Western Beef Resource Committee

Fourth Edition

Cattle Producer's Handbook

Animal Health Section 662

Leptospirosis

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Leptospirosis is an important bacterial infection of rodents, cattle, horses, dogs, and swine. Leptospirosis in animals is generally silent or sub-clinical. Clinically, leptospirosis in cattle causes milk production losses, kidney and liver infections, and reproductive failures. Infected animals routinely shed the organism contributing to the maintenance and transmission of this organism in nature. Leptospira infections require specialized media and techniques for culture and for confirmatory diagnosis.

Before the development of leptospiral vaccines, leptospiral abortion in cattle often exceeded 10 percent on infected premises. Vaccination decreases the clinical severity of the disease in domestic animals but does not prevent infection or eliminate the shedding of the organism.

Leptospiral vaccines do not produce long lasting immunity and require multiple vaccinations per year coupled with a strategic vaccination program for the control of the disease. Cattle vaccination programs for leptospirosis must be regular and routine to prevent the re-emergence of leptospiral diseases in cattle either by importation of susceptible animals into an endemic area or infected animals into a susceptible, unvaccinated herd. Veterinarians and producers are encouraged to include leptospiral vaccines into vaccination programs—especially for cow-calf operations!

Leptospirosis is an important zoonotic infection transmitted to humans primarily through water sources contaminated by infected rodents, dogs, and cattle.

The Organism

Leptospira are small corkscrew or spiral shaped, gram-negative bacteria (Fig. 1). They require a moist, humid environment to survive **and** to be transmitted from infected to uninfected individuals. There are seven major species of *Leptospira* encompassing over 200 individual serovars of leptospira. The species of importance in the cattle are *L. interrogans* serovar Hardjo strain hardjoprajitno and *L. borgpertersenii* servor Hardjo strain hardjobovis.

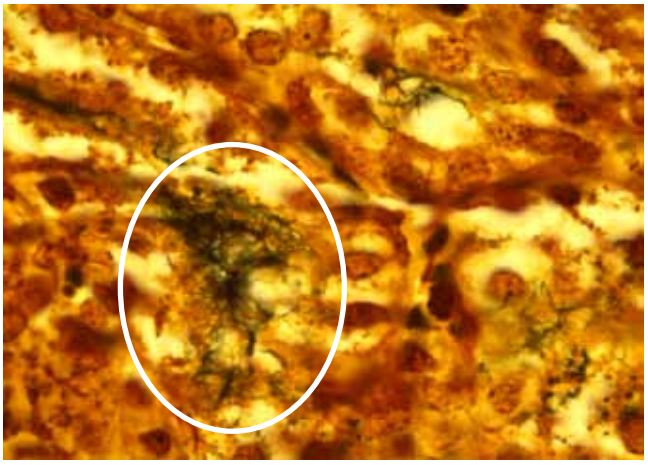

Fig. 1. Photomicrograph of kidney tissue from an aborted bovine fetus. The black central area is a colony of Leptospires (magnification approx. 1000X).

Serovar Hardjobovis is one of the most frequent leptospires associated with reproductive disorders in the U.S. Until recently, vaccines used in the U.S. contained serovar Hardjoprajitno, the most common leptospire associated with reproductive disorders in the United Kingdom. Other lesser significant leptospire strains of cattle include grippotyphosa, hardjo, icterohemorrhagia, canicola, and pomona, which are routinely included in most cattle vaccines.

The Infection

Two forms of infection can result from exposure to leptospira: host-adapted or non-host-adapted. In the host-adapted form, the infected host exhibits minimal signs of disease, is a maintenance or reservoir host, and is a major source of environmental contamination or

communication of leptospires to susceptible hosts. In the non-host-adapted form, the infected individual is an accidental or incidental host and develops mild to severe clinical signs with limited shedding of the organism.

The factors controlling the development of a host-adapted or non-host-adapted infection appears to be host related vs. organism related since the same serovar may be host-adapted in one host and non-host-adapted in another host. *L. hardjobovis* is usually host-adapted to cattle while *L. canicola* is more likely to be non-host-adapted. *L. grippotyphosa* is routinely non-host-adapted in cattle and produces more severe disease when infecting cattle. However, *L. hardjobovis* can be either host- or non-host-adapted in cattle.

