SALMONELLA SEROTYPES FROM ANIMALS AND RELATED SOURCES REPORTED DURING JULY 2000 - JUNE 2001

TABLE 7
HORSE—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 07/00 THROUGH 06/01

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ALL CLINICAL ROLES

| Typhimurium | 266         |         |       |           |        |        |       |
| Agona       | 222         |         |       |           |        |        |       |
| Newport     | 211         |         |       |           |        |        |       |
| Newington   | 54          |         |       |           |        |        |       |
| Anatum      | 32          |         |       |           |        |        |       |
| Others      | 255         |         |       |           |        |        |       |
| TOTAL       | 1040        |         |       |           |        |        |       |

TABLE 8
SWINE—MOST FREQUENTLY IDENTIFIED SEROTYPES FROM 07/00 THROUGH 06/01

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<th>Derby</th>
<th>Infantis</th>
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ALL CLINICAL ROLES

| Typhimurium | 863         |         |       |           |        |        |       |
| Derby       | 266         |         |       |           |        |        |       |
| Choleraesuis | 223        |         |       |           |        |        |       |
| (Kunzendorf) |            |         |       |           |        |        |       |
| Worthington | 181         |         |       |           |        |        |       |
| Heidelberg  | 173         |         |       |           |        |        |       |
| Others      | 1004        |         |       |           |        |        |       |
| TOTAL       | 2710        |         |       |           |        |        |       |
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TURKEY—MOST FREQUENTLY IDENTIFIED SEROTYPES
FROM 07/00 THROUGH 06/01

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REPORT OF THE COMMITTEE ON
SALMONELLA ENTERIDITIS 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 M. Arnoldi, WI; Dr. Edgardo Arza, GA; Dr. Marilyn F. Balmer, MD; Dr. Charles W. Beard, GA; Dr. Charles E. Benson, PA; Dr. Richard E. Breitmeyer, CA; Dr. Max Brugh, GA; Dr. Jones W. Bryan, SC; Dr. Sherrill Davison Yeakel, PA; Dr. Richard L. Dutton, NE; Dr. Robert J. Eckroade, PA; Mr. Kevin M. Elfering, MN; Dr. John E. Enck, Jr., PA; Dr. James M. Foppoli, HI; Dr. Richard K. Gast, GA; Dr. Eric N. Gingerich, PA; Ms. Brenda P. Glidewell-Erickson, GA; Dr. Peter S. Holt, GA; Dr. Keith A. Honegger, IN; Dr. William O. James, VA; Dr. Hallu Kinde, CA; Dr. Kenton S. Kreager, IA; Dr. Joan Leonard, KS; Dr. John Mason, NY; Dr. Armando Mirande, GA; Mr. Donald S. Munro, PA; Dr. Thomas J. Myers, DC; Dr. Kakambi V. Nagaraja, MN; Dr. Jean Petter, GA; Mr. Albert E. Pope, GA; Mr. Andrew R. Rhorer, GA; Dr. John P. Sanders, WV; Dr. H. L. Shivaprasad, CA; Dr. Martin A. Smeltzer, NC; Dr. Jill A. Snowdon, DC; Dr. David E. Swayne, GA; Dr. W. Douglas Waltman, GA; Dr. Gary L. Waters, MT; Dr. Nora E. Wineland, CO.

The Committee met on November 3, 2001 from 12:34 to 5:20 pm with 54 members, speakers and guests in attendance. The meeting began with updates on the Egg Safety Action Plan from the Food Safety Inspection Service (FSIS) and the U.S. Food and Drug Administration (FDA).

Dr. Alice Thaler, stated that FSIS has sent the draft proposed rule to the Department for approval and is in the process of responding to questions about the risk assessment. After the document clears the Department it will be sent to the Office of Management and Budget (OMB) for review. FSIS anticipates that the draft will go to OMB by the end of the calendar year. The FSIS components of the Plan will be combined with FDA components to produce the proposed Egg Safety Action Plan. In support of the Agency's liquid egg inspection program, the Office of Public Health and Science, in cooperation with the Office of Policy, Program Development and Evaluation is conducting a baseline study to analyze liquid egg products for Salmonella spp. and Listeria monocytogenes prior to pasteurization. Data from the study will be used to develop lethality standards and support risk assessment for liquid unpasteurized whole egg, liquid pasteurized egg, liquid unpasteurized egg white, and liquid unpasteurized egg yolk. The pre-baseline data collection shakedown began the last week of June, 2001 and was completed as of October 11, 2001. On October 15, 2001, FSIS initiated sampling for the Egg Baseline Study, which will sample between 900 and 1,000 samples over a minimum of a one-year period. Samples will be collected randomly from 80 plants that pasteurize liquid eggs. Questions regarding the Egg baseline

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SALMONELLA ENTERIDITIS IN EGGS

Study should be directed to Dr. Arshad Hussain, Director, Inspection and Enforcement Standards Development Staff, Office of Policy, Program Development and Evaluation, 202-720-3219.

Dr. Marilyn Balmer, reported that FDA sent its components of the Egg Safety Action plan to OMB in June, 2001. Regulations governing egg refrigeration and egg labeling became effective on 6/4/01 and 9/4/01, respectively. Contacts within FDA regarding Education, Research and Surveillance are Mr. Lou Carson, Dr. Bob Brackett and Dr. Marilyn Balmer, respectively. Dr. Balmer also presented national traceback data related to SE in eggs. In 2000, there were 45 SE outbreaks and thus far in 2001, there have been 15 SE outbreaks in the U.S. Dr. Balmer made a detailed presentation outlining the steps that FDA takes in conducting SE tracebacks. Outbreaks are typically detected through local health departments. Local health officials transfer outbreak information to state health departments, who in turn communicate directly with the FDA and the Centers for Disease Control and Prevention (CDC). FDA then reviews all epidemiological and environmental health data collected, including invoices and receipts. At the outbreak site, egg size, color, grade and package labeling information is assessed in addition to all invoices from the previous month. Egg packers are assessed with respect to suppliers, grading sheets and other records. At the distributor level, assessments are made regarding invoices, receipts, inventory and stock rotation. When all information warrants, a traceback proceeds to the farm level. On-farm sampling materials and methods were presented. Environmental samples are taken from manure, egg belts, egg escalators, fan blades, water and feed. Any positive environmental sample initiates four collections of 1000 eggs. Some committee members asked about the possibility of additional epidemiological information being gained from traceback investigations. Dr. Balmer said that the traceback data is being further analyzed.

A series of brief research reports and updates were presented.

Dr. Doug Waltman, Georgia, has been conducting research using commercial layers to evaluate a live SE vaccine. Three doses of a live SE vaccine (Megan Vac1) were given to experimental animals and then challenged orally at 30 weeks with an SE strain previously used by Dr. Peter Holt, of the United States Department of Agriculture (USDA), Agricultural Research Service (ARS), Georgia. Efficacy was assessed using fecal shedding and organ cultures including reproductive tracts. Vaccinated layers challenged at 30 weeks of age demonstrated no differences in culture results of feces or ceca but 10% of ovaries were positive in non-vaccinated birds. Egg production was higher for vaccinated birds than for non-vaccinated controls at peak production. Overall, there was no difference between vaccinates and controls in terms of total egg production. Culture of either feces or 40 birds post-challenge demonstrated that SE clears within 4 weeks.

Dr. Jean Petter, USDA/ARS, Georgia, discussed the strain heterogeneity of SE, even though isolates from around the world are closely related and
considered clonal. USDA has developed an improved animal model to study egg contamination by combining two proprietary strains of SE that together appear synergistic, by producing a high incidence of egg contamination. Several experiments indicate that between 6-15% of eggs are expected to become contaminated within a 21-day clutch. In this session, two distinctly different phenotypes of SE were reviewed that together, aid high incidence egg contamination and appear naturally in the hen environment. Dr. Guard-Petter advised biologics companies to continuously monitor challenge strains for shifts in colony morphology, because the performance of vaccines is likely to be overestimated if the challenge strain becomes attenuated.

Dr. Kakambi Nagaraja, Minnesota, briefly described three studies he has been involved with. The first involves the use of PCR and plasmid profiling for isolates collected in epidemiological surveys. The second study involves the evaluation of a serological test that can be used with serum or egg yolk, utilizing highly specific pili proteins.

The third study involves the development of a recombinant vaccine.

Dr. Hailu Kinde, California, summarized the objectives of a newly initiated cohort study on 3 California egg-producing flocks, funded by FDA. The study objectives are to evaluate early predictors of SE, the sequence of contamination and identify high-risk periods. The following hypotheses will be tested: 1) pullets are contaminated soon after introduction to a contaminated environment, 2) there is a constant source of infection for hens from flies, rodents and other vectors, 3) manure status is not related to hen status for SE at the same point in time, 4) SE shedding by hens is intermittent, 5) there is no correlation between SE positive manure and SE-positive eggs, 6) molting hens are at high risk for producing SE contaminated eggs. Study ranches include two ranches with a high likelihood of detecting SE and one ranch, which is not likely to become positive for SE. Dr. Kinde also described collaborative research with Lawrence Livermore Laboratory, which has identified a highly specific locus for SE that will be assessed for its use as a rapid diagnostic test.

Dr. David Henzler, Pennsylvania, presented interim results of the Pennsylvania Egg Quality Assurance Plan (PEQAP) SE Prevalence Survey initiated in 1998. The purpose of the study is to validate the PEQAP core components in 60 flocks, with 45 flocks sampled to date. The study utilizes environmental cultures as well as intestinal, liver and spleen cultures from hens and rodents. SE strains isolated were very diverse and mice tended to shed orally invasive strains. Salmonellae of serogroup B were also isolated from some organs. Manure samples were more likely to be positive than egg belts, louvers of fans, fan blades and walkways. The majority of SE positive houses have fewer than 20% of swabs positive, although one house did have greater than 50% of the swabs positive for SE. In classifying a flock as SE positive or negative, environmental sampling was superior to bird culturing. The study is also evaluating an SE antibody test.
Dr. Richard Dutton, Nebraska, presented several field experiences including the isolation of a Group D, organism in a layer house that was not SE and corresponded to isolation of the same organism in meat and bone meal, the previous week. Dr. Dutton discussed experiences with SE vaccination and prefers to use an SE bacterin in conjunction with a live SE vaccine. Post molt vaccination is also practiced. He indicated that that egg belts are the most likely site in which to detect SE.

Doreene Choffel, Pennsylvania, PEQAP coordinator, presented the results of a study designed to assess the effectiveness of cleaning feed troughs in 32 layer houses, all of which were previously found to be positive for SE. All houses were cleaned using wet cleaning methods. Troughs were subjectively scored at three levels for the amount of debris remaining, after washdown was completed. For 20 of 32 houses, feed troughs were not cleaned adequately. There was no significant difference in the amount of debris estimated by visual exam and SE positivity. Prior to disinfection of the feed troughs, 68.8% were SE positive and after disinfection 81.3% were positive. Producers selected disinfection methods individually.

Dr. Kakambi Nagaraja, Minnesota, delivered the National Poultry Improvement Plan (NPIP) report for Dr. Andrew Rhorer, USDA. During the past 2 years, 4 flocks in three states were found to be positive for SE. Since 1990, 52 breeder flocks were environmentally positive, 6 fertile eggs and 18 birds were positive.

Discussion followed on wet versus dry cleaning and disinfection methods.

Dr. Sherill Davison Yeakel, Pennsylvania, lead the discussion by asking whether water used in wet cleaning may be contributing to the persistence of SE in houses that test positively over time. Presently, phenol and quaternary ammonium compounds are the most widely used disinfectants in Pennsylvania layer houses and the cost of cleaning and disinfection ranges from $5,000 to $8,000, not including costs associated with equipment deterioration such as corrosion and wear. An earlier study was designed to assess cleaning methods in 18 houses previously found positive for SE. Although isolation of all Salmonellae was similar for houses cleaned using dry methods and fumigation (92%), versus houses washed and disinfected using water (85.7%), the prevalences of SE using these two methods were 7.6% and 28.6% respectively, indicating that wet cleaning methods may favor the persistence of SE in the environment. In an ongoing second study which to date involves 11 previously SE positive houses, 7 of 11 houses have remained positive after dry cleaning and fumigation. In addition, the rodent infection was found to be strongly associated with the likelihood of a house being positive for SE. Pullets placed in these houses were all vaccinated against SE.

Dr. Michael Opitz, Maine, initiated his presentation on cleaning and disinfection by stating that Maine has not had an SE outbreak in humans due to
shell eggs. Dr Opitz reviewed data from the past 13 years for the State’s egg producers. Goals of the program are to decrease exposure and prevent outbreaks of human illness due to SE. Exposure is prevented by sealing the house to prevent rodent entry, adequate cleaning and disinfection, inspecting and sampling the house following cleaning and disinfection, rodent control and vaccination. During this time period 44,358 tests were done and the incidence of positive environmental samples for SE decreased by 1.1%, from 3.5% to 2.4%, at a total estimated cost of $12 million. Dr. Opitz showed that the likelihood of detecting SE has shifted over time from mice, to egg handling equipment and hypothesizes that perhaps that this may be an outcome of vaccinating for SE. Only 3% of all salmonella isolated were SE, and overall, mice are considered the best indicator. Data indicates that complexes with cage layers are more likely to be positive for SE than pullet or breeder houses and are more likely to remain positive following cleaning and disinfection. Concerns were expressed on future use of disinfectants because of increasingly stringent environmental standards being implemented by Occupational Health and Safety Administration (OSHA) and the U.S. Environmental Protection Agency (EPA). Dr. Opitz concluded that cross-contamination remains a prime means of contaminating an SE negative house and that the cost of SE control programs is increasing with marginal reduction of SE incidence in Maine. Dr. Opitz suggested that effective decontamination of cage layer houses on in-line complexes is inconsistent because of complexity of structure, building material, insufficient downtime, limits on choice of disinfectants and incomplete rodent control, including rodent sealing.

Dr. Charles Benson, Pennsylvania, discussed SE microbiological methods with a view to the future. Dr. Benson urged consideration of the following issues:

1. level of sensitivity desired will determine the analysis required,
2. the need for rapid test results may require modifying analytical methods,
3. thresholds for routine monitoring versus traceback purposes have changed to support a zero tolerance policy,
4. the costs of tests and demands on laboratory staff will increase geometrically as each primary sample generates many secondary sub-samples,
5. statistical validity of samples submitted is not validated scientifically (e.g. sampling 500 or 1000 eggs),
6. analytical changes and advances need to be introduced carefully,
7. media, containers, transportation delays, specimen source and number of isolates to pick per plate affect validity and reliability of results,
8. laboratory capacity may be exceeded when combining routine tests with tests for outbreak investigations,
9. extension of salmonella of regulatory importance possible for other
Dr. Benson proposed that federal regulators incorporate input on analytical methods from across the U.S. as well as from Europe and consider pilot studies to evaluate new methods. Dr. Benson also proposed that recovery and enrichment methods for SE be modified by eliminating the use of tetrathionate, incorporating antibiotic sensitivity testing and considering effects of vaccination on laboratory methods and results.

Sandra Kelly-Aehle, Megan Health, stated that the NPlP culture method for the isolation of SE is recognized as being excellent for environmental and animal organ samples. Discussion ensued that test sensitivity can be influenced deliberately by selecting more suspect colonies per plate or inadvertently, due to increased or decreased background contamination with other competing Salmonellae.

Dr. Richard Gast, USDA/ARS, Georgia, presented research done by Dr. Peter Holt, USDA/ARS, Georgia, involving strategies to reduce SE problems in layer flocks during molt. It is estimated that 70-80% of U.S. flocks are molted annually and that 1/3 of the profits from a flock come from eggs produced after a molt. Dr. Holt's research indicates that molted hens shed more SE and remained infected longer, were dramatically more susceptible to SE infection and as a result, transmitted SE more readily to uninfected hens. Initial studies compared SE isolation from fed hens, molted via total feed withdrawal for 14 days or hens molted by ad libitum feeding of wheat middlings, a by-product of wheat processing. Birds subjected to feed withdrawal shed 3-5 logs more SE that either unmolted (normal fed) or wheat middlings fed birds. Liver, spleen, ovary and cecum counts were significantly higher in fasted birds versus the birds fed wheat middlings in one trial and the liver, spleen and cecum in the second. No differences in SE levels were observed in unmolted birds fed normally versus wheat middling-fed birds. Studies conducted at the University of Illinois showed that egg production parameters compared very closely in hens molted via feed withdrawal versus hens molted via ad libitum wheat middlings. A second group of studies were conducted to investigate the protective capacity of immunizing hens with Megan Vac1, an avirulent S. typhimurium vaccine, against SE infection during molt. Vaccinated hens received an aerosol dose of 5ml of 2X10^7 vaccine strain/ml and were allowed to sit for 14 days. Controls were untreated. All hens were molted via feed withdrawal and at day 4 of feed withdrawal the center hen in each row of vaccinated or unvaccinated hens (3 rows of 11 birds/row per treatment group) received a challenge dose of 1X10^6 SE. All hens were tested for SE on days 3, 9, 17, and 24, post challenge. Because of the large challenge dose, transmission was tremendous in the unvaccinated hens with 26 of 30 (87%) hens being SE positive at day 3 post challenge compared with 3 of 30 (10%) in the vaccinated group. By day 9 post challenge, 26 of 30 unvaccinated contact hens were SE positive and 16 of the 26 hens were shedding 10^3 SE or greater compared with 7 of 30 SE positive in
the vaccinated group shedding SE at levels of 100 organisms or less. By
days 17 and 24 post challenge, 85% and 90% of the hens were SE positive
compared with 15% and 20% of the vaccinated hens, respectively. Livers,
spleens, ovaries and ceca were removed from one row of each treatment
group of hens (n=10) and cultured for SE. While all of the tissues were 100%
SE positive in the non-vaccinated hens, only 10% of ovaries, 0% of the livers/
spleens and 20% of the ceca were positive in the vaccinated hens. These
results indicate that a single aerosol vaccination with the live Megan Vac 1 S.
typhimurium vaccine could provide substantial protection against an SE in-
fec tion during the high-risk period of molting via feed withdrawal.

In addition it was noted that in Europe where molting is not practiced, the
incidence of SE remains higher than in the U.S. Dr. Kradel, Pennsylvania,
brie fly addressed what he sees as the consumer, public health and media
perceptions of risk versus the real risk associated with SE and eggs from
molting flocks and concluded that the risk is probably so small as to not have
any significant effect on public health. The reasons for this include the fact
that even though the risk of producing an SE positive egg may double in an
SE positive molted flock for a short period of time following molting as com-
pared with an SE positive non-molted flock, the risk is still extremely small.
That is, an SE positive molted flock might be expected to produce 1 contami-
nated egg in 5,000 and an SE positive non-molted flock might be expected to
produce 1 contaminated egg in 10,000. Egg mishandling during preparation
would also need to occur to cause human illness. A second reason is that
the NAHMS study found only 7.1% of flocks to be positive for SE, so that
92.9% of flocks are not producing SE positive eggs whether they come from
molting or non-molting birds. Finally, producers have a tendency not to molt
flocks that are SE positive prior to when a molting cycle is to be initiated.

Three reports follow from vaccine producers with licensed SE vaccines.

Sandra Kelly-Aehle, Megan Health, presented results of a vaccine trial
for laying hens using a modified live Salmonella typhimurium vaccine. In
both laboratory and field studies, pullets vaccinated at 2, 4, and 16 weeks of
age by coarse spray were protected through 56 weeks of age. Use of antibi-
otics in hatchery injections or feed supplements, such as chlortetracycline
and propionic acid respectively, did not interfere with colonization of the
vaccine organism nor did the vaccination causes any practical level of inter-
ference with normal NPIP-related monitoring for Pullorum Typhoid or paraty-
phoid. Additional studies have shown the vaccine can be used successfully
in conjunction with induced molting programs to extend protection into the
second laying cycle. A vaccine containing the same organism as Megan ®
Vac 1 in a configuration and titer appropriate for use in laying hens is in the
final stages of licensing.

Jerry Maiers, Fort Dodge Animal Health stated that there are currently 3
live SE vaccines and 3 SE bacterins licensed for use in the U.S. Only 15-
20% of U.S. producers are vaccinating layer hens partly because companies
SALMONELLA ENTERIDITIS IN EGGS

that sell liquid egg and pasteurize the product feel that vaccination is not necessary. Primary layer breeders are not vaccinating at this time, but aim for Salmonella-free status by exclusion, not wanting to risk cross-reaction or interference with serological monitoring tests. Although broilers are seldom vaccinated with commercial SE vaccines, some flocks are vaccinated with autogenous vaccines in order to attain slaughter plant Salmonella reduction targets set by FSIS. Vaccination should be viewed as part of a comprehensive strategy to truly reduce Salmonella numbers in a flock and the effects of vaccination are often difficult to assess.

Dr. Armando Mirande, Biomune, stated that use of SE bacterin in the western U.S. has increased during the past 3 years. Dr. Mirande indicated that Pennsylvania sends few eggs to breaker plants, thus encouraging producers to vaccinate for SE. Dr. Mirande considers PEQAP the model SE reduction program in the U.S., with the most comprehensive testing regime. Trends in Pennsylvania indicate a decrease in environmental and egg samples positive for SE. PEQAP data shows the following proportions of positive flocks (as determined by egg testing) and vaccinated with an SE bacterin: 1997 – 0 of 3; 1998 – 0 of 21; 1999 – 0 of 87; 2000 – 1 of 71. An overall reduction of SE was documented in hens, eggs and environmental samples. Data indicates that the cost of vaccination was estimated to be 0.0035 cents per dozen eggs.

General committee discussion on vaccination followed. A question was raised about the use of live SE vaccines in breeders. Sandra Kelly-Aehle stated that 2.5% of vaccinated breeders are expected to react to the NPIP Pullorum plate test if administration of the vaccine is not timed appropriately with stressors such as moving birds. Jerry Makers indicated that after birds were vaccinated, whole blood remained negative. Dr. Richard Dutton was asked to suggest the most important things a producer can do to minimize the risk for SE. The top 3 recommendations include

1. buying clean pullets,
2. prevention and control of rodents and other animal vectors,
3. vaccination for SE.

Dr. Dutton ranked, vaccination as being the most cost effective measure to minimize the risk for SE, followed by rodent prevention and control. He also stated that he was pleased to see the PEQAP commitment to follow through on research and maintain past efforts to control and prevent SE.

Dr. David Kradel, presented results of a study that assessed cleaning, disinfection and fumigation (formaldehyde versus chlorine dioxide) methods in two pullet houses. Twenty sites of 48” sq. per site were semi-quantitatively cultured for coliforms after dry cleaning, after washdown and disinfection and after fumigation. In comparing coliform isolation rates following dry cleaning with rates after washdown, disinfection and fumigation, fewer coliforms were found in 8 of 40 sites, more coliforms were found in 16 of 40 sites and no change occurred in 16 of 40 sites. The results of this study also demon-
strated that formaldehyde was more effective in reducing coliform numbers than chlorine dioxide.

Dr. Mike Opitz stated that to compare cleaning methods effectively, it is necessary to assess Salmonella numbers quantitatively. He is also concerned about the increasingly larger size of poultry complexes and the disease and environmental challenges this presents. Dr. Singh Dhillon, Washington State, stated that flies also need to be considered in the transmission cycle of SE, since he recently isolated *Clostridium perfringens* from the internal contents of flies that were disinfected with alcohol, externally. Discussion focused on the need to acknowledge the unknown effects of reducing other Salmonellae that compete with SE in the poultry environment. Dr. Charles Beard, U.S. Poultry and Egg Association, Georgia was asked for his thoughts regarding the current SE situation in the U.S. Dr. Beard pointed out that other SE sources such as fresh fruit, nuts and vegetables are an important cause of human illness due to SE and that although regulations governing SE in eggs are pending, human illness due to egg-related SE continues to decrease. SE likely decreased in Europe due to exclusion from primary breeding flocks and NPIP has contributed to the decrease in SE incidence in the U.S.
REPORT OF THE COMMITTEE ON SHEEP AND GOATS

Chairman: Mr. Paul E. Rodgers, Ronceverte, WV
Vice Chairman: Dr. Katherine N. Bretzlaff, College Station, TX

Dr. Ramesh Akkina, CO; Dr. Arthur A. Andersen, IA; Dr. Derek J. Belton; Dr. Marie S. Bulgin, ID; Dr. Wilber W. Clark, MT; Dr. John R. Clifford, DC; Dr. Thomas F. Conner, IN; Dr. Linda A. Detwiler, NJ; Dr. Nancy E. East, CA; Dr. Najam Q. Faizi, MD; Dr. Lisa A. Ferguson, MD; Dr. James E. Fox, GA; Dr. Anthony M. Gallina, PA; Dr. Michael J. Gilford, MD; Dr. Chester A. Gipson, VA; Dr. R. David Glauer, OH; Mr. Joe N. Huff, CO; Dr. Michael M. Jochim, CO; Dr. William T. Jolly, DC; Dr. Cleon V. Kimberling, CO; Dr. Donald P. Knowles, Jr., WA; Dr. Howard D. Lehmkuhl, IA; Dr. Mary Jane Lis, CT; Dr. Jim Logan, WY; Dr. Linda L. Logan, TX; Dr. Michael R. Marshall, UT; Prof. C. John Maré, OR; Dr. I. Lee McPhail, OH; Dr. Bert A. Mitchell, MD; Dr. Bennie I. Osburn, CA; Dr. Charles Palmer, CA; Dr. Michael Piontkowski, CO; Ms. June M. Reed, PA; Dr. Mark A. Remick, MI; 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. David Thain, NV; 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. Nora E. Wineland, CO; Dr. Cindy B. Wolf, MN; Dr. Andres de la Concha, TX.

The meeting was called to order by the Chairman, Mr. Paul Rodgers.

Several aspects of the Scrapie Eradication Program were covered. Dr. John Clifford, USDA/APHIS, gave an overview of the National Scrapie Eradication Program. The goal for Scrapie eradication is to find no new infections by the year 2010 and to have the United States be recognized as scrapie free internationally by the year 2017. As of October 22, 2001, there were 864 flocks participating in the Scrapie Flock Certification Program of which 59 flocks are certified. In 2001, there were 68 scrapie infected and source flocks and 52 newly infected flocks. The final rule for scrapie eradication was published August 21, 2001. The Uniform Methods and Rules (UM&R) is being completed. The rule covers indemnity, requirements for flock cleanup, requirements for pilot projects, test and laboratory approvals, identification requirements, movement restrictions, procedures for designation of flocks, administrative procedures for the Scrapie Flock Certification Program and Consistent State requirements. Based on recommendations made by the Test Validation Subcommittee of the USAHA Committee on Sheep and Goats, APHIS has adopted the 3rd eyelid test as an official test.

Dr. Diane Sutton, USDA/APHIS, presented identification requirements for the National Scrapie Eradication Program. Identification requirements go
into effect for most sheep and goats on November 19, 2001. All breeding sheep regardless of age, all sheep over 18 months of age, all exposed, suspect, and high-risk animals and breeding goats except for low risk commercial goats must be identified to move in interstate commerce. APHIS will provide tags free to producers, veterinarians, and markets. Producers may also purchase custom tags for official use through approved tag companies.

Dr. Mark Hall, National Veterinary Services Lab, reported on the technology transfer for the scrapie eyelid immunohistochemistry diagnostic method from ARS to the NVSL. He also presented data on comparisons between NVSL and the contract laboratories at Colorado State University and the University of Wyoming. The third eyelid test is currently the best live animal test for detection of scrapie prion protein in sheep. Overall the three labs mentioned above have a 78.8% agreement in testing 651 triplicate/replicate samples. The test does have technical limitations, being subject to the interpretation of the pathologist reading the sample and limited by the amount of lymphoid tissue (tissue follicles) in the sample. Adequate tissue samples are obtained in only about 50% of samples taken.

Dr. Nora Wineland, USDA/APHIS/CEAH, provided an update on the Scrapie Test Validation. This joint ARS/APHIS project is aimed at validating several live animal tests for scrapie. As of October 1, 2001, 133 flocks have been eyelid tested in which 92 lid-positive animals have been identified. Of these, 42 have been moved to quarantine facilities in Ames, Iowa. Of the 1852 animals sampled so far, 40-60% of them within a flock have yielded untestable samples. Several of these animals have been necropsied to try to better understand animal factors which might make an animal more likely to be untestable. There are no reportable results on the necropsies to date.

Dr. Jim Logan, Wyoming Livestock Board, reported on Scrapie Control Pilot Projects in Wyoming. The purposes of the Pilot Project Program and requirements to participate were reviewed. The Program provides active surveillance targeting flocks at highest risk for the disease. Interested producers are evaluated for participation and if selected for testing, blood from up to 100 sheep between the ages of 14 and 36 months (inclusive) will be obtained for genotyping. Up to 60 sheep having QQ alleles at codon 171 will subsequently have lymphoid tissue biopsied from the third eyelid. If eyelid testing reveals the presence of scrapie, the flock will enter the scrapie control program.

The disease control program provides scientifically sound disease control policy for flocks containing an animal that tests positive for scrapie and flocks determined to be infected, source, or trace flocks. The program calls for mandatory identification and removal of positive, suspect and genetically susceptible animals through purchase of these animals by USDA for diagnostic testing. Based on the owner's informed request, certain animals considered to be "high risk" exposure sheep may be exempted from removal based on factors such as genetic susceptibility, gender, and live animal test
results. These exempted animals and certain offspring will be placed under restrictions until they are properly removed or USDA policy is altered and restrictions lifted. An incentive for sheep producers that maintain and exclusively use only RR rams will be incorporated as part of the disease control strategy.

Dr. Cindy Wolf, University of Minnesota, NIAA, ASI, outlined educational and implementation strategies for scrapie eradication. Two producer brochures have been mailed, as well as a packet to selected veterinarians and Press Kits to media resources. These are the result of the National Scrapie Educational Initiative which has been funded by a grant from USDA to the National Institute of Animal Agriculture (NIAA). The Initiative has been a joint effort by industry, APHIS, NIAA staff, and journalists. Future plans include additional mailings, an Industry Stakeholder’s Summit, and development of an informational site at the NIAA website.

Dr. Nora Wineland provided an update on the Scrapie Slaughter Prevalence Study. The study is in a startup phase with a limited number of samples being collected from each of the top 25 mature sheep slaughter plants. Plans are underway to monitor the level of identification these sheep are carrying. Once levels are sufficient to allow regional prevalence assessment, the study will move into Phase II. Roughly 1000 samples will be collected each month for a full calendar year. Sampled sheep will be traced back to the state of origin in order to allow determination of both national and regional prevalence of scrapie in mature sheep. There will be no regulatory action taken as a result of this tracing in order to get an accurate prevalence.

Dr. Don Knowles USDA, ARS, gave a presentation on Genetics and Sheep Prion Protein. Sheep prion protein production is determined by a single polymorphic gene. The two alleles associated with most of the scrapie prion protein production are at codon 171 and 136. The so-called Strain C scrapie is most commonly identified in the United States and is associated with a QQ status at the 171 site. Data was presented to show that testing for scrapie in QQ animals was likely to be more productive than testing QR or RR animals.

Dr. Wenbin Tuo, also USDA, ARS, presented information on the location of prion protein in pregnant sheep. The caruncles and cotyledons and allantoic fluid of the placental unit and fetal kidney, bladder and brain have relatively large amounts of normal prion protein. Scrapie prion protein is also found in caruncles and cotyledons, possibly in allantoic fluid, but not in the fetus. Scrapie therefore is not likely transmitted to the fetus in utero but the fetus is exposed during or after the birth process. Ewes with fetuses of the QQ genotype were highly likely to have scrapie prion protein in the placentomes (caruncle & cotyledon). No ewes carrying QR or RR fetuses had scrapie prion protein in the placentomes. It was concluded that breeding ewes to RR rams would decrease the spread of the scrapie agent at the time of lambing.

Dr. Andres delaConcha, Texas A&M University, presented a scientific
paper on Q fever. Then a review of contagious ecthyma, a contagious disease caused by a parapox virus, was presented. Problems were outlined that have been seen in recent years in sheep and especially Boer goats that get a severe form of the disease, even in vaccinated animals. Characterization of number of different viral samples using the VIR (Virus Interferon Resistance) gene has established a phylogenetic tree for the virus. The virus appears to be more heterogeneous in goats that in sheep.

Dr. Nora Wineland returned to provide an update on the National Animal Health Monitoring System Sheep 2001 Study. The objective for the study were to estimate the national prevalence of Johne's, Ovine Progressive Pneumonia, and intestinal parasitism, and evaluate management factors which might influence these levels. The study was also designed to estimate the national distribution of prion protein gene codon 171. Nutritional practices were also a focus. Lastly the study was intended to create a national serum bank for use in evaluation emerging diseases. In early 2001, 3210 sheep producers responded to a questionnaire administered by the National Agriculture Statistics Service and 1103 of these operations completed additional interviews in the spring of 2001. Roughly 700 of these operations also participated in biologic sample collection (blood, feces, forage). The first full report from the study is expected in January 2002.

Dr. Linda Logan, Texas Animal Health Commission, presented the following recommendation: that the Committee on Sheep and Goats of the USAHA establish a Uniform Methods and Rules Subcommittee, the chair of which will be determined by the Chair of the Committee on Sheep and Goats. The Subcommittee would be charged with evaluating proposed changes to the Scrapie Eradication UMR as they come forward. Proposed changes would then be forwarded to the full Committee on Sheep and Goats for action. Proposed changes approved by the full Committee would then be recommended to the APHIS Scrapie Coordinator for incorporation into the UMR. The recommendation was voted on and approved.

