



Bovine Leptospirosis

Leptospirosis is a contagious disease in animals and man caused by infection with leptospire. These are very slender, spiral bacteria with a characteristic hook in one or both ends. A wide variety of disease conditions have been described in cattle, horses, pigs, sheep, goats and dogs, including fever, jaundice, bloody urine, abortion and death. However, during the last 15 or 20 years, our concept of leptospirosis has changed from a highly fatal disease to that of a widespread, mostly subclinical infection of many wild and domestic animals.

In beef cattle, most infections go unrecognized except for abortion "storms" in pregnant cows, acute outbreaks in calves showing bloody urine and jaundice and occasional cases in cows, *sometimes with convulsions*. Following acute or subclinical infection, leptospire frequently localize in the kidneys where they persist and multiply, and from where they are shed in the urine for weeks or months after the original infection. The disease may be transmitted directly by droplets of infective urine or indirectly by means of contaminated surface waters.

Distribution and Transmission

In general, the leptospire have global distribution, but some serotypes, particularly if recently recognized, may appear to have a regional distribution in one or more mammalian hosts. The principal hosts are rodents and wild and domestic animals. Despite reports of leptospirosis in wildlife, there is not proof that they transmit the disease to cattle. In fact, wild species far removed from domestic animals are often free of leptospirosis.

Positive blood tests only indicate exposure or past infection with leptospire. It has been estimated that only 3 percent of reacting cattle were actively infected; the rest were either carrier-shedder or immune, cured animals. The identification of leptospiral disease would be facilitated if it were made a reportable disease for both animals and man. In England, human leptospirosis has been reportable since 1968. In 1965, veterinarians and veterinary diagnostic laboratories in New Zealand were required to report any animal believed to have leptospirosis to the nearest health officer.

The reservoir of pathogenic leptospire is the kidney of carrier-shedder animals. By urinary excretion and *modern, rapid, animal transport*, carrier-shedder animals transmit the disease locally, regionally and worldwide. Transmission occurs among cattle by direct exposure to droplets of infective urine, by indirect exposure to contaminated surface waters and probably by breeding and artificial insemination. The carrier-shedder animal may shed millions of leptospire in the urine for months without ever showing clinical signs of leptospirosis and with low serum antibody titers. The distribution of leptospire on a ranch is directly related to the number of shedder animals and conditions favoring leptospire survival outside the body, i.e., small streams or ponds with alkaline pH values, and warm temperatures (68 to 80° F). With poor sanitary practices, nutrition or rodent control, the disease may spread to rodents and other mammals in the area, including man. Under normal husbandry conditions, the herd-to-herd spread depends almost exclusively on movement of shedder cattle or water transmission, whereas transmission for greater distances occurs only by means of carrier-shedder animals.

Public Health Significance

The clinical forms described in man now occur less frequently, largely because of better sanitation, rat control and changes in agriculture. Although frequently diagnosed as flu and widely underdiagnosed, leptospirosis occurs among persons whose occupations bring them into direct contact with carrier cattle or swine, or who frequent rivers or streams contaminated with urine from shedder cattle. The route of infection is the mucous membrane, primarily of the eyes and the mouth, but direct penetration of water-sodden, broken or unhealthy skin was reported.

Recent reports of leptospirosis acquired from dairy cows emphasize the hazards of urine from shedder cows. Although the cows had been vaccinated, workers in a herringbone milking shed developed leptospirosis. The largest episode of human leptospirosis in the United States, 61 cases, occurred where leptospire-infected urine from cattle contaminated irrigation canals people used for swimming.

Symptoms

The clinical picture varies widely with calves more severely affected than adult cattle. The incubation period is 2 to 10 days. In calves and young fattening cattle, the classical case presents fever, prostration, jaundice, bloody urine, anemia and death. The temperature rises suddenly to 104 to 106°F. Darkening of the ears and nose was reported.

