



OVINE PROGRESSIVE PNEUMONIA

WHAT CAUSES OPP?

Ovine Progressive Pneumonia (known as Maedi Visna Virus or MVV outside of the U.S.) is caused by a lentivirus that resides in the white blood cells of sheep. It is a slow-growing virus that causes wasting and replaces healthy tissue with solid non-functional tissue due to the cellular immune response of sheep to the virus. It is often referred to as a Small Ruminant Lentivirus (SRLV) along with Caprine Arthritis Encephalitis Virus (CAE).

WHAT ARE THE SYMPTOMS OF OPP?

Because of the slow progression of the disease, most infected sheep show no visible signs. As the disease progresses the signs may result in a general decrease in flock productivity due to higher than normal culling and death rates in young animals. Visible signs depend on the organ involved:

- **UDDER** bilateral firm udders with decreasing amounts of milk to no milk leading to weak lambs due to milk deprivation and poor colostrum intake; increased amounts of milk replacer needed. Producers report poorer milk production with each subsequent lambing cycle.
- **LUNGS** coughing, labored breathing and unresponsive pneumonia when treated with antibiotics.
- **BODY CONDITION** wasting and failure to gain weight after weaning; general unthriftiness leading to death.
- **JOINT SWELLING AND LAMENESS** less commonly seen.
- **POOR QUALITY WOOL** reported in wool-breed sheep.

HOW IS OPP DIAGNOSED?

- **NECROPSY** Examination of the lung in multiple lobes: mediastinal lymph nodes, mammary tissue and mammary lymph node.
- **SEROLOGY** There are two serological tests available in the U.S. at the moment. Regardless of which test is chosen, it is recommended to use an American

Association of Veterinary Laboratory Diagnosticians-accredited laboratory. There are many private labs offering ELISA tests that are not accredited.

- **VMRD'S cELISA** Most commonly used at diagnostic labs for SRLVs, including both OPP and CAE, this cELISA was originally developed for CAE testing. It was later validated for sheep⁴, but at a lower percent inhibition (% I) cut-off of 20.9%, which USDA researchers apply for sheep studies. However, the cut-off used by commercial labs for cELISA testing of both sheep and goats is 35%.
- **HYPHEN BIOMED'S ELITEST** Not licensed in the U.S. and currently available only through the University of Minnesota's Veterinary Diagnostic Laboratory.
 - the only ELISA SRLV test to fulfill the validation standards recognized by the OIE.
 - brought into Minnesota to be used to confirm test-negative status in flocks that had erratic/positive cELISA tests following *Chlamydia* bacterin vaccinations⁶.
 - claim of recognizing new infections within 14–51 days so retesting every two months in an eradication scheme is recommended to prevent the virus from spreading.
 - results reported as S/N values with results <1.0 being negative, 1.0–3.0 positive and >3.0 strongly positive. **It is suggested that animals with unusual results should be retested in several weeks to avoid diagnosing false positives caused by interfering antigens (hormones, vaccines).**
- **PCR** Also available, but needs circulating virus so only positive results are helpful. May be used for confirmation.

HOW DOES OPP SPREAD?

We must remember this is a very fragile virus that does not live outside sheep for very long. It does not reside





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in the soil or equipment. Producers purchase infected animals that bring the virus into the flock and can cull infected animals to remove the virus from the flock.

- Since the virus resides in blood and macrophages, any exchange between animals shares the virus. The most common way is from coughing animals to others nearby. The virus can also be passed via milk and colostrum, shared needles, ear taggers, etc., which have fresh residual blood or tissues.
- **The most common way the virus is spread is from adult to adult via respiratory particles. A study at the USDA MARC in Nebraska found that 70–90% of new infections occur in this manner⁷.**
- Ten to thirty percent of infections occur from the dam to the lamb in the time before weaning. It is not unusual to find negative lambs born to positive-testing ewes and vice versa.
- In utero transmission occurs ~ 5% of the time¹.

HOW CAN I TREAT IT; HOW CAN I PREVENT IT?

There is no treatment for OPP. Flock owners prevent introducing the virus into their flocks by purchasing animals from OPP free flocks.

WHY SHOULD I CARE ABOUT THIS DISEASE?

For many years, some industry supporters downplayed the economic importance OPP. The 2001 NAHMS report for sheep reported 36.4% of all flocks and 24.2% of all the sheep in the U.S. were infected with the OPP virus⁵. Western flocks were much more heavily infected. OPP infected ewes are found to produce ~12 pounds less lamb weight at weaning and require increased amount of milk replacer and labor^{9, 10}.

Many astute shepherds are becoming aware of the devastation OPP can cause over years of infection. They are looking for information and guidance on how to test for and eradicate this disease. As the research from USDA MARC showed, there are other ways of eradicating the virus than orphaning. A flock owner can maintain genetic progress

and cash flow while still eradicating, but they need help and guidance from knowledgeable, caring veterinarians.