Dr. Marie Bulgin, University of Idaho, presented the following recommendation that the Test Validation Subcommittee of the Committee on Sheep and Goats discuss and consider recommending that ARS/APHIS sample mandibular lymph nodes in their scrapie surveillance projects (both in slaughter and positive flock examinations) and compare the results of diagnosing the presence of scrapie from these lymph nodes with results from other lymphoid tissues. The purpose would be to provide an alternative live-animal test. The recommendation was voted on and approved.
Q FEVER: AN OVERVIEW

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Introduction

Q (Query) fever is a disease caused by the rickettsial organism Coxiella burnetii that affects mostly humans, cattle, sheep, and goats (54,74). The infection has also been reported in dogs, cats, rabbits, a variety of wild and domestic mammals and birds, and the organism has been isolated from ticks (13,15,27,54,77,106,113).

In humans, the main characteristic of the disease is its clinical polymorphism (95). During the acute phase, the infection may result in fever, pneumonia, hepatitis and meningoencephalitis (21,26,97). In chronic cases, endocarditis is the main manifestation, but osteomyelitis, vasculitis and infection during pregnancy have also been reported (23,37,105).

In livestock species, C. burnetii infection is most often subclinical. However, abortion and infertility are common manifestations in flocks that are naive to the organism. Sheep, goats and cattle are considered the main reservoirs for C. burnetii, and in these species the organism is often shed in milk, urine, feces and birth products of infected animals (7,8).

C. burnetii is resistant to adverse environmental conditions, and infectious particles containing viable organisms can be transported long distances by the wind (111). As a result of these characteristics and the high virulence of the organisms, C. burnetii is part of the “High Priority” list of organisms that could be used in bioterrorism (40,62).

With the exception of New Zealand, prevalence is worldwide, and the presence of serum antibodies against C. burnetii has been reported in farm animals from several geographical areas of the United States (9,27,90). Veterinary practitioners are often confronted with questions by their clientele about the optimal methods to diagnose, prevent or treat this disease in livestock. A large number of recent Q fever publications deal with clinical cases of human infection, but relatively less information is available on the critical questions of this disease in ruminants. The objective of this paper is to provide a review of the existing literature on Q fever with special emphasis on the epidemiology, diagnosis and prevention of this disease in animal species that are important in production animal agriculture.
Etiology

*C. burnetii* is an obligate intracellular, small gram-negative, highly pleomorphic coccobacillus (0.2 to 0.4 μm wide, 0.4 to 1.0 μm long) that replicates within the phagolysosome of its eukaryotic host. Although possessing a prototypic gram-negative bacterial cell wall structure when observed by electron microscopy, the agent is usually not stainable by the Gram stain technique. The Gimenez method is often used to stain *C. burnetii* agents in clinical specimens or laboratory cultures (45). Based on the unculturability of the agent on artificial media and the fact that the coccobacillus is carried by ticks, *C. burnetii* has been classified in the *Rickettsiales* order, the *Rickettsiaceae* family, and the *Rickettsiae* tribe together with the genera *Rickettsia* and *Rochalimaea* (119). *Rochalimaea* have now been reclassified as the genera *Bartonella* and the family *Bartonellaceae* and belong to the alpha-2 subgroup of *Proteobacteria*, while bacteria of the *Rickettsia* genus belong to the alpha-1 subgroup of *Proteobacteria*. Recent phylogenetic analyses, using 16S rRNA sequences, have indicated that *C. burnetii* belongs to the gamma subdivision of *Proteobacteria* with the genera *Legionella*, *Francisella*, and *Rickettsiella* as its closest relatives (107,118).

Isolates of *C. burnetii* have been divided into six genomic groups (I to VI) based on restriction fragment length polymorphism (RFLP) analysis (52). The genome size of *C. burnetii* strains range from 1,500 to 2,400 kilobases (kb) (121). In addition, the *C. burnetii* genome comprises facultatively a 36 to 42 kb plasmid that is generally maintained at 1 to 3 copies per cell. There are 4 described plasmid types (QpHI, QpRS, QpDG, QpDV) that have been associated with specific genomic groups: QpHI with genomic groups I, II, III; QpRS with genomic group IV; QpDG with genomic group VI (65). The function of the plasmid remains undetermined; however, it has been hypothesized that it may play a critical role in some aspect of *Coxiella* biology and/or virulence. Plasmidless *C. burnetii* isolates have also been found with approximately 18 kb of plasmid sequences integrated into the chromosome (96).

*C. burnetii* shows antigenic lipopolysaccharide phase (LPS) variation that is similar to that seen in the family *Enterobacteriaceae*. Phase I, corresponding to smooth LPS, is the natural phase found in infected animals, arthropods, and humans and is highly infectious. Phase II, corresponding to rough LPS, is obtained only after serial passages in cell cultures or embryo-nated egg cultures and is not as infectious. Additionally, phase II displays a truncated LPS and lacks some protein cell surface determinants when compared to phase I (1). Despite their differences, phases I and II are indistinguishable with electron microscopy techniques, and both have similar intracellular growth characteristics. Phase I *C. burnetii* is poorly internalized by monocytes and macrophages whereas phase II *C. burnetii* is readily internalized by monocytes and macrophages (78).

After passive entry into the host cell, *C. burnetii* is internalized in
phagolysosomes. *C. burnetii* is an acidophilic bacterium that has an absolute requirement for the moderately acidic pH found in the phagolysosome to activate metabolism (47). *C. burnetii* undergoes slow growth (8-12 hour doubling time) within the phagolysosome, despite the presence of bactericidal toxic factors (acid hydrolases and defensins). Additionally, the *C. burnetii*-containing phagolysosome may be somewhat atypical as ingestion of *C. burnetii* by macrophage-like cell lines results in a greatly diminished respiratory burst with little production of superoxide anion (3). *C. burnetii* displays a complex intracellular cycle, leading to the formation of spore-like forms (75). The terms “small-cell variant” (SCV) and “large-cell variant” (LCV) are used to differentiate the two *C. burnetii* cell forms noted in persistently infected cells (76). Both SCVs and LCVs have a typical eubacterial gram-negative cell wall with two layers separated by a periplasmic space. In SCVs, the periplasmic space is densely filled with proteins and peptidoglycan, which may enhance the resistance of this variant to environmental conditions. SCVs are metabolically inactive, resistant to osmotic pressure and correspond to the extracellular form of the *C. burnetii*. LCVs are the metabolically active intracellular form of *C. burnetii*. Both activated SCVs and LCVs divide by binary fission. A sporogenic differentiation has been identified in LCVs and leads to the formation of resistant spore-like forms of *C. burnetii* (75,76). The endogenous spore-like forms undergo development to the metabolically inactive SCVs, which are released from the infected host cell by cell lysis or exocytosis.

**Epidemiology and Transmission**

Q fever has worldwide distribution with the exception of New Zealand (53,86). In the United States of America, there is relatively little information on the prevalence of the infection in food animals. In a serological survey of ewes in an endemic Q fever area in California, the prevalence of serum antibodies was found to be cyclic, with the highest peak (55%) in March (8 to 12 weeks following the December -February lambing period) and the lowest (18%) in late September (33). In this study, 7 to 18% of the lambs were seropositive at birth, and the prevalence of serum antibodies increased through the summer, reaching 30%. In a survey of wild mammals in Northern California, 78% of coyotes, 55% of foxes, 53% of brush rabbits and 22% deer had serum antibodies to *C. burnetii* (32). Results from a study conducted at 20 California dairies (from 17 counties) showed that 82% of 1,052 cows tested had serum antibody to *C. burnetii* (9). In the same locations, 34% of the calves and heifers were seropositive. In the heifers, seroprevalence increased with age and was higher in the latter half of pregnancy. Calves and heifers kept on open range or pasture had the lowest prevalence.

Because of its varied clinical presentation in humans and its often subclinical nature in domestic animals, the incidence of Q fever is probably underestimated. Further, the variation in cases reported from one area to another is likely due to the availability of reliable testing and physicians with
an interest in the agent (38). Although Q fever is common in urban and rural areas, and it is present in virtually all “animal kingdoms,” the infection in humans is considered mainly an occupational hazard among livestock workers, veterinarians and personnel of research animal facilities (22,56,79,114).

The mode of transmission is primarily by airborne dissemination of the organism from contaminated droplets or dusts emanating from placental tissue, birth fluids and excreta of infected animals. Infectious particles containing viable organisms can be transported long distances by the wind (111). In an epidemiological study to determine the influence of wind currents on the incidence of Q fever in a community located in the path of strong wind currents coming from a nearby densely sheep-populated area an incidence rate of 35.4 per 100,000 was found in the human population (111). In this study, a relationship between sheep density, incidence of the disease, and strong local winds was established.

Direct contact with infected animals or other contaminated materials and ingestion of raw milk from infected animals also represent potential routes of transmission. In addition, the infection can be transmitted by ixodid and argasid ticks. Less common modes of transmission include blood transfusion, percutaneous entry via accidental stick, and rarely person to person transmission (67). There is also a report of sexual transmission of the agent from a man to his wife (80). Viable C. burnetii has been detected in the semen of seropositive bulls, suggesting that venereal transmission can occur in cattle (60). The infective dose of C. burnetii is 1 to 10 particles, and the exceptionally hardy nature of the organism is unaffected by extreme environmental conditions. It is maintained in nature by two cycles with the basic cycle being in wildlife, with ticks as natural primary reservoirs responsible for transmission within wild animals and to domestic animals.

Domestic animals particularly cattle, sheep, and goats are the main reservoirs responsible for transmission of the agent to humans (86). Dogs and cats have been responsible for infections in humans as well (67). Close contact with sheep has been found to be a risk factor for dogs. The seroprevalence of Q fever among 77 dogs who had contact with sheep compared with 352 dogs who had no contact, was significantly higher in the former. Therefore, dogs in close contact with sheep could be a potential source of infection for humans (13). Serologic evidence of coxiellosis has been shown for coyotes, raccoons, opossums, badgers, jackrabbits, feral hogs, black bears and musk ox, but it is not known if these species play an important role in maintaining the cycle of infection between domestic animals and humans (27,90,101).

In ruminants the organism is often shed in milk, urine, feces and birth products of infected animals (7,8). In one report, C. burnetii DNA was detected by PCR in vaginal swabs of 44% of ewes (15 animals) that had normal deliveries, but that were part of a flock in which Q fever abortions had occurred (8). Seven of these ewes were seronegative. Five weeks after lambing,
only 2 ewes continued to shed the organism in vaginal secretions. Among the seropositive and PCR positive ewes, 25% shed C. burnetii in milk and 18% in feces. Chronically infected cows may continue to shed large numbers of C. burnetii in their milk during successive lactating periods throughout their lifetime (9). C. burnetii has been detected in dust samples collected from a barn housing dairy cattle (125).

**Pathogenesis**

After infection by the respiratory route, both macrophages and polymorphonuclear leukocytes are capable of internalizing C. burnetii in phagosomes which fuse with lysosomes to form phagolysosomes (86). C. burnetii has adapted to survive in the acid pH of the phagolysosome. Furthermore, C. burnetii has been shown to delay phagolysosomal fusion as part of the infection process (55). The organism spreads hematogenously in infected phagocytes to the lung, heart, liver, kidneys, and other organs. In these tissues, the host reacts by mounting an inflammatory response that eventually leads to a protective immune response in most cases. In some affected individuals, the immune response cannot eliminate the organism, leading to latency, and eventually reactivation that leads to chronic disease (48).

Immune responses play an essential role in C. burnetii infections and involve non-specific innate and specific humoral and cellular responses. Most studies that characterize the host immune response to C. burnetii have been done in humans after natural infection or vaccination, or in laboratory animals after experimental infection. In spite of the fact that domestic animals play an important role in the epidemiology of Q fever, most of the research dealing with the immune responses to the Q fever organism in these species has been done with the objective to detect serum antibodies for diagnostic purposes or to determine the prevalence of the disease. Much less is known about the critical epitopes of the organism or the branches of the immune response that are important in the control of the organism by the ruminant host. For this reason, in this review we will rely mostly on the work done in humans and laboratory animals, and when available we will include information in domestic animals.

A characteristic of C. burnetii is its phase variation due to a partial loss of polysaccharide that results in antigenic drift (41). During the acute phase of the infection, predominantly IgM antibodies against phase II antigens can be detected by enzyme-linked immunosorbent assay (ELISA) in 80% of infected subjects at the time of onset of symptoms (31). In the majority of individuals, these antibodies are still present by 32 weeks following the onset of symptoms. As with most antibody responses, the predominant antibody class switches from IgM to IgG over time. IgG, IgA and to a lesser extent IgM antibodies against phase I antigens appear later but may persist for several years, and possibly for life (28,89). Serum antibodies against C. burnetii have been shown to persist for at least five months in cows (126).
The role of IgG subclasses in Q fever has also been studied. The total lgG1 and lgG3 levels in serum have been found to be elevated in patients with chronic Q fever compared to patients with acute disease or non-infected negative controls. A decline in lgG2 levels was also observed in the former (18). This IgG subclass distribution is more typical of viral and autoimmune diseases than of bacterial infections. Furthermore, total lgA2 levels also have been found to be increased in patients with chronic infection (16). In this study, Q fever-specific lgA1 antibodies were detected in both acute and chronic infections, but only individuals with endocarditis had lgA2 antibodies to C. burnetii phase II antigens. By contrast, the antibody response found in Q fever-vaccinated patients was mainly restricted to the lgG1, lgG2 and lgA1 subclasses (17).

Using Western immunoblotting, several C. burnetii immunoreactive proteins have been described (12,51). In one study, antibodies to phase I proteins were more common than those to phase II proteins (12). Several antigenic protein bands were recognized only by serum from chronic Q fever patients. Furthermore, serum samples from individuals who had no antibodies to C. burnetii by either indirect antibody test or by ELISA, when analyzed at lower dilutions (up to 1:16) showed that the IgG fraction of serum reacted with as many as 10 proteins in phase I and phase II antigens.

Cellular immunity against phase I and II C. burnetii antigens has been evaluated. Using the lymphocyte blast transformation test, 100% of nine human patients were positive against phase I antigen and 44.4% against phase II antigen. Of twenty-two people that had been previously vaccinated against Q fever, 73% were positive against phase I, but none reacted against phase II (42). Studies on peripheral blood lymphocytes from patients with acute C. burnetii infection have shown that the proportion of 9T T cells are elevated in these patients, thus suggesting that this T cell subset is predominantly involved in the acute immune response to C. burnetii (99).

Cytokines are thought to play a fundamental role on C. burnetii replication and on progression of disease. Proinflammatory cytokines such as tumor necrosis(TNF)-a are produced in excess by monocytes of human patients with ongoing Q fever endocarditis (20). Similarly, marked elevation of TNF and IL-6, but not IL-1E, have been found in the plasma of humans with acute Q fever or Q fever endocarditis (19,43). Bacterial adherence to the cell membrane alpha(v)beta(3) integrin, but not phagocytosis, is necessary for TNF production by monocytes (24). The TNF receptor type II (TNF-RII), also referred as TNF-R75, and the IL-1 receptor antagonist (IL-1Ra) were also increased during the acute phase of the disease. It is believed that the elevation of these soluble receptors may contribute to an initial decline in resistance to C. burnetii infection by blocking the pro-inflammatory effects of TNF and IL-1 (19).

An increased production of interleukin-10 and inadequate killing of C. burnetii by monocytes has been observed in the chronic phase of Q fever in
humans with endocarditis (44). The effect of IL-10 is thought to be specific because the addition of anti-IL-10 neutralizing antibodies neutralized its effect, and the addition of transforming growth factor beta-1 did not have any effect on bacterial replication. *C. burnetii* replication involves the down-modulation of tumor necrosis factor (TNF) release. It is thought that IL-10 favors *C. burnetii* replication through the inhibition of tumor necrosis factor (TNF)-mediated cell killing.

The contribution of leukocyte activation markers in Q fever has also been emphasized. The expression of soluble CD23 by B cells in response to IL-4 stimulation has been associated with Q fever endocarditis. Because CD23 may play a role in inflammation by triggering cytokine release by monocytes, it is thought that its production helps perpetuate chronic inflammation in Q fever patients with endocarditis (19).

**Clinical Signs**

Infection of livestock species with *C. burnetii* is usually asymptomatic, but infertility, abortion, and the birth of full-term dead or weak, lower weight offspring have been associated with chronic Q fever in sheep, goats, and cattle (7,54,70,81,88,112). Abortions typically occur over a 2- to 4-week period and may affect 5 to 50% of the flock. In a study to determine the causes of caprine abortion in California, *C. burnetii* was thought to be the cause in 9% (19 cases) of the abortions (81). Most of the abortions occurred in the last trimester of pregnancy or near term. Clinical signs of acute infection, including fever, loss of appetite, mild cough, rhinitis and rapid respiration rate, have been reported in sheep experimentally inoculated with *C. burnetii*, but these signs are non-specific, and they have not been described in natural infections (6,70). Goats naturally infected with *C. burnetii* may abort without apparent clinical signs, but anorexia and depression for 1 to 2 days before abortions have been observed. In some affected does there is placental retention for 2 to 5 days, and agalactia may occur within 1 week of abortion (117). In cattle, *C. burnetii* has been implicated as the cause of fertility problems, including abortions and increased frequency of return to service (108,112). A latent stage persists after the acute infection subsides.

Both dogs and cats may have weak or stillborn offspring as a result of *C. burnetii* infection (15,69). Cats experimentally infected with *C. burnetii* become lethargic and febrile (71). In laboratory animals, intraperitoneal infection of female BALB/c mice with *C. burnetii* resulted in persistent infection associated with abortion and perinatal death, with a statistically significant decrease in viable offspring. In these mice, the abortifacient potential of *C. burnetii* and the increased risk of persistent infection was thought to be related to a decline in cellular immunity during pregnancy (104). In another study, young laying hens infected with *C. burnetii* showed no clinical signs, and transmission of the organism to eggs could not be detected (102).

Humans with *C. burnetii* infections are asymptomatic in as many as
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60% of cases. In symptomatic cases, approximately 38% of patients experience mild disease, and only 2% require hospitalization. The infection may manifest itself as an acute form, which is usually a self limiting febrile illness of abrupt onset, and/or a chronic form with endocarditis and a frequent association with chronic hepatitis (74). In humans, the incubation period varies from two to three weeks and is contingent on the size of the infective dose (66). The clinical manifestations vary depending on the route of infection. Ingestion often results in the hepatic form, whereas inhalation is more likely to present with atypical pneumonia (92).

Depending on the clinical course, Q fever in humans may be acute or chronic. In the acute form a variety of signs including prolonged fever, fatigue, chills, and a severe frontal throbbing headache can be observed. Pneumonia may be present in some cases with clinical signs of dry, nonproductive cough and negative sputum cultures. Hepatitis may be a feature of both acute and chronic Q fever, and if present in acute cases, it is primarily associated with pneumonia and mild elevation of liver enzymes (68). A rare but potentially fatal feature of acute Q fever is myocarditis (38). Pericarditis associated with chest pain has been reported infrequently but is potentially underdiagnosed as chest pain is not an infrequent complaint of patients with Q fever (74).

Q fever is considered a significant cause of morbidity and mortality during pregnancy in humans. The disease may present as an acute or chronic infection and can be reactivated during subsequent pregnancies (105). C. burnetii infection in pregnant women has been reported in numerous countries, and of a total of twenty seven cases described (74), nine women had premature infants, of which eight were natural deliveries and one was a cesarean delivery due to maternal illness. There were spontaneous abortions in six cases, in utero deaths in two cases and one pregnancy termination due to rubella. Only five of the women had healthy term infants. The primary lesion of Q fever during pregnancy is placentitis.

Chronic Q fever is predominantly associated with endocarditis which can be fatal if untreated (49). Appropriate antibiotic therapy reduces mortality to less than 10%, but relapse rates are high with cessation of therapy. Of patients suffering from Q fever endocarditis, over 90% have a history of previous cardiac valve defects, most often involving the aortic and mitral valves. Immunosuppression is another risk factor for the development of chronic Q fever (91). A very small number of patients may develop encephalitis, meningoencephalitis, and encephalomyelitis with a potential residual disturbance of vision following meningitis (34,49). Yet another uncommon manifestation of chronic Q fever is infection of osteoarticular tissues, including osteomyelitis, osteoarthritis and spinal osteomyelitis. A chronic fatigue syndrome has also been reported in patients with chronic Q fever and may persist for many years (74).
Pathology

Placentitis is a common feature in cases of *C. burnetii*-associated abortion in cattle, sheep and goats (11,81,88). Often, the placenta is leathery and thickened with large amounts of exudate mainly in the intercotyledonary areas and at the edge of the cotyledons. The exudate may be white-yellow and creamy but sometimes is red-brown and fluid. Microscopic examination of affected placentas reveals severe infiltration of the chorionic stroma by inflammatory cells including mononuclear cells and neutrophils with necrosis of chorionic trophoblast cells, mineralization and focal exudation of fibrin (11). Severe vasculitis, as seen in chlamydial abortion, is not common, although some degree of vascular inflammation and occasional thrombi may be observed in severely affected placentas (82,115). Placental trophoblast cells along the cotyledonary villi and intercotyledonary chorion may be distended with small, basophilic, intracytoplasmic organisms (82). The organism can be identified in areas of placental inflammation or in smears of exudate as pleomorphic, acid-fast, 0.2 by 0.5 μm coccoid or 0.2 by 2 μm filamentous organisms in trophoblast cells or extracellularly using modified Ziehl-Neelsen or Gimenez stain. Confirmation of the etiology can be done by immunohistochemical demonstration of *C. burnetii* in cytoplasmic vacuoles of trophoblast cells (115). The presence of organisms in otherwise normal placentas has been reported in a seal infected with *C. burnetii* (61) and has been observed in experimentally inoculated sheep (unpublished observation). Lesions in aborted fetuses are non-specific in most cases. Occasionally, focal accumulations of lymphocytes are found near bronchioles, and groups of lymphocytes and macrophages can be seen in the portal spaces of the liver and in the renal medulla (81,88). Fetal pneumonia has been reported in cases of *C. burnetii* abortion in goats and cattle, and probably also occurs in sheep (11,81,82).

Diagnosis

*C. burnetii* is a biohazard level 3 zoonotic agent and should be handled as such in the laboratory, as well as when collecting samples from infected animals. Placenta, placental fluids and fetuses from infected dams contain large numbers of the organism, and these samples pose the main risk of exposure. However, *C. burnetii* is present also in vaginal secretions, milk, urine and feces (7,29). In humans, goats and sheep, *C. burnetii* DNA has been detected in serum samples; thus, plasma and serum from infected animals also need to be handled with care (84,129).

Several methods have been explored for the diagnosis of *C. burnetii* infection, including: culture, indirect immunofluorescence (IFA), ELISA, complement fixation, microagglutination, indirect hemagglutination, radioimmunoassay, immunoperoxidase assay, dot immunoblotting, Western immunoblotting, and polymerase chain reaction (PCR) (39). *C. burnetii* does not grow on artificial media; therefore, its isolation requires the inoculation of
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cells, embryonated chicken eggs, guinea pigs or mice (100,103,112).

Serological diagnostic methods are more commonly used, but lack of standardization of these techniques, particularly with ELISA, may result in confounding results. In addition, cross-reactivity among some strains of *C. burnetii* and *Chlamydiae* with immune rabbit and mouse sera in ELISA and immunoblot analysis has been observed (64). Furthermore, *C. burnetii* and *Chlamydia psittaci* mixed infections have been shown to occur in cases of abortion in goats (100). Therefore, identification of *C. burnetii*-infected animals may require the use of additional confirmatory tests, such as PCR.

ELISA, IFA, and complement fixation tests are currently commercially available. IFA is currently used as the reference method for serodiagnosis of Q fever, detecting phase I and II antibodies in the IgG, IgM, and IgA fractions, but in humans, the presence of rheumatoid factor in the sample may confound results (39). A commercial ELISA is available with high sensitivity and moderate specificity, which can be increased by confirmation with IFA testing for *C. burnetii* IgM (35). Detection of specific IgA in addition to IgM using ELISA can improve specificity in the diagnosis of acute Q Fever (25). Complement fixation can be used to detect both phase I and II antibodies and is considered very specific, though less so than IFA, but not very sensitive and requires both acute and convalescent serum samples (39).

PCR is becoming a more popular method for the definitive diagnosis of *C. burnetii*. Specific fragments of *C. burnetii* DNA can be amplified from fresh or frozen samples, including serum, buffy coats, milk, cerebral spinal fluid, bone marrow, placenta, liver, cardiac valve, fetal tissue, vaginal swabs, feces, and other biological specimens. Paraffin-embedded tissues can also be used (127). Many methods have been utilized for DNA extraction [silica matrix (63), phenol, commercial extraction kits] and amplification [single touch-down PCR (7), nested PCR (57,128,129), and simplex and multiplex PCR (29)]. The PCR product can be evaluated using traditional gel electrophoresis, colorimetric microtiter plate hybridization assay (CMHA) (371), real-time PCR, or restriction fragment length polymorphism (RFLP) analysis (85).

**Treatment**

A limited amount of information is available about the treatment of *C. burnetii* infection in domestic animals. In clinical veterinary practice, treatment of pregnant infected ruminants with tetracyclines is often recommended to reduce the likelihood of abortion (117). However, these treatment regimes are mostly based on information extrapolated from data obtained in laboratory animals and humans. This empirical approach introduces the danger of antibiotic resistance and may result in animals that do not abort but continue to shed the organism. In one study, oral treatment of two chronically *C. burnetii*-infected pregnant dairy cows with 8 mg/kg body weight of chlortetracycline daily for 30 days during their dry period resulted in the lack of recovery of the organism from placental tissue, colostrum or calf tissues at the
time of parturition (4). With the exception of one sample of mammary fluid collected at 28 days, rickettsias were not recovered from the mammary fluids after the second week of treatment. These results suggest that in some cases chlortetracycline may suppress rather than eradicate the Q fever agent.

In man, treatment for the disease can be divided into two general categories: 1) treatment for the acute disease, and 2) treatment for chronic disease. Treatment regimens for both acute and chronic cases include antibiotic therapy. Effectiveness of antibiotic therapy appears to be related to a number of factors:

1. The cellular phase of the rickettsia.
2. An antibiotic’s bacteriostatic or bactericidal capacity. Antibiotics with a bacteriostatic activity are generally used to shorten the duration of the acute infection in man (74,94). Bactericidal antibiotics are believed to be more effective for treatment of chronic infections (94).
3. The ability of the antibiotic to penetrate the bacteria’s environment (73,78).
4. The pH of the phagolysosome environment where the bacteria resides. While the organism thrives and replicates in the acidic environment of the phagolysosome, most antibiotics require a more alkaline environment to be effective (72,78).
5. Antibiotic susceptibility and resistance. In vitro susceptibility of Coxiella to antibiotics varies among different C. burnetii strains and thus is assumed to vary in vivo as well. Most of the antibiotic regimens described have been bacteriostatic in activity. Antibiotic treatment regimens reported in the literature include tetracycline and its analogues (tetracycline, doxycycline, oxytetracycline), macrolides (lincomycin, erythromycin, telithromycin, clarithromycin, roxithromycin), co-trimoxazole, rifampin, chloramphenicol and the fluoroquinones (ofloxacin, ciprofloxacin, pefloxacin, moxifloxacin, trovafloxacin) (93). Resistance has been noted with tetracyclines, fluoroquinones and Beta lactamase antibiotics.
6. The length of therapy administration. Antibiotic treatment of chronic Q fever has been less rewarding, as there is a 50% relapse occurrence following antibiotic treatment. Antibiotic treatment regimens in humans with chronic Q fever usually entail prolonged treatment schedules - up to and beyond three years (74,87).
7. The efficiency in which the disease is recognized and therapy instituted. Antibiotic treatment of acute Q fever is often successful using a wide range of antibiotics when the disease is recognized and therapy is instituted within the first three days of onset. However, due to the nonspecific clinical signs associated with acute Coxiella infection, recognition and timely treatment is difficult (74). On the other hand, the chronic disease requires extended periods of
appropriate antibiotic treatment, and a high reoccurrence rate occurs once the treatment is discontinued (48). The disease in food animals, while generally considered subacute, displays some characteristics of chronic illness, specifically continued shedding of the organism in body fluids during parturition and stressful events after the initial infection.

These chronic characteristics would indicate that extended periods of antibiotic treatment may be required for food animals. Some of the more effective antibiotics for *C. burnetii* infection in humans, such as the fluoroquinones, cannot be used in food animal species, yet *Coxiella* has shown that it is capable of developing resistance to many of the antibiotics that can be used (83). Based on the lack of information available about the disease in animals, recommendations for the use of antibiotics in food animals would be misguided at this time.

**Prevention and Control**

The economic impact of abortion and infertility in food animal populations (cattle, sheep and goats) that can be caused by *C. burnetii* in combination with the zoonotic propensity of the disease, warrants that consideration be given to vaccination of both man and animals, especially in high risk areas. The earliest Q fever vaccines were originally developed and evaluated to control *C. burnetii* infection in susceptible animal populations and have varied in composition and response. The first vaccine available was a formalin inactivated whole cell (WC) vaccine that was not well tolerated by the animals. It resulted in severe localized reactions but provided acceptable efficacy. More purified vaccines have been developed for use in both man and animals. Chloroform-methanol residue (CMR) vaccines were developed and believed to be better tolerated by animals and equal in efficacy to the WC vaccines (14,30,116,116). In Australia, a highly purified phase I *Coxiella* whole cell (WCI) vaccine has been approved for use, and in Europe a combination vaccine (*Chlamydia psittaci* + phase II *C. burnetii*) has been used. Phase I vaccines have been found to be more effective than phase II vaccines (87).

Selected vaccines have exhibited cross-protection among various *C. burnetii* strains when tested in laboratory animal species, yet when tested in cattle and sheep they have shown varied protective effects against experimental and natural *Coxiella* infection. While Q fever vaccines have effectively helped protect animals against abortion (5), low fetal weight (14), and chronic infertility (98), they have not been able to eliminate rickettsia shedding in vaccinated animals, and thus the threat of human exposure remains (14,36,98). At least one study demonstrated that vaccination of dairy cattle with a phase I formalin-inactivated Q fever vaccine significantly reduced the shedding of the Q fever organism in milk (10). In this field trial, milk samples from 163 vaccinated animals were tested by mouse inoculation after the cows started
lactation. Only 1% of the cows (2 animals) from 1 herd tested as suspects initially but subsequently tested negative. By contrast, 24% of 164 non-vaccinated controls (39 cows) shed *C. burnetii* in milk.

Animal vaccines are inactivated strains of *C. burnetii* prepared from infected yolk sacs from inoculated specific pathogen free (SPF) embryonated hen’s eggs. They may be in the form of an aqueous suspension or may contain an adjuvant (aluminum hydroxide or mineral oil emulsion). Vaccines of mineral oil emulsions are the most active (123).

Vaccine strain isolates must be examined and selected carefully due to the high antigenic variation among *C. burnetii* strains. Ideally, vaccines should be prepared from local strains of *C. burnetii*. Serological surveys have shown that sheep and goats react best to the Henzerling strain, while bovine sera react best to the Nine Mile strain. If a local strain is not available, then vaccines should be prepared from both strains. Annual re-vaccination of animals is recommended. The vaccine can be combined with other antigens (*Chlamydia*) to provide a polyvalent vaccine for use in sheep, goats and cattle. Localized adverse reactions may still occur, especially in heavily infected herds or in endemic areas. Vaccine efficacy is verified by testing for complement fixation antibodies in vaccinated rabbits. The presence of complement-fixing antibodies in vaccinated ruminants is erratic.

Vaccination of animals against Q fever has been recommended by the World Organization for Animal Health (124). However, although Q fever vaccines are available in many countries, currently there are no vaccines licensed in the United States for humans or animals.

Prophylactic vaccination of humans against Q fever has been more extensively explored. As with livestock, early vaccines routinely caused severe local reactions, especially in individuals who had seroconverted or had been exposed to *Coxiella* prior to immunization. With the improvement of vaccine quality and composition, and with the development of skin and lymphocyte proliferation tests that appear to be predictive of adverse post-vaccination effects (2,58,120), local reactions have been minimized to erythema, and/or tenderness at the site of injection, or mild flu-like symptoms.

Generally speaking Q fever vaccines used in humans are highly purified inactivated phase I *C. burnetii* whole cell vaccines that contain LPS-protein complex antigens (59,123). They are monovalent, and therefore may not be protective in all geographic regions due to the genetic and antigenic heterogeneity among *C. burnetii* strains (46,50,52,110,122). Further studies on vaccine efficacy and safety are still needed.

Currently, a single dose vaccination is recommended for high risk human populations (74,109). Vaccination of immuno-suppressed humans or people previously sensitized to *Coxiella* is contraindicated, so diligent preliminary screening of individuals prior to immunization is required. Ideally, both cellular and humoral immune responses to *C. burnetii* should be assessed.

Because in the United States Q fever vaccines for food animals are not
Q FEVER: AN OVERVIEW

available, emphasis must be placed on avoiding the spread of the organism from infected to non-infected animals. Animals known to be infected must be segregated. Placentas and aborted fetuses must be removed quickly and disposed of properly to avoid being ingested by dogs, cats or wildlife. Pens and other hard surfaces should be disinfected with 10% bleach.

