

Myth-busting strategies for ovine progressive pneumonia virus (OPPV) control

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Abstract

This paper reviews the latest information on the spread and control of ovine progressive pneumonia virus (OPPV). Infected adult animals serve as the reservoir for the virus, and the virus is spread to genetically susceptible animals through respiratory secretions. It is now known that transmission of the virus through the colostrum and milk is not a significant risk factor. Control programs consist of segregating test-negative animals from those testing positive, and selecting replacement animals that have protective genotypes.

Key words: sheep, ovine, ovine progressive pneumonia, OPPV

Résumé

Cette présentation dévoile les derniers développements concernant la propagation et le contrôle du virus de la pneumonie progressive des ovins. Les animaux infectés servent de réservoir pour le virus et ce virus se propage aux animaux génétiquement susceptibles par l'entremise de sécrétions respiratoires. Il n'est pas clair si la transmission du virus par le colostrum et le lait est un facteur de risque important. Les programmes de contrôle comprennent la ségrégation des animaux négatifs au test de ceux qui sont positifs de même que la sélection d'animaux de remplacement qui ont des génotypes protecteurs.

Introduction

The sheep lentivirus virus is named ovine progressive pneumonia virus (OPPV) in the US, and has been researched for decades. Publications argue the effect that this virus has on productivity. Numerous factors influence this debate including breed-type, management style, lambing practices, flock prolificacy, and viral strain differences. Sheep producers who have monitored production levels from OPPV infected sheep and uninfected sheep are convinced that this viral infection is a production-limiting disease. Support for this belief is that producers move from infected flocks to uninfected flocks but not the other direction.

This virus lives in the sheep white blood cells. Once the virus gets outside the host, it only survives for minutes. Recent research, including results from a multi-farm field

trial, have demonstrated that the mode of transmission is different from what was initially believed. Based on these findings, a more producer and sheep friendly control strategy has been developed.

Clinical and Economic Implications

Historically range ewes from the west have been sold into Midwestern flocks when they reach 6 years of age. The basis for these sheep movements has been that these 'low-cost ewes' could be productive for approximately 2 to 3 more lambings under Midwestern farm flock conditions. Based on USDA NAHMS survey data from 2001, 45% of western ewes are infected with OPPV. When these sheep have been housed indoors for winter lambing, the conditions have been well-suited for OPPV transmission.

Reasons to eradicate revolve around the fact that freedom from infection allows sheep to perform to their full potential. It has been shown that OPPV-infected sheep produce less milk and have shorter longevity regarding their productive life. A large South Dakota sheep flock has compared their productivity pre- and post-OPPV clean up. When their flock was 85% infected, their 500 ewe flock produced a 140% lamb crop with 150 to 180 lambs needing to be orphaned and bottle fed due to lack of dam milk production. Observations about their lambs included lethargic newborn lambs due to insufficient colostrum intake, slow rate of gain due to insufficient availability of milk, recumbent ewes, and 5-year-old ewes flunking out of the flock due to weight loss. Now their 800 OPPV test-negative ewes produce a 185% lamb crop with only 15 to 30 orphan bottle lambs/year. The newborn lambs are vigorous at birth and nurse on their own, grow well, and remain healthy. Ewes are culled at age 10 and most are in good body condition at the time of culling. The economic difference between the cost of milk replacer alone is \$6,367.50 (150 bottle lambs x \$42.45/cost of bag of milk replacer needed per lamb) versus \$1,273.50 (30 bottle lambs x \$42.45/bag milk replacer). This difference is equivalent to \$12.74/ewe (\$6,367.50/500 ewes) compared to \$1.59/ewe (\$1,273.50/800 ewes). This cost does not account for the additional labor or equipment needed to raise these bottle lambs to the time that they can be weaned off of milk replacer, nor does this cost analysis take into account a higher cull rate due to OPPV infection in the original flock, which results in a greater cost due to a higher flock replacement rate.

Control of OPPv

Control programs for the OPPv now depend on 3 tools. First is the use and selection of rams and ultimately replacement breeding stock that have a specific genotype at the TMEM154 gene which helps protect against OPPv infection. Second is the start of a second flock on the existing farm premise that is kept spatially separate from other ewes. This separate flock contains only seronegative females that are tested annually beginning as young as 6 months of age. Third, the test used is the small ruminant lentivirus Elitest, which has superior sensitivity and specificity compared to other available OPPv serologic tests.

