Louping Ill

Ovine Encephalomyelitis, Infectious Encephalomyelitis of Sheep, Trembling–Ill

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Institute for International Cooperation in Animal Biologics
An OIE Collaborating Center
Iowa State University
College of Veterinary Medicine

the Center for Food Security & Public Health
IOWA STATE UNIVERSITY®

Center for Food Security and Public Health
College of Veterinary Medicine
Iowa State University
Ames, Iowa 50011
Phone: (515) 294–7189
FAX: (515) 294–8259
E–mail: cfsph@iastate.edu
Web: http://www.cfsph.iastate.edu

Importance

Louping ill is a viral infection that can affect a variety of species, but is most significant in sheep. This tick–borne infection can be asymptomatic or mild, or may result in serious neurologic symptoms and death. Losses can be significant in young adult animals with declining passive immunity, as well as in mature sheep moved into endemic areas. There is no treatment.

Etiology

Louping ill results from infection by a single–stranded, neurotropic, RNA virus (family Flaviviridae, genus *Flavivirus*). The strains of louping ill virus do not vary significantly in their pathogenicity.

Species affected

Louping ill is most prevalent in sheep, which seem to be the principal maintenance host. Louping ill can also affect cattle, goats, horses, pigs, dogs, deer, red grouse, and ptarmigan. This virus infects a number of small mammals including shrews, wood mice, voles, and hares. Humans seem to be an accidental host.

Geographic distribution

Louping ill can be found throughout the upland areas of Scotland, Northern Ireland, Cornwall, and Wales. It has also been found in Norway. A closely related disease of sheep is reported from Bulgaria, Turkey, and the Basque region in Spain. None of the known vectors of louping ill virus are found in the United States.

Transmission

Louping ill virus can be transmitted by several species of ticks, including *Rhipicephalus appendiculatus*, *Ixodes persulcatus*, *Haemaphysalis anatolicum*, and *I. ricinus*. *I. ricinus* is thought to be the natural vector of this disease. Peak disease incidence follows seasonal tick activity; louping ill is most common between April and June, and in September.

Louping ill virus is also shed in the milk of sheep and goats. Virus transmission can be demonstrated in kids that nurse from infected goats, but not in lambs that suckle infected sheep. Louping ill virus can also be transmitted to various host species after exposure to infective aerosols and by parenteral routes. Spread on fomites has been documented.

Incubation period

The incubation period for louping ill is six to 18 days.

Clinical signs

In sheep, the early clinical signs of louping ill are fever, depression, anorexia, and sometimes constipation. This initial phase may be mild or inapparent. A second fever spike occurs about five days after the symptoms first appear; at this time, the virus either enters the central nervous system (CNS) or the animal recovers without further signs. The early symptoms of CNS involvement include muscle tremors, incoordination, ataxia, hyperesthesia, profuse salivation, protrusion of the tongue, champing of the jaws and the development of a characteristic hopping "louping gait." As the disease progresses, additional symptoms appear; they may include head pressing, paraplegia, convulsions, opisthotonos, and coma. Death is common. Surviving animals may have residual CNS deficits. Concurrent infections with *Cytoecetes plagocytoplila* or *Toxoplasma gondii* can significantly increase the pathogenicity of louping ill virus, probably by suppressing the immune system.

Lambs born to non–immune ewes may develop a peracute form of the disease. These animals may die within 2 days after the first symptoms appear.

Louping ill in cattle, horses, and pigs is similar to the disease in sheep. The symptoms in cattle typically include a staggering gait, head pressing, hyperexcitability, recumbency, and convulsions, followed by death. The clinical signs in piglets may include ataxia,

muscle spasms, aimless movement, head pressing, and convulsions. Louping ill is rare in horses, and most cases seem to be subclinical.

Post mortem lesions

The only gross lesion on post–mortem is congestion of the meningeal vessels. Secondary pneumonia may be seen. On histology, severe meningoencephalomyelitis is apparent, with gliosis, perivascular infiltration, and neuronal degeneration.

