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Epizootiology and Epidemiology of Leptospirosis

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Leptospirosis is an acute infectious disease that is naturally transmitted between animals and man. Some of the synonyms of leptospirosis are Weil's disease, canicola fever, hemorrhagic jaundice, mud fever, and swineherd's disease. For many years this disease was associated with rats and dogs. At the present time, while rodents such as rats, mice, voles, and shrews remain as major host species, infections have been found in numurous wild mammals, including opossums, skunks, raccoons, foxes, bats, mongooses, bandicoots, jackals, hedgehogs, wildcats, squirrels, deer, beaver, nutria, armadillos, apes, and rabbits. Leptospirosis continues to cause major losses in domestic animal reservoirs, such as cattle, swine, and dogs. Since 1959, the number of cases of leptospirosis reported to the U.S. Department of Agriculture has decreased by 68 percent in cattle, 88 percent in swine, and 49 percent in horses, but has declined only 10 percent in dogs.[1]

In many host animals, *Leptospira* organisms become localized in the kidneys. After either acute or inapparent infection, these animals may become carriers, shedding organisms in their urine and serving as important foci of infection. Because of the varied clinical picture in animals, a definite diagnosis in domestic animals is frequently not made and many remain as carriers. Man and other animals become infected from direct contact with infected animals or their tissues, or indirectly from contact with urine-contaminated water or soil.

There are over 130 individual serotypes of *Leptospira*. Certain serotypes have been associated with specific host species although these organisms are not host specific. Serotype *icterohaemorrhagiae* is often found in rats, *pomona* is common in cattle, and *canicola* is more frequently isolated from dogs. On the other hand, each host species may be infected with a number of different serotypes.

Leptospirosis, although not a common human disease, has been reported from all regions of the United States. In 1947 it was made a nationally notifiable disease. The disease in man occurs in swimmers exposed to waters contaminated by the urine of infected domestic or wild animals; it is an occupational hazard to farmers, sewer workers, miners, veterinarians, animal husbandrymen, abattoir workers, and those who work in rat-infested environments.

During the period 1960-1968, the number of cases remained relatively constant at about 70-80 cases a year, except for 1964, when 142 cases were reported. Peaks in the number of reported cases were due to epidemics which were attributed to swimming in contaminated water. In 1952, 26 people were infected by *canicola* after swimming in contaminated water; the possible sources of the contamination included cattle, swine and dogs. Forty-two persons in 1959 were infected by *pomona* from water contaminated by cattle. Two separate outbreaks in 1964 affected a total of 76 people, all of whom were infected with *pomona;* in both instances cattle were implicated.

In reviewing 277 cases reported to the National Communicable Disease Center during the period 1965-1968, we found cases reported from 33 states. Ten patients died, and leptospirosis was a contributing cause of death. Hawaii recorded the most cases, 42 of the 277 cases (15 percent). From the continental states, Iowa reported the greatest number of cases; however, this large number of cases, 28, compared

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with the small number of cases in surrounding states may reflect the availability of diagnostic facilities and interest in leptospirosis in Iowa. Over 50 percent of all cases occurred in southern states.

Of cases for which the month of onset was reported, 48 percent occurred in the 3-month period from July through September, as would be expected with the recognized association of cases with swimming in contaminated water. Data from case reports show that males were more often infected than females, accounting for 81 percent of the cases. The disease was encountered in all age groups, but more frequently in teenagers and young adults.

In cases where a presumptive infecting serotype was noted, *canicola* was implicated in 30 percent, followed by *icterohaemorrhagiae* with 24 percent, and *pomona* in 17 percent. This distribution differs slightly from cases reported in 1949-1961.[2] In that series, *icterohaemorrhagiae* was the most common, accounting for 41 percent of the cases in which serotypes were identified. *Canicola* was associated with 28 percent, while *pomona* accounted for 20 percent.

The most common initial diagnostic impression of human leptospirosis cases reviewed since 1947, other than leptospirosis, was meningitis. This was followed by hepatitis. Other common impressions were nephritis, fever of unknown origin, and influenza. Leptospirosis was the initial diagnosis in only 20 percent of the cases where an initial diagnosis was noted.

The clinical manifestations of leptospirosis are variable. In the review of cases from 1949-1961, 47 different manifestations were recorded. In less than 50 percent was the classic Weil's disease with clinical jaundice reported. The most frequently noted symptoms included fever, headache, chills, severe malaise, vomiting, muscular aches, stiff neck, anuria, jaundice, and occasionally conjunctivitis.

Signs appear 4 to 20 days after infection and last for a few days to as long as 3 weeks. The severity of the clinical course is variable and the case fatality rates are usually low.

No specific therapy has been proven to be of definite value, but penicillin early and in high doses is considered to be the drug of choice. Patients have been treated with a variety of antibiotics, including ampicillin, chloramphenicol, kanamycin, penicillin, and tetracycline. Some patients recover spontaneously without antimicrobial treatment.

In many cases, no single source of infection could be identified. Cattle and swine were most frequently implicated as probable animal sources, but were closely followed by rodents and dogs or cats. Contaminated water was also an important source, but the animal causing the contamination was usually unknown. From this it is evident that leptospires shed into a suitable environment may persist in numbers adequate to initiate explosive epidemics and that intimate contact with infected reservoir hosts is not essential for transmission of disease. It is here that the *potential* that wild animals present for leptospirosis infections in domestic animals and man has been long recognized and often epidemiologically implicated. More definite information on the disease cycle in these populations and their role in the epidemiology and epizootiology of leptospirosis is lacking.

The range of the known animal reservoirs is broad and includes many species of wild animals. Eradication or control of this disease in wild hosts is unlikely, and since these animals serve as potential sources of infection for domestic animals and man, leptospirosis is likely to remain a public health problem.

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