It is only recently that the major means of transmission has been determined. Infected adult animals serve as the infection reservoir for genetically susceptible ewe lambs and ram lambs. This information has major implications for controlling the virus within infected flocks. Researchers at the USDA Meat Animal Research Center determined that there is genetic control over the susceptibility of becoming infected with the OPP virus given exposure. The diplotypes 1, 1; 1, 4 and 4, 4 at the gene TMEM154 provides partial protection against infection with the virus. This protection is not absolute as it can be overwhelmed with close confinement, inadequate ventilation, and high humidity which when combined results in high viral exposure loads. Sheep with diplotypes 1, 3 and 3, 3 are susceptible to OPPv infection. Haplotype 1 is recessive to haplotype 3. Breeding stock is now available throughout the nation with known TMEM154 genotypes. The TMEM 154 genotyping is commercially available for the industry at Geneseek. See <http://www.neogen.com/Genomics/pdf/SubmissionForms/OvineSubmission-Form.pdf> for details regarding submissions. The cost is \$12/sample and the test can be performed on either EDTA whole blood or FTA® cards. FTA is an acronym for “fast technology for analysis” of nucleic acids.

This collaborative research found that ewes within flocks with susceptible genotypes were infected by contact with other infected ewes, primarily via contact with respiratory secretions. Ewe lambs of diplotypes 1,3 or 3,3 commingled with infected ewes in a normal production setting through 2 lambings were 8 times more likely to be infected with the OPPv when retested at 35 months of age as compared to ewe lambs of diplotype 1,1 that were managed in the same group as the 1,3 and 3,3 ewes. Prior to this research, many believed that the primary route of OPPv transmission was due to young lambs drinking infected colostrum and milk from infected ewes. Current knowledge now makes control less formidable, especially in small to medium sized flocks as snatching lambs at birth and orphan rearing is not practical or economical with today's input costs.

Control programs now focus on genetic selection to increase the frequency of the TMEM154 haplotype 1 or 4 (which is less common in US sheep populations) in whole groups of replacement ewe lambs and ram lambs, serologic

testing using the OPPv Elitest, and flock management that includes lifetime group separation of adult infected sheep from test-negative replacement animals.

Initially the emphasis should be placed on using rams of ‘protective’ genotypes, i.e. 1, 1; 1, 4 or 4, 4. Second the Elitest is documented to be more specific and sensitive than other available ELISA tests for small ruminant lentiviruses. It is initially performed on weaned 6 to 10-month old replacement ewe lambs and ram lambs. Positive-testing lambs are immediately and permanently removed from the negative-testing group. The negative-testing replacements are maintained on the farm separately from the adult ewes and rams for their lifetime. The recommended separation distance is a minimum of 10 feet, but greater distances should be encouraged wherever possible. Serologic testing needs to be repeated every year on the negative testing group. Additional flock and farm management recommendations have been made by a motivated group of producers and DVMs who have championed OPPv control and eradication for many years. Visit <http://mn.gov/bah/media/opp-eradication-trial.pdf> for details. The Minnesota OPPv eradication trial has shown initial success in its first few years on farms of various sized flocks and breeds, and is planned to continue for another year.

In 2 of the trial flocks that experienced seroconversion in their test-negative groups, this result was thought to occur because of the use of a seropositive ram or close contact in show barns with sheep of unknown OPPv-infection status. When producers housed their test-negative replacement ewe lambs in their existing flock that contained a proportion of seropositive ewes, instead of the agreed-upon-approach of segregation, some of the test-negative replacement ewe lambs seroconverted to a positive or infected status. This finding in the applied Minnesota trial further emphasizes that true segregation of the test-negative replacement young stock is necessary for a control program to be effective. To be convinced that a producer is serious in their desire to develop an OPPv-negative flock, they have to plan how and where they will manage 2 productive ewe groups for 2 to 3 years while flock numbers are increased in the test-negative group. This approach affords the preservation of the flock's genetics while building an uninfected flock in an economical manner. The test-negative ewe and ram lambs can be naturally reared even by infected dams, thus saving money by not having to raise these lambs artificially with extra labor and purchased milk replacer at a cost of approximately \$2/lb (\$2/0.45 kg). The risk of infection from seropositive ewes is lowered by using early weaning practices, i.e. less contact time with viral dose. The industry has observed that dam-reared lambs grow faster and make superior replacements when compared to artificially reared lambs. By the third lambing, producers give serious consideration to selling/culling their infected ewe flock and focusing efforts of expanding the size of their uninfected flock.

Compared to the former control approach of repeated test and cull where genetically desirable ewes were culled

and their lambs were raised on milk replacer, this approach requires less testing of ewes and rams, and preserves genetics by permitting the producer to produce seronegative replacement lambs from infected ewes and rams, and these same lambs are reared naturally.

References

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