Morbidity and Mortality

Morbidity and mortality vary with immune status and other factors. Morbidity is usually low in mature sheep in endemic areas. Mortality ranges from 5–10% in adult sheep that have been previously exposed to the virus, to 60% in newly introduced animals. In endemic areas, most deaths occur in animals less than 2 years old. Lambs born in these areas are usually immune for the first year of life. At the end of the year, passive immunity declines and morbidity and mortality increase. Concurrent infections with tick–borne fever or toxoplasmosis, or environmental stress can significantly increase the development of encephalitis and mortality.

A vaccine is available. Treatment is not effective in sheep with CNS signs, but cattle may respond to supportive and symptomatic care.

Diagnosis

Clinical

Louping ill should be suspected in sheep with fever and signs of cerebellar and cerebral disease, particularly when the flock has recently been introduced to tick–infested pastures.

Differential Diagnosis

The differential diagnosis in sheep includes scrapie, pregnancy toxemia, maedi–visna, tetanus, rabies, hydatid disease, listeriosis, hypocalcemia, tick pyremia, hypocuprosis, heavy metal toxicity, and poisoning by a variety of plant toxins. In cattle, the differential diagnosis includes listeriosis, malignant catarrhal fever, bovine spongiform encephalopathy, rabies, pseudorabies, hypomagnesemia, hypocalcemia, acute lead poisoning, and toxic plants.

Laboratory Tests

Louping ill can be diagnosed by virus isolation, detection of virus antigens, or serology. Virus isolation from the blood can be successful during the acute phase of the disease, but is usually unsuccessful after the neurologic signs appear. Virus may also be isolated from necropsy samples of the brain and spinal cord. Louping ill virus can be isolated in embryonated eggs, primary pig kidney or chicken embryo cell cultures, or suckling mice. The virus is identified by serum neutralization.

Virus antigens can be detected by immunostaining of formalin–fixed brain or by a reverse transcriptase polymerase chain reaction (RT–PCR) assay.

Serologic tests include hemagglutination–inhibition, serum neutralization, and an enzyme–linked immunosorbent assay (ELISA). A complement fixation test is available, but rarely used; complement–fixing antibodies are transient and develop only late in the course of the disease.

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease. Louping ill is a zoonotic disease; samples should be collected and handled with all appropriate precautions.

For virus isolation, approximately 20 ml of uncoagulated blood should be collected during the acute stage of the disease, before the neurologic signs appear. Virus isolation is optimal during the first 3 to 4 days after the onset of the fever. Louping ill virus can often be isolated from the brain and spinal cord of sheep at necropsy; this is not as successful in cattle. For virus isolation from the nervous system, sterile unfixed samples of the brain and spinal cord should be placed in 50% glycerol and normal saline or frozen on dry ice. Samples for virus isolation should be transported to the laboratory as soon as possible.

Paired serum samples should be collected for serology. Half of the brain and pieces of the spinal cord should also be submitted for histology, in 10% formalin.

Recommended actions if louping ill is suspected

Notification of authorities

A diagnosis or suspicion of louping ill should be reported immediately to state or federal authorities. Federal: Area Veterinarians in Charge (AVICS) http://www.aphis.usda.gov/vs/area_offices.htm

State vets: http://www.aphis.usda.gov/vs/sregs/official.html

Quarantine and Disinfection

Prevention of infection of tick vectors is critical. Louping ill virus can also be spread in milk or contaminated tissues, and by fomites. Enveloped viruses such as louping ill virus are generally susceptible to most common disinfectants.

Public health

Humans can be infected by the louping ill virus after aerosol exposure, contamination of skin wounds, or tick bites. Transmission by ingesting milk from infected sheep or goats may be possible. Humans with louping ill can develop an illness that resembles influenza or polio, a biphasic encephalitis, or a hemorrhagic fever.

For More Information

World Organization for Animal Health (OIE)

http://www.oie.int

OIE International Animal Health Code

http://www.oie.int/eng/normes/mcode/A_summry.htm

USAHA Foreign Animal Diseases book

http://www.vet.uga.edu/vpp/gray_book/FAD/

Animal Health Australia. The National Animal Health Information System (NAHIS)

http://www. aahc.com.au/nahis/disease/dislist.asp

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