Conclusions
Q fever, caused by C. burnetii, is an important disease of ruminants, other domestic and wild animals and humans. The economic losses due to C. burnetii infection in farm animals may be associated with abortions and the birth of dead or weak offspring. Additional monetary losses may result from trade barriers imposed by countries, states or farms on infected flocks. Because of the zoonotic nature of the infection and the exceptionally hardy nature of the organism, C. burnetii has been placed in the list of potential organisms likely to be used in bioterrorism and biological warfare. Surprisingly, in the USA relatively little attention has been paid to Q fever in livestock species. Because sheep, goats and cattle play an important role as reservoirs of the organism and are often the source of infection to humans, there is an inherent need to support and develop Q fever research, particularly in the areas of shedding and transmission, diagnosis, treatment and control of C. burnetii.

Acknowledgments
The authors express appreciation to Mrs. Phyllis Benge for editing the manuscript.

References


The committee met on November 5th and 6th, with 92 attendees and the following reports were presented:

1. Update on FSIS
   The following report on

   HACCP Based Inspection Models Project
   presented by Dr. William James,
   USDA, OPHS, FSIS

Introduction
FSIS is completing the models phase of the HACCP-based inspection
models project. Under the models phase, participating plants assume their new responsibilities, and FSIS begins new inspection procedures. Organoleptic and microbial data are collected to determine the achievements of the new system.

Under the project, volunteer plants are extending their HACCP and other process control systems to cover certain activities conducted before and after slaughter that are not currently covered under HACCP. Plants are responsible for preventing meat and poultry that are unsafe or unwholesome from entering the food supply. They will carry out these activities while FSIS conducts carcass, verification, and system inspection and are required to meet FSIS performance standards. FSIS will be able to carry out additional food safety tasks within the plant.

The project is a natural extension of the Agency's implementation of HACCP in all meat and poultry plants. Under HACCP, plants identify and evaluate the food safety hazards that could affect the safety of their products and institute controls necessary to prevent those hazards from occurring or to keep them within acceptable limits. However, HACCP does not currently apply to all activities associated with the slaughter process; FSIS continues to use its slaughter inspection workforce in traditional ways. This means that during the traditional slaughter process, FSIS inspectors have assumed responsibility for identifying and removing defects, defining corrective actions, and solving production control problems. This contrasts with HACCP, under which plants assume their proper responsibilities for process control, and FSIS sets performance standards and verifies that they are meeting these and other regulatory requirements.

Greater Focus on Public Health

With inspectors in these slaughter plants no longer carrying out process control activities, which are the plant's responsibility, FSIS can better focus on public health concerns and further implement its farm-to-table strategy. FSIS believes there are additional tasks within slaughter plants, such as verification of the zero tolerance standard for fecal contamination, sampling for pathogenic microorganisms, and verification of HACCP systems, that deserve more attention in all plants, not just those operating under the models.

Volunteer Plants

Only plants that slaughter market hogs and young poultry (including young turkeys) are participating in the project. These classes are composed of young, healthy animals. FSIS is not planning to extend this project to other classes of animals that may have more complex pathology or other problems to address. Currently, 28 plants have volunteered for the project—3 hog, 5 turkey, and 20 chicken.

Baseline Data Collection

Baseline data were collected in the pilot plants to document the accomplishments of the current inspection system, before the models were tested.
FSIS has contracted with Research Triangle Institute (RTI), an independent consulting firm, to collect both microbiological and organoleptic data. The data were used to establish draft performance standards for plants slaughtering each of the market classes included in the project for diseases and conditions that are related to food safety (FS), and non-food safety, or other consumer protection (OCP).

**New Plant Responsibilities**

The project involves new roles and responsibilities for participating plants. Before the models testing phase begins, each plant must modify its HACCP plan to include at least one critical control point addressing food safety diseases and conditions. In addition, each plant must develop a process control plan to address other consumer protection concerns that are not food safety related, such as removing bruises and other quality defects.

With HACCP and other process control programs in place, plants will identify and remove from the slaughter production process carcasses and parts of carcasses that are unacceptable because they are diseased or unwholesome. FSIS will use the new performance standards to determine plant compliance.

**Inspection under the Models**

When volunteer plants assume these process control responsibilities, the FSIS inspection team implements new slaughter inspection procedures that verify the effectiveness of the plant’s modified HACCP and new process control plans, while conducting inspection of every carcass by one or more carcass inspectors. The number of inspectors needed to perform these inspection procedures will vary according to factors such as market class of animal or bird slaughtered, plant size and complexity of its operations.

**Transition to the New Model**

During the transition to the new models, FSIS has set post-mortem organoleptic performance standards for young poultry that each participating plant must meet. For young poultry, performance standards are set for seven categories of diseases and conditions detected at slaughter—two address food safety, and five address “other consumer protection” concerns. For the two “food safety” categories, the performance standards are set at “zero,” meaning that no food safety diseases or conditions are permitted. For the five “other consumer protection” categories, FSIS set the performance standards according to the baseline data collected so far, which reflect the achievements of the current system.

After data collection is complete, FSIS will go through rulemaking, with the opportunity for public input, to formalize the performance standards. During the transition, each participating plant must ensure that its HACCP and other process control systems are working as intended to meet FSIS standards. Any product deemed by inspectors as adulterated does not pass inspection.

In addition, FSIS conducts *Salmonella* testing above what is required
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under HACCP.

Data Collection

After the plant HACCP and process control systems and FSIS inspection procedures are working as intended, RTI again collects data in order to provide a “before” and “after” picture with regard to organoleptic and microbial data.

Regulatory Action by Inspection Personnel

Under the HACCP-based inspection models project, the authority of inspection personnel to take action in plants operating under the models is the same as in plants operating under traditional inspection. Inspectors now have, and will continue to have, the authority to stop the line as appropriate, retain product that they believe is adulterated or misbranded, to withhold the marks of inspection, and to reject facilities, equipment, or any parts of the plant they determine are not in compliance with the regulations.

Public Process

The HACCP-based Inspection Models Project is being developed through an open public process that allows all interested constituents the opportunity to participate and provide input through public meetings and other means. FSIS has consulted closely with the National Advisory Committee on Meat and Poultry Inspection; the National Advisory Committee on Microbiological Criteria for Foods; numerous public health, industry, and consumer groups; and FSIS employee and supervisory groups, among others. FSIS will go through formal rulemaking procedures to make any changes to its regulations.

The following report on:

Status of SSOP and HACCP

presented by Dr. Alice Thaler, USDA, FSIS:

The following tables are examples of information available in the Performance Based Inspection System (PBIS) data. The database does not allow an analysis that can distinguish meat plants from poultry plants because many plants have dual numbers (handle meat and poultry). The numbering system also does not distinguish slaughter from processing plants. Data can be reported publicly if the aggregation of the data prevents identifying individual plants.

Inspectors perform both scheduled and unscheduled tasks. The percent compliance rate is very high, 90+. Reports on all establishments, aggregated by month for a 90-day period are presented as an example of the data reports easily generated by the computerized system used to generate inspection tasks for FSIS field inspectors.

Reports can be summarized by activity, such as Activity 01, Sanitation Standard Operating Procedures (SSOP) which includes all tasks in PBIS for SSOPs.
### All Establishments Activity 01 SSOP From: 07/26/2001 To: 10/23/2001

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### All Establishments Activity 03 HACCP From: 07/26/2001 To: 10/23/2001

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### All Establishments Element 05A Microbiological Sampling From: 07/26/2001 To: 10/23/2001

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</table>

Reports can be summarized down to the level of elements such as 01B or to individual tasks such as 01B01.
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All Establishments Procedure 01B01 From: 07/26/2001 To: 10/23/2001
01B01 Review EST SSOP records ensure monitoring effective pre-op; corrective action initiated to prevent direct contamination

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FSIS posts a Quarterly Regulatory and Enforcement Report at http://www.fsis.usda.gov/oa/haccp/enforce.htm. The latest report covers the period from January 01, 2001 to March 31, 2001. The report states that during this 3-month period 29,891 Noncompliance Reports (NR) were written. Appeals were filed from 108 plants for 255 NRs. Appeal of the NR was granted for 69 NRs, 136 were denied and 50 were pending a decision. A total of 588 Letters of Warning for criminal violations (LOWs) were issued. Some LOWs were by issued by the Districts (556) and some by Headquarters (32).

The summary of Administrative actions includes actions taken in prior quarters. An individual establishment may have the same basis of action documented multiple times. Administrative actions were taken in 7 large establishments [all for a HACCP basis], 52 small plants [24 for SSOP, 41 for HACCP, 5 for Other causes and none for E. coli], and 91 very small plants [2 for E. coli, 25 for SSOP, 79 for HACCP, and 9 for Other causes].

2. Update on APHIS

The following report on Low Pathogenic Avian Influenza Control in the Northeast Live Bird Market

by Dr. Thomas J. Myers and presented by Dr. Leslie Bulaga
USDA, APHIS:

Introduction

H7N2 low pathogenic avian influenza (LPAI) virus infections have been present in the NY and NJ urban live bird markets since 1994. The Live Bird Market Working Group was established in March 1999 following a 1998 USAHA Resolution asking USDA, APHIS, Veterinary Services to assist the states in the control of LPAI virus infections. The working group is composed of State, Industry, and Federal personnel and is committed to the goal of eliminating all H5 and H7 LPAI infections from the live bird marketing system in the Northeastern United States. In October 2000, the USAHA adopted an
additional resolution calling on APHIS to fund the activities of this working group. During the past year, the working group has developed an LPAI control program and has succeeded in obtaining funds to carry out its activities. The group has received $926,000 of contingency funds from the USDA, APHIS, and approximately $140,000 of in kind support from the states of New York, New Jersey and Pennsylvania.

This report discusses the four elements of the control program developed by the working group.

1. Epidemiology study

From July through November 2001, an epidemiology study is being conducted in the northeast live bird marketing system. For the purposes of this study, the live bird marketing system has been divided into retailer and supplier activities.

**Phase 1 - Retail markets.**

During July and August 2001, survey information and virus isolation samples were collected from 109 retail markets in NY and NJ. This phase of the study was designed to answer three questions: (a) what is the current prevalence of LPAI in the markets; (b) what risk factors are present in positive markets; and (c) can a reverse transcriptase polymerase chain reaction (RT-PCR) test under development by the USDA Agricultural Research Service (Dr. David Suarez, Athens, GA) be used as a rapid screening test for positive markets?

Data analysis from this phase of the study is not yet complete. However, some preliminary results are available:

(a) Prevalence: 60% of the 81 retail markets in NY were positive for LPAI; 43% of the 28 retail markets in NJ were positive for LPAI. Nearly all of the viruses isolated were H7N2.

(b) Risk factors: Factors associated with positive markets (overall significance of p < 0.05) included a market being open 7 days a week and a market that cleans and disinfects less frequently than once a day. Factors not associated with positive markets included the state in which the market was located and the number and types of suppliers used by the market.

(c) RT-PCR test validation: When compared against virus isolation, the RT-PCR test for avian influenza appears to have adequate sensitivity and specificity (95% and 92%, respectively) to be used to screen markets for LPAI.

**Phase 2 - Suppliers.**

During the second phase of this study, survey information, virus isolation samples, and serum samples are being collected at supplier facilities (i.e., producer, dealer, wholesaler and auction market premises). This phase of the study is designed to assess the current prevalence of LPAI in these supply channels and to attempt to identify suppliers that might not currently
be participating in various AI testing programs. This phase of the study is due to be completed in November 2001.

2. Regulatory coordination

The states of New York, New Jersey and Pennsylvania have reviewed their regulations regarding their activities in the live bird marketing system and are adjusting their activities so that there is a greater degree of regulatory consistency across state lines. The most important change to arise from the efforts of this group is a rule promulgated in August 2001 by the State of New Jersey. This rule requires that an AI-negative serology test result must be documented for all lots of birds presented for sale in a live bird market.\textsuperscript{1} The State of New York has had such a rule in place since 1998.\textsuperscript{2} Therefore, the promulgation of this rule in New Jersey closes an important marketing loophole.

3. Education campaign

Prevention of LPAI infections will largely depend on educating suppliers and retail marketers about AI, biosecurity, cleaning and disinfection procedures, and the various state regulations which govern retailer and supplier activities and testing for AI. Information on these subjects is being made available to participants in the live bird marketing system through letters, brochures, public meetings, and one-on-one training.

4. Closure, cleaning and disinfection of AI-positive facilities

Beginning in January 2002, the States of NY, NJ, and PA will use the RT-PCR test as a rapid screening test to conduct frequent surveillance in live bird retail markets and supplier facilities. Specifically, each retail market will be tested twice during the month of January 2002 and once during the month of February 2002. Any market found to be positive for LPAI will be ordered by the state to close for 3 days for cleaning and disinfection. Subsequently, the states will continue regular surveillance and market closures at a frequency to be determined by the working group, based on the effectiveness of the initial test and closure activities.

Conclusion

H5 and H7 LPAI infections of poultry are a significant threat to our nation because of their potential to become highly pathogenic infections. An outbreak of HPAI would not only reduce the supply of poultry meat and eggs for domestic consumption, but would also disrupt our international exports of these products. A cooperative effort among federal, state and industry professionals will always be necessary to monitor for and prevent the occurrence of both low and highly pathogenic AI infections. The efforts of the Live Bird Market Working Group will continue until the current threat posed by the H7N2 LPAI viruses is eliminated. These efforts will also lay the groundwork for future control activities and prevention strategies.

References

The following report on Molecular Testing (PCR) of Avian Influenza Viruses presented by Dr. David Suarez, USDA, ARS, SEPRL:

Use of Real Time RT-PCR test for the diagnosis of avian influenza in the live bird markets of the Northeast U.S.

David Suarez, Erica Spackman, Dennis Senne, Leslie Bulaga, Lindsey Garber, and T.J. Myers

Low pathogenic avian influenza has been endemic in the live bird market (LBM) system in the Northeast U.S. since at least 1994. Although many subtypes of virus have been isolated from the market, the H7N2 subtype is the most prevalent strain. This subtype also carries the concern that it could become highly pathogenic, and an additional basic amino acid at the hemagglutinin cleavage site has already occurred. In an effort to eradicate avian influenza from the LBM system, a LBM working group was developed with federal, state, university and industry people to address the problem.

The working group felt that previous efforts to eradicate the virus from the LBMs were hampered by the delay for virus isolation to identify positive markets. Therefore, the working group felt a more rapid diagnostic test was needed to support the eradication effort. The use of a real time RT-PCR test was identified as one possibility. Since no current test was available, the test was to be developed in the laboratory of Dr. David Suarez at the Southeast Poultry Research Laboratory (SEPRL). The principal advantages of a real time RT-PCR test include that the results can be obtained quickly, no gels need to be run to read the results, the fluorogenic probe in the test provides confirmation of the specificity of the PCR product, and the PCR product does not have to be removed from the tube which decreases the potential of cross contamination of samples. The disadvantages of real time PCR is that the equipment needed to do the test is expensive, and specialized probes and primers have to be developed for each test.

Several different probes sets were developed. The first test was a type A influenza test targeted to the matrix gene that should amplify all type A influenza viruses. Positive samples for the type A influenza test were further tested with a H5 and H7 specific test, since these are the subtypes associated with highly pathogenic avian influenza. After demonstrating sensitivity and specificity of the probe and primer sets on experimental samples, the test was then compared directly to virus isolation from field samples as part of a separate epidemiology study. All 109 LBMs from New York and New Jersey were sampled as part of the study, with tracheal, cloacal and environmental swabs being taken from each unique lot of birds at the market. The swabs were placed in transport media and sent to SEPRL or taken directly to the NJ state diagnostic lab for testing. Part of the sample was removed for RT-PCR and the remainder of the sample was sent to NVSL in Ames, IA for virus isolation. The results from both labs were sent to a third party to compare the results.
A total of 1550 samples were compared with both methods. The results were compared at the individual sample level and at the market level. A good correlation was observed at the market level between the two tests for the Type A influenza test. At the tube level, the RT-PCR test appeared to be less sensitive than virus isolation. However, both tests appeared to miss some samples that were positive by the other test at both the tube and market level. The results were also compared for the H7 RT-PCR test. Because only samples that were positive by the type A influenza test were tested by the H7 RT-PCR test, the number of samples tested was much smaller. The correlation between virus isolation and RT-PCR was very good at both the tube level and at the market level with greater than 95% between the test results. The H5 RT-PCR test was also examined, but only two markets were positive for H5N2 influenza, making comparisons between the two test methods difficult.

Because of the good correlation of the two diagnostic tests at the market level, the real time RT-PCR test will be used as part of the LBM eradication program that is targeted to begin in Jan. or Feb. of 2002. Current plans are to test all the markets with the RT-PCR test within a one week period. All positive markets would then be depopulated and closed and disinfected for three days. The markets will continue to be tested every other week until all the markets are free of avian influenza. Continued comparisons of virus isolation and RT-PCR will continue to try to improve the correlation between the two test methods.


The following report on NAHRS was presented by Dr. Stanley Kleven, University of Georgia:

The latest meeting of the NAHRS steering committee was held by conference call on September 25 and 26, 2001. Participants representing poultry were Robert E. Good and S. H. Kleven. Discussions centered around non-participating states, improvement of data quality, and the possibilities of instituting web based data entry. Dr. Tom Walton of the Center for Epidemiology and Animal Health (CEAH) reaffirmed that NAHRS continues to have a very high priority.

The crucial points centered around increasing the number of participating states. An average of 24 states have participated from January 1999-2001. Reasons given by state veterinarians ranged from lack of resources for reporting, lack of interest from their animal industries, concerns about confidentiality of the data, industry fears of potential embargoes, and mistrust of the federal government.

Most of the major poultry states are currently participating. Major poultry states not reporting include Maryland, Missouri, Arkansas, Oklahoma, Georgia, Iowa, and West Virginia. A recent meeting of the executive board of the National Chicken Council (the CEO's of the major companies) recommended participation, indicating that the major poultry companies do not oppose the NAHRS reporting system. This has yet to be translated into participation of many of the major poultry states.
One suggested proposal to alleviate fears about confidentiality was to propose that a trusted state veterinarian assemble the monthly reports from the states and then use the data to submit a summary report.

Dr. Good is contacting the major non-participating poultry producing states to reinforce the importance of participation.

The committee was reminded of the in depth report prepared by Dr. Charles Beard on the Pro's and Con's of a Transparent Disease Reporting System. This was published as part of the proceedings of this committee last year.

4. Foot and Mouth Disease

The following report on APHIS Plan and It's Effects on the Poultry Industry was presented by Dr. Joe Annelli, USDA, APHIS:

Report not received

The following report on State Response to FMD and Specific Guidelines for Poultry was presented by Dr. Tom McGinn, North Carolina Department of Agriculture:

Interstate Movement of Poultry and Procedures During an FMD Outbreak

Tom McGinn, DVM; David T. Marshall, DVM; Eric Gonder, DVM; Rick Sharpton, DVM & Clint Nygaard, DVM

I. Overview:

This document contains 2 elements: 1) A grid describing movement restrictions on different classes of poultry under various conditions occurring during an FMD outbreak. 2) Procedures and Guidelines for Poultry Operations including a list of approved disinfectants for FMD.

II. Classification Grid:

The grid that follows categorizes actions for different classes of poultry moving interstate in the event of an FMD outbreak. It may also have intrastate applications. Different classes of poultry and poultry products are arrayed down the left side of the grid. These classes are generally recognized by the industry since they represent practical financial categories for the business. Different situations that may occur involving these classes are listed across the top of the grid. "An infected/exposed farm" is a farm premise with infected/exposed susceptible animals. The integrated industry would stipulate that the poultry would be in separate buildings from the affected animals, with different feeding and watering systems, but very likely common labor. "Hot/exclusion zone" is the geographic area in which nonspecific movement controls would be applied around an infected premise. "Surveillance/control area" is the geographic area in which increased monitoring would occur to detect any additional FMD cases.

A. The following definitions are employed:

1) Infected Farm – Any premises where FMD has been confirmed.

2) Exposed farm – Any contiguous premises or any premises with a direct link through trace back to an infected farm.

3) Hot/exclusion zone – Area within a 2 mile radius from an
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infected farm.

4) Surveillance/control zone – Area within a 6-mile radius from an infected farm.

5) Rest of State – Any portion of State not in a surveillance/control zone (assume no movement allowed for 48 hours after initial quarantine).

B. Three potential actions are described below (also see immediately below the grid):

A. No action required on poultry products.

B. Poultry can move to destination on disinfected trucks under permit.

C. No movement of poultry for a number of days after disposal of the infected animals.

III. Classification/Movement Grid

<table>
<thead>
<tr>
<th>Poultry Class Farm</th>
<th>Infected /Exposed Zone</th>
<th>Hot /Exclusion Zone</th>
<th>Surveillance /Control Zone</th>
<th>Rest of State (48 hrs after initial outbreak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Eggs</td>
<td>C for a minimum of 4 days, then B</td>
<td>B</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Hatching Eggs</td>
<td>C for a minimum of 4 days, then B</td>
<td>B</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Day-Old Poultry Placements</td>
<td>C for a minimum of 4 days, then B with trailer netting</td>
<td>B</td>
<td>C for ** days, then B coming into Zone, and B with netting going out of Zone</td>
<td>B</td>
</tr>
<tr>
<td>Immature Poultry Moving to Other Farms (Pullets, etc.)</td>
<td>C for a minimum of 4 days, then B with trailer netting</td>
<td>B</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Slaughter Shipment</td>
<td>C for a minimum of 4 days, then B with trailer netting</td>
<td>C for ** days, then B coming into Zone, and B with netting going out of Zone</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

** Number of days to be determined after a risk assessment by the State.

A - No action required on poultry products.

B - Poultry product can move to destination on disinfected trucks under State-of-origin permit.
C - No movement of poultry product for a number of days after disposal of infected animals and cleaning and disinfection of the premises.

IV. FMD procedures for Poultry Operations

A. Introduction:

Poultry are not susceptible to Foot and Mouth Disease and therefore are not a source of propagating the virus. Their role in transmitting FMD is strictly as a fomite. Traffic associated with feeding, servicing, and moving poultry on and off a farm, which has FMD infected animals, could possibly cause spread of the FMD virus. There will be multiple factors that will influence how poultry on such farms (called a hot premise) will be handled.

These factors include:

- proximity of poultry to FMD infected or exposed animals
- species of susceptible animals on hot premises (swine vs. goats)
- number of animals on hot premises
- weather conditions (cold & damp vs. hot & dry)
- traffic pattern on farm and in the area
- concentration of virus around the farm (single infected farm vs. large zone)
- type of poultry operation involved
- destination (proposed) of poultry

At this time, the decision for paying indemnity would be based on the following statement recently made by USDA.

1) If there is mixing of the poultry with FMD infected animals, and an onsite inspection determines that there is no way to safely move the poultry without risking spread of FMD, the poultry must be depopulated and USDA would pay indemnity.

2) If there is no mixing with FMD infected animals, and there is a reasonable way to move the poultry to market with no risk of spreading FMD, they could be moved on a permit. This evaluation must be made by an epidemiologist or other qualified person.

If a determination is made that poultry can be moved off the hot premises, the following procedures will be established.

B. Common procedures for all poultry operations located on the hot premises (eg., infected or exposed farms)

1) Designated employees in poultry-specific clothing/boots left at the poultry farm will care for poultry.

2) Servicing will be done by phone (from the serviceman to the on-farm worker).

3) Utility companies will be contacted, and meter reading will be completed by on-farm workers or estimates used.

4) All farm equipment will be cleaned & disinfected in and out of poultry houses.
5) If possible, establish a separate driveway for poultry farm traffic (away from the part of the farm where FMD susceptible species were located).

6) Dispose of dead poultry / cull eggs on the farm by method approved by the state veterinarian.

7) Litter will not be removed from the houses in the period between diagnosis and a minimum of 96 hours following disposal of FMD susceptible animals.

8) Litter will be removed by permit only after a minimum of 96 hours following disposal of FMD susceptible species; in most cases it will remain on the farm and be composted not far from the poultry house.

9) Poultry and eggs will be held on the farm for a minimum of 96 hours after disposal of FMD infected animals. The exact time period for holding the product will be decided based on an epidemiological investigation done within 36 hours of the FMD diagnosis.

C. Unique Procedures for different type operations located on a "hot premise" (FMD infected or exposed farm).

1) Breeder Farm (Chicken and Turkey)
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      • Hold all incoming breeder replacements
      • Hold all outgoing egg and bird movements
      • Restrict traffic to:
         — feed truck (estimated twice weekly)
         — emergency only repairs, supplies
      • No artificial insemination (AI) or vaccination crew movement on or off farm
   b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
      • Allow AI crew movements
      • Begin egg movements to hatchery
      • Begin incoming breeder replacements if absolutely necessary

2) Hatchery (Chicken and Turkey)* It is very unlikely that a hatchery would be on a premise with susceptible livestock, since hatcheries are not normally on farm sites. The below assumes a very close contact with infected susceptible animals and the hatchery facility.
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      • Hold all incoming egg deliveries
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

- Destroy chick and poult deliveries, since there is no holding capacity

b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
   - Clean and disinfect premises
   - Resume incoming egg deliveries
   - Resume chick and poult deliveries

3) Chicken Broiler Farm
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      - Hold incoming chick movements
      - Hold outgoing slaughter movements
      - Restrict traffic to:
        - feed truck (twice a week)
        - fuel truck (every 2-6 weeks)
        - emergency only repairs, supplies
   b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
      - Allow movement of broilers to slaughter with netting on trailer
      - Pressure wash truck and trailer undercarriage, and then disinfect with approved disinfectant before leaving farm
      - Follow poultry clean-out guideline for house (Appendix A.)
      - Allow incoming chick deliveries

4. Turkey Brooder Farm
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      - Hold incoming poult movements
      - Hold outgoing poult movements
      - Restrict traffic to:
        - feed truck (once a week)
        - fuel truck (every 2-6 weeks)
        - emergency only repairs and supplies
   b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
      - Allow movement of turkeys to finishing farm in enclosed pullet trailers (if not on farm with susceptible species)
      - Pressure wash truck and trailer undercarriage, and then disinfect with approved disinfectant before leaving the farm
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• Follow poultry clean-out guideline for house (Appendix A.)
• Allow incoming poult movements

5. Turkey Grow Out (Finishing Farm)
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      • Hold incoming turkey movements
      • Hold outgoing slaughter movements
      • Restrict traffic to:
        — Feed truck (twice a week)
        — Emergency only repairs and supplies
   b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
      • Allow movements of turkeys to slaughter with netting on trailer
      • Pressure wash truck and trailer undercarriage, and then disinfect with approved disinfectant before leaving the farm
      • Follow poultry clean-out guideline for house (Appendix A.)
      • Allow incoming movements from brooder farm

6. Table Egg Layers
   a. Time period after diagnosis and until a minimum of 96 hours after disposal of FMD infected animals:
      • Hold incoming replacements
      • Hold outgoing movements of eggs and birds
      • Restrict traffic to:
        — Feed delivery
        — Emergency only repairs and supplies
   b. Time period beginning at least 96 hours after disposal of FMD infected animals and until quarantine released on hot premises:
      • Allow outgoing egg delivery on cleaned and disinfected trucks
      • Allow incoming birds

D. Time Limitations for Holding Live Products
   The following lists holding times for poultry and eggs after which the product will be worthless if not permitted to be moved off the farm. This may be due to lack of storage ability, no market for the product, or spoiled product. Unless noted these days are maximums, not averages. These times can vary depending on differences in company situations and storage capacities at each farm. This list is for information purposes, so that planning can be done for moving or destroying these products.
TRANSMISSIBLE DISEASES OF POULTRY
AND OTHER AVIAN SPECIES

- Table Eggs from the farm - 2 to 4 days
- Hatching Eggs from Turkey Breeder farm - 4 to 7 days
- Hatching Eggs from Chicken Breeder farm - 4 to 7 days
- Day old poult from the hatchery - 1 day
- Day old chicks from the hatchery - 1 day
- Broilers due to go to slaughter - 7 days
- Turkeys due to move from the brooder to a finishing farm - 7 to 14 days
- Turkeys intended for slaughter
  a. Hens - 10 - 14 days
  b. Toms - 10 - 14 days

Disinfectants for Foot and Mouth Disease

<table>
<thead>
<tr>
<th>Product</th>
<th>Final Active Ingredient Dilution</th>
<th>Mixing Directions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.25 % Sodium Hypochlorite (NaOCl, household bleach) 1</td>
<td>3%</td>
<td>Add 3 gallons of chlorine bleach gallons of to 2 water, mix thoroughly</td>
<td></td>
</tr>
<tr>
<td>Acetic Acid 1</td>
<td>4-5%</td>
<td>Add 6.5 ounces of glacial acetic acid to 1 gallon of water, mix thoroughly</td>
<td>Vinegar is a 4% solution of acetic acid.</td>
</tr>
<tr>
<td>Potassium Peroxymono-sulfate and Sodium Chloride 1</td>
<td>1%</td>
<td>Follow label directions</td>
<td>Virkon-S</td>
</tr>
<tr>
<td>Sodium Carbonate 1</td>
<td>4%</td>
<td>Add 5.3 ounces of sodium carbonate to 1 gallon of hot water (or 1 pound to 3 gallons of hot water), mix thoroughly</td>
<td>Soda ash. The solution is mildly caustic, but can dull paint and varnished surfaces.</td>
</tr>
<tr>
<td>Sodium Hydroxide (NaOH) 1</td>
<td>2%</td>
<td>Add 1/3 cup of NaOH pellets (2.7 to 1 gallon of cold ounces of the lye) water, mix thoroughly</td>
<td>Lye. This solution is highly caustic. Use protective rubber clothing, gloves and safety glasses.</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Product</th>
<th>Final Active Ingredient Dilution</th>
<th>Mixing Directions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric Acid</td>
<td>.2%</td>
<td>Add 1 pound of citric acid to 55 gallons of water. Mix thoroughly.</td>
<td>Solution is acidic.</td>
</tr>
</tbody>
</table>

### Notes
- **WARNING:** Always add the lye to the water. Never pour the water over the lye.

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1. Memo, Joseph F. Annelli (Disinfectants for Foot and Mouth Disease, March 16, 2001)
2. AUSVETPLAN Edition 2.0 version 2.1 – Operational Procedures Decontamination Manual (pg 51, Table 4)

### Appendix A. Poultry House Decontamination on FMD Premises

1. Spray house with insecticide, then clean out litter. *(See procedures for litter disposal below.)*
2. Remove debris and dust from ceiling joists and walls.
3. Brush and blow dust from fans, motors, louvers, and electrical equipment.
4. Cover motors and electrical equipment with plastic and seal watertight.
5. Scrape and brush all equipment—feeders, brooders, waterers, etc.
6. Scrape and sweep floor to remove packed litter.
7. Clean up all debris outside of building—especially around entry room and any other entrances to building.
8. Wet down entire house inside with plenty of water to loosen caked material.
9. Thoroughly wash ceiling, walls and floors using water and a high-pressure sprayer.
10. Check entire house—reclean any areas not absolutely clean.
11. Allow house to dry thoroughly.
12. Disinfect entire house inside and 8 to 10 feet around outside of house with either Virkon, 0.2% Citric Acid solution, or other approved disinfectant using pressure sprayer. Use appropriate concentrations. Allow drying, then place new litter, equipment, etc. in house.
13. Remove covers from electrical equipment.
14. Once house is cleaned and disinfected, do not enter house without putting on clean and disinfected boots, caps and outer clothing, and thoroughly disinfecting any equipment brought in.
*Dispose of litter and debris by an approved method such as composting on the farm. (It may be possible, and at times preferable, to leave the litter in the house and let any pathogens in the house die by time, heat, etc.) All clean-out equipment must be cleaned with a pressure washer, disinfected, and inspected before leaving the farm.

This list was adapted from the AAAP guidelines for Salmonellosis control.

5. Bioterrorism

The following report on Biosecurity: A Defense Against Bioterrorism was presented by Dr. C.W. Beard, United States Egg and Poultry Association, Tucker, GA:

The events of September 11, 2001 have resulted in an increased concern over the possibility of a bioterroristic attack on the poultry industry. You hear discussions about the need for increased surveillance, rapid detection/identification and prevention/control methods. There are those in government who want to set up organizations and facilities to deal with the threat.

How real is the threat? After the twin tower disaster, it would take a foolish person to adamantly say that there was no threat. There is no way to precisely quantify the level of such a threat so we can set the question aside, acknowledging that the threat exists but we don’t know if an attack will materialize or not. Neither do we know how extensive such an attack will be if it occurs.

Is it feasible? Can it be easily accomplished? Well, I am not in the business of writing instruction manuals so that will not be discussed here. I will simply say that it is feasible. We have experienced two diseases in the poultry industry that would make good candidates for such covert activities: highly pathogenic avian influenza (HPAI) and velogenic viscerotropic Newcastle disease (VVND). Either one of these viruses could wreak havoc in the industry.

Can an attack be prevented? Hardly. Our poultry houses can be remotely located and often unattended especially at night. So without going into details, the answer is “no”, you probably won’t be able to prevent the attack. Not with a fence, not with a gate, and not with a lock. We need to face that fact squarely. We can’t do anything to completely rule out an attack.

