OPP CONCERNED SHEEP BREEDERS SOCIETY

— GENERAL FACT SHEET —

OVINE PROGRESSIVE PNEUMONIA

by Cindy Wolf, DVM

General

Ovine Progressive Pneumonia is a viral disease of sheep in North America. Common synonyms for this disease are Progressive Pneumonia and OPP. The OPP virus closely resembles Maedi-Visna which is a similar slow or retrovirus found in other parts of the world. The OPP virus can cause disease with any of the following signs: severe and progressive weight loss, labored breathing or pneumonia, paralysis, swollen joints associated with lameness, and palpably hard, unproductive udders. However most infected sheep never show clinical signs of disease. Once a sheep is infected with the virus, that animal stays infected for its lifetime and serves as a carrier even in the presence of high levels of circulating antibodies. Unlike some viral diseases, the presence of antibodies is not indicative of immunity.

Prevalence

A recent study found that 26% of the sheep in the United States are infected with the OPP virus. In some flocks the incidence of infection is much higher and can approach 100%; in others it is much lower. Related retroviruses are found in sheep worldwide with the exception of Australia, Iceland and New Zealand. The incidence of infection increases with ewe/ram age probably due to sheep-to-sheep spread of the virus. The percent of infected sheep that develop clinical disease is variable and is possibly dependent on flock management, strain and dose of virus, and genetics of sheep.

Susceptible Species

Sheep and goats are the only species that have proven to be naturally susceptible to the OPP virus, and any breed can become infected. While some are reported to be more susceptible to infection and development of disease—and others less so—there have not been adequate studies across all breeds to compile a comprehensive list of "most" to "least." In general, Ile de France and Rambouillet may be more effective at controlling OPPV infection, whereas Border Leicester, Corriedale, Dorset, Finnsheep, Finn crosses, North Country Cheviot and Texel are among those breeds more likely to develop disease. However, these findings may also relate to differences in viral strains as well as management practices, i.e. not solely a function of genotype of the sheep.

Transmission

The primary means of transmission is through the ingestion of infected colostrum and milk. This occurs when a lamb nurses from its infected dam or steals milk from another infected ewe. Contact transmission also occurs in closely confined sheep. This type of spread probably occurs at a much lower incidence than the former. It potentially occurs when respiratory droplets from infected sheep directly contact uninfected sheep or contaminate feed and water sources. Upon environmental exposure the virus has a very short life.

Therefore transmission from sheep to sheep is probably heavily dependent on environmental conditions: eg. a tightly confined group of sheep in a warm humid barn are probably at a greater risk of infection. Transmission in utero occurs very rarely and has not been found to be a practical problem in control programs. Transmission via semen has not been demonstrated.

Clinical Signs

Due to the nature of the virus, signs are seen primarily in mature sheep, usually those over two years of age. The disease progresses slowly. Once an animal starts to show signs, it will ultimately die if not culled beforehand.

Two early signs are: 1) progressive weight loss while maintaining a normal appetite, and 2) exercise intolerance which is noticeable in the early stages only when the sheep are forced to exercise further or more vigorously than a brief walk to the feed bunk. The affected sheep are often thought to have pneumonia which does not respond well to antibiotic treatment. In fact, their breathing becomes progressively more labored with time. They commonly develop a secondary bacterial pneumonia which is invariably fatal. Many producers separate the thin sheep and feed them specially only to find that they do not gain weight and are forced to cull them.

Some ewes develop a diffusely firm udder within three days post-lambing. Both halves of the udder are equally involved and vary from meaty to very hard in consistency. The affected udder is not inflamed and the scant amounts of milk produced appear normal in color and consistency, eg. not mastitic. This apparently subnormal milk production becomes apparent in the form of hungry twin or triplet lambs. Many of the affected ewes milk well enough to raise one lamb. To the eye these udders appear full of milk, but when the ewe walks one notices that this udder is not pliable. When these udders are examined microscopically, the normal milk secreting glands and ducts are replaced to a variable extent with fibrous/ scar tissue and lymphoid follicles with active germinal centers, eg. active lymph node tissue which are not present in the normal lactating udder. Some affected udders soften up during the first few weeks of lactation. Insufficient controlled research has been done to determine whether this condition, which has been named "Hardbag," repeats in subsequent lactations.

Thirdly, some sheep develop a lameness due to knee and/or hock arthritis. The incidence of this clinical manifestation is currently unknown, but the author suspects it to be higher than many realize.

Lastly, a rare clinical manifestation of the OPP virus is spinal cord or brain involvement which results in a rear limb weakness which may progress to paralysis.

