AABP & AASRP Sessions

Moderator: Paul Jones

Incorporating Veterinary Care into the Sheep Production Cycle

David C. Van Metre, *DVM, DACVIM*
Veterinary Teaching Hospital, Colorado State University, Ft. Collins, CO 80523

Abstract

According to recent national survey data, roughly half of sheep producers in the United States regularly utilize veterinary consultation as a diagnostic service. A large proportion of health problems in conventional flocks is the result of management errors and is potentially preventable. Veterinarians are well positioned to provide consultation services to improve management practices as well as diagnostic services to monitor health and disease in the animals. A logical starting point is the introduction of certain practices that have high potential to provide direct economic benefit to the producer, such as fertility testing of rams. By offering such services at opportune times, veterinarians can efficiently integrate their expertise into the annual flock production cycle.

Introduction

Veterinarians are currently viewed by sheep producers as an important source of flock health information. In the 1996 NAHMS survey of US sheep production practices, the percentage of producers surveyed who utilized veterinary consultation as a diagnostic service ranged from 40-53%.[1] Forty-six percent of producers surveyed for the 2001 national sheep study consulted a veterinarian in the year 2000.[2] Nonetheless, sheep practice represents the lowest proportion (~4%) of total food animal veterinary service market in the US, and compared to dairy, beef, and swine producers, sheep producers spend the least on animal health products and services.[18] Veterinarians commonly express frustration in developing consistent contact with sheep producers. While economic concerns may drive many sheep producers to minimize their veterinary services, some may possess a limited understanding of the potential flock health services that veterinarians could provide.

Primary health concerns cited by producers in 1996 NAHMS survey were common diseases such as footrot, parasitism and vitamin E and selenium deficiency.[1] However, the majority of death losses in lambing operations are considered to be due to management causes and are potentially preventable.[10,11] In a large Colorado study, management practices such as improvement of flock immunity, proper sanitation, effective dystocia intervention, proper colostrum feeding and prevention of hypothermia were cited as likely to improve lamb survival.[10] Similarly, the detrimental effect of ram infertility on lamb crop and flock economics has been well documented.[3,5,6,12] However, 1996 data indicate that only 17 to 28% of US sheep operations surveyed routinely evaluate ram fertility with breeding soundness examination.[1] In the 2001 NAHMS survey, 34% listed scrotal circumference and semen quality as very important parameters to consider in ram selection, but an equal percentage listed these parameters as not important.[2]

Veterinarians are well positioned to become valued participants in flock health programs through introduction of certain practices that have high potential to provide direct economic benefit to the producer. Opportune times for veterinary intervention include evaluation of the breeding flock in the fall prior to breeding, late fall / early winter pregnancy diagnosis and lambing management during the spring. This opportunity is clearly described by Scott:[12] "The primary objective must be to devise ways of getting onto sheep farms regularly so that the veterinarian can develop familiarity with, and gain the confidence of, the sheep farmer." This review will serve to describe potential flock health interventions that can occur during the fall (prebreeding) phase of the production cycle for a spring lambing operation.

At the end of the summer grazing period, the ewe flock (including potential or already selected replacement ewe lambs) is typically gathered for evaluation of fitness

for inclusion in the fall breeding program. To optimize the size of the upcoming lamb crop, the primary goal of the prebreeding flock health program should be optimization of fertility in the ewes and rams flock through nutritional management and disease control measures, as well as documentation of ram fertility.

Pre-Breeding Evaluation of Rams

Ram breeding soundness examinations and *Brucella ovis* control programs have served as the springboard for development of flock health programs by veterinarians in Australia and New Zealand.[12] Because it can so strongly influence the lamb crop, an annual ram fertility evaluation program is a powerful tool for convincing producers of the value of veterinary consultation. Accurate producer education regarding ram fertility is essential if the veterinarian is to establish an effective control program for this disease. Ovine brucellosis can reduce lamb crop by as much as 30% in naïve flocks; a 15-20% reduction is commonly seen in flocks in which *B. ovis* infection is endemic.[3] In endemic flocks, control programs must be maintained over several years before the organism can be eliminated. In an study of a range flock in Argentina, a single ram cull based on the results of clinical examination and serological test results did not decrease the prevalence of *B. ovis* in the flock in the subsequent year.[9] Obviously, a long-term commitment to eradication and persistence of efforts are necessary.