Well if you can’t prevent a bioterroristic attack, what can you do? In my opinion, if the poultry population has not been appropriately immunized against all the disease agents likely to be used, there is only one reasonable answer: Using the principles and practices of biosecurity, keep any introduced disease confined to the house or premise where the bioterrorist first introduced it; recognizing that they only have to infect a single bird in one house to achieve a successful introduction.

So when will we know to put heightened biosecurity practices into effect? After we see sick birds? Simply put, if we wait until we see sick birds,
it is too late, the disease agent will have already been tracked out of the initial house and spread to other houses and likely to other premises. The key to the success of any biosecurity program is that it be in place before the disease introduction. If it is not, it is essentially worthless in containing the disease and preventing its spread.

To closely adhere to a program of biosecurity to prevent the spread of a disease agent that neither growers or employees can see, smell or feel, requires dedication and discipline. It requires that all involved be convinced of the need and be well informed on the practices/procedures that comprise an adequate level of biosecurity.

The poultry veterinarian’s role in the defense against a bioterrorist attack will be multi-faceted. First, they will have to set an example of how to practice farm-to-farm biosecurity as they perform their routine duties. There will doubtless be many questions and discussions from growers and others over the need and effectiveness of such a program. As the primary expert on diseases in the eyes of the grower, it is important that the company poultry veterinarian profess support of the biosecurity program by both word and deed. To not do so will quickly kill the effectiveness of the effort. Second, the veterinarian may be the first individual beyond the service person or grower to observe the effects of any introduced disease. The veterinarians should hone up on their diagnostic skills of exotic diseases and know when to transport birds to the lab and when not to move any off the farm. The “first line of defense” diagnostic effort may likely be key to ratcheting up the level of biosecurity to “lock down” the premise, keeping the disease at the initial site of introduction.

Is all of this discussion about relying on biosecurity to defend against bioterrorism really necessary? My answer is that I certainly hope that it is not. However, few of us would have predicted the events of September 11th. To not discuss it, make plans, train, and educate and hopefully put some or all of a biosecurity program in place might, one day, in the future be considered irresponsible. None of us wish to be labeled as alarmists on the one end of the spectrum and none of us wish to be accused of being out of touch with the risks and realities of today’s world on the other end. There has got to be a good solid middle ground with which most of us can be comfortable. Only future events will tell us that we did too little or too much. One bit of good news is that a solid system of biosecurity will certainly pay dividends in the continuing struggle against the day-to-day diseases that the industry has fought for decades. Therefore, it is clear that there can be benefits, even if a bioterroristic attack never occurs. That should provide some comfort to all of us that advocate the need to improve the quality and quantity of our on-farm biosecurity efforts. If, however, there is a bioterrorist attack and it severely damages the industry, negatively impacting the consuming public, we need to know that we did our best to prevent it.

I believe biosecurity is the only way to soften the blow if we don’t have
the lead-time and vaccines available to protect a large portion of the population at risk. It may be that a combination of the two will be the most appropriate way to deal with the threat. An effective biosecurity program could allow for vaccinations and time for the development of protective levels of immunity, even in the face of nearby disease. The new generation of fowlpox vectored vaccines that have been demonstrated to provide protection even when administered to day-old chicks coupled with the use of inactivated oil-emulsion vaccines in older birds may be a valuable tool, especially against HPAI. There are numerous mass-administered vaccines that can be utilized against Newcastle disease. For the vaccine approach changes are needed to regulations controlling their use.

In conclusion, these are indeed interesting and challenging times. The poultry industry may or may not be attacked—only time will tell. If it is, we owe our country our very best effort to do as much as we can to protect this important source of food. One thing is for certain, regardless of the events of the future, it will be better to have overreacted than to have ignored the threat.

The following report on Geographic Information System was presented by Dr. Sherrill Davison, University of Pennsylvania:

Using Geographic Information System (GIS Technology) To Determine The Locations Of Commercial Poultry Flocks, Support Industry And Live Bird Market System Companies, Dealers And Markets In Pennsylvania

Sherrill Davison, Robert J. Eckroade, Susan W. Casavant, and Stephen Gallo

University of Pennsylvania, Laboratory of Avian Medicine and Pathology

GIS is a computer-based tool for mapping and analyzing data to assist in predicting outcomes and planning control strategies. This technology has been used not only in city and county governments but also in farming, public safety, marketing, and telecommunication companies. Parameters such as soil types, crime patterns, and customer sales have been tracked and analyzed.

Historically, the Pennsylvania poultry industry has experienced outbreaks of diseases such as avian influenza, infectious laryngotracheitis, *Mycoplasma gallisepticum*, and infectious bronchitis. These outbreaks have affected many flocks throughout a wide geographical area and the economic impact can be devastating. To determine the potential area spread of a disease in the past, a person needed to locate poultry flocks near infected flocks by driving in the area and visually locating poultry facilities. The use of GIS technology allows for easier and quicker access to the location and identification of surrounding poultry facilities. Our application permits a more rapid response in control efforts for avian influenza and other diseases. In addition, this system facilitates the analysis of data such as the type and number of birds affected or
the companies involved. Travel routes for feed, bird and egg trucks, and
schedules of service personnel may be integrated into the program. This
data analysis is essential to understanding whether spread of disease is
mechanical in nature (i.e. personnel or vehicles).

This application of GIS technology can serve as a model for other food
animal industries within Pennsylvania and nationwide. The recent outbreak
of Foot and Mouth disease in other parts of the world emphasizes the grow-
ing need for GIS technology implementation in the agricultural community to
to control disease, limit economic losses, and protect elements of our food
supply. The beef cattle, dairy, swine, and sheep industries are all prime
candidates for GIS technology.

In the short time since its inception, our GIS has been applied to the
epidemiology of nephropathogenic bronchitis and Mycoplasma gallisepticum.
In addition, we were able to minimize the risk of the spread of disease to
susceptible flocks by advising the industry on placement of potentially posi-
tive MG infected birds.

6. Diseases of Importance and Related Issues

The following report on TSE: Feeding Ruminant Meat and Bone Meal to
Poultry and the Ramifications was presented by Dr. Linda Detwiler:

Currently there is no evidence to suggest that poultry may be infected
by the BSE agent:

a) Parenteral and oral challenges of chickens with the BSE agent
resulted
in no evidence of transmission.

b) Inoculation of brain tissue of hens previously inoculated with
BSE agent 2-4 years before -hand have not transmitted
disease to mice or on further sub-passage to other hens (not
completed).

- The chicken PrP gene is very different from that of the
mammalian PrP genes.

Pigs

- Transmission experiments have shown that pigs are
susceptible to intracerebral challenge with BSE agent.
Seven of 10 pigs died of disease after IC inoculation.

- There is no evidence to date that pigs are susceptible to
BSE following oral challenge:

a) Seven years post oral challenge there was no clinical,
histological or biochemical (PrP) evidence of BSE in pigs.

b) Attempted transmission of brain tissue to mice from oral BSE
challenged pigs aching brains lesions has proved negative.

- The research available to date indicates that oral BSE
challenge of pigs and poultry does not result in disease
and that there is no evidence for residual infectivity present
in tissues.
What can be said about BSE passing through the gut of animals?

- Laboratory experiments show that mice orally challenged with scrapie have detectable infectivity that passes through the gut. Gut contents and fecal material may therefore contain infectivity.
- In oral challenge experiments in the UK, feces must be treated as medical waste for one month following challenge because of the risk of infectivity passing through.
- In regards to the feeding of ruminants, digestive contents and fecal material from livestock or poultry currently being fed with MBM potentially contaminated with BSE, should not be used as a feed ingredient. (WHO/OIE/FAO BSE Consultation, Paris, France, June 2001)

TSEs And The Ramifications Of Feeding Ruminant Meat And Bone Meal To Poultry presented by Dr. Burt Pritchett, FDA

FDA's current feed ban regulation (21 CFR 589.2000) final rule was published June 5, 1997 and became effective August 4, 1997. The feed ban is a mammalian-to-ruminant ban, that is, it prohibits use of mammalian protein, with certain exceptions, in feed for ruminant animals. In choosing not to extend the ban to poultry in its 1997 rule, FDA cited the absence of evidence for naturally occurring TSEs in poultry.

Susceptibility of Poultry to TSEs

The agency is aware of no new scientific evidence since promulgation of the rule that poultry are either susceptible to TSEs, or that they harbor the agent during their short life expectancy and pose a risk to humans via consumption of poultry, or to livestock via poultry meal as a constituent of ruminant feed.

A working group for the European Commission’s Scientific Steering Committee recently reviewed the risks of TSEs in poultry in an elaboration of a September 1999 Opinion on the same subject. The report, entitled The Risk Born by Recycling Animal By-Products as Feed with Regard to Propagating TSE’s in Non-ruminant Farmed Animals, cited the following research findings:

Chicks inoculated with BSE cattle brain i/c at one day old, and then inoculated i/p at two weeks of age, showed no evidence of spongiform encephalopathy at the conclusion of the study (duration of study not reported). Results of sub-passage studies were not yet available.

Birds challenged orally with 5g of BSE cattle brain deposited in the distal esophagus/crop at 4, 5, and 6 weeks of age showed no evidence of spongiform encephalopathy (duration of study not reported). Results of sub-passage studies were unavailable.

Addressing a 1991 report of spongiform encephalopathy-like clinical symptoms in ostriches in a German Zoo, the working group concluded that though histopathological examination showed vacuolization in the brain, there was
no indication that the birds suffered from a transmissible prion disease.

Among the conclusions of the working group were (1) to date no experiments have shown that pigs, poultry, and fish could be infected with TSE through the oral route and (2) that the hypothesis that orally inoculated non-ruminants, without any signs of disease, could carry over the TSE infection through their tissues, still has not been proven.

Use of Poultry Litter in Ruminant Feed

The risk of recycling BSE through the practice of using poultry litter in cattle feed was also addressed in the feed ban final rule. Poultry litter typically includes excreta, bedding, wasted feed, and feathers. Several comments to the proposed rule expressed concern that the BSE agent could be present in the feces of poultry that consumed bovine meat and bone meal in their diet, and that the agent could be recycled when cattle consume poultry litter in their feed, or consume plants to which poultry litter was applied as a fertilizer.

In choosing not to prohibit the use of poultry litter in ruminant feed, FDA said that none of the countries where BSE was present had reported the presence of prions in poultry litter; FDA was not aware of any epidemiological evidence that associates BSE with the incorporation of poultry litter in cattle rations or on crop land; and cited a WHO Bulletin referencing a study that found no detectable infectivity in the feces of Suffolk sheep with scrapie. FDA concluded that they were not aware of any research on this issue that would indicate that the agency should take regulatory action on poultry litter at that time.

Reviewing the Adequacy of the Present Feed Ban Regulation

An action item in FDA’s current TSE Action Plan (http://www.fda.gov/oca/roundtable/bse/FDA_actionplan.html) is to re-evaluate the adequacy of the present feed ban regulation. As part of the re-evaluation process, the FDA held a public meeting on October 30, 2001 in Kansas City, MO requesting comments on specific aspects of the feed ban. Two questions on which the Agency sought comments dealt with the ramifications of feeding ruminant meat and bone meal to poultry. The first question was “Should the present FDA ban on the use of certain mammalian proteins in ruminant feed be broadened? If so, what should the new parameters of use be? Should the rule be broadened beyond ruminant feed? Beyond mammalian protein?” So, included in this question is whether ruminant MBM should be fed to poultry, and should poultry by-products be permitted in ruminant feed. The second question was “Should FDA add to the list of prohibited material in ruminant feed (i.e., add to the definition of “protein derived from mammalian tissues”) poultry litter and other recycled poultry waste products?”

The deadline for submitting written comments to any of the 17 questions in the Notice of Public Hearing; Request for Comments, is November 21, 2001. Once the comment period closes, the Agency will analyze the comments and, should the determination be made that changes are needed to
the current feed ban regulation, publish a Proposed Rule inviting further com-
ment to the proposed changes.
Current Health and Industry Issues:

The following report on the Broiler Industry was presented by Dr. Bruce
Stewart-Brown, Salisbury, MD:

Bird health issues have been minor for most areas of the United States in
2001. Issues other than bird health such as food safety, environmental con-
cerns, antibiotic availability, antibiotic resistance, antibiotic use criteria/pre-
scription process, animal welfare, automatic catchers for catching chickens
and loading them on live haul trucks, FMD containment programs influence
on poultry/biosecurity in general, HIMP slaughter process, and relationship
of the grower and integrator (and veterinary client relationship within that
already complex relationship).

Atypical infectious laryngotracheitis (or other herpesvirus?)

In the southeast there has been research and fieldwork done that indi-
cates that LT (or another herpesvirus) may be more prevalent and silent. It
has long been clear that LT is capable of latency but the prevalence of latent
infections is unknown. The newer molecular tools used in diagnostics today
may reveal more about latent and subclinical infections.

Evolving Infectious Bursal Disease variants.

Several company veterinarians and research groups have reported early
bursal atrophy in broilers in the face of a consistent and well-designed vacci-
nation program in broiler breeders. Antigenic variants have been found and it
appears that autogenous vaccines made with these strains have been very
protective.

Coccidiosis/Necrotic Enteritis

There are two approaches to coccidia control that were different from
recent years: an increase in the use of live coccidia vaccines and the intro-
duction of a very potent chemical coccidiostat. These methods of coccidia
control are opposite in approach. Vaccine allows for early infection and im-
munity development and novel chemicals are almost capable of "absence of
infection". However they are similar in one aspect: the likelihood of signifi-
cant necrotic enteritis is higher with these two approaches than with the
more traditional ionophore-based coccidiostat program.

Breeder coccidia programs have been difficult at times. Breeder pro-
grams are very difficult to consistently manage and promise to be even more
so with cleaner and drier environments complicating immunity development.

Runting/Stunting etiology in broilers

There is a small, sporadic but concerning trend to of nonspecific runting/
stunting disease in broilers. Reovirus is being found and investigated but
other viral and bacterial etiologies are being considered as they have been in
the past.

Infectious bronchitis virus

There continues to be discussion, and some confusion, over the meth-
odds used to diagnosis IBV and particularly the interpretation of molecular diagnostics. In general, the field problem incidence is relatively low and sporadic in nature – for now.

Marek's Disease

Although disease incidence is currently very low to nonexistent, there was some evidence of an increase in the winter of 2000/2001. We are watching this very carefully as we go into this winter (traditionally, Marek's Disease in broilers is generally seasonally influenced being worse in the winter, and there is heightened concern for the winter of 2001/2002. An additional concern as it relates to Marek's, relates to handling a high incidence Marek's flock in a HIMP plant. Currently, this type of flock might very possibly shut a HIMP plant down for some short period of time.

Contribution of live production to Salmonella in final product

Although this is not a new development, many companies are either considering or have implemented live side BMP's aimed at food safety. There is very little research done that shows which of these Best Management Practices – if any – will yield any benefit for Salmonella control.

Egg peritonitis and Staphylococcus synovitis in breeders

Breeder hens have egg peritonitis typically from housing to peak production. Although this is not new it is significant and not always understandable. Staph infection in breeders - both males and females - is of concern in that antibiotics are either not available or are ineffective and leg problems are a significant animal welfare issue for us. The pathogenesis of staphylococcus in chickens is an ever changing and understudied issue for breeder birds. Coccidiosis control programs, chicken house environmental control, and weight control programs change – so does this disease.

The following report on the Table Egg Industry was presented by Dr. Eric Gingerich, University of Pennsylvania:

The present transmissible disease situation of the table egg industry remains relatively stable. Only one major outbreak, fowl coryza in Maine, occurred in the past year that was of great concern to the egg industry on the east coast. To follow is a summary of diseases of interest to the layer industry from my own experiences and information from my colleagues who are members of the Association of Veterinarians in Egg Production (AVEP):

Fowl coryza - An outbreak of serotype A *Hemophilus paragallinarum* occurred in 5 different complexes of non-vaccinated birds of one owner in Maine in December of 2000 and January of 2001. The disease was characterized in white egg layers by severe egg production drops of up to 50 to 80 % and mortality of 20 to 30 % over an eight-week period. In brown egg layers, the disease was less severe with only 20 to 50 % production losses and 5 % mortality over eight weeks. Rapid spread was seen between complexes and among the houses of a complex. The original source of the contamination has not been determined but is felt to be related to the live bird markets. Vaccination in the face of the outbreak with bacterin aided in re-
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

Vaccination of replacements is being done at this time and will continue until it is felt the threat of re-infection is gone. Luckily, no spread to other farms was seen.

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. Of note is the recent licensure of a pox vaccine produced from a current pox isolate that may alleviate the need to use double vaccination or bivalent pigeon and fowl pox vaccines.

Infectious laryngotracheitis (ILT) - Just as with pox, minor outbreaks due to vaccine strains of ILT have occurred and are felt to be 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 likely due to the continued use of the Rispen's Marek's vaccine. Some flocks with higher than expected mortality due to Marek's are seen due to a high challenge from poor C&D 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. Problems with SE have been reported in South Carolina and Ohio. Ongoing interest in the use of vaccination, especially using live, gene deleted Salmonella typhimurium (ST) vaccine, is being done in the areas where SE has been a consistent problem due to persistently positive houses in multi-aged complexes. There are now three live ST vaccines available for use in young chickens and these are being tried by some producers in pullet flocks to provide immunity against SE. Where SE has been identified on a farm, the SE bacterin is still considered the vaccine of choice. Live vaccination, prior to the use of bacterin, is being tested by some firms in an effort to improve the immunity provided by the bacterin.

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 H7N2 AI have occurred in
Pennsylvania in commercial poultry flocks in the last year although the virus continues to be isolated from live market premises in New York City. It has been determined that this virus has mutated and is now one mutation away from becoming a highly pathogenic virus. The east coast egg industry is eagerly anticipating the upcoming program (January 2002) to test all markets, close the positive markets for three days, and C&D these markets in an attempt to remove this potential source of H7 virus.

Of high concern to the egg industry is an outbreak of an H5 or H7 AI virus that is allowed to spread due to the lack of the ability to use vaccine. The H7N1 outbreak in Italy in 1999 should serve as a guide that the lack of intervention with vaccine that can cut down virus shed and spread can lead to the development of a highly pathogenic AI virus. Contingency plans are needed to respond to this need should it arise.

H6 low pathogenic AI is still present in California. It is confined to two companies on five production units. When the virus initially breaks on a premise, it results in a mild upper respiratory disease in the uncomplicated form but significant mortality (0.5 % per week) and morbidity due to secondary bacteria (*Hemophilus paragallinarum*, *E. coli*, *Pasteurella* spp. etc.), plus Mg infections. Egg production losses of up to 20 % have been seen with full recovery to production levels prior to the break in about three weeks. Vaccination of replacement pullets with an autogenous vaccine 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 and are still seroconverting to positive on these premises.

**Infectious bronchitis (IB)** - Variant bronchitis viruses continue to be a concern and are often difficult to diagnose. Production units have experienced significant drops in production, surprisingly with very little loss in shell quality, due to these variant viruses. A variant isolate from Ontario was isolated from a young flock of layers and was found to have the same DNA pattern as a variant isolate in PA. Theoretically, the link between the two locations is spent hen trucks as a large number of spent fowl from PA are transported to Ontario.

Producers respond to these types of breaks 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 using recurrent vaccinations during lay. The nephropathogenic IBV that once was found in Pennsylvania pullets and layers has not been seen in the last year.

**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.

**Colibacillosis** – A severe outbreak of *E. coli* occurred in a Texas complex with very high mortality, over ten percent in two weeks in one of the houses and between five and ten percent mortality in other houses. This outbreak is presumably due to a change in management from sweeping
walkways to blowing the walkways hence aerosolizing fecal dust. Mg, IB, and other primary infectious causes have been ruled out.

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.

Coccidiosis - Coccidiosis continues to be 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.

Focal duodenal necrosis (FDN) - This enteric malady is being found in Pennsylvania resulting in loss of egg weight or a failure to attain egg weight goals. Egg production losses are nil to minor. This problem has been reported on occasion in other states. Lesions are found in the mucosa of the duodenal loop and characterized grossly by gray, round foci on the mucosa. Ulceration of the tips of the villi associated with Gram-negative rods is seen histologically. At this point, a definitive cause has not been found although it is felt to be bacterial in nature as the condition responds well to antibacterial therapy.

The following report on the Turkey Industry was prepared by Dr. James Barton, Springdale, AR and Dr. Steven Clark, Gibsonville, NC, and presented by Dr. Steven Clark:

In preparation for this report to the USAHA Committee on Transmissible Diseases of Poultry and Other Avian Species, the subcommittee chairman, Dr. Clark, and turkey industry colleague, Dr. Barton, contacted several US turkey industry professionals and veterinarians involved in turkey production, to inquire about the health status of turkeys produced in October 2000 through October 2001. 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. This report will list, in alphabetical order, the challenges by disease.

Turkey production in 2001 is estimated to be 267 million head (26.1 pounds average liveweight, unofficial estimate), which is up from the previous year (270 million head and 25.9 pounds). Once again, birds are heavier and head numbers are slightly less, adding to increased overall production potential. Average weights through July were about 1.9% above 1999.

An informal survey was conducted of the US turkey industry to identify single-age production systems (all-in/all-out, brood-and-move). The US industry average in 2001 was 26% single-age production up from the 1995 estimate was 19%. The increase in single-age production over the last 6 years was due primarily to an attempt to control/minimize disease chal-
The lack of effective therapeutic agents remains to be a concern of the industry, including the loss and potential loss of efficacious treatments for bacterial diseases. The judicious use of antibiotics, including fluoroquinolone, appears to be reducing mortality in many turkey flocks. The turkey industry wants to ensure that any CVM antibiotic resistance policy is science based and results in no loss of available drugs unless there is clear scientific evidence those drugs pose a danger to human or animal health.

APV: Avian Pneumovirus Infection (APV) in turkeys causes a rapidly spreading respiratory disease of all ages. APV in the US is distinct from TRT virus in other countries. APV was first diagnosed in the US in 1996 and is limited to the upper Midwestern states. APV is a common cause of secondary colibacillosis. In 2001 the incidence is reported to be slightly less than or the same as the previous year. Severity of this disease appears to be less than in previous years.

BLACKHEAD: The sporadic incidence of histomoniasis in turkeys was increased across the US in 2001. In the Southeast and West, particular locations reported Blackhead as a significant cause of mortality, both in commercials and breeders. Some flocks reported mortality in excess of 50%. Control of this disease was impaired by not having available an effective, approved treatment.

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. In 2001 Bordetella continued to be a sporadic problem and cause of respiratory disease and subsequent immunosuppression on poorly managed farms, especially in the Midwest and Southeast.

CELLULITIS: Clostridium septicum, C. sordellii, C. coliunum, C. perfringens, or Staph. aureus can cause cellulitis. E. coli and Strep. have occasionally been isolated from birds diagnosed with cellulitis. Cellulitis in turkeys appears as excess mortality in older birds, around 16 - 18 weeks of age. It has been reported as early 7 weeks of age. Some cases present with dead birds having “bubbly tail”, fluid filled blisters associated with broken feather follicles around the base of the tail. Other cases will have dead birds with a gelatinous accumulation of fluid under the skin, usually along the thighs and breast. The dead birds decompose very quickly. Culturing the organism is difficult. In the lower Midwest cellulitis of the tail and lower abdomen was a sporadic occurrence on a few farms. Tail cellulitis affected as many as 5% of flocks in some upper Midwest companies.

CHOLERA: Pasteurella multocida infections were reported as problems in the Southeast, lower Midwest and upper Midwest. A higher incidence of cholera occurred in the Southeast compared to previous years, but the severity of the disease was muted. Cutaneous manifestations were interestingly common this year. In the upper Midwest Cholera was a sporadic prob-
Coccidiosis is a disease that is caused by the Eimeria protozoan parasites that develop within the intestine. The efficacy of currently used approved anticoccidial medications and vaccines has controlled, to a large degree, severe clinical coccidiosis in the field. Subclinical disease and the presence of coccidia oocysts is commonly diagnosed.

Colibacillosis: *E. coli* continues to be a cause of mortality in turkeys. The only approved, efficacious product for the control of mortality associated with *Escherichia coli* is fluoroquinolone.

Erysipelas continues to be a sporadic diagnosis.

Heat Stress and associated mortality was a problem mid-summer in the Midwest.

MG: *Mycoplasma gallisepticum* (MG) in turkeys can cause in a severe respiratory disease and subsequent airsacculitis condemnations at processing. A few sporadic cases of MG were reported in 2001. The 1999-2000 MG outbreak in chickens and turkeys diagnosed in North Carolina was eradicated. The primary breeders have remained free of MG.

MM: *Mycoplasma meleagrisidis* continues to be a sporadic diagnosis.

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. MS was sporadically reported in 2001. The primary breeders have remained free of MS.

NDV: Throughout the US, Newcastle Disease Virus (NDV) is a common cause of mild, even in apparent, respiratory disease in both turkeys and chickens. For 2001, the Midwest and Southeast US sporadically diagnosed lentogenic strains of NDV as the cause of respiratory disease but it was not associated with high mortality.

ORT: *Omithobacterium rhinotracheale* 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. ORT was a frequent, but seasonal contributo. To mortality in Southeast commercial flocks derived from a mixture of ORT vaccinated and unvaccinated breeder flocks.

PEMS: Poult Enteritis Mortality Syndrome (PEMS) is defined as an infectious, transmissible disease of uncertain, but probable viral etiology, which typically affect young turkeys between 7-28 days of age. Astrovirus has been implicated as a cause of poult enteritis and may be involved in PEMS. USDA-ARS scientists are actively researching turkey astrovirus. 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...
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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 the lower Midwest and Southeast.

POULT ENTERITIS: Poult enteritis of unknown etiologies has been less of 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 commonly suspected. 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. In the Southeast viral enteritis is still a problem in young poult and associated mortality in some cases reaches the level compatible with a diagnosis of PEMS. Viral enteritis was a cause of morbidity and mortality in the West.

PROTOZOAL ENTERITIS: Enteric protozoa (Cochlosoma, Trichomonas and Heximata) are common in the summer months throughout the Southeast and Midwest. Protozoa severely complicate TCV, PEMS and other enteric diseases. The University of Missouri is actively researching Cochlosoma infections in turkeys to determine the pathology and production effects of a pure Cochlosoma anatis infection and to study the mechanism by which Cochlosoma causes production losses.

ROUND WORMS (Ascaridia dissimilis) infestations are common. SALMONELLA has been a problem for some producers. It has been associated with poor poult quality issues, resulting in excessive poult mortality. Sporadic diagnosis of this disease has been made this past year.

TCV: Turkey Coronavirus (TCV), also known as Bluecomb disease or mud fever, is a highly infectious and acute enteric (intestinal) viral disease of turkeys. Serologic diagnostic tests for TCV are available from several of the state poultry diagnostic laboratories. TCV is a significant economic problem, mainly due to poor flock performance, causing financial losses for both growers and processors. In 2001, the incidence of TCV was less in parts of the Southeast despite a few cases localized to one small area. In the lower Midwest TCV incidence was similar to the past few years with sporadic cases. Some cases had extreme mortality and severe reduction in performance, however some regions reported a reduction in severity relative to previous years. TCV was eradicated from several farms in a localized Midwest location where excessive mortality previously occurred.

The following report on Pneumovirus Status in Minnesota was presented by Dr. Keith Friendshu, Minnesota Board of Animal Health:

Avian Pneumovirus was first diagnosed in Minnesota in 1997. It spread rapidly throughout the turkey dense area of Minnesota, but has not affected chickens.

The industry, government and University of Minnesota have cooperated
in research, diagnostic, and epidemiology studies. The industry has set a goal of a 50% reduction by 2004 by use of management changes, vaccination, surveillance, and improved diagnostic tests. So far in 2001, the incidence in the turkey dense area has dropped to 46% of the flocks, down from over 70% for the last 3 years. The severity of the disease has also decreased in most flocks and there has been a decrease in airsacculitis and condemnation rates at the processing plants.

The following report on Primary Breeder Industry was presented by Dr. Eric Jensen, Aviagen, Inc.:

The following information on the current health situation in the heavy breeder industry was collected from members of The Association of Primary Poultry Breeder Veterinarians and veterinarians employed in the broiler production industry. Overall health of heavy breeders is good but there is a growing incidence of diseases associated with reduced biosecurity practices and hygiene. This is due to cost cutting measures imposed because the industry is experiencing reduced profitability. It is questionable as to whether these practices truly reduce overall costs because of the increased incidence of disease in pullets and the additional selection pressure on microorganisms that could result in more virulent variants.

Reduced hygiene, in particular the use of built-up litter, has resulted in outbreaks of disease in pullets that have not been a concern for years. Problems include field outbreaks of coccidiosis or harsh reactions to live coccidial vaccination, histomoniasis and greater populations of internal parasites (helminths).

Reduced biosecurity practices have caused a higher incidence of respiratory disease. The number of cases of mycoplasmosis, particularly M. synoviae, appears to be on the increase. Variant strains of infectious bronchitis (GA 98, DE 072) have also caused sporadic problems, primarily production drops and reduced shell quality. Poor biosecurity has also led to an increase in flock infestations with the northern fowl mite.

Disease associated with immunosuppressive viruses is declining. The number of cases of ALV-J has greatly decreased compared to previous years reflecting the dramatic progress towards eradication achieved by the primary breeders. The incidence of Marek's disease associated with highly virulent strains (vvMDV+) has decreased and is likely the result of increased use of the Rispens strain of Marek's vaccine and in ovo administration. Immunosuppression in broilers associated with chicken anemia virus (CAV) and variant strains of infectious bursal disease (IBD) has lead to increased usage of CAV vaccine and autogenous IBD vaccines containing variant field isolates.

Chronic low-level morbidity associated with staphylococcal tenosynovitis and pododermatitis are the most common diseases in the laying house. Tenosynovitis tends to affect males more frequently than hens, while hens are more commonly affected by pododermatitis.

Pasteurellosis (fowl cholera) continues to be an endemic problem for
flocks in lay at some production units. Vaccination programs incorporating modified live vaccines and inactivated bacterins, often containing autogenous strains, have been generally successful at controlling the adverse effects of this disease. Strict rodent control is necessary for prevention.

Because of continuing food safety concerns the broiler industry is putting increased pressure on the primary breeders to supply parent stock free of all salmonellas, not just \textit{S. enteritidis} and \textit{S. typhimurium}.

A number of cases of viral arthritis in pullets have been reported. Investigations are underway to determine if the causal agent is reovirus, and if so, whether a new or more virulent serotype is involved. Current vaccination programs and routes of vaccine administration are also under evaluation.

Sporadic cases of inclusion body hepatitis have occurred in several areas of the country. Research investigating the epidemiology of this disease and adenoviruses in general is warranted, as there is concern that adenoviruses are becoming an emerging health risk to both heavy breeders and broilers.

7. Status Reports

The following report on Avian Import-Export Activities was presented by Mr. Dennis Senne, NVSL:

A. Poultry and Hatching Eggs
   There were 15,566,300 poultry, including day old chicks, and 11,259,075 poultry hatching eggs imported into the United States during fiscal year (FY) 2001.

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 1,920 birds released from USDA-operated commercial bird quarantine facilities in FY 2001. There were 187,860 commercial birds released from USDA-supervised private bird quarantine facilities.

C. Pet Bird Program
   There were 300 pet birds imported into the United States and quarantined at a USDA-operated animal import center during FY 2001.

D. Smuggled/Confiscated Birds
   There were 559 birds seized by the USDA, U.S. Fish and Wildlife Service, or the U.S. Customs Service for illegally entering the United States in FY 2001.

E. Ratite Importations
   During FY 2001, 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 AI and Newcastle Disease was presented by Mr. Dennis Senne, NVSL:

**AVIAN INFLUENZA**

During FY 2001, 2,756 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 53 of 284 samples in 18 submissions from New Jersey and from 366 of 2,347 samples in 102 submissions from New York (Table 1). During FY 2001, all LBMs in NJ (28 markets) and NY (81 markets) were sampled at least once. The H7N2 virus was isolated from 46% and 61% of LBMs from NJ and NY, respectively. Samples (in parentheses) collected from LBMs in Connecticut (24), Massachusetts (91), New Hampshire (2), and Rhode Island (8) were negative for AIV. The H5N2 AIV was isolated from 4 samples (4 submissions) from NY and 1 sample from NJ. Pathogenicity of all five H5N2 and selected H7N2 viruses were determined by the chicken pathogenicity test and deduced amino acid profile at the hemagglutinin cleavage site; all viruses were characterized as low pathogenic. Other AIV subtypes and number of isolates recovered from NY LBMs were H3N2 (3), H4N6 (8), H6N2 (3), and H9N2 (1).

Subtypes of AIV isolated from gallinaceous birds in premises other than LBMs are shown in Table 2. The H6N2 virus continues to circulate among layer flocks in California. Fourteen isolates of H6N2 virus from six submissions were characterized as low pathogenic by the chicken pathogenicity test. In February 2001, two isolations of H7N2 AIV were made from game chickens sampled as part of a follow up visit to a Florida premise that was positive for antibodies to the H7N2 virus. Initially, the game chickens were tested to meet requirements for export to the Dominican Republic. Multiple avian species, including chickens (fighting game chickens), guinea fowl, pigeons and ostriches were present on the farm. The ostriches were positive for antibodies to the H6N8 subtype. No clinical disease was reported. The Florida H7 virus was genetically related to the H7N2 virus currently circulating in the LBMs in New Jersey and New York. One additional H7N2 virus from a chicken and an H5N2 from an unidentified avian specie was isolated at the Cornell Diagnostic Laboratory, Cornell University, Ithaca, New York. The H5 and H7 viruses were low pathogenic by the amino acid profile at the cleavage site of the hemagglutinin and the chicken pathogenicity test. The H5N2 isolate from New York was detected as part of the pre-testing requirements for birds going to the LBMs. Other subtypes and number of AIVs isolated at the Cornell Diagnostic Laboratory and identified at the NVSL were: H3N2 (1), H3N8 (3), H4N4,8 (1), H6N2 (5), H6N4,8 (1), H9N2 (1), and H11N9 (1).

