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LEPTOSPIROSIS

by

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LEPTOSPIROSIS

Leptospirosis is a disease of man and animals characterized by a variety of clinical signs and symptoms. In man it may be a severe febrile illness marked by jaundice, hepatosplenomegaly and renal involvement, or it may be a mild illness resembling influenza, aseptic meningitis, or brucellosis. In both man and animals differential diagnosis of the disease is essential.

I CAUSAL AGENT

Spirochaetes of the genus Leptospira appear as slender thread-like organisms, ranging from 6 to 40 microns in length and about 0.1 micron in diameter. The organism is tightly coiled on its long axis and the ends are usually bent like a hook. They stain poorly with the usual bacterial stains, but may be stained readily by several silver impregnation techniques. Leptospires usually can be grown on artifical media without difficulty but they can be differentiated only be serological techniques. There are now more than 85 pathogenic serotypes as well as numerous saprophytic serotypes. The latter are widely disseminated in nature where they are free-living in water and sewage.

In the United States at least 15 pathogenic leptospiral serotypes have been isolated from man, domestic animals, and a variety of wild mammals:

> Leptospira icterohaemorrhagiae, the type species of the Genus, was isolated from rats in New York City in 1917, and 5 years later, the first isolation from man was reported. Although the rat is the primary reservoir of this type, it occurs also in dogs, foxes, raccoons, mice and other rodents.

Infections with canicola* were recognized in dogs in 1937 and in man in 1938 in California. Sporadic human cases have continued to occur and 2 large waterborne outbreaks have been reported. This type has also been found occasionally in swine, cattle, and skunks.

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*Woff, J.W., and Turner, L.H. Report of a meeting of the Taxonomic Subcommittee on Leptospira, Int. Bull. Bact. Nomenclature and Taxonomy 13: 161-165, 1963.

Pomona infections are widespread in cattle and swine and a high percent of skunks and raccoons harbour the organisms. This type probably occurs more frequently as the cause of the disease in man in the United States than any other serotype.

Infection with autumnalis was recognized in man as the cause of 3 rather large outbreaks among soldiers in 1942, 1943, and 1944. More recently it has been found in raccoons and opossums.

Two types, mini georgia and alexi, have been isolated from laboratory acquired cases. Serologic evidence has indicated other human infections with mini georgia and it is found frequently in wild animals.

Other types isolated only from animals in the United States include: ballum, australis, grippotyphosa, hardjo, paidjan, hyos, hyos bakeri, zanoni myocastoris, and atlantae. An additional pathogenic serotype, naam dakota, has been isolated from water.

II EPIDEMIOLOGY

The different leptospiral serotypes are generally associated with a primary mammalian host, but investigations during the past decade have revealed multiple hosts for many of these types. For years rodents were thought to be the principal animal reservoir; now it is known that cattle, swine, dogs, and other domestic animals, as well as numerous wild animals, are frequently infected. Some of these wild animal reservoirs include skunks, raccoons, foxes, wildcats, beavers, nutria, bats, jackals, hedgehogs, and armadillo.

After acute, mild or even inapparent infection, these animals may become carriers and shed the leptospires in their urine for several months, and sometimes for a year or longer. These animal carriers serve as important foci. Transmission of the infection to man and other animals results from direct or indirect contact with infected urine of these carriers. Direct contact may occur when caring for sick animals or handling the tissues of infected animals in abattoirs. Indirect contact occurs when the organisms are excreted in water, moist soil, or on food, and individuals are then exposed when they come in contact with the

contaminated environment or food. The organisms usually enter the body through the mucous membranes of the mouth, nose, conjunctiva, or skin lesions. It is doubtful that they will penetrate the unbroken skin unless it is softened by long exposure to water.

The role of non-mammalian hosts in the transmission of leptospirosis is uncertain but leptospires have been isolated from reptiles, birds, and ticks. Further investigations are needed to clarify their position.

In man the disease is usually sporadic except in certain occupational groups. Opportunities for exposure are encountered frequently by veterinarians, abattoir workers, dairy workers, animal husbandrymen, and swine herdsmen. In addition, exposure is more frequent among individuals working in rat infested surroundings such as sewers, mines, and fish and poultry houses. During wars the disease was not uncommon in soldiers in rat infested trenches. Outbreaks of the disease are usually associated with recreational groups swimming in contaminated waters.

Man usually does not shed organisms for longer than 2 to 3 months. Transmission of the disease from man to man occurs only rarely, if at all. In summary, man is the accidental victim and appears to be a terminal host of leptospirosis.

