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Leptospirosis

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Leptospirosis is a zoonotic bacterial disease affecting a majority of mammals worldwide. Leptospires are thin gram negative facultative aerobes preferring moderate temperatures and pH ranges from 6.8 to 8.0. They can survive for considerable periods of time in moist alkaline soil and stagnant water but are susceptible to dry conditions.

Leptospira are associated with production and reproductive losses in cattle throughout the world. The following leptospires are found in all 5-way Lepto vaccines and have been isolated in cattle:

- *Leptospira interrogans* serovar *hardjo* (Type: *hardjo-prajitno*)
- *Leptospira interrogans* serovar *pomona*
- *Leptospira interrogans* serovar *canicola*
- *Leptospira interrogans* serovar *icterohaemorrhagiae*
- *Leptospria kirschneri* serovar *grippotyphosa*

The following serovar is found in only two products marketed in the United States:

- *Leptospira borgpetersenii* serovar *hardjo* (Type: *hardjo-bovis*)

History

Leptospira classification:

Prior to 1989 –

– Pathogenic leptospires classified as *Leptospira interrogans*

– Environmental leptospires classified as *Leptospira biflexa*

After 1989, when PCR techniques became available – Based on surface antigens and genomic testing:

– *Leptospira interrogans* serovar *hardjo* was further divided into

– *Leptospira borgpetersenii* serovar *hardjo* (Type: *hardjo-bovis)* (HB)

– *Leptospira interrogans* serovar *prajitno* (Type: *hardjo-prajitno*) (HP).

Current prevalence data indicates HB is the predominant serovar present in the US and the rest of the world, while HP is found in the United Kingdom. However, HB is not a new organism, just a new name for an existing organism found in the United States since Leptospires were first identified.

Epidemiology

Leptospires invade cattle through mucous membranes or breaks in the skin. After an incubation period of three to twenty days, the organism enters the blood stream where it can replicate in multiple organs including the liver, kidney, spleen, reproductive tract and possibly the central nervous system. Shortly after the organism enters the blood stream antibodies may be found for a short time.

Leptospires are transmitted to cattle through maintenance host and incidental hosts. Maintenance hosts are the most efficient at transmitting disease from one animal to another due to their ability to colonize organs poorly available to the immune system, such as the kidney. HB has an affinity for the renal tubules of the kidney and, occasionally, the genital tract. Maintenance hosts shed the organism to other animals without showing clinical signs themselves. This allows the maintenance host to be a constant source of the organism for weeks and possibly the lifetime of the animal. Diagnosing disease in the maintenance host is difficult due to the short duration of antibody titers. Cattle are maintenance hosts for HB and *pomona*.

Transmission of leptospira in incidental hosts occurs through animals of other species such as rodents, raccoons, and opossums. Leptospira infection in the incidental host is generally short in duration and marked by severe clinical signs. The animal has an increased antibody response and will shed leptospira for a short period. Eliminating contact between the incidental host and the maintenance host will normally eliminate or shorten the duration of the disease.

Clinical Signs

Acute infection with Leptospira results in sudden temperature rise, anorexia, and lethargy. Acute infections in pregnant cows in early gestation may result in early embryonic death, resorption, or abortion due to septicemia. Abortions may be the only presenting clinical sign. Infection during the second half of gestation results in placental invasion and transmission to the fetus. The birth of dead or weak calves may be observed. Abortion storms associated with infection by *pomona* and *grippotyphosa* can be as high as 30%. Late term abortions can be particularly damaging to a cow/calf operation due to the inability to get cows rebred in a timely manner.

In calves, acute infection with an incidental serovar may result in a transient hemoglobinuria lasting 2-3 days. Infection may result in fever, anemia, icterus, dyspnea due to pulmonary congestion, and possibly meningitis. Blood clots in the urinary tract resulting from hemorrhage into the renal tubules may also be found.

Mastitis resulting from leptospirosis is easily distinguished from other forms of mastitis due to the udder not being hard and firm. Secretions from all four quarters are thick, yellow, and generally blood tinged.

The subacute form of leptospirosis produces similar clinical signs found in the acute form but less severe. Abortions occur three to four weeks later than typically observed in the acute form. Milk production declines with thickened yellowish to reddish milk.

Chronic leptospirosis is characterized by mild clinical signs and is generally restricted to abortions or reduced fertility. Reproductive problems generally occur weeks to months after the initial infection making diagnosis difficult. Chronically infected cattle will not show clinical signs but still test positive for disease.

Diagnosis

Diagnosis of leptospira infection is difficult on an individual animal basis due to intermittent shedding; therefore, focusing on the whole herd will provide an increased opportunity to make a definitive diagnosis. Select a minimum of 15 high risk animals that are classified as difficult breeders and animals with abnormal inter-estrus intervals. Blood is drawn for serology and the animal is given an injection of a diuretic. A urine sample is collected from the second urination; this ensures that if leptospires are present they can be collected. A diagnosis is based on the absence of, or low, antibody titers and the presence of leptospires in the urine. Speciation is not normally performed.

Following is a list of current available tests and their advantages and disadvantages.

Diagnostic Test	Advantages	Disadvantages
Culturing	Definitive	Expensive Time Consuming Labor-intensive
Dark Field Microscopy		Threads and fibrin easily confused with Leptospires Absence of Lepto doesn't rule it out
Histopathology		Nonspecific May not identify degenerated leptospires
Fluorescent Antibody (FA)	Quicker than culturing. Lepto organisms are readily observed	Only genus specific
Serology (MAT)	Best of serological assays Useful for herd level diagnosis	Maintenance host normally have low titers Not *hardjo-bovis* specific Cannot distinguish vaccination induced titers from infection
Polymerase Chain Reaction (PCR)	Quick Sensitivity is high for Lepto	Not serovar specific Requires special equipment High cost of reagents

Prevention and Treatment

- Limit contact with streams and stagnant water.
- Limit exposure to raccoons, opossums, and rodents.
- Vaccinate twice initially, prior to exposure to prevent renal colonization, and then annually.

Research by Kastmanickam, et al, showed no improvement in reproduction in a beef herd, utilizing antibiotics and a monovalent HB vaccine.

The herds involved in this trial had a vaccination history of using a MLV L5 combination at least annually for several years.

Conclusion

Leptospires have been around for a long time, and no new Leptospires have been introduced to the United States cattle industry. Herds that have had a diagnosis of Leptospirosis are generally herds on a poor or no vaccination program. In herds where vaccinations are routinely performed, reproductive disruptions due to Leptospira are rare. In a retrospective study in Northern England looking at Leptospira infection, there was a decrease in reproduction in the year of diagnosis but reproduction returned to normal in the year after diagnosis. Management changes in these herds were not examined.

It is important to develop a vaccination program that provides protection against Leptospirosis prior to the risk of exposure. Once colonization of the kidneys has occurred, vaccines will not eliminate the Leptospires and treatment with antibiotics will be required. While leptospirosis remains a threat to reproduction in cattle operations, risk can be controlled with the routine use of effective 5-way vaccines.

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