Table 3 shows AIV subtype-specific antibodies detected in avian species originating from 14 states. Antibodies to the H5 subtype AIV were detected in ducks in Pennsylvania and Virginia and antibodies to the H7 subtype AIV
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were detected in Florida (H7N2 virus was also isolated from this premise), New Hampshire and New York. AIV subtype was H1 was identified in six states (Minnesota, North Carolina, Ohio, Pennsylvania, Texas, and Wisconsin). Other subtype-specific antibodies found were: H4N2, H4N6, H6N1, H6N2, and H9N2.

In support of domestic AIV surveillance, the NVSL produced and shipped 7,926 units of agar gel immunodiffusion (AGID) reagents to state and private laboratories. This quantity is sufficient to perform approximately 950,000 AGID tests. In addition, 407 units (48,840 tests) were sold to international laboratories.

NEWCASTLE DISEASE

No velogenic or mesogenic Newcastle disease virus (NDV) was isolated from domestic poultry in FY 2001. Fifty-six NDV isolates received from diagnostic laboratories or isolated at the National Veterinary Services Laboratories (NVSL), Ames, Iowa, were characterized as lentogenic pathotype based on the intracerebral pathogenicity index (ICPI) and the amino acid profile at the fusion protein cleavage site. The ICPI for the isolates ranged from 0.0 to 0.54. All had an amino acid sequence compatible with lentogenic NDV.

An NDV was isolated from an unidentified psittacine bird at the San Diego County Diagnostic Laboratory, San Diego, California. The virus was characterized at the NVSL as viscerotropic velogenic pathotype. There was no known exposure to commercial poultry. In addition, a velogenic NDV was isolated from a half-moon conure that was confiscated by US Customs officials in California.

In FY 2001, specimens from six states yielded 15 pigeon paramyxovirus type-1 (PPMV-1) isolates. The states and number of isolates were as follows: Colorado (1), Florida (2), North Carolina (1), New Jersey (3), New York (1) and Pennsylvania (7). The isolates from New Jersey and New York were recovered from LBM surveillance samples (specie not known), the remaining isolates were from pigeons. There was no known exposure to commercial poultry. The viruses were characterized by a panel of monoclonal antibodies, the intracerebral pathogenicity index (ICPI), 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. The intracerebral pathogenicity index (ICPI) for the PPMV-1 ranged from 0.67 to 1.09.

AVIAN METAPNEUMOVIRUS (AVIAN PNEUMOVIRUS)

A total of 1,400 serums from 16 states were tested for antibodies to avian metapneumovirus (AMPV) Colorado and/or UK and Hungarian subgroups. Of these, 796 serums were from chickens in 8 states (AL, AR, CA, FL, IA, MA, ME and NY) and 601 from turkeys in 10 states (CA, CO, IA, MI, MN, MO, SD, TX, VA and WV) and 3 from pheasants from South Dakota. Two
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submissions from turkeys in Minnesota were positive for antibodies to the Colorado AMPV by the enzyme linked immunosorbent assay (ELISA), the remaining chicken and turkey serums were negative for antibodies to AMPV. Table 1. Avian influenza virus (AIV) subtypes isolated from live-bird markets, FY 2001.

Table 1. Avian influenza virus (AIV) subtypes isolated from live-bird markets, FY 2001.

<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* (53)</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>H5N2* (1)</td>
</tr>
<tr>
<td>New York</td>
<td>Avian</td>
<td>H7N2* (366), H3N2 (3), H4N6 (8), H5N2* (4),</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H6N2 (3), H9N2 (1), H?N2</td>
</tr>
</tbody>
</table>

* The H5 and H7 AIV were characterized as low pathogenic.

The following report on Diagnostic Bacteriology was presented by Ms. Kathleen Ferris, NVSL:

Reagents supplied for the period of October 1, 2000 to September 30, 2001

Mycoplasma
Product                  Number of vials
Mycoplasma gallisepticum HA antigen, 5 ml  96
Mycoplasma meleagridis HA antigen, 5 ml  67
Mycoplasma synoviae HA antigen, 5 ml  93
Total vials of HA antigen supplied 256

Mycoplasma gallisepticum turkey positive control antiserum for HI test, 2 ml  28
Mycoplasma gallisepticum chicken positive control antiserum for HI test, 2 ml  153
Mycoplasma meleagridis turkey positive control antiserum for HI test, 2 ml  37
Mycoplasma synoviae turkey positive control antiserum for HI test, 2 ml  31
Mycoplasma synoviae chicken positive control antiserum for HI test, 2 ml  164
Mycoplasma gallisepticum plate test turkey positive control antiserum, 2 ml  14
Mycoplasma gallisepticum plate test chicken positive control antiserum, 2 ml  58
REPORT OF THE COMMITTEE

Mycoplasma meleagrisis plate test turkey positive
control antiserum, 2 ml 11
Mycoplasma synoviae plate test turkey positive
control antiserum, 2 ml 9
Mycoplasma synoviae plate test chicken positive
control antiserum, 2 ml 34
Mycoplasma negative plate and HI negative chicken
control antiserum, 2 ml 37
Mycoplasma negative plate and HI negative turkey
control antiserum, 2 ml 18
Total vials of control antiserum supplied 594

Avian Mycoplasma serology

MG, MM, and MS hemagglutination inhibition 227 tests

Summary
During a twelve month period (October 1, 2000 through September 30, 2001), the National Veterinary Services Laboratories (NVSL) performed 227 avian Mycoplasma hemagglutination inhibition tests. During this same period, clients requested and were provided 1280 ml of hemagglutination antigen and 1188 ml of control antiserum.

Salmonella
During the period of October 1, 2000 through September 30, 2001, the National Veterinary Services Laboratories provided 1,575 milliliters of Salmonella pullorum stained microtiter antigen, 805 milliliters of Salmonella pullorum tube test antigen, and 202 milliliters of Salmonella pullorum control antiserum to diagnostic laboratories for pullorum disease testing.

During the period of July 1, 2000 through June 30, 2001, the National Veterinary Services Laboratory serotyped 18,923 Salmonella isolates recovered from animals, their environment, or feed. Of these, 4147 were isolated from chickens or their environment and 3519 were isolated from turkeys or their environment. The most common serotypes found in poultry are listed in tables 1 and 2.
# TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

## TABLE 1

### CHICKEN—MOST FREQUENTLY IDENTIFIED SEROTYPES

<table>
<thead>
<tr>
<th>Clinical Disease</th>
<th>07/00 THROUGH 06/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heidelberg</td>
<td>100</td>
</tr>
<tr>
<td>Enteritidis</td>
<td>93</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>33</td>
</tr>
<tr>
<td>Kentucky</td>
<td>19</td>
</tr>
<tr>
<td>Bredeney</td>
<td>12</td>
</tr>
<tr>
<td>Others</td>
<td>71</td>
</tr>
<tr>
<td>Total</td>
<td>328</td>
</tr>
</tbody>
</table>

### ALL CLINICAL ROLES

<table>
<thead>
<tr>
<th>Clinical Disease</th>
<th>07/00 THROUGH 06/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heidelberg</td>
<td>2079</td>
</tr>
<tr>
<td>Kentucky</td>
<td>346</td>
</tr>
<tr>
<td>Enteritidis</td>
<td>293</td>
</tr>
<tr>
<td>Berta</td>
<td>248</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>234</td>
</tr>
<tr>
<td>Others</td>
<td>940</td>
</tr>
<tr>
<td>Total</td>
<td>4140</td>
</tr>
</tbody>
</table>

## TABLE 2

### TURKEY—MOST FREQUENTLY IDENTIFIED SEROTYPES

<table>
<thead>
<tr>
<th>Clinical Disease</th>
<th>07/00 THROUGH 06/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heidelberg</td>
<td>275</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>193</td>
</tr>
<tr>
<td>Senftenberg</td>
<td>112</td>
</tr>
<tr>
<td>Muenster</td>
<td>96</td>
</tr>
<tr>
<td>Bredeney</td>
<td>86</td>
</tr>
<tr>
<td>Others</td>
<td>286</td>
</tr>
<tr>
<td>Total</td>
<td>1048</td>
</tr>
</tbody>
</table>

### ALL CLINICAL ROLES

<table>
<thead>
<tr>
<th>Clinical Disease</th>
<th>07/00 THROUGH 06/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heidelberg</td>
<td>736</td>
</tr>
<tr>
<td>Senftenberg</td>
<td>480</td>
</tr>
<tr>
<td>Typhimurium</td>
<td>386</td>
</tr>
<tr>
<td>Muenster</td>
<td>368</td>
</tr>
<tr>
<td>Hadar</td>
<td>311</td>
</tr>
<tr>
<td>Others</td>
<td>1237</td>
</tr>
<tr>
<td>Total</td>
<td>3518</td>
</tr>
</tbody>
</table>

453
REPORT OF THE COMMITTEE

The following report on the National Poultry Improvement Plan (NPIP) was prepared by Mr. Andy Rhorer, APHIS, VS, NVSL, and presented by Dr. K.V. Nagaraja, University of Minnesota:

Pullorum-Typhoid Status:

In Calendar Year 2000, there were four isolations/outbreaks of Salmonella pullorum reported to the Poultry Improvement Staff. There was one isolation of Salmonella pullorum reported during Calendar Year 2001 from January to October 1, 2001. There have been no isolations of Salmonella gallinarum since 1988 in any type poultry.

All five 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 &lt; 15 birds</td>
<td>1</td>
</tr>
<tr>
<td>&gt;15 &lt; 25 birds</td>
<td>1</td>
</tr>
<tr>
<td>&gt;25 &lt; 50 birds</td>
<td>1</td>
</tr>
<tr>
<td>&gt;50 &lt; 75 birds</td>
<td>1</td>
</tr>
<tr>
<td>&gt;75 &lt; 100 birds</td>
<td>1</td>
</tr>
<tr>
<td>&gt;100 &lt; 200 birds</td>
<td>0</td>
</tr>
<tr>
<td>&gt;200 birds</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
</tr>
</tbody>
</table>

HATCHERY PARTICIPATION
IN THE NATIONAL POULTRY IMPROVEMENT PLAN
TESTING YEAR 2000

Egg and Meat-Type Chickens Participating - Number 310
Capacity - Eggs 720871396
Average per Hatchery 2379114
Participating Dealers 738
Participating Independent Flocks 41

HATCHERY PARTICIPATION
IN THE NATIONAL POULTRY IMPROVEMENT PLAN
TESTING YEAR 2000

Turkeys: Participating - Number 54
Capacity - Eggs 34748626
Average per Hatchery 709156
Participating Dealers 157
Participating Independent Flocks 29
## Transmissible Diseases of Poultry and Other Avian Species

### Hatchery Participation in the National Poultry Improvement Plan Testing Year 2000

#### Waterfowl, Exhibition Poultry, and Game Birds

<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>739</td>
<td></td>
<td>24085051</td>
<td>32903</td>
<td>498</td>
<td>2455</td>
</tr>
</tbody>
</table>

#### Egg-Type Chicken Breeding Flocks

- **U.S. Pullorum-Typhoid Clean**: Participating - Number 265
  - Birds in Flocks - Number 3520361
  - Average per Flock 13284
  - Primary Breeding Flocks
    - Flocks-Proportion of Total 19.2
    - Birds-Proportion of Total 5.5

#### Meat-Type Chicken Breeding Flocks

- **U.S. Pullorum-Typhoid Clean**: Participating - Number 5126
  - Birds in Flocks - Number 75616300
  - Average per Flock 14752
  - Primary Breeding Flocks
    - Flocks-Proportion of Total 14.1
    - Birds-Proportion of Total 6.8

#### Turkey Breeding Flocks

- **U.S. Pullorum-Typhoid Clean**: Participating - Number 717
  - Birds in Flocks - Number 5516096
  - Average per Flock 7693
  - Primary Breeding Flocks
    - Flocks-Proportion of Total 12.1
    - Birds-Proportion of Total 5

#### Waterfowl, Exhibition Poultry and Game Breeding Flocks

- **U.S. Pullorum-Typhoid Clean**: Participating - Number 3501
REPORT OF THE COMMITTEE

Birds in Flocks- Number 1003375
Average per Flock 287
Primary Breeding Flocks-Proportion of total 27.5
Birds- Proportion of Total 45.9

*Mycoplasma gallisepticum, Mycoplasma synoviae, and Mycoplasma meleagris* status 2000-2001 No. of Positive Breeding Flocks (Primary and Multiplier)

<table>
<thead>
<tr>
<th></th>
<th>Egg-Type</th>
<th>Meat-Type</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chickens</td>
<td>Chickens</td>
<td></td>
</tr>
<tr>
<td>Mycoplasma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>gallisepticum</em></td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td><em>synoviae</em></td>
<td>10</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><em>meleagris</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*U.S. Salmonella enteritidis Monitored* - Egg-Type Chickens
No. of flocks and birds in the flocks with *Salmonella enteritidis* isolates, 1990-2001

<table>
<thead>
<tr>
<th></th>
<th>Environmental</th>
<th>Dead Germ</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flocks</td>
<td>52</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>559871</td>
<td>77179</td>
<td>181342</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>1</td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>6000</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>400</td>
<td>46000</td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Birds in Flocks</td>
<td>3900</td>
<td>3700</td>
<td>1200</td>
</tr>
</tbody>
</table>

456
## TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

### 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>13</td>
<td>9</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Flocks</td>
<td>143000</td>
<td>3700</td>
<td>63900</td>
</tr>
<tr>
<td>13A</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Flocks</td>
<td>54321</td>
<td>27479</td>
<td>25092</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Flocks</td>
<td>28900</td>
<td></td>
<td>18900</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>15000</td>
<td>46000</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>12500</td>
<td>12500</td>
<td></td>
</tr>
<tr>
<td>RNDC</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flocks</td>
<td>7000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Newcastle Disease Update

The following report on New Approach in Reporting Occurrences of Newcastle Disease and Avian Influenza was presented by Dr. Michael David, APHIS, USDA:

Background

Compartmentalization is the concept of ecologically defining distinct animal populations of different animal status within a country’s territory. The intent of compartmentalization is to enable countries to segregate and isolate certain animal populations for a given disease agent and thus allow for the unimpeded international trade of such animals and their products. The merits of this concept are currently being debated. Many believe the concept has merit, but do question its practicality. Nonetheless, the idea appeals to many countries, particularly in the developing world, which otherwise are prevented from trading their animals and animal products. If a country has a sub-population (a compartment) that is free of the disease agent, even though that disease may exist in another population within that country, that country would be able to trade its animals and animal products from its free compartment.

Responding to requests from its Member Countries, the Office of International Epizootics (OIE) agreed to look at the concept of compartmentalization. The issue was how to address a Member Country’s List A disease status when such diseases are present in wildlife. Since there was particular interest in Newcastle Disease (ND) and Classical Swine Fever (CSF), the OIE’s Working Group on Wildlife Diseases was given the task of addressing the issue of compartmentalization in the context of these two diseases. However, it was recognized that compartmentalizing animal populations would be dependent on the ecology of the animal populations and the epidemiology of the disease in question.

While the term “compartmentalization” may be new, the concept is not.

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List A diseases are defined by the OIE as those diseases which have the potential for very serious and rapid spread irrespective of national borders, which are of serious economic and public health consequence and which are of major importance in the international trade of animals and animal products. They include such diseases as foot-and-mouth disease, highly pathogenic avian influenza, and classical swine fever.
TRANSMISSIBLE DISEASES OF POULTRY AND OTHER AVIAN SPECIES

diseases apply the concept at the premises level. In the United States, for example, the bovine brucellosis and the bovine tuberculosis programs establish "certified free herds" and "accredited free herds", respectively, when certain criteria are met. The diseases are compartmentalized to the herd level, recognizing the herd as free of that disease. The concept taken by the OIE is extended to larger population groups - wildlife populations and commercial poultry or livestock populations.

The challenge, therefore, comes when a country must show that a given population within its territory is free of the disease in question, and has the appropriate veterinary infrastructure (surveillance and laboratory support) to always prove such population remains free.

Based on the recommendations of the Working Group on Wildlife Diseases, in September of 2000, the OIE International Animal Health Code Commission drafted language for a new proposed Chapter on Newcastle Disease*, which, for the first time, presents the concept of compartmentalization.

The definition of Newcastle disease is defined in the OIE's Manual of Standards for Diagnostic Tests and Vaccines. This definition, which was adopted by the International Committee at 1999 General Session, is as follows:

"An infection of birds caused by a virus of avian paramyxovirus serotype 1 (APVM-1) that meets one of the following criteria for virulence:
  - The virus has an intracerebral pathogenicity index (ICPI) in day-old chicks (Gallus gallus) of 0.7 or greater.

Or

  - 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."

The proposed new Code chapter suggests that birds be defined as either domestic or free-living, and proposes that domestic birds be divided into two groups, commercial poultry and domestic birds that are not commercial poultry. Thus three "compartments" are suggested:

1. The commercial poultry compartment defined as "birds raised or held in captivity for the purposes of meat or table egg production or for re-stocking supplies of game, or other commercial products including the breeding stock for the aforementioned birds"

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* Proposals have not been adopted by the International Committee of the OIE, and cannot be considered as official recommendations by the OIE for international trade issues.
2. The domestic birds other than commercial poultry compartment defined as "birds other than commercial poultry kept in captivity, including racing pigeons and captive feral and wild birds"

3. The free-living bird compartment defined as "feral and wild birds that live without supervision, control by or dependence on humans". Should an outbreak of ND occur in the domestic birds other than commercial poultry compartment, the ND free status of the commercial poultry compartment will not be affected, and countries should not place trade restrictions. However, should an outbreak of ND occur in the commercial poultry compartment, the status of the domestic bird other than commercial poultry would be affected in that country.

The status of a given compartment is not affected if a country or zone vaccinates against ND as long as the master seed (in the case of live vaccines) does not have an ICPI of 0.7 or greater.

The proposed Code chapter outlines the criteria for the compartments to be considered free of Newcastle disease, and the conditions that need to be met to regain freedom should an outbreak occur in previously free domestic bird compartments. The proposed Code chapter also lists the health conditions an importing country may require for importing poultry and poultry products.

The following report on Change in Nomenclature, the Difference between Avian Paramyxovirus Versus Newcastle presented by Dr. Jack King, USDA, ARS, SEPRL:

Newcastle Disease (ND) Nomenclature – Differences Between the U. S. Code of Federal Regulations (CFR) and Office International des Epizooties (OIE) Definitions

Changes in the definition of reportable ND, those outbreaks that may impact international trade, have been presented in previous reports of this committee. These changes have evolved following improved control of virulent Newcastle disease virus (NDV) infections and recent events that have extended the definition of viruses that are a risk to poultry. The U. S. Code and the OIE definition of Newcastle disease were essentially the same until the new OIE definition was approved in 1999. The U. S. Code (9CFR53.1) (3) defines Exotic ND as any velogenic Newcastle disease, an acute rapidly spreading, and usually fatal viral disease of birds and poultry. The OIE (1,6) now defines ND as an infection of birds by a virus of avian paramyxovirus type 1 (APMV-1 synonymous with NDV) that meets one of the following criteria for virulence: a) The virus has an intracerebral pathogenicity index (ICPI) of 0.7 or greater. Or b) Multiple basic amino acids have been demonstrated in the fusion cleavage activation site of the virus. Therefore reportable ND is defined as Exotic ND in the U.S. and simply ND by the international standard. Further the U. S. definition includes only infections with highly virulent or velogenic viruses whereas the OIE definition includes infections of moderate virulence, the mesogenic strains, as well as the velogenic viruses.
Neither the CFR nor OIE provide a definition for other than reportable infections.

Some of the reasons the definition of virulence in the OIE standard was expanded to include viruses of lower virulence than velogens follow: 1) Some isolates from species other than chickens require chicken passage to acquire virulence. This occurred naturally with the ND outbreak in England in the mid-80s that was due to pigeon isolates that became virulent for chickens (2). 2) Mesogenic strains are not recovered from poultry except where mesogenic vaccines are used in control of virulent infections. Mesogenic isolates haven't been recovered from poultry in the U. S. since the 1970s. 3) The mutation of low virulence strains to a virulent form that caused the ND outbreaks in Australia has elevated the concern about the potential of low to moderate virulence strains becoming virulent (4).

Available evidence indicates that NDV isolates from U. S. chickens and turkeys have ICPIs well below 0.7 (5). This would classify them as low virulence, the lentogenic pathotype. The clinical disease, primarily respiratory in nature, which was the source of these isolates, was not reportable ND by either the current U. S. Code or OIE definitions. However, diagnosticians in the U. S. have in the past reported these low virulence NDV infections as ND, which they differentiate from the virulent, velogenic, reportable form they would call Exotic or velogenic ND. It is understood that the National Animal Health Reporting System uses international guidelines as the criteria for reporting OIE List A diseases like ND. Reporting the status of NDV infections in the U. S. is therefore complicated by differences in wording of the U. S. Code on Exotic ND and the 1999 OIE definition of ND. It is critical therefore that U. S. disease reporting clearly differentiate the common low virulence, lentogenic NDV infections from reportable ND. It remains to be determined whether infections with low virulence viruses should be reported as APMV-1 infections to differentiate them from ND, or to define the virulence of an isolate such as NDV, lentogenic type or NDV, with its ICPI value.

References:


Newcastle Disease (ND) World Situation – 10/1/01 to 11/2/01. The OIE Bulletin continues to report large numbers of ND outbreaks worldwide. Details of some of those are presented on the OIE web site http://www.oie.int. Italy and Australia have reported no further outbreaks and have been declared free of ND as of June 2001 and October 2001, respectively. The last outbreak in Australia was in February of 2000 and the last virulent virus detected in their national surveillance program was in March of 2000. V4 vaccine and killed vaccine use has continued but only in the state of New South Wales. In November 2000 Honduras reported two outbreaks of viscerotropic velogenic ND involving 45,000 birds in the same area where outbreaks occurred in June 2000. Mexico reported one outbreak in 10,000 chickens in the state of Durango in January of 2001.

The following report on Blackhead in Turkeys was presented by Dr. H.L. Shivaprasad, University of California:

Blackhead is a parasitic disease of turkeys, chickens, chukar partridges, peafowl, quail, guinea fowl and pheasants. The disease is caused by a protozoan parasite, *Histomonas meleagridis*. The disease caused severe economic losses to the turkey industry before modern practices of raising chickens and turkeys separately was instituted. The cecal worm of chickens, *Heterakis gallinarum* plays a prominent role in transmission of the protozoa. Turkeys between the ages of 7 and 24 weeks are most susceptible to the disease. Mortality in turkeys can range between 70 and 80 % and sometimes approaches 100 %. In chickens the mortality can approach 30 %. Various factors such as management practices, breed, age of infection, concurrent infections, virulence of the parasite, etc, may influence the severity of infection. Clinical signs include diarrhea with characteristic sulfur-colored droppings, anorexia, weakness, depression and loss of weight. Gross lesions consist of severe enlargement of the ceca with a caseous or necrotic core in the lumen, sometimes with hemorrhage, perforation and peritonitis. Mild to severe enlarged livers with a few to many white foci or characteristic saucer-shaped brownish depressions can be seen.

Recently there has been a resurgence of blackhead associated with high mortality in Leghorn pullets and broiler breeders in Southeast US and in turkeys in California and North Carolina. There have been five outbreaks of blackhead in turkeys in the last several months of 2001 in California involving
three different companies. In one company, turkeys between the ages 7 and 11 weeks on three different ranches experienced mortality ranging between 23 and 68% in a span of four weeks. In another company an outbreak of blackhead occurred in a 58 week-old turkey breeder flock of 9200 birds resulting in mortality between 5 and 22 birds per day for a period of 6 weeks. Details of an outbreak of blackhead in 7 week-old turkeys in another company are not known. Treatments with 3-Nitro and Histostat have not been helpful. Heavy culling of sick birds and prompt removal of dead birds has been helpful in slowing the spread of the disease. There was no evidence of cecal worms or earthworms involved in these outbreaks. However, there were large numbers of darkling beetles on some of the ranches.

8. 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 Committee on Salmonella met from 12:30 p.m. to 5:30 p.m. on November 4, 2001 with 32 members and guests. There was 1 resolution discussed recommending that the USAHA encourages Congress to provide mandatory funding for the Master Plan for facility consolidation and modernization. There were 9 presentations, 8 were poultry related.

K.E. Ferris and her coworkers from the National Veterinary Services Laboratory in Ames, Iowa presented serotyping results for 18,923 Salmonella isolates from animals and epidemiologically related sources reported during July 1, 2000, through June 30, 2001. The 10 most common serotypes account for 68% of the total isolates reported.

*S. typhimurium* continues to be among the 5 most frequently identified serotypes from chickens, and turkeys. *S. typhimurium* was identified in 11% of the turkey isolates, and 6% of the chicken isolates.

Andrew R. Rhorer, the Senior Coordinator of the National Poultry Improvement Plan - USDAAPHIS, provided the "National Plan's Status Report" on pullorum-typhoid status. In Calendar year 2000, there were four isolation/outbreaks of *S. pullorum* reported to the Poultry Improvement Staff. There was one isolation of *Salmonella pullorum* reported during Calendar year 2001 from January to October 1, 2001. There have been no isolations of *S. gallinarum* since 1988 in any type of poultry.

Dr. Michael Jolly from DiaChemix Corp, presented on detection of Salmonella enteritidis (SE) and Salmonella typhimurium (ST) cells by Fluorescence Polarization Immunoassay.

The FPIAs showed great promise for the very rapid and specific detection of SE and ST cells after culture.

Dr. Richard Gast from USDA-ARS Southeast Poultry Research Laboratory in Athens, GA reported on detection of antibodies to *Salmonella enteritidis* in Serum and Egg Yolks from experimentally infected laying hens by
Fluorescence Polarization. They evaluated the sensitivity and specificity of detection of specific antibodies in sera and eggs yolks from experimentally infected chickens by an FP assay using tracers prepared from the O-polysaccharide of SE and an enzyme immunoassay (ELISA) using an SE flagellin antigen. Both assays detected a high percentage of hens infected with SE but also identified a substantial number of hens infected with S. typhimurium as antibody-positive. The FP test often demonstrated both superior sensitivity and specificity in comparison to the ELISA.

Dr. Armando Mirande, from Biomune Company reported on reduction of the prevalence of salmonella enteritidis in the commercial egg industry through vaccination: The Pennsylvania experience. Analysis of PEQAP data from January, 1997 to December, 2000, show an 89% reduction in environmental samples (manure swabs) and a 93% reduction in eggs in SE bacterin vaccinated flocks when compared to contemporary, non-vaccinated flocks.

Dr. Sandra Kelly-Aehle and co-workers from Megan Health, Inc reported on protection of laying hens against wild type Salmonella enteritidis following vaccination with a modified live Salmonella typhimurium vaccine. She reported that recent clinical studies have shown that laying hens vaccinated with a higher dose of Megan Vac 1 were protected from internal organ infection and had significantly reduced GI tract, ceca and egg contamination after challenge with wild-type S. enteritidis. Three doses administered to pullets through coarse spray or drinking water application protected birds through a full lay cycle.

Drs. Doug Waltman and Chuck Hofacre from Georgia, presented data on protection of a live, attenuated Salmonella vaccine to a challenge of Salmonella enteritidis in commercial layers. They vaccinated commercial layer pullets 3 times as recommended by the producer with the Megan vaccine. The environment was monitored on both the pullet and layer farms where these birds were housed. At transfer to the layer house and at 30 weeks of age birds were removed and transferred to houses where they were challenged with a strain of S. enteritidis. The birds were cultured over a 4 week period for the presence and shedding of SE as well as egg production. They did not see a complete elimination of challenged SE in birds vaccinated with Megan vaccine in their studies.

Dr. Ed Mallinson made comments on perspectives of Salmonella control and research. His comments included the following: Farm building designs and operational procedures (e.g., uniform litter / manure surface airflow, water leakage control, etc.) now reported to suppress the multiplication of Salmonella in accumulated litter / manure appear central to true farm – level HACCP. This perspective is consistent with long-established health principles for concentrated populations of humans. Future food safety research should continue to explore / validate the value of house / pen design and management changes in Salmonella risk reduction / neutralization.
Avian Influenza in Europe, Asia and Central America during 2001

David E. Swayne and David L. Suarez, Southeast Poultry Research Laboratory, USDA, ARS, Athens, Georgia.

Avian influenza (AI) infections of poultry continue to be reported around the world in various countries. Most reports have been of mildly pathogenic (MP) AI, especially of H9N2 in Asia. Two highly pathogenic (HP) outbreaks were reported: Hong Kong (H5N1) and Pakistan (H7N3). MP AI (H5N2) continues to circulate in Mexico and Guatemala, and was reported for the first time in El Salvador during 2001. These three Central American MP AI viruses (H5N2) are of the same phylogenetic lineage. MP and HP AI continue to be a poultry health problem around the world. This report will not include the USA, which is covered elsewhere in this document by Dennis Senne, Thomas J. Myers and David L. Suarez.

Pakistan - H7N3 HPAI

In March 2001, AI viruses were identified in chickens from an isolated and relatively new poultry region of Pakistan 200 km southwest of Islamabad. The affected population was layers, broiler breeders and broilers with approximately 75% of the flocks experiencing mortality ranging between 20-85%. The total population of layers and broiler breeders affected was around 500,000. Out of 100,000 broilers (flock size 3000-5000) reared every week in this area, approximately 35% of the flocks were infected between 2-4 weeks of age. H9N2 and H7N3 avian influenza and Newcastle disease viruses were isolated in various combinations. Both HP and MP forms of the H7N3 virus were identified. Most of the flocks were depopulated and after a three month interval, the farms were operational. Vaccination is being practiced using a bivalent H7+H9 oil-based inactivated vaccine given at 15 days of age for all chickens, followed by two more doses at 8 week intervals for layers and breeders. This vaccination plan was based on the 1995 H7N3 AI experience. The H7N3 viruses are very similar to the 1995-96 H7N3 that caused a previous outbreak. Therefore, it is unclear if the HP H7N3 AI virus came from the field, was a laboratory escaped virus or was a laboratory contaminate. 2.2 million doses of the bivalent AI vaccine have been used as of fall 2001.

Hong Kong - H5N1 HPAI

From December 2000 to April 2001, 29 H5N1 HPAI viruses were isolated from ducks and geese in the Western Wholesale Poultry market. The hemagglutinin and neuraminidase were similar to those from the 1996 H5N1
virus isolated from a goose in Guangdong, China. Some internal genes were similar and some were of different lineages from the 1996 goose AI virus but all differed from the 1997 HP AI viruses isolated from chickens in the Hong Kong markets. An H5N1 was isolated from a chicken retail market in February. Increased mortality or signs of disease in birds were not reported. This virus was very similar to 2000-2001 H5N1 virus isolated from ducks and geese, but was not re-isolated despite repeated sampling of the market in the following 6 weeks.

In mid-May, 10 different retail markets had chickens with confirmed infections by H5N1 HPAI virus and three of these retail markets had high mortality rates. However, H5N1 infections of chickens were not demonstrated on Hong Kong farms. On May 21, 2001, the goose/duck and chicken wholesale markets and the chicken retail markets were closed, and the birds depopulated (http://www.info.gov.hk/gia/general/200105/18/0518293.html, http://www.who.int/disease-outbreak-news/n2001/may/18may2001.html). The retail markets were closed for approximately four weeks. Live chickens, quail and pigeons on local farms ready for market were destroyed within the first two weeks. A total of 1.6 million birds were depopulated in the markets and on the farms. Due to the closure of markets, importation of chickens from mainland China stopped. No human cases of influenza A (H5N1) virus have been detected. The strains isolated from these retail markets are genetically similar to the viruses isolated from ducks and geese in December 2000. The hemagglutinin gene is of the same lineage as the 1997 Hong Kong chicken AI viruses and the goose H5N1 viruses from 1996, 1999 and 2000 (Figure 1). However, all the internal genes differed from the 1997 H5N1 AI viruses and from some of the 1999 goose H5N1 AI viruses.

In July 2001, a bird was virus isolation positive for H5N1 HPAI. A monthly three day rest period was instituted in the wholesale markets and a 1 day per month rest period in all retail markets and stalls. All birds are sold and/or killed and the premises are cleaned and disinfected. Monitoring of the markets since July has not revealed additional H5N1 infected birds.

In April 2001, an H5N1 AI virus was isolated from duck meat imported from China to South Korea. The hemagglutinin gene of the virus is closely related to similar genes from viruses isolated in the Hong Kong markets.

