Cache Valley Virus: A Differential Diagnosis for Lamb Malformation and Pregnancy Loss in Sheep

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During the latter half of December 2015 and the start of 2016, the Animal Health Laboratory (AHL) received several submissions of stillborn and aborted lambs with unusual and severe birth defects. Other similar cases were also reported to OVC and OMAFRA veterinarians. The most likely cause of these birth defects was Cache Valley virus (CVV). Blood and tissue samples from fetuses, as well as blood samples from ewes, were tested for the virus and/or antibodies to CVV. On January 14, 2016, test results came back positive for CVV. CVV was previously diagnosed in Ontario flocks in 2011 and 2012.

Cache Valley virus is a mosquito-borne arbovirus in the family Bunyaviridae. It is transmitted to sheep by infected mosquitos that previously fed on infected white tail deer, or that are offspring of infected mosquitos. Late summer and early autumn are the months when the highest amount of virus is present in the mosquito population. CVV is considered endemic in most parts of the United States, Mexico and Canada and infects a wide range of domestic and wild animals, as well as humans. Clinical disease is most often reported in sheep. The Schmallenberg virus that has affected ruminants in many European countries also belongs to the same family of viruses.

In sheep, the majority of infections are subclinical. However, if infection occurs during the first trimester of pregnancy, the virus may cross the placenta and result in a variety of issues. If infection occurs during the first 28 days of gestation, embryos usually die and are resorbed. Infection between 28 and 48 days of gestation usually result in fetal malformation. CVV may cause occasional abortions in sheep, though the most common clinical presentations are stillborn lambs and the birth of live lambs with congenital defects affecting the central nervous and musculoskeletal systems. Malformations include hydranencephaly, cerebellar and muscular hypoplasia, torticollis, scoliosis and arthrogryposis (Figures 1 and 2). It is not unusual for not all fetuses in the same litter to be affected, i.e. a normal lamb may be born co-twin to a deformed lamb. Ewes tend not to show signs of disease. Infection after day 48 of gestation causes no harm to the fetuses. Most producers report that deformed lambs are born in late December and early January – reflecting that the infection occurred approximately 3 to 4 months earlier (August to October) when ewes were in early gestation. Lambs born after this are unaffected because mosquito populations are decreased or killed by cold weather in late October and November. Goat fetuses may also be affected by CVV but to-date, no affected goat kids have been reported in Ontario.

Diagnosing CVV as the cause of lamb malformations or pregnancy loss is difficult because the infection occurs months before the lambs are born. Diagnosis involves the demonstration of precolostral or fetal serum antibodies to the virus or CVV RNA in fetal tissues by RT-PCR. Maternal antibodies taken at parturition will simply indicate that infection has occurred previously, though absence of a titre rules out CVV as a diagnosis. Samples should be sent to the Animal Health Laboratory in Guelph or Kemptville. Animals that have been exposed to the virus may have lifelong immunity which should be protective to subsequent lambings. However, infection with CVV does not
protect against infection from other bunyaviruses. Research into the seroprevalence of CVV in the Canadian sheep flock is ongoing.

Humans can also be infected with CVV through bites from infected mosquitoes. Infection may be asymptomatic or cause mild fever. More severe neurological signs are rare but have been reported. Antibodies to CVV were identified in 5 to 16% of West Nile suspect cases from Manitoba and Saskatchewan in a 2009 report. Disease prevention is aimed at reducing exposure to mosquito bites by eliminating mosquito breeding sites, wearing protective clothing and using insect repellants.

There are no vaccines or treatments available to protect livestock against CVV. Preventive measures such as using insect repellants and breeding females outside of the mosquito season may help decrease fetal infections, but they are often difficult to implement. Keeping sheep away from cedar bushes and from wet areas during the breeding season may help to reduce exposure to mosquitos. A 2011 Ontario study showed that sheep housed in a dry lot during the autumn were more likely to be infected. This may be because of near-by breeding areas for mosquitos and the inability for sheep to move away (e.g. upwind or into shelter) when being bitten.

It is unclear as to why there has been an increase in CVV cases this year given the high prevalence of antibodies (exposure) in the Ontario sheep population. A new strain of CVV or the unusually warm autumn of 2015 allowing for increases in mosquito populations, may be reasons for the greater number of cases.


*Theriogenology question of the month—In utero infection of the doe by CVV. JAVMA, 122(10): 1361-1362, 2003.*