Diagnosis

A diagnosis of infection is made by identifying either virus or antibody in the blood. The presence of antibody only implies infection and does not equal immunity. The presence of antibody does not indicate the extent of the disease process. A presumptive diagnosis of disease is made from clinical signs and correlation with a seropositive test result from the affected animal. A definitive diagnosis of disease is made at necropsy when the characteristic lesions are found grossly and histologically in conjunction with a supportive history of disease and seropositive test results. Characteristic lung lesions are as follows:

oversized, heavy, meaty, grayish-blue discolored lungs often with lesions of an active secondary bacterial pneumonia in the antero- ventral areas. Sometimes the lungs are so distended due to the accumulation of fibrous tissue that one can actually see rib impressions on the lung surface. The lymph node which normally lies in between the lungs is often enlarged to the size of a fat cigar.

The most commonly used live-animal test to identify virus-infected animals is the Agar Gel Immuno-diffusion Test, or AGID. This test detects circulating antibody to the virus. Since colostrally-derived antibody is present until six months of age, animals should not be tested before reaching this age. A positive test result from a sheep older than six months of age means that animal is infected for life with the OPP virus. Be aware that a negative test result from a sheep older than six months can mean that either the animal was not infected at the time of drawing blood or the animal is actually infected, but has not produced detectable levels of antibodies. For presently unknown reasons, a small percentage of infected animals never produce detectable levels of antibodies. Also, some seropositive sheep or goats become temporarily seronegative right after lambing/kidding due to losses of large quantities of OPP virus antibodies in colostrum.

The Enzyme Linked Immunosorbent Assay (ELISA test) for OPP, long used for research in the U.S., is more sensitive than the AGID and a new version of this test is presently being validated for use in sheep. However, the AGID test has been successfully employed in OPP flock eradication programs for years.

Treatment

There is no effective treatment or vaccine for OPP. The future holds promise for the development of a vaccine.

Control and Eradication

Flock owners may be interested in eradicating this infection from their sheep flocks when OPP has been demonstrated to result in a significant proportion of: 1) ewe losses via forced culling or deaths and/or 2) poor milk production resulting in poor lamb growth and high rates of starvation or a high percentage of milk replacer-raised lambs.

The OPP virus can best be eradicated from flocks by either of two methods. One is to test and remove all positive sheep every six to twelve months until three negative flock tests are achieved at six month intervals or in two consecutive years. An alternative method is to separate offspring from infected ewes at birth, before the lambs nurse or are licked by the ewe. These lambs are then reared artificially and are the start of an OPP-free flock which should never contact the infected flock. Which method a producer selects depends on his/her operation, objectives, economics, resources, and type of sheep.

Method 1: Test and Remove

1. Bleed all sheep in the flock over six months of age and test serologically for antibodies to the OPP virus.

2. Cull all seropositive sheep and any of their progeny that are less than 1 year old. The offspring born to

positive ewes are very likely to have been infected with the virus transmitted from the ewe to the lambs during the natural rearing process.

3. Isolate the clean flock from infected sheep and from people and equipment in very recent contact with infected sheep. Fortunately the virus is very sensitive to environmental exposure and will only survive for minutes outside of the sheep's body.

4. Add only seronegative animals to the flock. Such sheep should originate from other seronegative flocks. A riskier alternative is to obtain sheep from seronegative parents from an infected flock and isolate the new sheep for one year and re-test them prior to mixing them with the resident seronegative flock. Only add them to the seronegative flock if they have tested negative.

5. Test annually until there are at least two to three consecutive 100% negative flock tests to be reasonably sure that the flock is free of the virus.

6. Monitor the flock regularly for signs of the disease and blood test and necropsy any suspected cases whenever practical.

Note: Random testing 10% of the flock every year will help insure that the flock is remaining free from the virus.

This method usually takes at least three or more years to achieve a negative status, and can only be advised in flocks which on initial testing are already less than 50% infected.

Method 2: Isolate and Artificially Rear Progeny

1. Remove lambs from dams prior to licking and nursing and rear them in isolation. Do not feed these lambs colostrum from ewes which test positive for the virus. Either feed them colostrum from ewes known to be negative, or clean (heat treated) cow's colostrum, or an antibody-rich colostrum substitute. Where there is any doubt as to whether or not the lamb nursed, leave the lamb in question with the ewe assuming that it nursed and ingested the virus. In the author's experience, the practice of taping teats as a means of preventing suckling in unobserved lambings has not been a reliable method of preventing nursing by aggressive lambs. Secondly, lambs fed goat colostrum that contains the Caprine Arthritis Encephalitis (CAE) virus are likely to later test positive on the OPP/CAE AGID test. Therefore, in an OPP flock eradication program, artificially reared lambs should not receive goat colostrum that contains CAE virus.

2. Proceed with steps 3 and 4 as described above to assure an OPP virus-free flock. Serologically test all animals on an annual basis until two consecutive negative flock tests have been achieved.

Note: This method is more costly and labor intensive in the short-run, but will result in a virus-free flock more quickly than Method 1.

This method requires 24-hour lambing supervision in order to be successful, thus when considering this method one should manage the flock's breeding program accordingly.