Leptospirosis

by Pat White, DVM

Leptospirosis is a bacterial disease of cattle that is noted for its ability to cause abortions, stillbirths and loss of milk production. "Lepto" is important from an economic standpoint in loss of production but also in that it is a zoonotic infection: it can and does infect people (and other mammals) with potentially serious consequences. In people, the disease usually causes a flu-like illness that ranges from mild to severe. The main source of infection in people is direct contact with infected urine. Risk groups include dairy farmers, AI techs, veterinarians and anyone exposed to either urine or reproductive fluids from infected animals.

There are over 200 different varieties (serovars) of the seven pathogenic species of Leptospira. Different serovars are prevalent in different regions and are associated with one or more maintenance hosts, which serve as reservoirs of infection. Transmission of infection between individuals of the maintenance host species is extremely efficient and many of that particular host will be rapidly infected. Incidental hosts are those species not considered to serve as maintenance hosts and these are not considered important reservoirs of infection. Transmission of disease between one incidental host to another is not as common. In the US, pigs (including feral swine) are the maintenance host for L. Pomona and Bratislava; dogs are the host for L. Canicola; raccoons, skunks and opossum harbor L. Grippotyphosa and cattle are reservoirs for L. Hardjo and Pomona. Mice and rats are hosts for L. Icterohemorrhagiae.

The disease transmission in the maintenance hosts is usually direct and involves contact with bodily fluids containing the organism. Such fluids include urine, afterbirth or milk. Infection may also be spread venereally and transplacentally. Incidental hosts usually acquire infection by indirect means, such as contact with contaminated surfaces from urine of infected maintenance hosts. Indirect transmission is dependent upon environmental conditions. Leptospires require moisture and moderately warm temperatures, often in stagnant water with a neutral pH. Survival is very brief in dry soil or at temperatures either below 50 degrees or above about 93 degrees. Leptospires invade the body through intact mucous membranes in the mouth, eyes or perineal regions or through damaged skin. An amazing ability to penetrate mucous membranes rapidly has been demonstrated in guinea pigs, where the organism was introduced to the conjunctiva of the eyelid and recovered from the blood stream in as little time as 15 minutes. After an incubation period of 3-20 days, the organisms circulate in the blood and reproduce in many organs including the liver, spleen, kidneys, reproductive tract, eyes and the central nervous system. Antibodies are produced by the infected host and usually clear the body of the organisms, except in the kidneys, where urine shedding of the bacteria can occur for weeks to many months after first being infected. In maintenance hosts, the bacteria may persist in the genital tract, the cerebrospinal fluid and the vitreous humor of the eye.

Clinical signs of disease vary with the serovar and the host. In maintenance hosts, antibody production is generally low, there are relatively mild acute signs of disease and a prolonged carrier state with organisms in the kidneys. In incidental hosts, the disease may be far more severe, with high titers of circulating antibodies and a very short or nonexistent renal carrier state. In general, young animals have more serious disease than adults.

In the USA, Hardjo and Pomona are the most important leptospires of cattle. In US dairies, prevalence of leptospirosis is approximately 50% with Hardjo being the most common. A recent study indicates that up to 42% of beef herds may also be infected.

Many infections are subclinical, particularly in nonpregnant and non-milking animals. These infections are only evident either by the detection of antibodies on a random blood check or evidence of kidney disease at slaughter. More dramatic signs of acute disease are usually limited to incidental hosts while the bacteria is circulating in the blood stream. In breeding age cattle, clinical signs are generally associated with reproductive loss through abortion and stillbirths. Infertility due to chronic infection of the female reproductive tract is probably typical with Hardjo infection in the cow and appears to be the most economically significant manifestation of leptospirosis. Bulls may also harbor the organism and can be a source of recurring infection in the cow herd.

Acute leptospirosis can be very severe in calves and death is not uncommon. Pomona seems to result in the most severe disease, although other serovars can produce similar disease. Signs include high fever (up to 106 degrees), depressed appetite, difficult breathing from pulmonary congestion, jaundice and destruction of red blood cells (hemolytic anemia) resulting in hemoglobinuria (the red blood cell protein hemoglobin shows up in the urine, which can make the urine appear the color of red wine, thus the apt name for the disease, "redwater".) Hardjo, being a host adapted strain, does not usually cause acute disease in calves.

The most common form of acute infection with leptospirosis in adult dairy cattle is called "milk drop syndrome". Undoubtedly this occurs in beef cattle also but would be more difficult to detect in those cattle not coming in for milking 2-3 times per day. It is manifested as transient fever, with a marked drop in milk production lasting for two to ten days. The milk will have the consistency of colostrum; thick, yellow with blood clots and a high somatic cell count typical of mastitis but the udder remains uniformly soft. This soft, flabby udder in the face of mastitis is unique to leptospirosis. Recovery is typically within 10 days, although cows in late lactation may dry up and others may not recover to full production during that lactation cycle.