HOW SHOULD I HANDLE POSITIVE SHEEP?

There are two choices: either cull positive animals as soon as possible to prevent them from infecting others, or keep them separated from negative-tested sheep. The further apart the better, but more than coughing distance (10 ft. has been suggested); solid partitions and electric fences should be adequate.

Do not share taggers, needles, etc. between positive and negative flocks.

HOW CAN I ERADICATE OPP FROM A FLOCK?

First, a serious discussion regarding commitment to this endeavor must take place. A budget must be outlined as multiple tests and a large amount of money may be invested. There is no doubt that eradicating OPP is a good investment, but if any virus is left, it will reinfect and the producer will be right back where they started, only more discouraged and with a lighter pocketbook.

Regardless of which protocol you follow, excellent identifications are necessary to match the resulting lab reports to the animals. Leaving one infected animal in the group due to poor identification tags or sloppy recording can be a discouraging setback.

ERADICATION METHODS

- 1 Test several clinical animals to verify virus is present in the flock, whether via necropsy or serology.
- 2 If owner agrees, either test all remaining animals in the flock over 12 months of age, or a statistically significant portion to be 95% assured that at least one animal will test positive if at least 5% of the flock is infected (http://www.oppociety.org/download/opp_update.pdf). If animals under 12 months of age are in close contact, it is best to separate them from adults until the test results return.
- 3 If >50% are infected it is recommended to not test





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the remainder of the animals, but rather test the replacement ewe lambs and continue to keep them away from the infected adult flock. Positives should be removed, and negatives retested in two-to-three months, repeating the test-and-cull until several 100% negative results are received. **Some producers have chosen to include yearlings in this replacement group because many of these have not joined the infected adult flock yet and should have a lower percent infected.**

The positive adult flock may be kept and allowed to breed and lamb as long as they are segregated from the new negative flock.

- 4 If <50% of adults are positive, the owner may wish to cull the positives and continue to test and cull every two-to-three months until several 100% negative tests are received. Replacement ewe lambs should also be tested at this point, using the same schedule.
- 5 Do not forget the rams!

DO GENETICS MATTER?

Genetics may matter, but it is unknown how much. Another finding at the USDA MARC was that sheep with particular haplotype combinations were less susceptible to the OPP virus^{7,8}.

In the Minnesota OPP Trial 2013-2017 sheep with desirable haplotypes at the start eventually became seropositive after exposure to infected sheep. What is not known is if these sheep would shed or become clinically affected with time. Often we found older ewes that remained negative in a heavily infected flock. Is this genetic resistance? Much more research must be done.

CAN MY FLOCK GET OPP FROM COWS, GOATS OR OTHER ANIMALS?

Sheep cannot become infected with OPP from other species. CAE is caused by a similar lentivirus and sheep have been infected with CAE when exposed to infected goats. As the SRLV tests are the same for both OPP and CAE, a sheep infected with CAE would likely test positive¹¹.

WHAT DOES IT MEAN IF A SHEEP TESTS POSITIVE BUT HAS NO SYMPTOMS?

Asymptomatic sheep that test positive means they have been exposed to the OPP virus. Even though they are symptom free, they may still shed the virus in their respiratory secretions and blood. Positive test results in young lambs may result from passive immunity received from infected dams.

RESOURCES

In 2012, the USDA encouraged the OPP Concerned Sheep Breeders Society to conduct a trial in Minnesota to see if OPP could be eradicated using the new research coming out of MARC. The ELITEST was chosen due to the issues recently experienced with the VMRD cELISA and AGID in *Chlamydia* vaccinated flocks⁶.

The University of Minnesota's Veterinary Diagnostic Laboratory, Minnesota Lamb and Wool Producers, USDA, and Minnesota Board of Animal Health all supported this trial financially and physically. After the infected flocks were chosen, annual testing began and indicated that testing needed to be done more often. Some producers could not manage the protocols due to facility or management constraints. Every flock needs to choose an eradication plan that fits their farm. See the results at http://www.oppociety.org/download/opp_trial_final_report.pdf.

As a result of that trial, Minnesota now has an evolving OPP/CAE program coordinated through the Minnesota Board of Animal Health. View the program at <http://www.oppociety.org/download/opp-final-guidelines-2020.pdf> or <https://www.bah.state.mn.us/sheep-goats/#opp/cae-program>.

The OPP Concerned Sheep Breeders Society was formed in the 1980s by producers and veterinarians to provide education and answers for sheep producers battling OPP in their sheep or looking for test-negative replacement animals. It is a wonderful resource and can be found at www.oppociety.org. New member veterinarians are welcome.





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