Italy - H7N1 MPAI

In August 2000, H7N1 MPAI virus re-emerged in meat turkeys in the southern part of Verona province in Northern Italy. Limited vaccination is in progress as part of the AI control strategy. Vaccination will be allowed from mid-November 2000 to May 2002 in meat turkeys and table-egg layers in the restricted zone (2). Furthermore, optional authorization for vaccine use may be obtained for meat-type guinea fowls, capon farms and cockerel farms if the need arises (1). The vaccine is an inactivated whole H7N3 HPAI virus (A/CK/Pakistan/95/H7N3) and not the homologous H7N1 MPAI field virus (2). Initially, vaccinated and field exposed birds were differentiated based solely
on the serologic results of non-vaccinated sentinel birds maintained within the vaccinated flocks. A minimum of 100 non-vaccinated sentinels were used per farm or 50 per house. Ten sentinels were serologically tested each month, and if positive for AI antibodies on hemagglutination inhibition (HI) tests, 10 sentinels are sacrificed and samples taken for virus isolation. Since August 2001, an indirect immunofluorescent antibody test has been used to differentiate infected from vaccinated birds. A baculovirus with N1 gene insert is inoculated onto 96 well plates of insect cell cultures with expression of N1 protein in the cells. Test sera from the birds is incubated with the baculovirus-infected cells, washed and incubated with a secondary fluorescein-labeled conjugate. Birds immunized with the H7N3 vaccine are negative for N1 antibodies but birds exposed to the H7N1 field virus are N1 antibody positive. The presence of the H7 antigen in the vaccine provides protection against clinical signs and reduces virus shedding. Table eggs and meat from vaccinated flocks must be consumed in Italy and cannot be exported to other European Union countries.

Since August 2000 to March 2001, 71 flocks of H7N1 MPAI virus infected birds have been identified. However, the majority of the outbreaks occurred prior to the beginning of the vaccination campaign. Among the over 300 vaccinated flocks only 1 has had evidence of infection, as determined by serology and virus isolation. A second epidemic wave occurred in an area contigu-
Mildly pathogenic AI virus continues to circulate in some flocks of Central and Southern Mexico. Vaccination continues to be used in the control efforts. Over 1.3 billion doses of inactivated vaccine have been used since January 1995 and approximately 460 million doses of recombinant fowlpox-AI-H5 vaccine. The first dose of inactivated vaccine is administered at 8 days of age with boosters given at later dates. The inactivated vaccine is used in layers, breeders and broilers while fowlpox-AI-H5 recombinant is used only in broilers and is administered at the hatchery.

In March 2000, serologic detection of H5N2 infection was reported in chickens of central Guatemala. May 2000, an isolate was made and was typed at NVSL, Ames, IA as mildly pathogenic. In a 2000 survey, 13.8% of the farms were positive while in 2001 this has been reduced to 8.13% of the farms. The country is divided into 5 zones for AI control: 1) AI free zone (51% national territory - northeast area), 2) Epidemiologic study zone (prior to certification as free of AI - northwest area), 3) Infected zone (south central area - has highest concentration of chicken production), 4) Perifocal zone (surrounds infection zone), and 5) Area of Protection (Around the Perifocal Zone). Most recent national survey results: 1) 48 of 378 layer flocks infected (12.6%), 2) 15 of 358 broiler flocks (4.2%), 3) 19 of 3190 backyard flocks (0.6%) and 4) no infected breeder flocks. An AI-free farm must be serologically negative for 3 tests over a 6 month period and have specific biosecurity measures in place. They receive an AI-free certificate from the government for a six month period. If they become serologically positive, the certificate is rescinded and state epidemiological studies are initiated. There have been no isolations of AI virus in over 1 year, but antibody is being detected in sentinel birds in the infected zone. Some farms have had NDV, AI or combination of both NDV and AI. In layers, decreased egg production is the most common signalment with minimal or lack of excess mortality or clinical signs. Occasionally, there are mild respiratory signs. Eggs may be misshapen. Production returns to near normal levels in 2-4 weeks and egg quality will be normal.

The control program has three components - emphasis on biosecurity, education and use of vaccination. Vaccination is allowed in three areas: Infected Zone, Perifocal Zone and Area of Protection. Inactivated vaccine is allowed, based on Mexican H5N2 vaccine strain. AI-negative farms in the infected zone are required to have 50 non-vaccinated sentinels per flock for surveillance. In serologically positive farms, 100% birds are vaccinated until the last flock leaves the farm. The vaccination program for broilers uses inactivated vaccine at 8-10 days. For layers, first dose at 8-10 days, second dose between 10-12 weeks and third dose between 14-16 weeks of inactivated vaccine are given. A booster may be given between 35 and 40 weeks. Bivalent inactivated vaccine (H5 AI plus NDV) is used. The goal is eradication.
An H5N2 MPAI virus was isolated from poultry in El Salvador during the Spring of 2001. A vaccination program has been instituted with 10 million doses of recombinant fowlpox-Al-H5 and 3 million doses of inactivated H5N2 vaccines used by the first of October. The H5N2 AI viruses from Mexico, Guatemala and El Salvador are all closely related phylogenetically (Figure 2).

Acknowledgments
Information on status of AI in various countries was provided by Ilaria Capua, Khalid Naeem, Inpil Mo and Les Sims as personal communications. Information on Guatemala was obtained from a presentation on the subject given at the 17th Latin American Poultry Congress by Dr. Edgar Bailey.

References

A survey was conducted to determine the use of avian influenza (AI) vaccine in the US for the period July 1, 2000 through June 30, 2001. Thirty-one state veterinarians from major poultry producing regions were contacted and responded to a request for information on AI vaccine usage. Only 7 states had AI vaccine usage. Five states (IL, MI, NC MN, OH) used 2,697,000
doses of inactivated H1N1 vaccine to protect turkey breeders against H1N1 swine influenza. Missouri used autogenous inactivated influenza vaccine in 100,000 turkey breeders for the new H1N2 swine influenza virus. California allowed use of 677,000 doses of H6N2 inactivated AI vaccine on a single layer farm.

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<td>Turkey Breeders</td>
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The following report on Licensure and Use of AI Vaccines was presented by Dr. Lawrence Elsken, APHIS, USDA:

USDA, APHIS, Veterinary Services (VS) considers avian influenza in chickens to be an exotic disease and regulates the importation or interstate movement of AI viruses by permit (9 CFR 122.2). USDA, APHIS, VS, Center for Veterinary Biologics is responsible for ensuring that all veterinary biologicals marketed in the US, including AI vaccines, are pure, safe, potent, and effective (9 CFR 100-117). Specific guidance regarding the licensure and use of AI vaccines may be found in VS Memorandum No. 800.85, “Avian Influenza Vaccines.”
APHIS will consider licensing conventional killed AI vaccines, live or killed recombinant vaccines (that have immunogenic AI gene(s) inserted in the recombinant vector), subunit vaccines, or other biotechnology-derived AI vaccines. Due to the high rate of mutation documented for AI viruses, APHIS will not consider license applications for conventional modified live AI vaccines.

APHIS has issued both conditional licenses and full licenses for AI vaccines. Licensees issued conditional licenses must work toward, and demonstrate satisfactory progress toward, eventual regular licenses. Licensees must support applications for regular licenses with appropriate vaccination-challenge efficacy data. These challenge studies must be conducted under biosafety level 3 (BL3) containment conditions.

Distribution of AI vaccines is limited to authorized recipients designated by proper State officials (or foreign regulatory authorities for exported products). Domestic distribution and use is only allowed under the supervision or control of USDA, APHIS, Veterinary Services, as part of an official USDA disease control program.

The following AI Symposium Announcement was presented by Dr. David Swayne, USDA, ARL, SEPL:

5th International Symposium on Avian Influenza
Athens, Georgia, USA, 14-17 April 2002

The 5th International Symposium on Avian Influenza will be held at the University of Georgia Center for Continuing Education, Athens, Georgia, USA, on 14-17 April 2002. Sessions for oral and poster presentations will include global reports on avian influenza; avian influenza outbreaks in Hong Kong and Italy; avian influenza ecology and epidemiology including reservoirs; regulations, trade and risk assessment; impact of avian influenza viruses on human health; field experiences in control and eradication; vaccines and chemotherapeutics; pathobiology and pathogenesis; advances in molecular biology; diagnostics; and late breaking issues. During the opening banquet, Dr. Jeffery Taubenberger will give the symposium keynote address titled, “Characterization of the 1918 Influenza Pandemic Virus”. Online registration is preferred and is available at the symposium website: http://seprl.ars.usda.gov/AI%20Symposium/avian.influenza.symposium.htm. Registration brochures are available by contacting: Dr. D.E. Swayne, USDA-ARS, Southeast Poultry Research Laboratory, 934 College Station Road, Athens, Georgia 30605 USA; Phone: 706-546-3433; FAX 706-546-3161; E-mail: AI.symposium@seprl.usda.gov.

The following report on Mycoplasmosis was presented by Dr. Fred Hoerr, Auburn, AL:

The Mycoplasma Subcommittee met on Sunday, November 4, with 12 in attendance. The NPIP proposed rules for spike males classification of Mycoplasma gallisepticum Clean and Mycoplasma synoviae Clean were reviewed and feedback will be provided to the NPIP General Conference Committee.
Dr. Stanley Kleven submitted a report on research planned with Dr. Maricarmen Garcia to evaluate PCR primers for mycoplasma diagnostics and potential application to the NPIP. The research is supported by the US Poultry and Egg Association. National issues involving mycoplasmosis were reviewed; no major outbreaks or significant new diagnostic issues were identified for 2001.

10. New Business
   The following resolutions were discussed and approved:
   1. Support for the USDA ARS / APHIS Master Plan
   2. Encourage USDA ARS to complete and release the 2001 congressionally mandated feasibility study to consolidate avian disease research in Athens, Georgia.
   4. Support for Foreign Animal Disease diagnostic capability at the state and local level
Dr. Paul Anderson called the meeting to order at 12:30 pm. Over 100 people attended the meeting throughout the afternoon.

Concerns about foreign animal disease surveillance at the local level:

Dr. Robert Glock opened the meeting with a presentation on foreign animal disease diagnostic capabilities in the United States. He reported that early detection of foreign animal diseases may be seriously delayed due to lack of specific and distinct clinical signs and the fact that minimal numbers of herds are being sampled annually by the United States Department of Agriculture (USDA).

He also talked about daily movement of large numbers of animals throughout the United States and that, while necessary for effective commerce, such movement creates a critical need for early detection of the entrance of a foreign animal disease.

He suggested that effective foreign animal disease surveillance would be strengthened by the examination of larger numbers of specimens and animals than are currently examined by USDA. State and university veterinary diagnostic laboratories currently examine thousands of animals, specimens and sera from diseased domestic animals and wildlife on a daily basis. Testing for foreign animal diseases in these laboratories would greatly strengthen surveillance capabilities in the United States.

He talked about the importance of accurate disease reporting in regard to foreign animal diseases. It is understood that testing for foreign animal
diseases at the local level would be for screening and surveillance. Suspect or positive findings by state and university laboratories would be immediately reported to USDA and specimens forwarded to the appropriate USDA laboratory for confirmation. Final diagnosis of presence or absence of foreign animal disease in the United States would be made only by officials from USDA-APHIS-VS.

Rapid Diagnosis of Foreign Animal Diseases by Portable RT-PCR Assay:

Dr. Daniel Rock from the Plum Island Animal Disease Center in New York led a team that demonstrated and discussed the development of new portable Real-Time PCR (RT-PCR) tests for rapid diagnosis of foreign animal diseases. The team set up all the equipment and ran a test for foot and mouth disease. The test was completed and results shown during the one hour presentation. The idea is that these tests could be run at any location and could actually be taken into a field laboratory in the case of a foreign animal disease outbreak.

Bill Nelson and Johnny Callahan, representing Tetracore, Inc., explained how their company developed the tests and how the equipment worked.

Daniel Rock, Guillermo Risatti, Fred Brown and Manuel Borca explained the science behind the tests for foot and mouth disease and classical swine fever. According to their reports, these RT-PCR tests are sensitive and specific and performed well in early studies. Plans are now to take these tests to the field and evaluate them in areas of the world where these diseases are present.

Update on Swine Influenza in the United States:

Dr. Sabrina Swenson, from NVSL in Ames, Iowa, reported on swine influenza test results from samples collected over the last year.

Serotypes identified in swine were H1N1 (64%), H3N2 (32%) and H1N2 (2.7%).

Update on Swine Influenza and PRRS in Minnesota:

Dr. Kurt Rossow, from the veterinary diagnostic laboratory in Minnesota, reported on swine influenza and PRRS in Minnesota.

His findings on swine influenza mirrored those from NVSL. While most cases reported in Minnesota are H1N1 or H3N2, he is seeing some H1N2. Interestingly, he is seeing many herds that have antibodies to all 3 types. Also, with the increase in size of swine operations, he observed that disease caused by swine influenza is becoming less seasonal and more endemic in these larger units.

He discussed a regional episode of PRRS near Mapleton, Minnesota. This episode involves multiple farms in the area and is clinically more severe than cases seen in other parts of the state. Abortion rates on affected farms approached 50%. Mortality rates were 50% in farrowed pigs, 30% in nursery pigs, and some deaths occurred in sows. Virus sequencing of ORF5 indicates that this strain of PRRS is significantly different than either the North
TRANSMISSIBLE DISEASES OF SWINE

American or the European strains and that is not a recombination of existing strains. The virus appears to be a new introduction.

Current procedures for submission of samples for Foreign Animal Disease (FAD) investigation:

Dr. Paul Ugstad, AVIC from California and Nevada, summarized for the group how samples are currently classified and submitted for FAD diagnostics in the United States.

Under current protocol, when a veterinarian or producer thinks a FAD may exist, they notify the state veterinarian or the AVIC. A foreign animal disease diagnostician (FADD) is then assigned to go to the farm, evaluate the situation and collect samples. Depending on findings, the case is given a priority. All samples for foot and mouth disease or classical swine fever are sent to the USDA-APHIS laboratory on Plum Island.

Priority 1 is given to cases that are "highly likely". These samples are sent by overnight mail, or in some extreme cases, are hand carried to Plum Island. In these cases, technicians would work overtime and diagnosis would be made as soon as possible.

Priority 2 is given to cases that are "possible". These samples would be sent to Plum Island by Federal Express and technicians would complete testing as quickly as possible.

Priority 3 is given to cases that are "unlikely". These samples would still be sent to Plum Island by Federal Express, but testing would be completed as time permits.

In most cases, once it is determined that a foreign animal disease is not involved, the case is closed and no further testing is done on the samples to identify the definitive disease. Differential diagnostics are done as time permits and at the discretion of the AVIC and NVSL.

National diagnostic capabilities and issues surrounding local diagnosis of foreign animal diseases:

Dr. Joe Annelli, Chief of USDA-APHIS-VS Emergency Programs Staff, and Dr. Tom McKenna, Chief of the Foreign Animal Disease Diagnostic Laboratory (NVSL-FADDL) at Plum Island, led a discussion of the issues surrounding diagnosis of foreign animal diseases at the local level.

They talked about real concern from USDA-APHIS-VS that if FAD diagnostic tests are run at local laboratories, a "false positive" diagnosis might be made and announced prematurely to the public. They talked about the international trade implications surrounding an incorrect diagnosis of a FAD in the United States.

Committee members assured Dr. Annelli and Dr. McKenna that local laboratories would not make final diagnosis of FADS. They would run tests. Suspect or positive samples identified by state and university laboratories would be immediately reported to USDA-APHIS-VS and forwarded to the appropriate USDA laboratory for confirmation and final resolution.

Dr. Annelli and Dr. McKenna expressed serious reservations, but as-
REPORT OF THE COMMITTEE

sured the group that they would consider the possibility of testing for FAD at the local level.

Committee Actions:
The Committee considered and approved two resolutions to forward to the resolutions committee.

The first is entitled "USDA ARS/APHIS Master Plan" and supports the renovation and improvement of the laboratory facilities in Ames, Iowa.

The second is entitled and supports the idea of establishing "Foreign Animal Disease (FAD) diagnostic capability at the state and local level."

Background Information: Under current protocols, testing for a foreign animal disease (FAD) such as Foot and Mouth Disease or Classical Swine Fever in the United States can only be accomplished by shipping samples to USDA National Veterinary Services Laboratories. The process of shipping samples to these laboratories takes time and a great deal of effort and is not one that is normally used unless signs are very strong that a FAD may exist. Also, the current protocol is not one that is conducive to screening routine laboratory submission for foreign animal diseases.

If an outbreak of a foreign animal disease occurs in the United States, early detection will be critical in the containment and elimination of the disease. Probabilities suggest that by the time an outbreak is detected, it will already have spread to more than one location, probably in more than one state. Our ability to respond could be greatly increased by the ability to conduct tests for FADs at the local level.

With the development of new diagnostic tests such as PCR, it seems that early detection and rapid response to a foreign animal disease outbreak could best be accomplished if state veterinary diagnostic laboratories are trained and equipped to run FAD diagnostic tests. Sample submission would be more rapid than current protocols allow and it is likely that routine screening for FADs would increase. FAD diagnostic capabilities at the local level would increase the likelihood of early detection of a FAD outbreak in the United States.

Proposed Resolution: USAHA urges USDA-APHIS to implement a program to train, equip and encourage state veterinary diagnostic laboratories to run tests and enhance surveillance for diseases that are foreign to the United States.

The committee adjourned at 5:45 pm.
REPORT OF THE COMMITTEE ON TUBERCULOSIS

Chairman: Dr. Charles E. Massengill, Jefferson City, MO
Vice Chairman: Dr. Richard D. 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, OK; Dr. Carole A. Bolin, MI; Dr. Richard E. Breitmeyer, CA; Dr. H. Michael Chaddock, VA; Dr. Thomas F. Conner, IN; Dr. Robert A. Cook, NY; Dr. James J. Corbett, CA; Mr. Ed Corrigan, WI; Dr. Donald S. Davis, TX; Dr. Jere L. Dick, NC; Dr. Steven R. England, NM; Ms. Ethel M. Evans, CO; Mr. Joe B. Finley, TX; Dr. Murray E. Fowler, CA; Ms. Barbara R. Fox, MD; Mr. Bob Frost, CA; Dr. Arnold A. Gertonson, MT; Dr. Michael J. Gilsdorf, MD; Dr. Larry M. Granger, MI; Dr. Thomas J. Hagerty, 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. Luisa Ibarra Lemas, ; Dr. Victor P. LaBranche, MA; Dr. Robert M. Meyer, CO; Dr. Michael W. Miller, CO; Dr. James E. Oosterhuis, CA; Dr. Mitchell V. Palmer, IA; Dr. Janet B. Payeur, IA; Mr. Scott Petty, Jr., TX; Dr. Michael Piontkowski, CO; Dr. Mo D. Salman, CO; Dr. David D. Schmitt, IA; Dr. Stephen M. Schmitt, MI; Dr. Larry A. Schuler, ND; Dr. Clarence J. Sirko, WI; Dr. Ralph E. Slaughter, NE; Mr. Les C. Stutzman, NC; Dr. Charles O. Thoen, IA; Dr. Dennis L. Thompson, CA; Dr. Tom Thorne, WY; Dr. Cheryl B. Tillman, OR; Dr. Paul O. Ugstad, CA; Dr. Joseph S. VanTiem, MD; Mr. Alejandro Varela, AZ; Ms. Diana L. Whipple, IA; Mr. Dave Whittlesey, CO; Dr. George O. Winegar, MI; Mr. Steve Wolcott, CO; Dr. Glen L. Zebarth, MN.

The Committee on Tuberculosis met on Monday, November 5, 2001. Over 73 people attended.

Update on U.S. Regulatory Initiatives—Dr. John Clifford, USDA/APHIS/VS

Status Report on Bovine and Cervid TB Eradication Program in the U.S.—Dr. Joe VanTiem, USDA/APHIS/VS

Update on TB Surveillance in the U.S.—Dr. Bob Meyer, USDA/APHIS/VS

Status Report on Mexico TB Eradication Program—Dr. Ricardo Flores Castro, SAGARPA

Status Report on Canada TB Eradication Program—Dr. Maria Koller, CFIA

Report on Riding Mountain National Park—Dr. George Luterbach, CFIA

U.S./Mexico Binational TB Committee Report—Dr. Billy Johnson, BNC

Activities Related to South American Camelids—Mr. Bob Frost, South American Camelids
REPORT OF THE COMMITTEE

Report of the TB Scientific Advisory Committee—Dr. Dianna Whipple, USDA/ARS
Update on PCR on Fixed Tissues—Dr. Janis Miller, USDA/ARS
Update on Michigan Bovine Tuberculosis—Dr. Larry Granger, Mi. Department of Agriculture
Update on Bovine Tuberculosis Transmission Studies—Dr. Dianna Whipple, USDA/ARS
Update Report Tuberculin Tests in Reindeer Sensitized with Bovine Sensitinogen—Dr. Michael Philo, USDA/APHIS & Dr. Linda Carpenter, USDA/APHIS
Industry Perspective on Tuberculin Testing of Reindeer—Mr. Tom Sheib, Reindeer Owners & Breeders Assn.

Committee Action Items

The Committee considered and passed three resolutions. One, a resolution already passed in another Committee, requested that the USAHA encourage Congress to provide mandatory funding for the USDA-ARS/APHIS Master Plan for Facility Consolidation and Modernization. This resolution was similar to one passed last year but added wording to provide for mandatory funding. The second resolution asked that USDA-APHIS approve the tuberculosis PCR assay as an official USDA laboratory procedure for the diagnosis of tuberculosis in livestock. The third resolution requested that USDA-APHIS exempt reindeer from the definition of Cervidae in the UM&R.

One recommendation was approved and forwarded to the USAHA President for concurrence and forwarding to USDA, APHIS.

RECOMMENDATION # 1
SUBJECT: REQUEST TO ESTABLISH WORKING GROUP TO REVISE TB UM&R
RECOMMENDATION:

The Committee on Tuberculosis recommends that the committee chair appoint a subcommittee to review the TB UM&R in order to provide recommendations for revision to bring it in-line with the Code of Federal Regulations. These recommendations for change are to be provided to Committee members for review prior to the 2002 meeting of the Committee and discussed for action at that meeting.

Dr. John Clifford, USDA/APHIS Assistant Deputy Administrator for Veterinary Services, gave an update on current and pending regulatory initiatives for TB. He mentioned that the rule for fair market value for indemnification was in the agency clearance phase. The buyout of the approximately 20,000 dairy cattle in the El Paso area was in the rule drafting stage. No dairies would be allowed back in the area for at least 15 years. Also, a bill has been introduced in Congress to grant 2-5 year tax deferrals for those dairies slated for buyout. The interim rule on TB was being finalized and would be published within the next two months. In the meantime, modifications of the proposed interim rule were already being enforced including the
requirement for an import permit with the exception of Canada and some states in Mexico. The international rule on TB should be published for comment by summer of 2002. The UM&R was slated for revision to bring it in agreement with the recently revised CFR. Dr. Clifford also talked about the fact we were in a transition from the Border States Consensus Document to the International Rule. In this transition, APHIS was reviewing states in Mexico to see where they fit into the statuses of the U.S. domestic rule for TB. Sonora had recently been recognized as meeting regionalization requirements for two zone designations; modified accredited advanced in the north, and modified accredited in the south. Finally, he mentioned the risk modeling that they were conducting to see if the prevalence levels set for the domestic TB rule were correctly set.

Status of the State and Federal Cooperative Bovine Tuberculosis Eradication Program
Fiscal Year 2001
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National Animal Health Programs
USDA, APHIS, VS

The 2001 fiscal year was a year that showed how a small increase in surveillance can find sources of domestic infection that were previously undiscovered. At the end of the 2001 fiscal year, 48 States, Puerto Rico, and the US Virgin Islands were free of bovine tuberculosis in cattle and bison (figure 1). The State of Texas is split into two status zones for the State to enhance eradication efforts in the El Paso, Texas area. The State of Michigan is classified as Modified Accredited. Current regulations have assigned status for captive cervids at Modified Accredited status for every State. This status will be a temporary level for most States, and Veterinary Services (VS) will work with all States to develop measurable surveillance for tuberculosis in those species. VS will also work with industry groups and research institutions to assure that testing protocols are adequate and reasonable in all cervid species, including reindeer.

During 2001, 13 newly infected cattle herds were disclosed, four herds were carried over from the previous fiscal year and there were no newly infected captive cervid herds (figures 1&2). 7 beef herds and 2 dairy herds were identified in northeastern lower Michigan. These herds are most likely associated with the endemic infection of white tailed deer in that area. Two large infected dairy herds in El Paso was carried over from the previous fiscal year, due to our inability to depopulate that herd with our current indemnity scale. These herds were previously infected and had successfully tested out from under State quarantine, but it is just as likely that they were re-infected, rather than a recrudescence of disease.
REPORT OF THE COMMITTEE

State Status for Cattle and Bison

September 2001

Figure 1

USDA

13 Cattle/Bison herds affected during FY 2001

Figure 2

Quarantined (4) Depopulated (9)
*released from quarantine this fiscal year
TUBERCULOSIS

Forty-eight States plus the US Virgin Islands and Puerto Rico are Accredited-free for bovine tuberculosis in cattle and bison. Only two States remain as not having Accredited-free status, Michigan and Texas (figure 1). Texas has established a split status zone that focuses eradication efforts on the final pocket of disease in that State. Michigan is currently classified as Modified Accredited for the entire State. VS is working with Michigan officials to develop split status requirements for the State that would better focus on eradication of tuberculosis in Michigan.

Dairy herds in the El Paso, TX area have been infected with *M. bovis* since 1985. Depopulation of TB infected herds is the method of choice in eliminating this disease from a herd and some El Paso dairies have been depopulated. However, current indemnity rates would not cover the losses that the 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 averaging around $1.2 Million.

The science indicates that as long as the Mexican dairies continue to have a high prevalence of TB and are located near the border 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 be paid for all cattle taken as a result of the bovine tuberculosis eradication program. VS is considering such a regulatory change during FY 2002.

Simply depopulating the infected dairies in the El Paso area and allowing them to repopulate and stay in the dairy business will not succeed in the eradication of 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 US. This action will create a buffer zone between TB infected dairies in Mexico and the US. This would allow the entire State of Texas to be declared free of TB and leave TB in Michigan the remaining State in the US being recognized internationally as not free of bovine TB.

In Michigan, transmission of TB is occurring by more traditional routes of TB transmission from infected to a susceptible species of animal. Transmission from deer to deer is predominately from artificial manipulation of a wild population; congregation occurs associated with supplemental feeding of deer. Control of the artificial feeding 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 infected deer could be curtailed quickly, given adequate surveillance. Since June 1998, there have been
fourteen infected beef herds in Michigan, two infected dairy herds, and one infected captive cervid herd.

Currently there are 38 States that have been at Tuberculosis Free status for over ten years and 44 States that have been free for more than five years. Of these, only 2 have had singleton cases of bovine tuberculosis, North Dakota and Kansas. These States depopulated those herds and conducted the epidemiologic investigation associated with each case, as per the regulations in the Code of Federal Regulations, to maintain Accredited Free status.

There were no captive cervid herds affected with bovine tuberculosis during fiscal year 2001 (figure 4). This is the second year that no cases of bovine tuberculosis were disclosed, even in the face of higher levels of surveillance and more stringent movement requirements. Since 1991, there have been 36 cervid herds in the United States (US) that have been identified with bovine tuberculosis (figure 5). All States are currently at Modified Accredited for bovine tuberculosis in captive cervidae. In order to maintain status, every State will require a review of their program and surveillance plan.

The main avenue of surveillance for cattle and bison, slaughter surveillance, is still inadequate to detect tuberculosis in the United States cattle and bison populations, although great progress has been made over the past year. During fiscal year 2001, there were 2,991 submissions from slaughter plants across the country and 71 tuberculosis cases diagnosed from these submissions (figure 6). This represents a 2.9 fold increase over the previous fiscal year. However, when the data is analyzed further, it shows that 33% of the total submissions were from 3 slaughter plants in 3 States (figure 7). Since these three plants are primarily adult-kill plants, they also account for almost half of the adult submissions last year, with a Pennsylvania plant accounting for over ¼ of the total adult submissions (figure 8).

Mexican origin feedlot cattle continue to be a source of tuberculosis cases seen at slaughter in the United States (figure 9). Eighty percent (figure 10) of the closed feedlot investigations had direct evidence of a Mexican origin. This is an increase in percentage and absolute number from previous fiscal years.

The regulations that were recently finalized in the tuberculosis program reinforce the concept of risk-based interstate and international 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.

Come February 20, 2002, all Mexican States that wish to move cattle to the US and to other regionalized Mexican States will have to have a regionalization request in place. Any country/region can ask for regionalization at any time. The September 1, 2001 deadline for submission was to assure that any request could be included in the proposed international rule. If
TUBERCULOSIS

Tuberculosis Freedom in the US:

- >25 years (10)
- > 15 years (18)
- > 10 years (10)
- > 5 years (6)

Recent outbreak, depopulated and found not to have spread within 90 days of disclosure as per CFR.

ZERO Captive Cervidae herds affected in FY 2000 or FY 2001

- Tuberculosis in free-ranging white-tailed deer

Figure 3

Figure 4
REPORT OF THE COMMITTEE


- Tuberculosis in free-ranging white-tailed deer
- All States Currently Classified as Modified Accredited

**Figure 5**
- Quarantined and Tested Out – 11 (31%)
- Depopulated – 25 (69%)

Suspicious Lesions Submitted from Regular Slaughter

Fiscal Year 1992 - 2001

**Figure 6**

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Submissions by State

Exactly 33% of all submissions nationwide originated from 3 slaughter plants in 3 States.

Adult Submissions

Almost half of all adult submissions nationwide originated from 3 slaughter plants in 3 States, and over ¼ of those were from Tailor Packing in PA.
59% of cases most likely due to Mexican origin cattle.
7 cases couldn't be traced to a herd of origin
16 cases still pending

Completed Slaughter Investigations of Feedlot Origin and Percent Traced to Mexico
Fiscal Year 1992 - 2001
Reviews of the Mexican TB Program

Scheduled Reviews:

- September - Chihuahua
- October - Durango, Tamaulipas, Aguascalientes, Campeche, and Chiapas
- November - Coahuila, Sinaloa, Nuevo Leon, San Luis Potosi, and Colima
- December - Baja California, Baja California Sur, Tabasco, and Vera Cruz
- January - Yucatan Quintana Roo, Nayarit, Zacatecas, and Jalisco

Trend in Tuberculosis Eradication

- Infected Herds
- Eradication Trend
- Eradication Goal

Figure 11

Figure 12

487
requests were received after this deadline, they still may make the rule, but no assurance could be made. An aggressive review schedule is in place for the Mexican States that wish recognition (figure 11). The international rule will mirror our domestic rule and will be finalized in about two years.

On October 23, 2000, the Secretary of Agriculture declared an emergency in connection with an opportunity for the United States Department of Agriculture to accelerate the eradication of tuberculosis from the United States. An emergency declaration will allow the U.S. Livestock industry to become more competitive in the global market, and further protect the public health from this zoonotic disease.

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 the its reputations 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, but also the purchasers' perception of quality, contribute to continued world market acceptance. 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).

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 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. The trend of tuberculosis eradication in the United States is disturbing and shows that, given the current number of herds found to be infected over a fiscal year, a projected eradication date that is well beyond the 2003 eradication goal (figure 12).

Tuberculosis has 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.

The bovine TB situation in Michigan has prompted the Michigan to request provisions for recognition of zones within a state as a means to focus disease eradication efforts. Two status zones, each containing a contiguous geographic area, are allowed in any one state for bovine tuberculosis program status as defined in Title 9, Code of Federal Regulations (CFR). Therefore, zoning will allow for two levels of infection within a state, separated by a recognizable boundary.

We are also proposing to pay indemnity based on market value of the animal, create a TB buffer zone in El Paso by eliminating all dairy operations in that region, establishing baseline international import requirements with respect to bovine tuberculosis, and proposing international import requirements based on regionalization requests.

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. The reviews of the Mexican programs and regionalization of Mexican States will dramatically decrease the risk of importing tuberculosis infected feedlot cattle.

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.

2001 was a very active year in the bovine tuberculosis eradication program. The trend in tuberculosis eradication is distressing and indicates that the 2003 eradication date might not be achieved (figure 12). 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 followed through with a continued commitment to surveillance, then the eradication date will be met.

The author wishes to acknowledge the valued contributions of Robert M. Meyer, Epidemiology Officer of the Western Region, VS; Dionne Murray, Veterinary Program Assistant, VS, Riverdale, Maryland

SURVEILLANCE FOR BOVINE TB IN CATTLE IN THE UNITED STATES FISCAL YEAR 2001

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Slaughter surveillance for bovine tuberculosis (TB) in the United States during Fiscal Year 2001 continued to identify new cases of TB in both adult and immature cattle. Seventy-one (71) cases of mycobacteriosis were found in cattle in U.S. slaughter plants during the past fiscal year. These findings represent a 309% increase in the total number of positive cases from the year previous when 23 total cases were detected.

Six cases (8%) of the 71 positive slaughter cases were found in adult cattle two years of age or older. Sixty-five (65) cases were detected in fed or
Results of investigations of the 6 cases from adult cattle showed that 4 cases were caused either by *M. avium* or Johne's disease, and were not caused by *M. bovis*. The other 2 adult cases were true bovine tuberculosis cases. Extensive investigation and testing of consignors comprising the slaughter lot failed to identify a source for infection in one of the 2 adult TB cases. Lack of good identification on this particular animal at the time it was slaughtered seriously hampered investigation of this case. Testing of the most probable herd of origin (based upon official backtag information) for the second adult TB case was conducted in Texas, and a new infected beef herd was found. This beef herd was depopulated with indemnity, and a thorough epidemiological investigation was conducted.

