

REPORT OF THE COMMITTEE ON SHEEP AND GOATS

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The Committee met on October 29, 2008 at the Sheraton Greensboro Hotel Greensboro, North Carolina, from 8:00 a.m. to 12:00 p.m. There were 17 members and 16 guests present.

Marie Bulgin, Caine Veterinary Center, presented a time-specific paper, A Novel Approach to Control John's Disease in a Western US Range Flock. The paper is included in its entirety at the end of this report.

Stephen White, Animal Disease Research Unit (ARS), United States Department of Agriculture (USDA), Center for Integrated Biotechnology, Department of Veterinary Microbiology and Pathology, Washington State University, spoke about Sheep CCR5 variant reduces levels of ovine progressive pneumonia virus.

CCR5 is a chemokine receptor that regulates immune cell recruitment in inflammation and serves as a coreceptor for human immunodeficiency virus (HIV). A human CCR5 coding deletion (termed delta-32) results in strong resistance to HIV infection, and polymorphisms in CCR5 regulatory regions have been implicated in delayed progression to acquired immune deficiency syndrome (AIDS). Both OPPV, also known as maedi-visna, and HIV are macrophage-tropic lentiviruses, have similar genomic structures, and cause lifelong persistent host infection, suggesting CCR5 may have a role in regulating OPPV provirus levels. Therefore, the ovine CCR5 genomic sequence was determined, and polymorphisms were obtained from the open reading frame and surrounding regulatory sites. One CCR5 variant contained a 4-base deletion within a known regulatory binding site, and a test for differential transcription from each allele in heterozygous animals showed a 3.9-fold transcription difference ($P < 0.0001$). OPPV proviral levels were also measured in 351 naturally exposed Rambouillet, Polypay, and Columbia sheep. Deletion homozygotes showed reduced OPPV proviral levels among these animals ($P < 0.01$). The association of this CCR5 deletion with OPPV levels will need to be validated in additional populations before the deletion can be recommended for widespread use in marker-assisted selection. However, because of the large impact on transcription and because CCR5 has roles in inflammation, recruitment of effector cells, and cell-mediated immunity, this deletion may play a role in the control of infection with many diverse pathogens of sheep.

Kate O'Connor presented her work on anthelmintic resistance in sheep and goat herds titled, Is Your Dewormer Working - Case Studies of Anthelmintic Resistance in the Upper Midwest. Her work is funded through a competitive process aimed at involving veterinary students in research. She has tested statistically representative fecal samples in five flocks/herds and found significant anthelmintic resistance in one goat herd and one sheep flock. Test results have shown parasites to be insignificant in a third flock, effective anthelmintic treatment in a fourth flock and under-dosing to be contributing to parasite problems in a fifth flock.

Lindsey Garber, USDA, Centers for Epidemiology and Animal Health (CEAH), Veterinary Services (VS), Animal and Plant Health Inspection Service (APHIS) presented the plans for the 2009 National Animal Health Monitoring System (NAHMS) Goat Study. USDA has done preliminary work surveying producers and non-producers to find out the industries concerns and starting in February 2009 will start investigating these concerns.

The Committee heard three presentations on bighorn sheep-domestic sheep issues. First, Margaret Soulen-Hinson, Soulen Livestock, presented the Rancher Perspective of the Complexity of Grazing Sheep on Public Lands. Soulen-Hinson explained how integral each range (private and public) is to their operation.

She explained how the sheep are managed for their own grazing needs, protection from predators and agency mandates.

Next, Mike Miller, Colorado Department of Interior presented the August 2008 CAST Report titled Pasteurellosis Transmission Risks between Domestic and Wild Sheep. This seven page report is available on the CAST website (www.cast-science.org), and also was presented as a time-specific paper in the Committee on Wildlife Diseases. Lastly, Walt Cook, Wyoming State Veterinarian presented a preliminary report of the working group which is a joint group from this Committee and the Committee on Wildlife Diseases. Their work has been initiated via conference calls and email communication; Greater understanding and progress was made amongst this group when able to meet face to face in Greensboro. Cook hopes to have a full report to be presented to both Committees next year. An important message that the working group wishes to share at this time is their belief based on scientific review that more research is needed to better delineate what role the domestic and bighorn sheep (BHS) play in the decline of certain populations of BHS. Research is also needed to better understand the immune system of BHS as it relates to disease defense and survivability. The Committee urges both USDA and the Department of the Interior to seek funding for bighorn sheep research (as stated in 2007 Resolution 15 and 64). Examples of such dual funding include research funds for chronic wasting disease.