Many producers are unaware of the presence of *B. ovis* infection in their flocks, simply because the most common manifestation is a lamb crop that is smaller than it would otherwise be; in other words, the losses caused by the disease are often invisible. In 1998, Kansas producers were offered reduced-cost serologic testing for *B. ovis* in exchange for voluntary participation in a questionnaire-based survey of flock management practices. Thirteen producers participated, and serum samples from 58 rams were submitted for testing. Nine of 58 rams (16%) representing four of 13 flocks (31%) were found to be seropositive. Based on questionnaire data obtained prior to testing, none of the 13 producers believed the disease was present in their rams.[17]

Although ram epididymitis is the most prominent clinical feature of infection, clinically apparent epididymitis is present in only a subset (~20%) of infected rams.[6] Infected rams may harbor the organism in the seminal vesicles and have palpably normal testes and epididymes. Palpable lesions of the epididymis may not be present if the infection is in the early stages. Palpation alone, therefore, is not a sensitive means of detecting infected animals. On the other hand, epididymitis may be caused by trauma or bacteria other than *B. ovis*.[3,13] White blood cells in the semen and detached sperm heads are findings compatible with *B. ovis* infection, and semen examination is necessary to detect rams in the early stages of infection.[5]

Given these considerations, a combination of *B. ovis* serologic testing, physical examination (including careful palpation of the testes and epididymes) and semen evaluation are necessary steps to optimize the fertility of the ram population.[3,5,6,12,13] In a study of two Western US flocks, Kimberling and Schweitzer[6] compared the lamb crop of a flock served by rams that had been documented to have excellent semen quality and were seronegative to *B. ovis* to that of a flock served by randomly selected, untested rams. The increased lamb crop produced by the semen-tested, *B. ovis* - seronegative rams resulted in an economic advantage of nearly $12 US / ewe (1987 dollars).[6] Additional potential benefits to a ram fertility program include reduced expenditures on extra rams, a shorter lambing season and more lambs born early in the lambing period.

Brucella ovis infection of the ewe may cause early embryonic death, stillbirths, weak lambs and abortions. Ewes are only infected transiently, usually for 1-2 heat cycles (~ 6 weeks).[3] In multi-sire breeding systems, ewes serve as sources of venereal spread of the organism among rams, but ewes are not considered likely to harbor and spread the organism from year to year.

Spermatogenesis in rams requires approximately seven weeks to complete; therefore, limitation of heat stress prior to breeding is an essential step in ram management. Rams that are excessively conditioned are prone to heat stress, as are rams in full fleece. Shearing rams at this time should be considered to limit heat stress. Careful shearing of the scrotal wool should be performed for breeds and individuals with greater scrotal wool cover. For flocks in colder climates with mid to late-fall breeding schedules, ram shearing should be timed such that 2-4 cm of fleece has grown by the time breeding begins. Heat stress can be further limited by provision of adequate shade. Sand bedding in shaded areas allows for greater body heat loss when the rams lie down; the scrotum is kept cool as well. Salt and water should be readily available near the areas where the rams seek shade during the hottest periods of the day. In flocks with significant ectoparasite or biting insect problems, reduction of these burdens through insecticide application to the animals and / or the environment may limit fertility impairment from scrotal dermaz tis.

Since weight loss is expected during the breeding season, the target BCS for rams at the onset of the breeding season is 3.5-4.0. Rams should be treated with an anthelmintic, immunized and foot trimmed prior to the onset of breeding. To limit the risk of development of ulcerative posthitis (pizzle rot), thin rams should not be fed high-protein complete feeds or allowed unlimited access to forages such as alfalfa aftermath pastures. If

under-conditioned rams are to be fed increased levels of energy, booster immunization against enterotoxemia is recommended. The ram population should be measured against ewe numbers, with adequate consideration of ram age, breed characteristics and topography of the breeding pastures.[12] A ram-to-ewe ratio of 1:50 (2% of the ewe population) is usually appropriate for mature rams on flat pasture or rangeland.[6,12] A 1:25 ram:ewe ratio is recommended if ram lambs are to be used. Greater ram numbers may be needed for synchronized breeding programs.[12]

Pre-Breeding Evaluation of the Ewe Flock

Culling of ewes prior to breeding should be based upon body condition score (BCS), udder health, dentition, lameness or other musculoskeletal problems, and in some flocks, results of serologic testing for eradicable diseases (e.g. ovine progressive pneumonia, Johne's disease). The body condition scores for the entire ewe flock should be recorded, as this data can be used to adjust feeding practices to optimize body condition at breeding. In addition, trends in flock BCS data accumulated over subsequent years can be used to adjust summer grazing or feeding practices. The ewe cull should precede any immunization or anthelmintic treatment administered to the ewe flock, as administration of these products to cull ewes represents a lost treatment expense for the producer and might create violative residues if the ewes are promptly taken to slaughter. If the owner does not elect to maintain a closed flock, the framework for a biosecurity program for newly purchased ewes and rams is outlined in Table 1.