Meat inspection personnel with the Food Safety Inspection Service (FSIS) working at a plant in southwestern Texas made the initial submission of the suspicious granuloma that led to the discovery of this herd, and, as a result, were recently awarded a substantial APHIS performance award for their efforts.

Investigations completed to date in 51 of the 65 immature (fed) cattle cases showed that 18 cases from steers or heifers wore official Mexican ear tags at the time they were slaughtered. The epidemiologic investigation of 23 other cases clearly showed the origin of the cattle to be from Mexico. 80% (41 of 51 cases) of the immature cattle cases closed to date traced to Mexico. Six (6) cases were unable to be effectively traced past the feedlot. Two (2) of these 6 cases were found in steers previously used for roping or rodeo events. Three (3) cases of mycobacteriosis in fed cattle were determined to have been caused by *M. avium* or Johne's disease, and 14 cases are still being investigated.

One case of TB was detected in a lot of heifers from Michigan slaughtered in a large plant in Pennsylvania. Investigation of this case also led to a newly recognized beef herd in northeastern Michigan, and meat inspection personnel at this plant were also recognized for their significant contribution to the TB eradication program.

Efforts have been made during the past few years to communicate the need to collect all identification from animals for which a granuloma submission is being made. Fifty (50) of the 71 (70%) cases found in cattle at slaughter during FY 2001 had some form of ID collected. Twenty-one cases (30%) had no ID of any type. These percentages suggest improvements are continuing.

A closer examination of cattle importations from Mexico is warranted especially since 80% of FY 2001 fed cattle cases closed to date indicate their origin to be from herds somewhere in Mexico. For the past 3 years, importations of feeder cattle have continued to increase resulting in over 1.2 million steers/heifers exported to the United States from various states in Mexico last year. This trend tended to be the same in all the major Mexican
exporting states over the past three years.

TB lesioned cattle identified with Mexican eartags at the time of slaughter have followed this same trend over two year periods since 1997. Eight Mexican eartags were recovered from TB-infected steers or heifers during the period 1997 & 1998, and 24 official tags have been collected in U.S. plants since October, 2000. These tag numbers have been communicated to Mexican animal health authorities for follow-up investigations in their country.

An analysis of Mexican State TB case rates, based on the number of feeder animals being exported from each state, for the past 2 years also suggests some interesting trends in certain states. Only 2 Mexican states, Coahuila and Nuevo Leon, had decreasing TB case rates. The rates in other Mexican exporting states increased to varying degrees.

Surveillance for the remaining cases of bovine TB in our nation's cattle population is largely dependant on efforts of our state and federal meat inspection agencies. About 6 million adult cattle and 30 million immature cattle are slaughtered and inspected in U.S. plants each year. 1,028 suspicious tissues from all classes of cattle were submitted to the National Veterinary Services Laboratories (NVSL) for TB diagnosis in FY 2000. This past year at least 2,991 submissions were made. Granuloma submissions from adult cattle, which may be more representative of the status of our native herds, increased from 436 submissions in FY 2000 to 2,030 in FY 2001. The national adult granuloma submission rate at the end of this year of 3.29 per 10,000 adult cattle killed represents an increase of over 4 times what it was a year ago, and is now over halfway to our target of 5 submissions for every 10,000 head of adult cattle slaughtered.

A closer analysis of these adult granuloma submission rates by regions in the United States shows distinct variations between some regions. However, all regions improved their rates over the year previous. During FY 2001, the achievement of adult granuloma submission rates of 5.6 and 4.5 in the western and northern areas of the United States respectively was outstanding. Plants in both these regions combined killed slightly over 50% of all adult cattle, but submitted 76% of all the granulomas from adult cattle.

During FY 2001, 42 plants located in only 19 states slaughtered over 93% of all adult cattle. Granuloma submission rates per 10,000 adult cattle killed ranged from 17.25 to 0 in these 42 plants. These plants are critical in our national disease surveillance programs.

Outstanding efforts were made particularly in 8 of these 42 major, adult-kill plants. Each of these 8 plants exceeded adult submission rates of 4 submissions for every 10,000 adult cattle slaughtered. These 8 plants are located in the seven states of Pennsylvania, California, Wisconsin, Idaho, Nebraska, Texas, and Ohio.

Similar good efforts in supporting the TB surveillance program were made last year in 8 plants that slaughter predominantly large numbers of fed cattle (> 250,000 head slaughtered/year). These plants collectively submitted 608
of the 961 submissions from fed or immature cattle. States where these plants are located are Arizona, Colorado, Idaho, Michigan, Texas, and Utah.

However, 19 of the 42 plants killing the majority of adult cattle in the U.S. submitted at a rate of less than 1 submission per 10,000 adult cattle slaughtered. Since these 19 plants collectively kill 43% of all adult cattle, it is imperative that continued efforts are made to increase their submission rates. This will provide added assurance that the areas from which they are receiving cattle are truly free of bovine TB.

Several program enhancements were added or emphasized during the past year that positively impacted the bovine TB surveillance program in cattle. A laminated TB poster was developed and distributed to over 500 plants emphasizing the important role that meat inspectors play in the program. An initial printing of a TB Surveillance newsletter was also distributed, and elements of this report will be included in the next issue. The APHIS Performance Awards program was improved to provide more incentives for sending in suspicious samples by increasing the award for finding a positive case, and now also includes provisions for recognizing frequent submitters and supporters of the surveillance program. State and federal animal health personnel also increased their contacts with state and federal meat inspection personnel at various levels of their organizations to elicit their continued support. The professional staff at our national laboratory developed and distributed improved TB mailer kits, and the communication of lab results back to case submitters and epidemiologists was enhanced by implementing such ideas as overnight delivery of samples to the lab and the use of computers to fax results directly back to the field.

In quick summary, the increased numbers of TB suspicious granulomas that were sent to NVSL, especially from adult slaughter cattle, this past year indicates renewed and continued commitment to TB surveillance by our state and federal meat inspection agencies. However, the challenge now is to continue to improve this surveillance consistently across the nation in all plants.

The increased number of TB positive cases detected this past year, especially in immature cattle, indicates that our surveillance program at slaughter is functioning. However, there is strong evidence and concern that many of these case are originating in shipments of cattle from certain areas outside the United States. We must continue to be diligent in our efforts to manage this situation.

The authors acknowledge the many state and federal animal health personnel who contributed data for compilation of this report.

Dr. Ricardo Flores of the Office for the General Direction of the Animal Health Programs of Mexico gave an update of the progress and future plans for the bovine tuberculosis eradication program in Mexico. Dr. Flores explained that seven states are currently in the eradication phase of the Mexican tuberculosis program, with the remainder of Mexico being in the control phase of the program.
REPORT OF THE COMMITTEE

The number of animals tested for tuberculosis in 2001 is behind the 2000 because of the timing of the federal funding cycle. But, cattle testing is expected to increase this fall and winter. As of the end of October 2001, 2,502,596 total cattle have been tested. Included in that number are 684,690 animals tested for export. There has been a slight increase in the percentage of reactors disclosed over the tests performed in 2000. There has also been an increase in the number of Mexican origin cattle with tuberculosis lesions at slaughter in 2001.

Dr. Flores explained that the plans for the remainder of this year and next year are directed toward three major areas. First, work is in progress toward harmonization of the Mexican NOM with international criteria. Second, increased efforts encouraging regionalization efforts. And finally, to increase campaign activities nation wide.

Dr. Maria Koller, Canadian Food Inspection Agency, gave an update of their eradication program. Canada continues to near the complete eradication of bovine tuberculosis from cattle and farmed bison. Presented in the attached table, is a summary of the 9 separate outbreaks in 5 of Canada’s provinces during the period from 1991 through 2001. No cases of bovine tuberculosis were found in cattle or farmed bison in 1993, 1995, 1998 and 2000 (see Table 1).

All 16 infected herd were depopulated. All exposed susceptible animals were traced out of the infected herds, investigated, tested and destroyed. Tissues from all exposed trace-outs were submitted for histopathology and culture. Federal compensation was paid for all animals ordered destroyed up to maximum prescribed amounts. All potential sources of infection, including all sources of animals were investigated and tested. Other contact herds and all herds within a 10 kilometer perimeter zone were investigated and tested. Standard cleaning and disinfection measures were applied. Repopulated herds were tested over several years following restocking.

Surveillance for bovine tuberculosis in Canadian cattle and farmed bison herds is based on slaughter inspection and testing of farmed bison. In 2000, of the 3.31 million cattle slaughtered in Canada, 492,556 were cull cows & bulls with submission of 159 granulomatous lesions. With a target submission rate of one lesion per 2000 adult culls, the submission rate in 2000 reflects achievement of 64% of target. Of the more than one million slaughter cattle exported to the U.S. annually, more than 200,000 head are cull cows and bulls. These animals are subjected to slaughter surveillance in the U.S. In addition, 21 lesions were submitted from farmed bison slaughtered in Canada in 2000. Almost all farmed bison slaughtered in Canada are market bulls less than 3 years of age. Because of lack of adequate numbers of adult cull bison being slaughtered, we also conduct on-farm testing of farmed bison. On-farm testing of cattle in selected areas where enhanced surveillance is deemed appropriate. In 2000, approximately 55,000 tuberculin tests of cattle & farmed bison were conducted by federal inspectors.
<table>
<thead>
<tr>
<th>Year/Species</th>
<th>Province/Type</th>
<th>Herds Involved</th>
<th>Description</th>
<th>Most Likely Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991/cattle</td>
<td>Manitoba/beef</td>
<td>5</td>
<td>detect at slaughter surveillance; spread from source herd to 4 contact herds;</td>
<td>residual latent cattle infection, OR exposure to infected wildlife</td>
</tr>
<tr>
<td>1992/cattle</td>
<td>Ontario/beef</td>
<td>1</td>
<td>detected in perimeter testing; no spread to other herds;</td>
<td>exposed to infected farmed cervid herd</td>
</tr>
<tr>
<td>1994/cattle</td>
<td>Ontario/beef</td>
<td>1</td>
<td>re-infection of re-populated herd after 1992 eradication (animals &quot;hidden&quot; from investigation);</td>
<td>exposed to infected farmed cervid herd</td>
</tr>
<tr>
<td>1994/bison/cervids</td>
<td>Quebec</td>
<td>3</td>
<td>detected during routine surveillance testing; 1 bison only &amp; 2 bison/cervid; all 3 bought from infected safari park detected in 1993</td>
<td>exposed to infected safari park</td>
</tr>
<tr>
<td>1996/cattle</td>
<td>Manitoba/beef</td>
<td>1</td>
<td>reactor at export test to US; not held for CCT; NVL &amp; histoneg &amp; M. bovis; no inter/intra-herd spread;</td>
<td>residual latent cattle infection</td>
</tr>
<tr>
<td>1997/cattle</td>
<td>Manitoba/beef</td>
<td>2</td>
<td>detected at slaughter surveillance (US); spread from source herd to 1 contact herd;</td>
<td>residual latent cattle infection, OR exposure to infected wildlife</td>
</tr>
<tr>
<td>1999/cattle</td>
<td>Sask/beef</td>
<td>1</td>
<td>detected at slaughter surveillance; closed herd; single lesion in 15 yr natural increase cow; no inter/intra-herd spread;</td>
<td>residual latent cattle infection</td>
</tr>
<tr>
<td>2001/cattle</td>
<td>Manitoba/beef</td>
<td>1</td>
<td>reactor detected during enhanced area testing; no intra/inter-herd spread;</td>
<td>residual latent cattle infection, OR exposure to infected wildlife</td>
</tr>
<tr>
<td>2001/Bison</td>
<td>Alberta</td>
<td>1</td>
<td>detected at slaughter surveillance; 20 yr cow bought from Quebec in 1997; no intra/inter-herd spread;</td>
<td>exposed to infected safari park in QC in early 1990s</td>
</tr>
</tbody>
</table>
Canada continues to near the complete eradication of bovine tuberculosis from farmed Cervidae, which consist mainly of elk, red deer, elk/red hybrids, and fallow deer. During the first 5 years (1989 through 1993) following the extension of the National Bovine Tuberculosis Eradication Program to farmed Cervidae, 30 infected herds were found involving 5 provinces. During the next 5 years (1994 through 1998) of the program, 5 more infected herds were found in 2 provinces; all of them epidemiologically linked to previously detected infection. During the last 3 years (1999 to Oct. 2000), 2 infected herds were found in 2 provinces. Again, the source appears to be previously test-negative animals exposed to previously detected infected herds. All 37 infected Cervidae herds, except one, were completely depopulated of all exposed susceptible species of animals. Compensation, quarantine, investigation, trace-outs, trace-ins, contacts, perimeter premises, cleaning & disinfection, and restocking were all carried out in the same manner as for infected cattle or farmed bison herds. In the one exception, a safari park housing many species, a number of primates & endangered species were placed in permanent quarantine. After 7 years of observation, repeated tuberculin testing, complete post mortem on all deaths, no evidence of tuberculosis has been found in these animals. As with bison, almost all Cervidae slaughtered in Canada are market stags. Therefore, on-going surveillance for bovine tuberculosis in farmed Cervidae is based on the testing, every 3 years, of all cervid herds involved in the commercial trade of these species. In 2000, approximately 27,000 tuberculin tests were conducted on farmed Cervidae in Canada under this program. In 2000, 10 suspect lesions were submitted to the laboratory from routine slaughter inspection.

Currently, there is one definitive reservoir of bovine tuberculosis in Canada: a free-roaming herd of approximately 2,000 wood bison in and around Wood Buffalo National Park, which straddles the northern boundary of the province of Alberta and the Northwest Territories. The herd is heavily infected with both \textit{M. bovis} and \textit{B. abortus}. It poses its greatest threat to adjacent healthy free-roaming herds. A bison management plan is in place that includes the establishment of no-bison buffer zones, the killing of stray bison, and other measures to minimize the risk of these diseases spreading to wild bison, farmed bison, or cattle. These measures consider the findings of a risk assessment carried out in 1998.

Currently, there is a second possible/probable reservoir of bovine tuberculosis in Canada: a free-roaming herd of approximately 3,000 elk in and around Riding Mountain National Park (RMNP) located in Manitoba. Evidence supporting the hypothesis includes the fact that \textit{M. bovis} infection has been confirmed in a total of 10 elk submitted as part of a hunter-kill surveillance program around RMNP which commenced in the 1997, that \textit{M. bovis} infection had been confirmed in a single elk in 1992 which was shot on a farm adjacent to the source farm of the 1991 outbreak, and that the source infected cattle herds for 3 of the 4 outbreaks of bovine tuberculosis in cattle.
found in Manitoba since 1991 (1991, 1997, 2001) are located close to the RMNP boundary, and in areas where infected elk have been shot. The 4th outbreak (1996) has no such association.

A multi-agency Bovine TB Management Program Steering Committee has been established and has identified a number of initiatives & measures that have been/are being/will be implemented to further define the problem, prevent spread of the infection to cattle & other farmed livestock, and to eliminate the infection in the wild Cervidae. Its major elements include; (1) enhanced surveillance and area testing of cattle herds in the area around RMNP which was initiated following the finding of the two infected cattle herds in 1997 and continues. The infected cattle herd found in 2001 was detected as a result of this enhanced surveillance; (2) continued surveillance of wild Cervidae to determine the geographic and species extent of the infection, and to further define the prevalence; (3) separating wild elk from farmed livestock in the area through barrier fencing of forage/feed and cattle feeding yards, prohibition on elk feeding, encouraging producers to remove hay from fields into fenced areas, public awareness & education; (4) elk population management through adjustment of hunting opportunities; (5) further research & field studies, including radio-collar studies of elk movements, improved population survey methods, other possible TB vectors/reservoirs in the area.

All provinces in Canada except Manitoba, are classified as TB-Free according to Canadian. Alberta's TB-Free status is suspended pending completion of trace back, trace out, and perimeter testing associated with the positive finding in 2001. Manitoba is classified as TB-Accredited according to Canadian standards. All Canadian provinces, including Manitoba, are classified as Accredited Free according to U.S. standards. If a second infected cattle or farmed bison herd is found in either province within 24 months of the infection found in 2001, the province would be reclassified as Modified Accredited Advanced according to U.S. standards. In the event this happens, zoning/regionalization measures would be instituted to protect the Accredited-Free status of the remaining Canadian provinces.

Dr. George Luterbach, Chief Veterinarian, Animal Health & Production, Western Network of the Canadian Food Inspection Agency, presented a report on the Riding Mountain National Park (RMNP) TB situation. In 1991, TB was discovered in Manitoba from a traceback to a farm near Rossburn. During the course of the epidemiological investigation, 550 farms were investigated with 15,500 head of cattle tested and 5 herds with 1,000 head depopulated. Infected wild elk discovered 1 mile from the source farm of the TB outbreak and 6 miles from RMNP. In 1992, during the course of a local wildlife monitoring survey in the Rossburn area, 55 hunter-harvested deer, elk and moose were checked with no evidence of TB.

In 1997, another cattle farm in the same vicinity of the 1990 outbreak in Rossburn was found infected. Cattle from this herd had tested negative in 1991 and 1992. Thirty of 85 cows in this herd tested positive and the herd
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was depopulated. Fifty-six herds with 2,479 head in the area were tested. All were negative. Tracing of sold cattle from the infected herd resulted in the discovery of one other infected farm that was also depopulated. In 1997, a comprehensive wildlife health monitoring hunter-harvest survey was conducted around the Park. Two hundred samples were collected from elk (139), moose (55), and white tailed deer (6). Although two elk had acid fast lesions, they were cultured as *M. avian*. While waiting for the culture results testing of 55 herds in the area was initiated. All herds tested negative.

In 1998, wildlife survey samples were enhanced. Five hundred eighty samples were collected including 278 elk, 149 moose, 153 deer and some coyotes, raccoons and a wolf. Two elk cultured positive for *M. bovis*; one elk found dead in RMNP and one hunter shot elk in January 1999. Twenty-one herds along the south side of RMNP were tested with negative results. A follow-up retest of twelve herds at Rossburn was conducted. All were negative.

The wildlife health survey conducted in 1999-2000 included 335 submissions including 227 elk, 108 deer, 1 bear, 12 beaver, 20 coyotes, 5 mink, 4 raccoons, and 1 wolf. Sampling revealed two additional cases in elk. Testing of 26 cattle herds in the Grand View area was completed in 2000-2001 with two reactors discovered. One was found to be no visible lesions the other with lesions. Samples were submitted from both. One cultured positive for *M. bovis* in April 2001. The herd was depopulated in May 2001.

The plan for this year is an intergovernmental approach. The Canadian Food Inspection Agency will enforce the mandatory national cattle identification program, consider disease zoning to a smaller area than the province, proceed with an ongoing surveillance strategy for all farmed livestock in the at risk area, continue to provide lab support for the wild life surveillance, and work closely with our trading partners. Additional plans include wild elk population management with hunting permits, specific wild elk elimination, hay exclusion and winter cattle feeding exclusion.

Report of Bi-National Committee Activities 2000-2001

Billy G. Johnson, D.V.M.

The U.S. Mexico Bi-National Tuberculosis and Brucellosis Eradication Committee (BNC) was formed in 1993 based on a recommendation from the U.S.A.H.A. with responsibility to provide oversight to the tuberculosis eradication programs in each country and to establish minimum requirements for the exportation of Mexican cattle into the United States. Brucellosis responsibilities were added to the Committee at a later time. At the time the Committee was formed APHIS was in the process of developing new regulations for the entry of steers and spayed heifers from Mexico into the U.S. but because of concerns by the Border States Officials those proposed regulations were withdrawn. The Border States Officials then developed the Con-
sensus Document under which animals have been imported since that time. This document outlined a three tier program under which states in Mexico could qualify to ship steers and spayed heifers into the U.S. The program stages were Stage I, Stage II and Free. Each state was given time to progress through Stage I and then qualify for Stage II. The BNC assumed the responsibility for conducting reviews in each state as they progressed through these stages. The BNC conducted more than thirty reviews since the Consensus Document was implemented. Each review required from three to five days with at least four or five reviewers from the U.S. as well as participation from Mexico. The reviewer's expenses were paid by their employer or their supporting organization. As a result of those reviews, ten states were approved for stage II and nine additional states were approved for stage I. That work was suspended during the past year since APHIS is now in the process of amending both their domestic and continue to be a primary concern of the BNC.

The Committee has begun to give more attention to the brucellosis programs in each country as the U.S. also moves closer to eradication of this disease in cattle. Mexico has not applied as much effort toward brucellosis eradication as it has to the tuberculosis program because it is not of concern with the movement of steers and spayed heifers to the U.S. However, the state of Sonora has progressed in their program to where they now have approval to ship intact heifers to the U.S. and hopefully this will encourage other states to now move forward in their programs.

The BNC is proud of the progress made up to this point but realizes there is still much work to do. This will particularly be true as Mexico moves forward in the harmonization of their regulations and as the U.S. moves closer to their goals of eradication of tuberculosis and brucellosis. It was the goal of the USAHA when recommending that the BNC be formed that the livestock industries of both countries, the appropriate government officials and the research organizations could work cooperatively under this arrangement in developing procedures that would lead to the eradication of tuberculosis and brucellosis. It is difficult to imagine the two countries operating under a procedure such as that outlined in the Consensus Document without the coordination that has been provided by the BNC. There will be a similar period during the next two years as APHIS implements their final international regulations during which the BNC can continue in it's coordinating role.

Bob Frost, First Vice-President of USAHA and a representative of the Camelid industry from Lincoln, California, presented an update on llamas and alpacas. Since bovine tuberculosis is close to being eradicated in the United States, regulatory officials are rightly concerned about known infected species. Bovine tuberculosis (Mycobacterium bovis) is known to infect a broad range of mammals. South American camelids (SAC) have been infected, but are known to be quite resistant to the disease, even when cohabitating with infected cervids. There is no evidence that SAC in North or
South America have bovine tuberculosis. In 1992 USDA published the "Assessment of Risk Factors for *M. bovis* in the U.S." and stated that the "current evidence indicates that camels have not been a factor in the spread of *M. bovis.*" To date there is not a documented case of transmission of *M. bovis* infection to any other animal that has been traced to a SAC. SAC are not a pocket of infection to thwart control programs in livestock species.

There is a Uniform Methods and Rules manual (UMR) for program species (cattle, bison, cervids) that discusses ante-mortem detection of tuberculosis. Screening tests and ancillary diagnostic tests have been validated and sensitivity and specificity determined for them. Regulatory officials would prefer to have validated testing protocols for all non-program species, but such is not yet possible.

The definitive test for ante-mortem diagnosis of tuberculosis is the isolation and identification of the organism from tracheal washings, feces or biopsies. The principle screening test is the intradermal injection of tuberculin (Bovine PPD, Avian PPD and others). Additional confirming tests are used experimentally, including DNA probes, serological tests (ELISA, gamma interferon and blood test for tuberculosis [BTB test]). At necropsy the diagnosis is made by histological and bacteriological examinations.

The most appropriate site for conducting the intradermal tuberculin test in SAC is at the caudal axillary space (single injection and comparative injections). This was determined by experimental studies conducted in Argentina, Canada, Mexico and the United States. The response also occurs in the mid-cervical region and at the base of the ear, but these latter sites are more difficult to measure because of the thickness of the skin or lack of skin flexibility. Furthermore, those sites require clipping the hair, which is not accepted well by owners. A skin fold is measured by a caliper in the precise spot where the tuberculin is to be injected and the response is measured at the site of the injection, 72 hours later. Thousands of these tests have been performed on camels in New York.

The type 4, delayed hypersensitivity response to the administration of intradermal tuberculin has been validated experimentally in SAC, but the sensitivity and specificity of the tests have not been established because no population of infected SAC can be found.

The official policy of the USDA tuberculosis eradication program for program species is to slaughter positive reactors. With certain endangered zoo animals (elephants, giraffe) and other extremely valuable non-program species it is possible to place the animals on a therapeutic regimen usually consisting of isonicotinic acid hydrazide (isoniazid) in combination with other antimicrobial agents. Be advised that once isoniazid therapy begins it is impossible to utilize the tuberculin skin test to monitor the course of the disease. Furthermore, if isoniazid therapy is instituted as a prophylactic in a herd, the tuberculin skin test is not valid as a screening test. Studies have shown that isoniazid inhibits the delayed hypersensitivity response. A
negative response to a tuberculin skin test in an animal on isoniazid therapy does not mean that the organism has been eliminated.

Update on PCR on Fixed Tissues
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At the 1999 meeting of the U.S. Animal Health Association, the Tuberculosis Committee passed a resolution requesting that USDA/APHIS conditionally approve the tuberculosis PCR assay for a period of two years as an official USDA laboratory procedure for confirming tuberculosis in livestock. The test was to be applied only to formalin-fixed, paraffin-embedded tissues having lesions characteristic of tuberculosis with acid-fast organisms. The resolution further stated that during the period of conditional approval, additional data on test performance should be collected and analyzed prior to the 2001 USAHA meeting. The purpose of this report is to provide the requested information to the Scientific Advisory Subcommittee of the USAHA Tuberculosis Committee for consideration.

PCR examination of diagnostic samples submitted to the NVSL Pathobiology Laboratory began in FY97. During that year the only validated test conducted was for identification of *Mycobacterium tuberculosis* complex organisms, using the method described in J Vet Diagn Invest 9:244-249, 1997. The testing procedure was subsequently modified and additional primers were selected to provide tests for identification of *M. avium* organisms. This protocol, which was published in J Vet Diagn Invest 11:436-440, 1999, has been used on all samples tested since the beginning of FY98 and the results presented in this report summarize data accumulated from October 1, 1998, to September 30, 2001.

Culture results were not available from all cases submitted to the NVSL Pathobiology Laboratory, so the PCR results from those cases are summarized separately. This latter group included cases for which culture was not done or for which culture results were not yet available.

Summary of cases for which both culture and PCR results were available

| Total tested | 184 |
| Agreement between PCR and culture | 139 |
| Both tests positive for *M. tuberculosis* complex | 108 |
| Both tests positive for *M. avium* | 16 |
| Both tests negative | 15 |
| Disagreement | 45 |
| PCR positive, culture negative | 25 (11 *M. tuberculosis* complex*; 15
PCR tests indicated the presence of an *M. tuberculosis* complex organism and *M. avium*, subspecies *paratuberculosis*.

** 3 *fortuitum*, 1 *gordonae*, 1 *smegmatis*, 1 *terrei*

Summary of cases for which only PCR results were available
Total tested — 64
PCR positive — 44 (16 *M. tuberculosis* complex, 28 *M. avium*)
PCR negative — 20

General observations
Positive mycobacterial identifications were made by PCR in 198 of 248 tissues examined (80%).

139 *M. tuberculosis* complex*
60 *M. avium*

Comparison of PCR to culture:
139 of 184 tests were in agreement (76%), which included 124 positives and 15 negatives
Of 133 samples positive for *M. tuberculosis* complex by either test:
123 were PCR positive* (92%)
118 were culture positive (89%)
Of 35 samples positive for *M. avium* by either test:
32 were PCR positive* (90%)
20 were culture positive (57%)
*Includes 1 dual infection

Conclusions
With respect to test efficiency, culture and PCR were nearly equivalent for identification of *M. tuberculosis* complex infections but PCR was more successful for detection of *M. avium*. Diagnosis of either *M. tuberculosis* complex or *M. avium* infection was maximized when both culture and PCR results were considered.

Technology transfer from ARS to APHIS
Prior to January 1, 2001, all PCR tests were conducted by an ARS technician at NADC under the direction of Dr. Janice Miller. At that time, a technician from NVSL was trained to conduct the procedure and she performed all of the tests from January 1 to June 30 at NADC under Dr. Miller’s supervision. Since July 1 she has been conducting the tests at NVSL, although Dr. Miller continues to interpret test results. Beginning September 1, a pathologist at NVSL has been concurrently reviewing test results to
ensure uniformity of interpretation. In addition, training of a back-up technician has begun. It is anticipated that by January 1, 2002, all responsibility for mycobacterial PCR tests will reside in the Pathobiology Laboratory at NVSL.

Diana Whipple presented results of research on transmission of *Mycobacterium bovis* from white-tailed deer and cattle. The studies were conducted in three phases. Results of the first phase show that cattle can become infected with *M. bovis* by indirect contact with experimentally infected white-tailed deer. Cattle can also become infected by ingesting as few as 5,000 organisms in contaminated feed as indicated by results of the second phase of the study. The third phase is currently underway and final results will not be available until 2002.

Dr. Joe VanTiem presented proposed changes in the U.S. Tuberculosis UM&R. Specific changes were suggested for the definitions of: Herd, Herd of origin, Herd of origin test, Accredited herd plan for cattle or bison, Accredited herd plan for goats, Accredited herd plan for captive cervids, Monitored herd plan for captive cervids, Qualified herd plan for captive cervids, State Status- Surveillance, Specific state status plans for Accredited Free, Modified Accredited Advanced, Modified Accredited, Accreditation Prepatory, and Non-accredited. These changes would bring the UM&R into agreement with the CFR. The proposed changes were referred to a Subcommittee for review and presentation to the committee at a later date.

Dr. Larry Granger, Michigan Department of Agriculture, provided an update on the Michigan bovine tuberculosis control/eradication program. Dr. Granger reported that they concluded testing all Michigan dairies in June 2001 and have no infected dairies and are concentrating on testing beef herds this year. Michigan has implemented a mandatory test prior to movement, mandatory animal identification for movement. Michigan may submit an application for regionalization in the upcoming year.
EVALUATION OF THE SINGLE AND COMPARATIVE CERVICAL TUBERCULIN TESTS IN REINDEER PREVIOUSLY SENSITIZED TO KILLED *MYCOBACTERIUM BOVIS*  

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Linda Carpenter, Area Epidemiologist, USDA-APHIS-VS, Washington/Alaska/Hawaii Area, Olympia, WA  
Bert Gore, State Veterinarian, Department of Environmental Conservation, State of Alaska, Palmer, AK

Sale and interstate movement of reindeer require prior negative TB test results. Routine TB tests on many reindeer have suggested that the false positive rates for the SCT and CCT in reindeer are higher than in other Cervids. There has never been a case of tuberculosis diagnosed in reindeer in the United States. Scientific review of the literature and additional data support this belief. False positive tests have caused the loss of sales and the destruction of valuable animals. This project was a preliminary study to evaluate the current tuberculosis testing regime for reindeer in the United States. It was designed to collect preliminary data and facilitate future research. The objective was to evaluate the single (SCT) and comparative cervical (CCT) tuberculosis tests, including preliminary estimates of test sensitivity and specificity, in reindeer that were sensitized to tuberculosis antigen.

Fifteen SCT-negative, female reindeer were used in the study. Ten were subsequently sensitized to tuberculosis antigen by an injection of killed *Mycobacterium bovis* organisms. These ten deer were given follow-up SCTs and CCTs at 100, 220 and 380 days postsensitization. Control deer were not sensitized. They were given SCTs at 100, 200 and 380 days with CCTs only at days 220 and 380. CCT results from all fifteen reindeer were plotted on the currently approved reindeer scattergram described in Veterinary Services Notice No. 00-08 (March 10, 2000) and on five alternate scattergrams, including the Cervid scattergram which is based on the Bovine Tuberculosis Eradication Uniform Methods and Rules (January 22, 1999). Sensitivity and specificity for the SCT and CCT were calculated.

Sensitivity and specificity for the SCT were consistently 100% and 80%, respectively. One of five control deer tested as an SCT suspect each of the three times the test was given, but it was a different deer every time. The CCT results, plotted on the reindeer scattergram, identified 62% - 100% of the sensitized reindeer as reactors (depending on number of days postsensitization) and 80% of control deer as negative (regardless of number of days postsensitization). Including suspects with reactors increased sensitivity at 100, 220 and 380 days but had no affect on specificity. None of the five alternate scattergram scenarios provided a consistently better combina-
tion of sensitivity and specificity than did the reindeer scattergram.

On the reindeer scattergram, five of the sensitized deer and two of the control deer changed CCT classification at least once among test repetitions. The five sensitized deer tested at least once as negative or suspect, depending on number of days postsensitization. One control deer was classified as a reactor at 220 days but changed to negative at 380 days. Another control deer tested negative at 220 days but changed to reactor at 380 days. The other three control deer tested negative under both tests. The five alternate scattergram scenarios were not substantially different from the reindeer scattergram with regard to numbers of deer that changed classification. Depending on the specific alternate scenario, four to six sensitized deer and two to four control deer changed CCT classification at least once among test repetitions.

Specificity never exceeded 80% for any of the repetitions on any scattergram, and changes in classification of sensitized and control deer occurred under each of the six scattergrams. Thus choosing alternate scattergrams over the current reindeer scattergram did not increase specificity and did not improve consistency in classification among test repetitions.
West Nile virus update

Dr. Daniel Mead of the Southeastern Cooperative Wildlife Disease study (SCWDS) briefly updated the committee on the spread of West Nile virus (WNV) in the United States, then presented an in-depth report on WNV surveillance in Georgia.

West Nile virus is an arthropod-borne virus that had never been reported in the Western Hemisphere until the fall of 1999. Prior to the summer of 2001, WNV was found mainly in the northeastern U.S. It has slowly made its way to the south and southeast, and more recently has been detected well west of the original focus. Since the initial detection of WNV in New York in 1999, the virus has been detected in birds, humans, horses, or mosquitoes in 26 additional states, the District of Columbia, and Canada. To date, WNV has been detected in all states east of the Mississippi River except for West Virginia and South Carolina.

