REPORT OF THE COMMITTEE ON SHEEP AND GOATS

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The Committee met on November 17, 2010 at the Hilton Hotel, Minneapolis, MN, from 8:00 a.m. to 11:30 a.m. There were 17 members and 31 guests present.

Presentations

Serological Diagnosis of Mycoplasma Ovipneumoniae by cELISA

Tim Baszler, Washington Animal Diagnostic Disease Laboratory

Mycoplasma ovipneumoniae infection is associated with population limiting respiratory disease in free-ranging Rocky Mountain bighorn sheep. Serology could provide a practical and consistent “live animal” test for *M. ovipneumoniae* infection in both bighorn and domestic sheep and would not be affected by culture or PCR-based agent detection method limitations such as intermittent/variable shedding by the host or maintaining agent viability during sample transit. The most widely used *M. ovipneumoniae* serologic test is the indirect hemagglutination assay (IHA) based upon whole bacterial cells, which is difficult to standardize in the laboratory and can potentially detect antibodies to closely related agents such as *Mycoplasma arginini*. To increase standardization and specificity of *M. ovipneumoniae* serologic testing we report herein development of a competitive inhibition ELISA (cELISA) assay based upon a *M. ovipneumoniae*-specific monoclonal antibody.

Analytical validation studies showed sera from bighorn sheep and domestic sheep experimentally infected with *M. ovipneumonaie*, serum from BALB/c mice immunized with whole *M. ovipneumoniae*, and monoclonal antibody (MAb) F141.224.2.1, produced from BALB/c immunized mice, bound a 71 kDa antigen from whole *M. ovipneumoniae* cells as indicated by immunoblot analysis. MAb 141.224.2.1 was specific for *M. ovipneumoniae* and did not bind to closely related agents *M. agalactia, M.capricolum, M. mycoides, M. putrifacions*, and *M. arginini*. A cELISA based upon MAb 141.224.2.1 correctly classified pre-inoculation and temporal post-inoculation sera from experimentally infected bighorn and domestic sheep and there was an appropriate decrease in percent inhibition during end-point dilution of cELISA positive serum. Sera from free-ranging bighorn sheep shown positive using *M. ovipneumoniae*-specific PCR had mean percent inhibition of 85% (+/- 7.5%).

Diagnostic validation was implemented using a set of sera from 218 free-ranging Rocky Mountain bighorn sheep (76 positive and 142 negative samples) defined as *M. ovipneumoniae* positive by clinical disease (presence or absence of pneumonia in a group) and seropositivity using *M. ovipneumoniae* indirect hemagglutination assay. MAb 141.224.2.1 cELISA showed a distinct bimodal distribution of negative and positive sera with histogram analysis. **A cutoff was determined of “≥50% inhibition = positive” and “<50% inhibition = negative” based upon 3 standard deviations from the mean percent inhibition of negative sera. Using this cutoff the performance analysis of the cELISA showed 88% sensitivity, 99.4% specificity, and 95.6% agreement.** Ongoing validation of the *M. ovipneumoniae* cELISA with sera from free-ranging Rocky Mountain bighorn sheep is in progress. The analytical and diagnostic validation studies for the *M. ovipneumoniae* cELISA indicate a rapid, simple, easily standardized serological assay for accurate identification of *M. ovipneumoniae* infection versatile for domestic and wildlife ovine species.

Recommendations for Research that Would Improve Respiratory Disease Prevention and Control in Domestic Sheep and Bighorn Sheep

Walt Cook, University of Wyoming

Dr. Cook's presentation provided the following list of research needs

- Tools for recovering wild sheep after an outbreak
- Tools to protect neonatal wild sheep
- Tools to increase recruitment of wild sheep
- Investigating roles of other factors in contributing to die-offs
- Tools to eliminate pathogenic *Pasteurellaceae*
- Investigating what constitutes "Good Habitat
- Retrospective analyses of die-offs to establish common factors prior to event
- Retrospective analysis of all data to establish relationships after outbreaks
- Investigate "Probiotics"
- Investigate role of *Mycoplamsa* and other agents Retrospective analyses of die-offs to establish common factors prior to event
- Retrospective analysis of all data to establish relationships after outbreaks
- Investigate "Probiotics"
- Investigate role of *Mycoplamsa* and other agents
- Investigate epidemiologic tools to help mangers predict an outbreak
- Increase our understanding of sheep immune systems
- Calculate probability of interaction, risk and disease transmission.
- Determine risk of wandering bighorn rams

NAHMS Sheep 2011 and Goat 2009 Studies

Katherine Marshall – NAHMS

The Goat 2009 study in 21 states represented 75.5% and 82.2% of goat operations and goats respectively, in the United States. Descriptive reports on the management, health, marketing and biosecurity of goat operations in the US will be completed by early 2011. Overall, 2087 producers responded to either telephone or personal interviews conducted by the National Agricultural Statistics Service (NASS), with 634 completing the second, mail-in, survey. Participation in biologic sampling was low due to no Veterinary Services field support.

