REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES OF CATTLE, BISON, AND CAMELIDS

Chair: James Evermann, WA
Vice Chair: Chuck Massengill, MO

Helen Acland, PA; Chris Ashworth, AR; Charlie Broaddus, VA; Charles Brown II, WI; Beth Carlson, ND; Karen Conyngham, TX; Stephen Crawford, NH; Edward Dubovi, NY; William Edmiston, TX; Anita Edmondson, CA; Adam Eichelberger, SC; James England, ID; Betsy Flores, VA; W. Kent Fowler, CA; Robert Fulton, OK; Donna Gatewood, IA; Dale Grotelueschen, TN; Thomas Hairgrove, TX; Rod Hall, OK; Timothy Hanosh, NM; Del Hensel, CO; Floyd Horn, MD; Dennis Hughes, NE; David Hunter, MT; Annette Jones, CA; Paul Jones, AL; Bruce King, UT; Diane Kitchen, FL; John Lawrence, ME; James Leafstedt, SD; Howard Lehmkuhl, IA; Rick Linscott, ME; Pat Long, TN; Francine Lord, CAN; Janet Maass, CO; Patrick McDonough, NY; Shelley Mehlenbacher, VT; Richard Mock, NC; Cheryl Nelson, KY; Jewell Plumley, WV; Jeanne Rankin, MT; Julia Ridpath, IA; Keith Roehr, CO; Mark Ruder, KS; Bill Sauble, NM; Ben Smith, WA; Tom Smylie, ONT; Nick Striegel, CO; Rodney Taylor, NM; Susan Tellez, TX; Robert Temple, OH; Charles Thoen, IA; Kenneth Throlson, ND; Paul Virkler, NY; Brad Williams, TX; William Wilson, KS.

The Committee met on October 20, 2013 at the Town and Country Hotel, San Diego, California, from 12:30 to 5:00 p.m. There were 28 members and 34 guests present. An amended agenda was presented due to the unavailability of the USDA speakers. Dr. Evermann announced the upcoming International Bovine Viral Diarrhea Virus (BVDV) Symposium to be held October 15-16 in conjunction with the American Association of Veterinary Laboratory Diagnosticians (AAVLD)/USAHA meeting in 2014.

Dr. Evermann also reported on recent information about MERS-Corona Virus epidemiology in the Middle East. There have been approximately 140 human cases with a mortality rate of 50%. Bats and camels have been implicated as carriers of the virus. To date the virus has only been isolated from bats but not from camels. Camels however have a high seroprevalance over 90% in some regions.

BVDV Subcommittee report was presented by Dr. Massengill and Dr. Evermann on behalf of Dr. Ridpath.

Introduction of a New Subcommittee on Trichomoniasis

Dr. Keith Roehr, Colorado State Veterinarian, Colorado Dept. of Agriculture

Dr. Roehr offered a historical perspective of Trich control and regulatory programs in the Western States. The importance of education of producers and practitioners was emphasized. He described the need for each state to develop their program in conjunction with the cattle industry of that state to address the unique production methods within that state. He suggested that the subcommittee would serve to share current knowledge. Dr. Bud Dinges, Texas A&M University and Carl Heckendorf, Colorado Department of Agriculture agreed to serve as co-chairs.

Utah's Continued Effort on Trichomoniasis

Dr. Kerry Rood, Extension Veterinarian, Utah State University

Dr. Rood summarized the current status of TRICH control in the State of Utah. Control programs have reduced prevalence in Utah bulls from approximately 5% in 1990 to 0.3% in 2012. Economic losses from the disease have been reported as high as $650 million nationally. It was pointed out that complete eradication is not feasible at this time due to several factors, including lack of compliance by producers, lack of assay sensitivity, sample collection and storage issues, co-grazing on public land, and the inability to identify infected cows. Dr. Rood reported on a slaughter sample collection trial used to compare sensitivity of polymerase chain reaction (PCR) and culture. They found PCR disclosed 38/241 samples positive and culture disclosed 24/241 positive. Ninety five percent of the positive samples had 100 or greater trichomonads/ml. A pooled sample trial revealed that if one sample with 100 trichononads/ml was included in a pool with four negative samples, the PCR showed a sensitivity of 94.9%. The conclusion from the trial was that with individual sample PCR, 1.7% of infected bulls were not detected and with pooling of five samples, 3.6% of infected bulls were not detected. The Utah state veterinarian asked the Utah State University (USU) extension to set up meetings with veterinarians and producers to discuss control programs for trichomoniasis this Fall.

Johne's Disease Vaccination: How Close Are We?