The most common form of chronic infection in cattle, usually associated with either Hardjo or Pomona, involves fetal infection resulting in abortion, stillbirth or premature and weak calves. Abortions usually occur 6-12 weeks after acute (and mostly asymtomatic) infection and usually in the 3rd trimester. This may manifest as an abortion storm, with multiple abortions about the same length of gestation, because the mild initial signs of acute infection passed unnoticed. In chronically infected herds, abortions will occur mostly in younger animals and are more sporadic in nature. Likewise, Hardjo infection tends to be associated with sporadic abortion, where serovars Pomona and Grippotyphosa are more likely to cause abortion storms. In infected herds, abortion usually only occurs with the first infected pregnancy.

Infertility may become a problem on a herd basis and typically more services per pregnancy are needed and calving intervals tend to be prolonged. This is probably due to localization of the infection in the uterus and fallopian tubes.

Diagnosis of leptospirosis can be difficult and relies on a good clinical and vaccination history. If diagnostic samples are submitted for pathology, it is critical that a laboratory with experience dealing with lepto be utilized. Diagnosis relies on detecting antibodies against the organism or actual detection of the bacteria or its DNA. The best chance to confirm a diagnosis is using some combination of tests to maximize accuracy. The organism is notoriously difficult to find, and in maintenance hosts, antibody titers are typically

low or nonexistent, even with active disease. In the case of endemic disease in a maintenence species, herd antibody levels may be more diagnostic than serology on a sick or aborting individual. Antibody titers may be useful on aborted fetal serum, however.

Animals with acute lepto can be treated with tetracycline for 3-5 days. The organism is also susceptible to erythromycin, tiamulin and tylosin but these last 3 cannot be depended upon to remove the renal carrier state. Injection of a long-lasting oxytetracycline, (LA 200, Biomycin, Tetradure) at 20mg/kg has been shown to be effective in eliminating shedding of lepto in cattle infected with Hardjo and presumably others.

Control of disease is accomplished through a combination of prevention of exposure, vaccination and selective treatment. Efforts should be made to limit exposure between cattle and carriers of incidental infections i.e. rodent control and fencing off swampy areas and streams. Lepto can survive for at least 6 months in wet soil, several months in running water and several weeks in stagnant water. Quarantine and routine antibiotic treatment for purchased additions to the herd may be necessary to prevent introduction of infected carrier animals into the herd.

Lepto is a common additive to routine herd vaccination programs and many vaccines are available for the 5 most common serovars. Actually these vaccines have been available for years, and include serovars Pomona, Grippotyphosa, Canicola, Icterohaemorrhagiae and Hardjo. These vaccines generally do a good job of protecting cattle from disease for all of the included serovars except Hardjo, perhaps helping to explain why it is now the most common serovar affecting cattle in the USA. Repeating these combination lepto vaccines up to 3 times per year does not improve protection from Hardjo. Recent vaccines have been developed for Hardjo that induce much better immunity. Unfortunately, there are only 2 companies manufacturing these improved Hardjo vaccines. Schering Plough produces Leptavoid, available in the UK; and Pfizer Animal Health markets Spirovac, originally developed in Australia, which is available in the US. Pfizer has incorporated the new Hardjo vaccine into some of its product line, including Bovishield Gold HB. The new formulation of Lepto HB (Hardjo-bovis) does require a booster dose 3-6 weeks following the initial vaccination. (An improvement over previous Bovishield vaccines is the new label change to IM or SC administration, a great improvement over the old Bovishield Gold IM label claim only.) Vaccination alone is not effective in reducing urinary shedding in infected herds; it will not cure infected animals. Early vaccination of calves becomes important to prevent infection and the development of renal shedding in those chronically infected herds. While antibiotic treatment will cure the disease, it is not known for how long a "cured" animal will resist reinfection. It appears that cell-mediated immunity is necessary to resist infection and development of a carrier state; it has been shown that active infection does not produce this necessary type of immunity (nor do the older Hardjo vaccines). Recovery from natural infection is not nearly as effective in preventing disease in the individual animal as administering the newly developed Hardjo vaccines. It appears that judicious use of antibiotics and a herd vaccination program are both necessary to prevent and control this disease.

Leptospirosis is a difficult disease to understand and control. Only by staying on top of recent developments can the cattleman expect to gain the upper hand against this reproductive robber.

Management to Help Control Leptospirosis

1. Eliminate accress of cattle to surface water or streams used by other livestock or wildlife.
2. Remove trash that attracts rodents.
3. Limit access of rodents and wildlife to livestock feed.
4. Eliminate urine drainage into water sources.
5. Reduce contact between cattle, other livestock, rodents and wildlife as much as possible/practical.
6. Clean disinfect and dry barns, pens and other confinement areas after use by infected or possibly infected cattle.
7. Drain or fence swampy areas likely to harbor the organism.
8. Vaccinate susceptible animals.
9. Treat infected or possibly infected animals (purchased additions) with a single injection of a long-acting oxytetracycline to eliminate the carrier state.