Committee Business:

This Committee has asked Jim Logan to serve as their representative on NAHRS. The Committee will also be asking USDA-APHIS-VS National Veterinary Services Laboratory (NVSL) for a greater explanation of inconclusive test results from the *Brucella ovis* enzyme linked immune sorbent assay (ELISA) on virgin rams, etc.

The Committee passed three resolutions, submitted to the Committee on Nominations and Resolutions.

A NOVEL APPROACH TO CONTROL JOHNE'S DISEASE IN A WESTERN U.S. RANGE FLOCK.

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Johne's disease (paratuberculosis) in small ruminants, as with many ruminant species, is a chronic inflammatory bowel disease, caused by *Mycobacterium avium paratuberculosis* (MAP), resulting in chronic wasting and eventually death. Infection commonly takes place at a very early age, less than six months, but clinical signs may not be evident until greater than four years of age. Fecal-oral transmission is thought to be the most common route but intrauterine and transmammary transmission have been reported and may be of greater importance in small ruminants. The organism is variably shed in the feces depending on strain (cattle versus sheep), species infected, and stage of infection. The tendency is for cattle to shed higher numbers and for longer periods than in sheep which often do not develop diarrhea until the terminal stages of the disease. This variability in shedding and extended incubation period (especially with sheep) makes identification of subclinical carriers imperative for any control program. Diagnostic tests range from fecal culture (gold standard but very slow), sera and milk enzyme linked immune sorbent assay (ELISA), gamma-interferon, and Johnin PPD skin test. Sensitivities and specificities of these tests also are highly variable confounding interpretation.

Diagnosis and control of Johne's disease in sheep has been especially frustrating due to many factors including: variable shedding of MAP, extended culture times often greater than 6 months, variable sensitivity/specificity of available ELISA tests, economical considerations of both testing and handling of sheep (especially in large range flocks) and time of year that ewes are available for testing. Based on our work previously reported (Mamer, et. al. United States Animal Health Association and American Association of Veterinary Laboratory Diagnosticians 2007 and Ayers et al WBC 2008) we have designed a test and sort program in an attempt to control Johne's disease in a cooperative infected flock.

The goal of the control program is to create a nucleus of Johne's negative ewes that are bred to provide replacement ewe-lambs. White-faced ewes that have a white-faced ewe-lamb have milk collected on day two post-partum by herders and refrigerated or frozen until testing. Milk samples are tested undiluted (unless very viscous, then a 1:2 dilution is used) using the IDEXX Herdchek™ ELISA system. At present we are using an S/P ratio of 0.300 to 0.499 as suspect and greater than 0.500 as positive. Ewes testing positive or suspect are identified with a unique colored tag and removed from the replacement flock. Their ewe-lambs are also identified and are typically sold as fat lambs. Only ewe-lambs from test negative ewes are identified and designated to the replacement band.

January 2008 was the first year of implementation of this test and sort program. Two hundred ninety nine ewes were sampled and 86 identified as suspect (43) or positive (43). These data suggest an incidence rate in the replacement flock of 28.7 percent. Plans are to locate as many ewes that had been identified as positive or suspect and perform follow up testing in the fall of 2008 and again at lambing in 2009. In this way we hope to be able to generate enough data points that we can refine the milk test S/P cutoff and make the results as predictable as possible. We will continue to test the replacement band and follow the incidence rate as a measure of progress.

A test and cull program is not a practical economic means to control or eliminate Johne's disease in flocks of this size. However, control with reduction of clinical cases is necessary and therefore current plans are to continue the test and sort program outlined here with adjustments as necessary to maintain the goal of economic convenient control of Johne's disease in this large western range flock.