Dr. Murray E. Hines, II
University of Georgia, Tifton

Current vaccines for Johne's disease (JD) are highly problematic. A *Mycobacterium avium* subspecies *paratuberculosis* (MAP) vaccine that reduced the rate or eliminated disease or fecal shedding would be useful in control of JD. Efficacy of four vaccine combinations, including cell-wall competent (CWC) alum adjuvant, CWC-QS21 adjuvant, cell-wall deficient (CWD) alum adjuvant and CWD-QS21 adjuvant vaccines at were evaluated. Baby goats were vaccinated at one and four weeks of age with each vaccine or a sham control vaccine consisting of alum adjuvant. Kids were challenged orally with approximately 6.0 X 109 organisms in four divided doses (1.5 X 109 organisms per dose) using a confirmed goat isolate of MAP. Eighty kids were used with each experimental group consisting of ten kids and each control group six kids. Half of the kids within each group were necropsied at six months post challenge and remaining kids were necropsied at nine months post challenge. Gross and microscopic lesions, as well as, relative number of acid-fast bacilli were evaluated and scored at necropsy. Results indicated all challenged kids had some lesions compatible with JD suggesting none of the vaccines prevented infection. Results suggested that three vaccines (CWC-alum, CWC-QS21 and CWD-QS21) reduced lesion scores resulting in 45.6 - 50.6% reduction of lesion scores at the nine-month period. CWD-alum vaccine resulted in a more severe (+33.5%) lesion score than sham-vaccinated challenged control. Lesion scores increased from the six to nine-month necropsy period in the sham-vaccinated challenged group and CWD-alum vaccinated group, while lesion scores were generally stable with remaining vaccines. Mean fecal CFU/g were significantly different across time from challenge to nine month necropsy (p=0.043) and the CWC-QS21 vaccine group had a marked reduction in fecal CFU/g at all time points post challenge. A reduction in MAP CFU/g was also detected in necropsy tissues from kids given the CWC-alum, CWC-QS21 and CWD-QS21 vaccines, and increased CFU/g were detected in tissues from kids given the CWD-alum vaccine.

Hines II, Murray E., Stiver, Shane, Giri, Dipak, Whittington, Lisa, Watson, Cindy, Johnson, Jill, Pence, Mel, Baldwin, Charles and Aly, Sharif. (2007). Efficacy of spheroplastic and cell wall competent vaccines for *Mycobacterium avium* subsp. *paratuberculosis* in experimentally-challenged baby goats. *Vet. Microbiol.* 120:261-283.

Vaccine Model Standardization

Experimental Challenge Models for Johne's Disease: A Review and Proposed International Guidelines. Hines II, M.E., Stabel, J., Sweeney, R., Griffin, F., Talaat, A., Bakker, D., Benedictus, G., Davis, B., de Lisle, G., Gardner, I.A., Juste, R., Kapur, V., Koets, A., McNair, J., Pruitt, G., and Whitlock, R. *Vet. Microbiol*. 2007. 122:197-222.

Other Vaccine Studies:

Evaluation of immune responses and protective efficacy in a goat model following immunization with a coctail of recombinant antigens and a polyprotein of *Mycobacterium* avium subsp. *paratuberculosis*. Kathaperumal K, Kumanan V, McDonough S, Chen LH, Park SU, Moreira MA, Akey B, Huntley J, Chang CF, Chang YF. *Vaccine*. 2009 Jan 1;27(1):123-35. doi: 10.1016/j.vaccine.2008.10.019. Epub 2008 Oct 26.

Immune response and protective efficacy of live attenuated Salmonella vaccine expressing antigens of *Mycobacterium avium* subsp. *paratuberculosis* against challenge in mice. Chandra S, Faisal SM, Chen JW, Chen TT, McDonough SP, Liu S, Moreira MA, Akey BL, Chang CF, Chang YF. *Vaccine.* 2012 Dec 17;31(1):242-51. doi: 10.1016/j.vaccine.2012.09.024. Epub 2012 Sep 20.

Evaluation of a *Mycobacterium avium* subsp. *paratuberculosis* leuD mutant as a vaccine candidate against challenge in a caprine model. Faisal SM, Chen JW, Yan F, Chen TT, Useh NM, Yan W, Guo S, Wang SJ, Glaser AL, McDonough SP, Singh B, Davis WC, Akey BL, Chang YF. *Clin Vaccine Immunol.* 2013 Apr;20(4):572-81. doi: 10.1128/CVI.00653-12. Epub 2013 Feb 13.