This year, seven states have reported 37 human cases with a median age of 69 years (range: 36-81 years). A single human death was reported in
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Georgia. WNV infections in 151 horses were reported from 11 states. In addition, WNV has been isolated from 5,190 wild birds (3,796 crows) from 25 states and the District of Columbia, and in 725 mosquito pools from 14 states.

The SCWDS continues to collaborate with the Georgia Department of Human Resources, Division of Public Health to conduct WNV surveillance among wild birds in Georgia. The state's first case was confirmed at SCWDS in an American crow found dead in Lowndes County on July 10th. Subsequent to identification of the first positive bird, SCWDS has detected WNV in 311 dead birds submitted by public health officials from 52 additional counties around Georgia, and in one live bird collected by SCWDS personnel in Lowndes Co., on July 16th. Although the majority of virus isolates have come from blue jays and American crows, virus has been detected in other avian species. Other species from which SCWDS has isolated WNV include American robin, common grackle, Northern cardinal, Northern mockingbird, wood thrush, red-tailed hawk, Cooper's hawk, and an osprey.

Avian Vacuolar Myelinopathy

Dr. John Fischer of the SCWDS provided an update on avian vacuolar myelinopathy (AVM), a neurologic disease that had caused the deaths of at least 69 bald eagles in Arkansas, Georgia, North Carolina, and South Carolina prior to autumn 2000. The cause of AVM remains undetermined despite extensive diagnostic and research efforts. Evidence of infectious agents has not been detected and a natural or manmade neurotoxin is suspected. The disease was first recognized in 1994 when it killed at least 29 bald eagles at DeGray Lake, AR. AVM also has been detected in numerous American coots and it is hypothesized that eagles are exposed to the agent of AVM via ingestion of affected coots. In the winter of 1998-99, AVM was detected in bald eagles from Georgia, North Carolina and South Carolina, and in mallards and a ring-necked duck from North Carolina.

From November 2000 through February 2001, AVM was diagnosed or suspected in 13 dead bald eagles at Clarks Hill Lake/Lake J. Strom Thurmond on the Georgia/South Carolina border. This brings to 82 the number of dead bald eagles in which AVM has been confirmed or suspected since it was first recognized in 1994. Lesions of AVM also were found in large numbers of coots, 2 Canada geese, 2 great-horned owls, and a killdeer at Lake Thurmond. A Canada goose with AVM was recovered at Lake Murray, SC and AVM was found in coots at other sites in AR, GA, NC, SC, and TX.

AVM was reproduced experimentally for the first time in feeding trials conducted at the SCWDS. Affected coots were collected during the severe AVM outbreak at Lake Thurmond, AVM brain lesions were confirmed by microscopic examination, and selected tissues were fed to unreleasable, rehabilitated red-tailed hawks. Although all hawks remained clinically normal, the birds that received tissues from affected coots developed brain lesions. Results of this study confirm the hypothesis that birds of prey are exposed to the cause of AVM via ingestion of other affected birds, such as coots.
Sentinel bird studies were conducted in North Carolina by the National Wildlife Health Center, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resource Commission, and North Carolina State University. Healthy birds placed on site during an AVM outbreak soon developed neurologic disease and brain lesions, but healthy birds remained unaffected when co-housed at a remote site with sick birds captured alive during the outbreak. Feeding trials in which young ducks and laboratory mice received coot tissues, vegetation, sediment, and water from a lake during an AVM outbreak were conducted by the above agencies with the assistance of SCWDS. All animals remained clinically normal and failed to develop brain lesions of AVM. Additional studies are in progress with the ultimate objective of determining the cause of AVM and potential management actions to reduce the impact of this disease on bald eagles and other birds.

Anthrax in South Texas Wildlife


Anthrax has occurred sporadically in domestic livestock and free-ranging cervids in Texas. The prominent endemic area is a five-county area located in the southwestern part of the state along the border with Mexico. Usually one or two anthrax cases are confirmed annually in this area, but during the summer of 2001, there were 11 culture-confirmed cases. Three of the confirmed case occurred in white-tailed deer (*Odocoileus virginianus*), two in captive cervids (one fallow deer, *Cervus dama*, one red deer, *Cervus elaphus*), and the rest in variety of domestic livestock species. In the affected five county area, the estimated population of free-ranging white-tailed deer was between 50,000 and 100,000. The estimated death loss attributed to anthrax was 1000-1200 animals. In general, the most severely affected areas were those with poorer quality or overstocked habitats. Cervids appeared to be the most severely impacted of all species in this epizootic. An effective vaccine is available for inoculation of livestock. Dr. Conger suggested that the development of an approved and effective delivery system for the vaccine would reduce the severity of the problem in cervids in the future.

Hemorrhagic Disease of Deer: Epidemiology & Research Update

Dr. David Stallknecht from SCWDS and the University of Georgia presented a portion Dr. Joe Gaydos' graduate research on white-tailed deer (WTD) host resistance factors to hemorrhagic disease (HD) viruses and also provided an update on HD activity for 2001.

In Dr. Gaydos' research, experiments were conducted to determine the potential role of three host-related factors in the epidemiology of epizootic disease (EHD) viruses in WTD. These included acquired immunity and cross protection between EHDV-1 and EHDV-2, passive immunity via maternal antibody transfer, and innate resistance within WTD subspecies. Results indicated that previous exposure to EHDV-2 significantly reduced clinical
response to subsequent EHDV-1 challenge. Maternal antibodies to both the 
EHD and bluetongue (BT) viruses persisted in fawns for a period of time 
coinciding with the transmission season for these viruses. Clinical disease 
scores from white-tailed deer from Texas, where these viruses are endemic, 
(challenged with both EHDV-1 and EHDV-2) were significantly lower than 
those observed from deer where these viruses do not normally occur (PA). 
These results indicate that host-related factors including acquired, passive, 
and innate immunity represent important components in explaining the clini-
cal variation observed with hemorrhagic disease in WTD throughout their 
range in the United States. These findings support the idea of enzootic 
stability in areas of the West and Southeast where BT and EHD virus trans-
mision may occur annually.

During 2001, seven EHD viruses were isolated from deer samples sub-
mitted to SCWDS. These included an EHDV-2 from a captive Texas WTD, 
four EHDV-2 isolates from captive and free-ranging WTD in Kansas, one 
EHDV-2 from a free-ranging WTD in Missouri, and an EHDV-1 isolated from a 
free-ranging mule deer in Idaho. Committee members reported documenta-
tion of additional HD epidemics over the past several months in Colorado, 
Wyoming, and Nebraska.

Immune Responses of Elk to Brucellosis and Tuberculosis Vaccines

Dr. Steve Olsen of USDAARS National Animal Disease Center reported 
on studies of immune responses of elk to brucellosis and tuberculosis vac-
cines.

Following inoculation with $1 \times 10^{10}$ CFU of the *Brucella abortus* strain 
RB51 (SRB51) vaccine, elk remained bacteremic for longer periods of time 
when compared to bison or cattle. Antibody responses of SRB51-vacci-
nated or *Brucella abortus* strain 19 (S19)-vaccinated elk peaked at 4 to 6 
weeks after vaccination, and remained greater than nonvaccinated elk until 
approximately 18 to 22 weeks after vaccination. Antibody responses to SRB51 
could be detected in elk vaccinated with S19, whereas significant antibody 
responses to S19 could not be detected in SRB51-vaccinated elk. Antibody 
titers of SRB51-vaccinated elk were greater than responses of SRB51-vacci-
nated cattle or bison. Proliferative responses of peripheral blood mononuclear 
cells were delayed in vaccinated elk and were not detected until between 18 
and 22 weeks after vaccination, whereas proliferative responses can be de-
tected SRB51-vaccinated cattle and bison at approximately 14 weeks after 
vaccination. Data obtained at 14 and 20 weeks after vaccination suggest 
that proliferative responses of elk peripheral blood mononuclear cells to S19 
or SRB51 antigens are primarily in B cells subsets. Preliminary data follow-
ing vaccination of elk with BCG suggest that responses of elk to tuberculosis 
vaccine is similar to responses following inoculation with brucellosis vac-
cines. Our preliminary data suggests that elk primarily develop humoral 
responses to brucellosis or tuberculosis vaccines, and have delayed or poor 
cellular immune responses. Our data may suggest that currently available
brucellosis vaccines will have poor long-term efficacy in elk.

Bovine Tuberculosis in Michigan White-tailed Deer: Current Status and Emerging Issues

Dr. Stephen Schmitt provided an update on progress being made in the management of an endemic focus of bovine tuberculosis (TB) in free-ranging white-tailed deer. Since 1994, the state of Michigan has recognized a problem with TB, caused by *Mycobacterium bovis*, in wild white-tailed deer from an eleven county area in northeastern Lower Michigan.

During the year 2000, surveillance activities for *M. bovis* continued statewide. In white-tailed deer, 53 animals cultured positive from 25,858 deer submitted for testing. Thus far in 2001, 3 deer are positive of 4,030 tested. Apparent prevalence in the core area of the outbreak was 2.3% in 2000. In the remainder of the five-county area of northeast Michigan where TB is most prevalent, apparent prevalence was 0.3%. Prevalence in both areas remains essentially unchanged since 1998, but is about half the 1997 rate. Prevalence continues to remain highest in older bucks. Of 341 positive deer found since 1994, 67% have come from only 8 townships, suggesting foci of relatively higher prevalence surrounded by broad areas of much lower prevalence. To date, 1,153 non-cervids of 15 species also have been cultured for evidence of infection; 27 have been positive. Thirteen of those have been coyotes. Gross lesions have been quite rare in non-cervids, and none of the culture-positives has shown extensive pathology. Since 1996, 931 elk have been tested for TB. The first positive elk was found in 2000, at the eastern edge of the elk range, near the core outbreak area in deer. This animal likely was infected by feeding at a bait site or feed site that had been contaminated by infected deer. A second elk taken during the September 2001 hunt was found to be positive. This second elk was killed just 9 miles from the first positive elk. DNA analyses of isolates from infected animals of all species continue to implicate a single strain of *M. bovis*.

Strategies for eradication of TB from Michigan wildlife remain focussed on 1) reducing deer population densities and 2) reducing man-made aggregations of deer by restriction or elimination of baiting and recreational feeding. These strategies have been implemented through provision of extra rifle seasons and unlimited antlerless permits to reduce deer densities and by banning or restricting deer baiting and feeding to reduce aggregations. In the five-county area most severely affected by TB, deer numbers have declined by ~35% since 1995, but persistent focal areas of high density, particularly on private land, remain problematic. For 2001, baiting and feeding are prohibited in twelve counties. Dr. Schmitt reported that despite uneven compliance with restrictions and challenges in enforcement, the overall occurrence of baiting and feeding has declined substantially since 1997.

Dr. Schmitt also reported that a number of research studies are currently being carried out by DNR scientists and collaborators from Lincoln University (Canterbury, New Zealand), Michigan State University, North Carolina State
University, the U.S. and Michigan Departments of Agriculture, the Michigan Department of Community Health, and the National Institute for Occupational Safety and Health. Ongoing studies include attempts to determine the sensitivity of deer surveillance methods, to model spatial and temporal aspects of TB epidemiology, to follow movements of TB-infected deer relative to bait and feed sites, to evaluate on-farm management of risk factors for cattle transmission, to document transmammary TB transmission in deer, and to assess risks of occupational exposure of wildlife professionals, and hunter perceptions of risk from venison processing and consumption. Issues of emerging interest and concern include the potential role of elk as a maintenance host, the challenges of maintaining public cooperation with, and political will for, TB eradication strategies, and the role of farm management and cattle to cattle transmission in perpetuating this outbreak.

Update on Bovine Tuberculosis in Riding Mountain National Park, Manitoba, Canada

Dr. George Luterbach of the Canadian Food Inspection Agency (CFIA) presented an update on the recently-discovered focus of bovine TB in free-ranging elk in Riding Mountain National Park (RMNP), Manitoba, Canada.

Between 1992 and 2000, data from investigations of cattle TB outbreaks and wildlife surveillance provided increasingly convincing evidence that an endemic focus of bovine TB had become established in the RMNP elk population. Further evidence came from winter 2000-2001 wildlife surveys, where new TB cases were confirmed in 5/541 sampled elk harvested in the RMNP vicinity.

An established, joint stakeholder group that includes the CFIA, Parks Canada, Manitoba Agriculture, Manitoba Natural Resources, the farmed livestock industry associations and local producers has continued working together to develop a comprehensive TB management strategy. The wild elk population continues to be lowered through increased hunting permits, and elimination of specific elk subpopulations is being considered. Strategies for excluding elk from hay stockpiles and from winter cattle feeding areas are also under development. Stakeholders are also considering ways to share in responsibility, costs, and logistics for TB management in this area. Options for regionalization and control zoning are also under consideration by CFIA and the various stakeholder partners. Dr. Lutterbach indicated CFIA is committed to encouraging continued progress on surveillance and management of TB in the RMNP area, as well as working closely with trading partners to communicate and minimize risks associated with this situation.

Chronic Wasting Disease Surveillance in Captive Cervids: Canada

Dr. Luterbach also provided the committee with an update on recent surveillance, program development, and management activities related to chronic wasting disease (CWD) in Canada’s elk industry.

Since more comprehensive epidemiological investigations of CWD cases in farmed elk were initiated in February 2000, one or more cases of CWD
have been confirmed on 38 Saskatchewan elk farms. All infected herds show either primary or secondary tracebacks to a single "source" herd that apparently imported one or more infected elk from South Dakota in 1989. In all, over 7,400 captive cervids have been destroyed as part of CFIA's program to eradicate CWD from farmed cervids in Canada. Cases have not been detected in other provinces or states, but CWD-infected elk apparently were shipped from Saskatchewan to Korea, where 2 cases have been confirmed in recent months.

Canada has continued its process of making CWD a federally reportable disease and developing a national program; CWD became reportable in Canada in April 2001. In the interim, science-based policies related to CWD management have been developed and implemented. Management policies have been tailored to address two broad categories of infection that distinguish recently-infected facilities with little or no evidence of CWD transmission from those with longstanding infections where considerable opportunity for transmission and environmental contamination has occurred. Data being gathered during investigations and depopulations should be of use in evaluating the assumptions underlying these policies. At present, provincial surveillance programs are mandatory in Saskatchewan and Alberta and under various stages of development in other provinces. Dr. Lutterbach indicated that heightened vigilance and broader surveillance participation appear essential in order to achieve national eradication goals. The role of CFIA in CWD management has broadened from depopulation activities alone to a combination of depopulation and decontamination activities that represent a more comprehensive approach that appears necessary to assure meeting Canada's national goals for CWD eradication. Issues related to assessing the degree of environmental contamination, efficacy of decontamination methods in "highly contaminated" premises, and schedules for restocking infected premises remain unresolved.

Chronic Wasting Disease Surveillance in Captive Cervids: USA

Dr. Lynn Creekmore, USDA, APHIS, VS, National Animal Health Programs Staff Veterinarian and CWD contact presented an update on surveillance and national program development for farmed elk in the U.S.

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 19 farmed elk herds in five states (CO, MT, NE, OK and SD). The last five positive farmed elk herds were identified in August, September and October of this year. Ten of these elk herds have been depopulated or have gone to slaughter for testing. The state quarantine has been lifted for one herd in NE that completed more than three years of surveillance with no further evidence of disease. Eight positive herds containing more than 1900 animals remain in CO, NE, and OK.

USDA support of surveillance continues to include both farmed and free-ranging cervids. More than 4000 farmed cervids have been tested as part of
surveillance efforts since the latter half of 1997; 1920 of these were tested in FY 2001 and most were farmed elk. USDA will continue to encourage increased CWD surveillance in both the farmed elk and deer industries. For the 2000/2001 hunting season, USDA supported surveillance was conducted in free-ranging cervids in KS, MT, NE, OK, and WI. With the exception of a single mule deer buck harvested by a hunter in Kimball County, NE (southeastern corner of the State), CWD tests for all of the free-ranging animals sampled in these surveillance efforts were negative. Depending on funding, USDA plans to support similar surveillance in these States and seven others in the 2001/2002 hunting season. Again, priority States will be those that contain positive farmed elk herds or that are adjacent to the endemic area. If adequate funding is available, States that are interested in surveillance but which do not meet these criteria will be included.

At the USAHA meeting in October of last year a resolution was passed requesting that APHIS continue to develop and implement a federal program for the eradication of CWD in domestic elk with provision of indemnity. In response to that resolution, the VS CWD study group met again in February 2001 to create a final draft. This draft was circulated back to the National Working Group and State Veterinarians in June of 2001. A final draft proposal is available in hard copy or on the web (http://www.aphis.usda.gov/vs/CWD_Program.htm) for input from USAHA participants. USDA will begin the formal regulatory development process and the drafting of the Uniform Methods and Rules (UM&R) after receiving the input from this meeting.

The proposed program was described last year and the basic framework remains the same. The program is based on herd certification with advancement in the program based on surveillance. After five years of surveillance without evidence of disease, the herd is considered a “certified herd”. The preferred response to positive and source herds and trace animals is depopulation. In order to move animals interstate, a producer must be participating in the program. The only substantive changes are details related to the implementation of the program and the development of the UM&R.

In terms of funding, VS has submitted a budget to support the proposed CWD program as a new line item for FY 2003. In addition, VS submitted a request for emergency funds from the Commodity Credit Corporation (CCC) to enhance surveillance and provide indemnity for CWD-positive, -exposed or -suspect animals for FY2001 and 2002. The Secretary of Agriculture approved this request and released $2.6 million in CCC funds on September 27 of this year. Using 9 CFR 53.2, VS is able to use these funds to immediately purchase, euthanize and test traces that have moved interstate and pose a disease risk. There are about 240 such traces in 22 States. These animals are from two positive herds in Canada and three positive herds in Colorado and moved during the time frame from 1997 to present. In addition there are about 200 traces that moved from positive Colorado herds to other herds within Colorado (i.e. did not move interstate). Because the State of Colorado
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and the Colorado Alternative Livestock Board are willing to provide 50% of the indemnity, VS is also able to contribute the additional 50% and purchase these traces as well under 9 CFR 53.2. Two additional positive herds have been identified in Colorado as the result of testing of traces. As soon as an interim rule is published, VS will begin the purchase of the positive herds. The funds released by the Secretary were for FY 2001; VS has begun the process of requesting the funds needed to provide indemnity and enhance surveillance for FY 2002.

Scientific Basis for Chronic Wasting Disease Surveillance Guidelines

Dr. Michael Miller of the Colorado Division of Wildlife (CDOW) reviewed existing data on CWD incubation periods and surveillance in elk that should be considered in developing and evaluating surveillance programs.

In an unpublished study conducted in Wyoming by Williams, Kreeger, and Miller, the minimum incubation period (infection to clinical onset) for CWD in elk was 12 months after high-dose oral inoculation. The minimum time from experimental infection to death (experimental disease course) was about 15 months, but the range was 15-35 months. Dr. Miller explained that because both incubation period and disease course are believed to be dose-dependent, experimental infections probably underestimate natural timeframes.

Similarly, in a study reported by Williams, Kreeger, and others at the 2000 Wildlife Disease Association Annual Conference, captive elk held under conditions of natural exposure to heavily contaminated research environments had a minimum natural disease course (time from exposure to death) of about 22 months. The range of natural disease courses in this study was 22-42 months. Both the maximum incubation period and disease course remain undetermined in this study because some of these elk are still alive.

As published previously by Dr. Miller and others, the time interval between clinical CWD cases in endemic herds can be used to estimate incubation period and disease course; however, because of overlap between cases, the interval between cases is also likely to underestimate actual timeframes. The CDOW's captive elk herd has been monitored continuously for CWD since 1986. During 15 years of complete surveillance, observed time intervals between clinical CWD cases ranged from 13-58 months (mean = 32.2 months; 95% CI 10.2-54.2 months).

CWD surveillance programs for captive elk herds have been ongoing in Colorado and Nebraska since 1998 (40-42 months). Of eight CWD-infected (or, in one case, presumed infected) herds detected via these surveillance programs, the time from program implementation to detection of the first CWD case in infected herds ranged from 16 to >40 months. Only three of the eight herds (~38%) were detected within the first 36 months of surveillance; one of the eight (CO-VD) has not yielded a case in >40 months of surveillance, but was the sole source of animals for another confirmed in-
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Based on available data, short-term surveillance appears inadequate to assure that captive elk herds are not infected with CWD. Dr. Miller concluded that in the absence of replicated, long-term surveillance data a 60-month surveillance requirement appears most likely to minimize opportunities for introducing CWD via movements of captive elk.

Chronic Wasting Disease Surveillance and Management in Free-ranging Cervids

Drs. Terry Kreeger of the Wyoming Game and Fish Department (WGFD) and Michael Miller of the CDOW provided brief updates on CWD-related surveillance, research, and management activities in Wyoming and Colorado. In addition to cases in captive elk discussed in the preceding reports, CWD is endemic in free-ranging deer and elk in southeastern Wyoming, northeastern Colorado, and the southwestern corner of the Nebraska panhandle.

Dr. Kreeger reported that the WGFD continues both targeted and hunter surveillance for 2001. Last year, a new surveillance system was initiated in Wyoming in which meat processors were paid to collect and tag deer heads. In that first year, many samples were unusable because tags were lost or incomplete. This year, their system was expanded and improved. A better tagging system was employed, thereby greatly reducing the number of unusable samples. As of this date, over 750 deer and elk heads have been collected with only about 20 unusable samples. Research on CWD continues in collaboration with the University of Wyoming and the CDOW. Ongoing studies include cattle susceptibility to CWD via contact with CWD-infected deer and elk, infectious dose titration in elk, CWD susceptibility of pronghorn and CWD transmission mechanisms in deer.

Dr. Miller reported that CWD surveillance in Colorado is also ongoing. In 2000-2001, over 1,300 harvested deer were examined in Colorado for evidence of CWD infection. Estimated prevalence ranged from 0-11% in male mule deer, and overall prevalence trends remained essentially unchanged from previous years. Immunohistochemistry (IHC) of lymphoid tissues (tonsil, retropharyngeal lymph node) was adopted in Colorado as the new standard for CWD diagnosis in deer based on blind comparative evaluations of samples collected during 1999-2000 and 2000-2001. Prevalence estimates based on lymphoid IHC will likely be about 10% higher than estimates based on obex IHC in deer.

Dr. Miller also reported on expanded efforts to contain and control CWD in free-ranging cervids in Colorado. Based on concerns about the potential adverse impacts of CWD on deer and elk resources in Colorado and elsewhere, a new policy for managing deer and elk herds in northeastern Colorado was adopted by the Colorado Wildlife Commission in September 2001. This policy established CWD containment and prevalence reduction as the primary criteria for managing deer and elk populations in herd units where CWD occurs. Colorado's management goals include preventing the spread
of CWD beyond those populations where it already occurs and reducing prevalence to <1% in both deer and elk populations where CWD is endemic. The texts of this policy, as well as ensuing deer and elk herd management plans, are available at the CDOW home page (http://wildlife.state.co.us/hunt/HunterEducation/chronic.asp). Experimental deer population reduction programs, as well as geographically and epidemiologically targeted culling of deer, began during the winter of 2000-2001 and will be expanded in coming months under the new management policy. Progress is also being made on formulation of broader regional policies and strategies for CWD management in free-ranging deer and elk.

Resolutions

Dr. Miller provided a brief summary of a proposed USAHA resolution, encouraging expedited appropriation of 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 discussion, 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. The resolution was unanimously supported by Committee members and will be forwarded to the Resolutions Committee for further consideration.
III. Organizational Matters
   A. Bylaws
   B. Administrative Policies
   C. Previous Meetings
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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 II-Purpose, may become a member upon approval of the Board of Directors by a majority vote.

d. Elected Regional Delegate Member. Such elected regional
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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
and shall pay 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.

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 conduct prejudicial to its interests. Suspension or expulsion shall be by two-thirds vote of the entire membership of the Board of Directors.

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

Section 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. 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 shall be the chairman of all meetings of the Board of Directors.
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He/she 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.

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; and shall perform such other duties as the President, Board of Directors or Executive Committee may assign.

d. **Second Vice-President.** The Second Vice-President shall act in place of the First Vice-President in the event of his/her absence, death or inability to act; and shall perform such duties as the President, Board of Directors or Executive Committee may assign.

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; and shall perform such duties as the President, Board of Directors or Executive Committee may assign.

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 Executive Director.

g. **Election.** The Committee on Nominations and Resolutions shall annually report its recommendations for the offices of President, President-Elect, First Vice-President, Second Vice-President, Third Vice-President, Treasurer and Regional Delegates to the Association’s membership at the first business session.

The Committee on Nominations report will be presented during the first business session. The committee report shall be posted on the registration bulletin board immediately following its presentation at the first business session. The report shall be read again during the second business session at a time certain specified in the program for “Report of Action of the Committee on Nominations and Resolutions.” If a paper is being presented at the specified time, the presentation will be completed and, immediately after, the report shall be read. If the program is ahead of schedule, a recess will be taken until the time specified in the program for the amendments to the slate presented by the Committee.

The report or amendments approved by a majority vote of the membership is forwarded to the Board of Directors. The acceptance of the report by a majority vote of the Board of Directors shall constitute election of the nominees to office.

h. **Term.** The officers shall serve for one year and until their successors are elected and qualify.
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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.

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.

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.
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.

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.
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.
The following amendments were proposed and approved by the Board of Directors at the 2001 Annual Meeting. Final action on these amendments will be taken at the 2002 annual meeting. The wording is underlined and the wording to be removed is marked through.

Article III – Membership

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 II – Purpose, may become a member upon approval of the Executive Committee Board of Directors by a majority vote.

Article VI – 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 emergency meetings of the Board of Directors. At any meeting of the Board of Directors, the President Elect (Chairman of the Board of Directors), with a majority vote of the Board of Directors, may call for an Executive Session limiting attendance.
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.
<table>
<thead>
<tr>
<th>Date</th>
<th>Place of Meeting</th>
<th>President</th>
<th>Secretary</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>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>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>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>Oct. 8-9, 1901</td>
<td>Buffalo, NY</td>
<td>* Dr. E. P. Niles, VA</td>
<td>* Dr. E. T. Eisenman, Louisville, KY</td>
</tr>
<tr>
<td>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>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>
</tr>
<tr>
<td>Aug. 23-24, 1904</td>
<td>St. Louis, MO</td>
<td>* Dr. J. C. Nolton, AZ</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
</tr>
<tr>
<td>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>Aug. 15-16, 1906</td>
<td>Springfield, IL</td>
<td>* Mr. M. M. Hankins, Quanah, TX</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
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<tr>
<td>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>Sept. 14-16, 1908</td>
<td>Washington, DC</td>
<td>* Dr. Charles G. Lamb, CO</td>
<td>* Dr. C. E. Cotton, St. Paul, MN</td>
</tr>
<tr>
<td>Sept. 13-15, 1909</td>
<td>Chicago, IL</td>
<td>* Dr. W. H. Dalrymple, Baton Rouge, LA</td>
<td>* Dr. C. E. Cotton, St. Paul, MN</td>
</tr>
<tr>
<td>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>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>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>Dec. 2-4, 1913</td>
<td>Chicago, IL</td>
<td>* Dr. Peter F. Bahnson, Atlanta, GA</td>
<td>* Mr. J. J. Ferguson, Chicago, IL</td>
</tr>
<tr>
<td>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>
</tr>
<tr>
<td>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>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>Dec. 3-5, 1917</td>
<td>Chicago, IL</td>
<td>* Dr. J. G. Wells, Albany, NY</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
</tr>
<tr>
<td>Dec. 2-4, 1918</td>
<td>Chicago, IL</td>
<td>* Dr. M. Jacob, Knoxville, TN</td>
<td>* Dr. S. H. Ward, St. Paul, MN</td>
</tr>
<tr>
<td>Dec. 1-3, 1919</td>
<td>Chicago, IL</td>
<td>* Dr. G. W. Dumpy, Lansing, MI</td>
<td>* Dr. D. M. Campbell, Chicago, IL</td>
</tr>
<tr>
<td>Nov. 29-Dec. 1, 1920</td>
<td>Chicago, IL</td>
<td>* Dr. S. F. Musselman, Framtont, KY</td>
<td>* Dr. D. M. Campbell, Chicago, IL</td>
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<tr>
<td>Nov. 28-30, 1921</td>
<td>Chicago, IL</td>
<td>* Dr. W. F. Crewe, Bismarck, MD</td>
<td>* Dr. Theo. Burnett, Columbus, OH</td>
</tr>
<tr>
<td>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>Dec. 5-7, 1923</td>
<td>Chicago, IL</td>
<td>* Dr. W. J. Butler, Henena, MT</td>
<td>* Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>Date</td>
<td>Place of Meeting</td>
<td>President</td>
<td>Secretary</td>
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<td>28. Dec. 3-5, 1924</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>29. Dec. 57, 1925</td>
<td>Chicago, IL</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>30. Dec. 1-3, 1926</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>31. Dec. 34, 1927</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>32. Dec. 57, 1928</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>33. Dec. 4-6, 1929</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>34. Dec. 6-8, 1930</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>35. Dec. 6-8, 1931</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>36. Dec. 6-8, 1932</td>
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<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>37. Dec. 6-8, 1933</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>38. Dec. 6-8, 1934</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>39. Dec. 6-8, 1935</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>40. Dec. 6-8, 1936</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>41. Dec. 6-8, 1937</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>42. Dec. 6-8, 1938</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>43. Dec. 6-8, 1939</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>44. Dec. 6-8, 1940</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>45. Dec. 6-8, 1941</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>46. Dec. 6-8, 1942</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>47. Dec. 6-8, 1943</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>48. Dec. 6-8, 1944</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>49. Dec. 6-8, 1945</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>50. Dec. 6-8, 1946</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>51. Dec. 6-8, 1947</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>52. Dec. 6-8, 1948</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>53. Dec. 6-8, 1949</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>54. Dec. 6-8, 1950</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>55. Dec. 6-8, 1951</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>56. Dec. 6-8, 1952</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<td>57. Dec. 6-8, 1953</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>58. Dec. 6-8, 1954</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
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<tr>
<td>59. Dec. 6-8, 1955</td>
<td>Chicago, IL</td>
<td>Dr. C. F. Bishop, Huntsburg, PA</td>
<td>Dr. O. E. Dyson, Kansas City, MO</td>
</tr>
</tbody>
</table>

**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>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>
</tr>
<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>
</tr>
<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>
</tr>
<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>
</tr>
<tr>
<td>60. Nov. 28-30, 1956</td>
<td>Chicago, IL</td>
<td>* Dr. A. L. Bruckner, 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>* Dr. John G. Milligan, Montgomery, AL</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>* Mr. F. G. Buzzell, Augusta, ME</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
</tr>
<tr>
<td>64. Oct. 17-21, 1960</td>
<td>Charleston, WV</td>
<td>* Dr. J. R. Hay, Chicago, IL</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. A. P. Schneider, Boise, ID</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>67. Oct. 15-18, 1963</td>
<td>Albuquerque, NM</td>
<td>* Dr. T. J. Grennan, Jr. Providence, RI</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. C. L. Campbell, Tallahassee, FL</td>
<td>* Dr. R. A. Hendershott, Trenton, NJ</td>
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<tr>
<td>72. Oct. 6-11, 1968</td>
<td>New Orleans, IA</td>
<td>Dr. John F. Quinn, Lansing, MI</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>75. Oct. 24-29, 1971</td>
<td>Oklahoma City, OK</td>
<td>* Dr. M. D. Mitchell, Pierre, SD</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>76. Nov. 5-10, 1972</td>
<td>Miami Beach, FL</td>
<td>Dr. J. C. Shook Mechanicsburg, PA</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>77. Oct. 14-19, 1973</td>
<td>St. Louis, MO</td>
<td>* Dr. W. C. Tobin, Denver, CO</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>79. Nov. 2-7, 1975</td>
<td>Portland, OR</td>
<td>* Dr. J. E. Andrews, GA</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>80. Nov. 7-12, 1976</td>
<td>Miami Beach, FL</td>
<td>* Dr. H. E. Goldstein, Columbus, OH</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>81. Oct. 16-21, 1977</td>
<td>Minneapolis, MN</td>
<td>* Dr. A. E. Janawicz, Montpelier, VT</td>
<td>* W. L. Bendix, Richmond, VA</td>
</tr>
<tr>
<td>Date</td>
<td>Place of Meeting</td>
<td>President</td>
<td>Secretary</td>
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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, Montpelier, 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>
</tr>
<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>
</tr>
<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>
</tr>
<tr>
<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>
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<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, TX</td>
<td>Dr. J. C. Shook, Mechanicsburg, PA</td>
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<tr>
<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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<tr>
<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>
</tr>
<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>
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<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>
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<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. Oct. 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>
<tr>
<td>105. Nov. 1-8, 2001</td>
<td>Hershey, PA</td>
<td>Dr. Bob R. Hillman, Boise, ID</td>
<td>Dr. J. Lee Alley, Montgomery, AL</td>
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+ This was the last meeting of the Interstate Association of Livestock Sanitary Boards
106th ANNUAL MEETING
October 17 - 24, 2002
THE MILLENNIUM HOTEL
St. Louis, Missouri

107TH ANNUAL MEETING
October 9-16, 2003
TOWN & COUNTRY HOTEL
San Diego, California

108TH ANNUAL MEETING
October 21-28, 2004
SHERATON GREENSBORO HOTEL
Greensboro, North Carolina