The Sheep 2011 study will begin with NASS enumerator interviews in January 2011. The study encompasses 22 of the top sheep producing states and represents 71% of the farms and 84% of the sheep inventory in the US. Study objectives include: Describe the trends in sheep health and management practices from 1996 through 2011, describe management and biosecurity practices used to control common infectious diseases, including scrapie, ovine progressive pneumonia, Johne's disease and caseous lymphadenitis, estimate the prevalence of gastrointestinal parasites and anthelmintic resistance, Mycoplasma ovipneumonia , facilitate the collection of information and samples regarding the zoonotic causes of abortion, determine producer awareness of the zoonotic potential of contagious ecthyma, and provide serum to the serological bank for future research.

Visits to farms for the second questionnaire and possible biological sampling will begin in March and run through May 2011.

The National List of Reportable Diseases

Dr. Ellen Kasari, USDA APHIS VS CEAH National Surveillance Unit, Fort Collins, Colorado presented the following update on the National List of Reportable Animal Diseases (NLRAD).

The NLRAD is being developed in response to the 2007 USAHA Resolution # 9 that requested a national list of reportable animal diseases be developed, and the 2008 USAHA Resolution #10 that tasked the NAHRS Steering committee and Veterinary Services with the development of the national list of animal diseases, including case definitions and reporting criteria for each disease. In response, the NAHRS Steering Committee, in cooperation with Veterinary Services drafted a NLRAD overview document and a proposed list of reportable animal diseases in 2009. The drafted NLRAD is based on the OIE list of animal diseases. In 2010, the NLRAD overview document and disease list were revised and redistributed to the NAHRS steering committee. An update on the NLRAD was shared with the VSMT in October and their comments will be addressed in an upcoming revision. Commodity group, NASAHO, and other stakeholder

review and input are either actively being sought, or are planned in the near future. A brief overview of the definitions "Notifiable" and "Monitored" have been provided along with a list of proposed NLRAD diseases that impact Sheep and Goats. Comments about the NLRAD from the Committee on Sheep and Goats should be directed to the NAHRS Steering committee's Small Ruminant Working Group Chair, Dr. Jim Logan. Support for a CAHSIS resolution for continued support of the NLRAD development is requested.

Whole Genome Association with Susceptibility to Ovine Progressive Pneumonia Virus: Odds of Onfection and Proviral Concentration

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Ovine progressive pneumonia virus (OPPV), also known as maedi-visna, causes varying degrees of respiratory distress, body condition wasting, mastitis, arthritis, and/or encephalitis. Twenty-four percent of U.S. sheep have lifelong OPPV infection and are potential sources of transmission to naive animals. Like the human immunodeficiency virus (HIV), OPPV is a macrophage-tropic lentivirus that has eluded vaccine-based prevention. There are no known treatments for OPPV, but consistent breed differences in seroprevalence and proviral concentrations suggest a genetic basis for degree of susceptibility to OPPV. A total of 1,000 animals from the Rambouillet, Polypay, and Columbia breeds were genotyped using the Illumina OvineSNP50 marker set. Infection status was determined using 1) a competitive ELISA, which detects anti-OPPV antibodies, and 2) a quantitative real-time PCR assay, which measures OPP provirus concentration in peripheral blood leukocytes. The cELISA data yielded 28 genomewide significant or suggestive markers that accounted for 30% of the variation in cELISA status; one example is a gene with limited annotation expressed in immune cells that may play a role in regulating natural killer responses. The provirus concentration data yielded 18 significant or suggestive markers accounting for 32% of the total variance in $\log_{10}$-proviral concentration; one example is an antiviral gene with activity in suppressing translation of viral transcripts. The inclusion of substantial numbers of animals from multiple breeds allowed the detection of associated regions in multiple genetic backgrounds that include genes important for susceptibility to lentiviruses such as OPPV and HIV.

Scrapie Program Update

Dr. Diane Sutton reported an update concerning 2010 Scrapie Program

Committee Business

Resolutions

A resolution was passed by the committee to identify and approve appropriate sites for RFID implants for goats and sheep.

A resolution was passed by the committee supporting the United States National List of Reportable Animal Diseases (NLRAD). Both resolutions were sent to the Committee on Nominations and Resolutions for review.

New Business

Due to the combination of the national scrapie oversight board and the USAHA scrapie committees the possibility of moving the meeting time of the Sheep and Goat Committee to Tuesday afternoon was discussed. The majority of committee attendees were in favor of moving the committee time.