The infection begins by exposing a susceptible animal to body fluids of infected animals such as fetal and/or reproductive tract fluids, urine or milk, or to contaminated water sources. Due to the high numbers of organisms present in the urine of infected animals, urine splashing is a major method of transmission to humans. The bacteria invade through the mucous tissues of the mouth and nasal passage or through moisture softened skin. The bacteria then enter the blood stream and spread throughout the body.

Leptospira localize in the cells of the kidney, mammary gland, and reproductive tract. Organisms are excreted in the urine, milk, and reproductive tract fluids facilitating the transmission of this organism to susceptible animals and to humans. Leptospiral infected animals will shed the organism in urine, and other fluids, for prolonged periods or time—up to several months has been documented.

Infected cattle rarely exhibit clinical illness. In cattle, the most common clinical entity is abortion from the fourth month through the end of gestation. In dairy cattle, leptospirosis is associated with a drop in milk production—a decrease in milk production in beef cattle may be evident only as an unthrifty calf. Bulls become chronically infected and transmit the organism during breeding, but they rarely exhibit overt signs of infection. The dilemma is differentiating leptospirosis from the myriad of other causes of reproductive failures and decreased production in cattle.

Cattle may also exhibit jaundice associated with liver infection and, rarely, signs of kidney infection such as hemaglobinuria. Clinically normal, shedding animals continue to present the greatest risk for transmission of leptospirosis—to animals or humans!

Diagnosis

An accurate vaccination history and clinical problem description and diagnostic laboratory support are required for confirmation of leptospirosis. Due to the nature of leptospira, specialized laboratory techniques are necessary for the confirmation of a leptospiral infection. Access to a qualified and experienced laboratory is of paramount importance. Diagnostic techniques used for leptospiral infections rely on the demonstration of specific antibodies, the organism, or its DNA.

Aborted fetuses, kidney tissues, or urine can be examined directly for the presence of leptospiral organisms or DNA. Direct culture of leptospiral organisms is generally unsuccessful because the organism is rapidly inactivated after the death of the animal or during transport of specimens. Newer DNA technology permits the direct identification of the organism's DNA in tissues and fluids; however, only a limited number of veterinary diagnostic laboratories currently are **experienced** in such techniques.

Serum specimens from infected animals can be examined for specific antibodies. Diagnosis of infection via serological testing presents special challenges. Annual vaccinations often result in varying levels of persistent antibodies to one or more serovars. Occasionally individual animals will exhibit high titers to selected serovars, especially *L. pomona* and *icterohemorrhagica.*

Infection with leptospira can result in the development of cross-reactive antibodies between one or more serovars. The infected animal usually produces a higher antibody level to the infecting serovar and post-infection titers are routinely higher than post-vaccination titers. Therefore, diagnosis is usually made by demonstrating a high titer (>400) in an animal with a clinical problem compatible with a leptospiral infection (i.e., abortion, stillbirth, hemaglobinuria, and a **known** vaccination history).

Treatment

Leptospirosis is susceptible to treatment with tetracyclines. However, treatment for 14 to 21 days is necessary to clear the organism from the kidneys. Due to the sub-clinical or asymptomatic nature of the infection, antibiotic therapy is seldom applied to the cattle industry.

Prevention

Vaccination is the primary method of prevention of leptospirosis in cattle. The vaccines available contain antigens against the major serovars in the U.S. It is recommended that open herds be vaccinated twice a year while closed herds may suffice with annual vaccinations. To initiate a sound vaccination program for cattle, the initial vaccination must be administered twice 2 to 4 weeks apart; it is best to vaccinate all animals before access to standing water supplies/sources and before introducing bulls to breeding females.

Prophylactic treatment with tetracyclines has been suggested when purchasing animals to be introduced into a new herd. Prophylactic antibiotic therapy has not been routinely successful, therefore, new additions should be isolated for 15 to 30 days and vaccinated before introduction to the herd to minimize potential communication to susceptible herd mates and contamination of water source(s).

Additional Reading

Bolin, C. A., and D. P. Alt. 2001. Use of a Monovalent Leptospiral Vaccine to Prevent Renal Colonization and Urinary Shedding in Cattle Exposed to *Leptospira borgpetersenii* Serovar Hardjo. AJVR, 62(7):995-1000.

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