Blood in the urine may be the noticeable first sign. It may diminish after 2 to 4 days, or persist until death. Jaundice may be found along with high levels of protein in the urine. Severe anemia may follow and the number of red blood cells begins to increase after 4 or 5 days and return to normal 7 to 10 days later. The disease may affect 50 percent of infected calves with a mortality of 5 to 15 percent.

In older cattle, signs of leptospirosis vary greatly and the diagnosis is often difficult. The signs are particularly obscure in dairy herds where lowered milk and calf production occur with few clinical signs. In dry cows, the infection is so mild that it is usually overlooked, but in milking stock, a sharp drop in milk production is noted. The milk is thick, yellow and blood-tinged, although there is no evidence of udder inflammation. Abortion is common and takes place 2 to 5 weeks after the initial infection. It is most common about the

seventh month of pregnancy. An abortion storm in a beef herd is often the first indication that leptospirosis exists, the mild initial signs having passed unnoticed. Calves reared by cows that have been previously infected acquire passive immunity through the colostrum that lasts 1 to 2 months. The calves generally have a higher antibody titer (or blood test) than their dams.

Pathology

Anemia and jaundice are prominent features in the acute form of the disease. The urine is a clear-red or port-wine color. The kidneys show the most significant lesions in the form of a reddish-brown mottling of the outer portion that is often sufficiently pronounced to be visible through the intact capsule. The liver may be swollen, with minute white spots. Small hemorrhages in the heart and lymph nodes are seen in severe cases.

Diagnosis

Blood tests with "paired" serum samples, direct culture in media or animal inoculation techniques are usually necessary to confirm clinical and postmortem findings. The absence of mammary inflammation despite the gross physical changes in the milk is suggestive of leptospirosis. Similarly, elimination of brucellosis, vibriosis and trichomoniasis as possible causes of an abortion outbreak would point to leptospirosis.

Of the more than 100 leptospire, only three are known to cause disease in U.S. cattle. There is remarkably little cross-immunity, and dual and even treble infections have been reported. Antibodies first appear in the blood serum of infected animals by the sixth or seventh day, and titers rise rapidly to a high level. The titer then declines to a more or less constant level that may persist for years. A single positive blood test result indicates either vaccination, passive immunity from the milk of the dam or current or past infection. Confirmation of a clinical diagnosis of leptospirosis requires the demonstration of a rising titer in consecutive serum samples, the first taken as early in the disease as possible and the second after an interval of 7 to 10 days. Vaccination with bacterins stimulates only low titers in the blood. The carrier or shedder state cannot be diagnosed serologically. The serologic methods commonly used include the "plate" agglutination, microscopic agglutination and complement-fixation tests.

Prognosis

Leptospirosis in a herd of susceptible beef cattle often results in jaundice and bloody urine in 50 percent or more of affected young calves. Mortality ranges from 5 to 15 percent. The acute disease occurs in only 2 to 4 percent of adults and deaths are rare. Affected animals exceed 75 percent in older stock and usually approach 100 percent in calves.

Treatment

No treatment will have much effect on the course of the disease once the destruction of red blood cells has developed. In the case of valuable animals, the intravenous transfusion of washed red cells may prove beneficial if the anemia approaches the critical level. Antibiotic therapy—streptomycin, chlortetracycline or oxytetracycline—is often successful if it can be given early. Dihydrostreptomycin, 25 mg. per kg. of body weight in one dose (10 mg. per pound or 10 grams per 1,000 pound cow), is recommended for termination of the carrier or shedder state.

Prevention

In the absence of state or federal regulations for the control of leptospirosis, cattle owners rely on annual vaccinations with commercial *L. pomona* bacterins. Although bacterins confer protection against abortions and death, their efficacy in preventing persistent kidney infections has not been proved. Management methods to prevent leptospirosis include: rat control, fencing cattle from potentially contaminated streams and ponds, separation of cattle from swine, selection of replacement stock from herds that have passed serologic tests for leptospirosis and antibiotic treatment of replacement stock.

Further information on leptospirosis control can be obtained from local veterinarians, state Extension veterinarians, or the U.S. Department of Agriculture.