JDIP Vaccine Development Project Phase III Study

Johne's disease vaccine efficacy study and validation of a caprine vaccination and challenge model. Murray E. Hines II, Sue E. Turnquist, Marcia R S Ilha, Sreekumari Rajeev, Arthur L. Jones Lisa Whittington, John P. Bannantine, Yrjö T. Gröhn, Robab Katani and Vivek Kapur. Will be submitted to *Frontiers in Microbiology.*

A *Mycobacterium avium* subspecies *paratuberculosis* (MAP) vaccine that reduced the incidence of clinical disease and/or reduced fecal shedding of MAP would aid control of Johne's disease (JD). The objectives of this study were 1) to evaluate the efficacy of 5 attenuated strains of MAP as vaccine candidates alongside one commercially available MAP vaccine (Silirum®, Pfizer) using the protocols and endpoints proposed by the Johne's Disease Integrated Program (JDIP) Animal Model Standardization Committee (AMSC), and 2) to validate the AMSC Johne's disease goat challenge model (see Hines et al., 2007b). Eighty goat kids were vaccinated orally twice at 8 and 10 weeks of age with one of the experimental vaccines or once subcutaneously at 8 weeks with Silirum®, or an oral sham control vaccine consisting of goat milk. Kids were challenged orally with a total of approximately 1.44 X 109 CFU divided in 2 consecutive daily doses using a bovine MAP K10-like isolate (ATCC-700535). Immunological tests performed included Agar Gel Immunodiffusion (AGID), ELISA, and cell mediated response by comparative purified protein derivative (PPD) skin testing (*M. avium*, Johnin and *M. bovis* PPD's). Kids within each group were euthanized and necropsied at 13 months post challenge. Results indicated all challenged kids had gross and/or microscopic lesions compatible with JD suggesting none of the vaccines prevented infection. However, there was a marked reduction in fecal CFU/g and necropsy lesion score in the group given the Silirum® vaccine and a lesser reduction in the 329 vaccine group. A marked reduction in MAP CFU/g and PCR percent positivity was also detected in necropsy tissues from kids given the Silirum® vaccine, and increased CFU/g were detected in tissues from kids given the 315 and 319 vaccines vs. the positive control group. Vaccination also resulted in false-positive PPD skin test reactions for M. avium PPD and Johnin. These data show Silirum® was the best performing vaccine followed by attenuated vaccine strain 329. Furthermore, the goat challenge model for Johne's disease has been validated.

Where are we?

We are within striking distance of developing a more efficacious vaccine, but are not yet where we need to be. Mycopar® is currently the only licensed vaccine within the U.S., it is only licensed for cattle, and it requires approval by each State Veterinarian.

Bovine Viral Diarrhea Virus (BVDV) Infection in Free-Ranging Wildlife in Nevada

Dr. Peri Wolff, Nevada Department of Wildlife

The detection of BVDV was observed coincidentally during an investigation of a die-off event in Big Horn Sheep in Eastern Nevada. This prompted further surveillance of the population of wild ungulates including Mule Deer and Mountain Goats. Some populations had elevated antibody titers in greater than 80% of the animals tested. The titer patterns were unique in that the titers were negative or extremely high. Populations of wild ungulates in other parts of the state were found to have no serological activity. Further surveillance is planned in coordination with hunter harvested animals to determine the significance of these findings. Currently the effect of BVDV on wild ungulates is undetermined.

Committee Business:

A resolution was introduced, discussed and passed unanimously to ask State Milk Regulatory Agencies in states which allow the retail sale of raw milk, to initiate a *Coxiella burnettii* surveillance in herds producing raw milk for retail sale. The resolution has been shared with the Committee on Sheep and Goats and the Committee on Public Health and Rabies.

REPORT OF THE SUBCOMMITTEE ON BOVINE VIRAL DIARRHEA VIRUS (BVDV)

Julia Ridpath, Chair
Presented by Chuck Massengill and Jim Evermann

Strategies for BVDV Control in the United States

There was a brief overview of BVDV defining populations at risk, aim of control programs, and use of vaccination. Populations included feedlots and cow calf production units and reduction of disease from transient infection in feedlots and persistent infection in cow/calf operation. Emphasis was placed on: 1) shifting BVDV sub genotypes prompting reanalysis of vaccine efficacy; 2) engaging producers and veterinarians in utilization of BVDV test for PI detection.

Introduction of the BVD Website "BVD CONSULT"

Dr. Bob Larson, Kansas State University

A short description of the interactive web based educational resource for producers and veterinarians. BVD CONSULT provides information on the various options available for the control of PI risk. The web address is: www.bvdinfo.org