Surveys have revealed that infection in rats is widespread throughout the world with infection rates ranging from 25 to 75 percent. In an investigation in New York State, leptospires were isolated from 55 of 100 rats examined. L. icterohaemorrhagiae is the primary serotype found in the rat although occasionally they have been found to harbour other serotypes.

It has been estimated that 25 to 35 percent of the dogs in the United States have or have had leptospirosis. Although serologic studies have revealed antibodies in 25 to 35 percent, the presence of antibodies cannot be depended upon to detect urinary shedders. Leptospires have been isolated from carriers months after infection when antibodies cannot be demonstrated. The primary serotype infecting dogs is canicola but icterohaemorrhagiae and pomona have been isolated occasionally and

antibodies have been found against 4 other serotypes. Elsewhere in the world, at least 6 additional serotypes have been isolated from dogs. The disease may vary from severe illness with jaundice, haemorrhage and uremia, to inapparent infection.

Bovine leptospirosis is enzootic in many parts of the world. In the United States it is caused primarily by serotype pomona although canicola and hardjo are found occasionally. These infections, characterized by acute to inapparent disease, have been found to be prevalent throughout the country. Frequent signs include abortion and thickened blood tinged milk.

Leptospirosis in swine is also widespread in many countries. In the United States serotype pomona appears to be the primary infecting serotype, although canicola was isolated from swine for the first time in Georgia in 1952 during the study of an outbreak involving 26 human cases. Generally the disease is mild in swine. Abortion, birth of weak pigs, metritis, and lowered fertility, are frequently the only signs of infection. Infected pigs shed the organisms in their urine in greater numbers and for longer periods of time than do cattle. Thus, leptospirosis in swine probably constitutes a greater and more important public health hazard than the disease in cattle.

III CLINICAL DISEASE

Symptoms of leptospirosis vary considerably in man and animals as one can gather from the foregoing description. The disease is manifested by fever, chills, headache, conjunctivitis, muscle and joint pain, and encephalitic symptoms, the latter usually being due to meningitis. Some clinicians have observed an orchitis. The urine examination reveals albumin, casts, and a few red blood cells. Jaundice is infrequent, appearing only in severe cases, which may terminate fatally. Haemorrhage may be seen in the mucous membranes and skin in some cases. The duration of illness varies with the severity of the illness, from a few days to several weeks or even a month or longer. Diagnosis can usually be established by history of occupation or possible exposure to diseased animals, a clinical picture, characterized by meningeal, renal or hepatic

involvement, and the appearance of agglutination antibodies. The latter appear about the second week of disease and reach a maximum titer about one month after onset. The isolation of the leptospiral organisms from the blood or urine of infected patients is a comparatively simple procedure and by far the most reliable.

The treatment of leptospirosis is difficult. There is no one specific drug that arrests the infection or disease. Penicillin, streptomycin, aureomycin and terramycin are effective in "vitro" against leptospirae but do not produce the desired effects in treating a patient even when given shortly after exposure. Some investigators believe that a combination of antibiotics along with supportive therapy is the most effective procedure in managing the diseased patient. Encouraging results were obtained with experimental infections in the elimination of the organisms from dogs which were shedding leptospires. Likewise terramycin has been reported to be successful in the treatment of swine leptospiremia. Further work is needed to find an effective method to prevent or eliminate shedder states.

It is believed that an attack of disease in man or animal confers immunity against the infecting serotype and possibly serologically related types. However, multiple infections with different types have been observed in both man and animals. No doubt many animals, and possibly human beings are exposed, and develop an immunity without showing any clinical symptoms or signs of disease. Vaccines developed for dogs and cattle, are used extensively in veterinary medicine and are of some value. Vaccines for man have been used in certain occupational groups, particularly ricefield workers. There is no evidence to indicate the need of vaccines for persons other than those subject to occupational exposure.

IV CONTROL

Control is based on the prevention of disease in domestic animals that are close to man, and reasonable precautions on those handling infected animals or their products. No doubt the decline of the disease among agricultural workers in some parts of the world is due in part to higher standards of living and increased mechanization. The use of clean,

protected water supplies has also contributed to a reduction of the spread of disease. The improvement of working conditions in mines and sewers and other places where contaminated water can accumulate has been an important step in disease prevention.

There is little likelihood that the disease can be eradicated or controlled in the wild animal hosts which may serve as sources of infection for man and other animals. However, establishment of immune domestic animal populations by vaccination and education of the human population regarding the dangers of infection through contact with infected urine or tissues of these wild animals, will reduce the hazard from such foci.