Thin ewes, including ewes selected for culling on the basis of low body condition, can be targeted for specific disease testing, using serology (OPP, Johne's disease), necropsy, or slaughter checks. As an initial step in documenting the presence of Johne's disease in the flock, serologic tests can be applied to the thinnest 20% of ewes and rams, as these animals are more likely to test positive if their thin condition is truly due to this disease.[15] Fecal flotation for determination of helminth

Table 1. Basic flock biosecurity.

Protocol for introduction of new sheep:

1. An isolation pen or barn is required. New arrivals should have no direct or fence line contact with main flock. The isolation period should last a minimum of two weeks.
2. All purchased rams should be serotested for Johne's disease, OPP and *B. ovis*. Thorough palpation of the testes and epididymes should have been performed prior to purchase. Pre-sale semen evaluation, when available, is recommended; alternatively, sale conditions should state that the purchase is contingent upon a satisfactory breeding soundness examination prior to the subsequent breeding season. Repeated serologic testing of rams for *B. ovis* in 4-6 weeks is recommended, in case exposure occurred during sale.
3. Purchased ewes should be serotested for OPP and Johne's disease.
4. All incoming sheep should be examined for evidence of caseous lymphadenitis. If the receiving flock is *Corynebacterium pseudotuberculosis* free, one may consider serologic testing of new arrivals for evidence of exposure to that organism. Vaccine-induced antibody titers will complicate interpretation of serologic results.
5. At arrival, the animals should be foot trimmed and bathed in zinc sulfate solution (10%) or each trimmed foot should be thoroughly coated with Koppertox" or some other topical disinfectant. Consider all trimmings from the feet to be potential sources of *Dichelobacter nodosus*. Collect and dispose of the trimmings, then disinfect the foot trimming equipment and the area where the animals were trimmed.
6. Treat with an anthelmintic. Some recommend deworming with a 2X label dose of two anthelmintics with separate mechanisms of action (e.g. ivermectin and a benzimidazole) in order to avoid introduction of anthhelmintic-resistant worms via newly purchased animals.
7. Vaccinate ewes for Enzootic Abortion of Ewes (*Chlamydophila* spp) and vibrionic abortion (*Campylobacter* spp) soon after arrival. Introduction of new ewes into a band of pregnant ewes carries a high risk of induction of a contagious abortion storm; if this practice cannot be avoided, prophylactic chlortetracycline or oxytetracyline therapy of the ewes should be considered.
8. Prior to commingling of new arrivals with the flock, pare out the feet of the new animals and repeat the footbath or application of the topical disinfectant.

Protocol for show animals or any animal exposed to a salebarn, show ring, or an outside-owned livestock trailer:

1. Immediately at arrival on home premises, foot trim or pare out soil and bedding from feet, bathe feet in 10% zinc sulfate solution or cover foot completely in Koppertox" or a similar topical disinfectant. Consider all trimmings from the feet to be potential sources of *Dichelobacter nodosus*. Collect and dispose of trimmings, then disinfect the foot trimming equipment and the area where the animals were trimmed.
2. Isolate for two weeks after arrival. Monitor for signs of orf, footrot, pneumonia, and ringworm.

burden should be based on individual fecal samples taken from 10 adult ewes and an equal number of ewe lambs.[8] Composite fecal samples (equal amounts of individual fecal samples mixed together) may be used in place of individual samples in ewe lambs; composite samples may be a less accurate sample in adults.[8] Ewe fertility has been shown to be responsive to prebreeding anthelmintic treatment in flocks where helminth infestation is problematic.[7]

Abortion caused by *Campylobacter* or *Chlamydophila* (formerly *Chlamydia*) is most effectively controlled by maintenance of a closed flock and segregation and culling of ewes that have aborted.[4,14] In an Oregon study, immunization of the ewe flock with two doses of a killed vaccine at the onset of the breeding season resulted in significant reduction (but not elimination) of abortion losses caused by these two agents.[4] Abortion from toxoplasmosis can be controlled through maintenance of a mature, spayed or neutered adult cat population on the premises and preventing contamination of stored feeds and feed bunks by cat feces.[16] Prevention of toxoplasmosis requires that naïve, pregnant ewes do not encounter infective oocysts in the feed during pregnancy. Since cats are most likely to defecate in hay stored indoors, storing hay intended for pregnant ewes outdoors under sealed tarps may limit contamination of the hay with oocysts. If hay is suspected to be contaminated with cat feces, it may be fed to open ewes or ewe lambs well in advance of the breeding season in order to induce immunity.[16]

Flushing and introduction of a vasectomized teaser ram are adjunct management measures that may help to increase the both the lamb crop and the number of lambs born early in the lambing period.[12] In temperate climates, the fall is an optimal time to set aside a pasture for turnout of lambs and ewes in the spring. Allowing a pasture to remain vacant until the following spring will provide ample time for die-off of helminth larvae in the pasture.[8] To increase the efficacy of larval die-off, the grass in the pasture can be mowed and the clippings discarded or put up for hay for another livestock species. This practice increases drying and sunlight exposure of larvae located near the soil surface. Alternatively, if grass is dry and dormant, controlled burning can be used to decrease the parasite burden in the pasture designated for next spring's lambs.

Conclusion

For spring lambing operations, the prebreeding period in the fall represents an opportune time to introduce veterinary consultation and services onto sheep farms. Flock health management procedures such as breeding soundness examination, flock immunization and anthelmintic treatment, and rational ewe culling protocols are recommended as critical starting points in flock health programs, as the resulting benefits (increased lamb crop) tend to carry significant economic weight. With the value of veterinary oversight demonstrated to the sheep producer, the veterinarian may then experience greater success in initiating additional flock health checks at other opportune times, such as ultrasonographic pregnancy confirmation and consultation during lambing.[12]

References

1. Anonymous: *Reference of 1996 U.S. Regional Sheep Health and Management Practices*. USDA: APHIS: VS, CEAH, National Animal Health Monitoring System. Fort Collins, CO. #N211.996.
2. Anonymous: *Part 1: Reference of Sheep Management in the United States, 2001*. USDA: APHIS: VS, CEAH, National Animal Health Monitoring System. Fort Collins, CO. #N356.0702.
3. Bulgin MS: Epididymitis in rams and lambs. *Vet Clin North Am Food Anim Pract* 6:683-690, 1990.
4. Hansen DE, Hedstrom OR, Sonn RJ, *et al*: Efficacy of a vaccine to prevent *Chlamydia*- or *Campylobacter*-induced abortions in ewes. *J Am Vet Med Assoc* 196:731-734, 1990.
5. Kimberling CV, Arnold KS, Schweitzer DJ, *et al*: Correlation of the presence of seminal white blood cells and the prevalence of separated spermatozoal heads with subclinical *Brucella ovis* infection in rams. *J Am Vet Med Assoc* 1:73-76, 1986.
6. Kimberling CV, Schweitzer D: *Brucella ovis* infection and its management in ovine reproduction. *Ag Pract* 10:36-39, 1989.
7. MacKay RR: The effect of strategic anthelminthic treatment on the breeding performance of hill ewes. *Vet Parasit* 7:319-331, 1980.
8. Pugh DG, Navarre CB: Internal parasite control strategies. *Vet Clin North Am Food Anim Prac* 17:231-244, 2001.
9. Robles CA, Uzal FA, Olaechea FV, *et al*: Epidemiological observations in a Corriedale flock affected by *Brucella ovis*. *Vet Res Commun* 22:435-443, 1998.
10. Rowland JP, Salman MD, Kimberling CV, *et al*: Epidemiologic factors involved in perinatal lamb mortality on four range sheep operations. *Am J Vet Res* 53:262-267, 1992.
11. Rook JS, Scholman G, Wing-Proctor S, *et al*: Diagnosis and control of neonatal losses in sheep. *Vet Clin North Am Food Anim Pract* 6:531-562, 1990.
12. Scott PR: Health and production management in sheep flocks. in: Radostits OM (ed): *Herd Health: Food Animal Production Medicine*, ed 3. Philadelphia, WB Saunders Co, 2001, pp 765-844.
13. Sharkey S, Callan RJ, Mortimer R, *et al*: Reproductive techniques in sheep. *Vet Clin North Am Food Anim Pract* 17:435-455, 2001.
14. Smith MC: Exclusion of infectious diseases from sheep and goat farms. *Vet Clin North Am Food Anim Pract* 6:705-720, 1990.
15. Stehman SM, Shulaw WP: Paratuberculosis (Johne's Disease) in sheep and goats: Recommendations for diagnosis and control. *Proc of the 100th Annual Meeting, United States Animal Health Association*, Little Rock, AR, pp 538-551, 1996.
16. Underwood WJ, Rook JS: Toxoplasmosis infection in sheep. *Comp Cont Ed Pract Vet* 14:1543-49, 1992.
17. Van Metre DC, Kennedy GA: Unpublished data, Kansas State University, 1998.
18. Wise KJ: United States market for food animal veterinary medical services. *J Am Vet Med Assoc* 190:1530-33, 1987.