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Leptospirosis

Issue Description

Leptospirosis is caused by a spirochaete bacterium called Leptospira spp. that has at least 5 serovars of importance in the United States and Canada causing disease in dogs (Icterohaemorrhagiae, Canicola, Pomona, Grippotyphosa, and Bratislava). There are other (less common) infectious strains. It should however be noted that genetically different leptospira organisms may be identical serologically and vice versa. Hence, an argument exists on the basis of strain identification. The traditional serologic system is seemingly more useful from a diagnostic and epidemiologic standpoint at the moment (which may change with further development and spread of technologies like PCR).

Leptospirosis is transmitted by the urine of an infected animal, and is contagious as long as it is still moist. Although rats, mice and voles are important primary hosts, a wide range of other mammals including dogs, deer, rabbits, hedgehogs, cows, sheep, raccoons, possums, skunks, and even certain marine mammals are also able to carry and transmit the disease as secondary hosts. Dogs may lick the urine of an infected animal off the grass or soil, or drink from an infected puddle. There have been reports of "house dogs" contracting leptospirosis apparently from licking the urine of infected mice that entered the house. The type of habitats most likely to carry infective bacteria are muddy riverbanks, ditches, gulleys and muddy livestock rearing areas where there is regular passage of either wild or farm mammals. There is a direct correlation between the amount of rainfall and the incidence of leptospirosis, making it seasonal in temperate climates and year-round in tropical climates.

Other Names

7-Day Fever, Weil's Disease, Canicola Fever, Canefield Fever, Nanukayami Fever

Symptoms

In animals, the incubation period (time of exposure to first symptoms) is anywhere from 2 to 20 days. In dogs, the liver and kidney are most commonly damaged by leptospirosis. Vasculitis can occur, causing edema and potentially disseminated intravascular coagulation (DIC). Myocarditis, pericarditis, meningitis, and uveitis are also possible sequelae. One should strongly suspect leptospirosis and include it as part of a differential diagnosis if the sclerae of the dog's eyes appear jaundiced (even slightly yellow), though the absence of jaundice does not eliminate the possibility of leptospirosis, and its presence could indicate hepatitis or other liver pathology rather than leptospirosis. Vomiting, fever, failure to eat, reduced urine output, unusually dark or brown urine, and lethargy are also indications of the disease.

Complications

Complications include meningitis, extreme fatigue, respiratory distress, and renal interstitial tubular necrosis, which results in renal failure and often liver failure (the severe form of this disease is known as Weil's disease, though it is sometimes named Weil Syndrome). Cardiovascular problems are also possible. Approximately 5-50% of severe leptospirosis cases are fatal; however, such cases only constitute about 10% of all registered incidents.

Diagnosis

On infection the microorganism can be found in blood for the first 7 to 10 days (invoking serologically identifiable reactions) and then moving to the kidneys. After 7 to 10 days the microorganism can be found in fresh urine. Hence, early diagnostic efforts include testing a serum or blood sample serologically with a panel of different strains. It is also possible to culture the microorganism from blood, serum, fresh urine and possibly fresh kidney biopsy. Kidney function tests (Blood Urea Nitrogen and creatinine) as well as blood tests for liver functions are performed. The latter reveal a moderate elevation of transaminases. Brief elevations of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma-glutamyltransferase (GGT) levels are relatively mild. These levels may be normal, even in children with jaundice. Diagnosis of leptospirosis is confirmed with tests such as Enzyme-Linked

Immunosorbent Assay (ELISA) and PCR. Serological testing, the MAT (microscopic agglutination test), is considered the gold standard in diagnosing leptospirosis. As a large panel of different leptospira need to be subcultured frequently, which is both laborious and expensive, it is underused, mainly in developing countries.

Differential diagnosis list for leptospirosis is very large due to diverse symptomatics. For forms with middle to high severity, the list includes dengue fever and other hemorrhagic fevers, hepatitis of various etiologies, viral meningitis, malaria and typhoid fever. Light forms should be distinguished from influenza and other related viral diseases. Specific tests are a must for proper diagnosis of leptospirosis. Under circumstances of limited access (e.g., developing countries) to specific diagnostic means, close attention must be paid to anamnesis of the patient. Factors like certain dwelling areas, seasonality, contact with stagnant contaminated water (Bathing, swimming, working on flooded meadows, etc) and/or rodents in the medical history support the leptospirosis hypothesis and serve as indications for specific tests (if available).

Treatment

Leptospirosis treatment is a relatively complicated process comprising two main components - suppressing the causative agent and fighting possible complications. Aetiologic drugs are antibiotics, such as cefotaxime, doxycycline, penicillin, ampicillin, and amoxicillin (doxycycline can also be used as a prophylaxis). There are no human vaccines; animal vaccines are only for a few strains, and are only effective for a few months. Human therapeutic dosage of drugs is as follows: doxycycline 100 mg orally every 12 hours for 1 week or penicillin 1-1.5 MU every 4 hours for 1 week. Doxycycline 200-250 mg once a week is administered as a prophylaxis. In dogs, penicillin is most commonly used to end the leptospiremic phase (infection of the blood), and doxycycline is used to eliminate the carrier state.

Supportive therapy measures (esp. in severe cases) include detoxication and normalization of the hydro-electrolytic balance. Glucose and salt solution infusions may be administered; dialysis is used in serious cases. Elevations of serum potassium are common and if the potassium level gets too high special measures must be taken. Serum phosphorus levels may likewise increase to unacceptable levels due to renal failure. Treatment for hyperphosphatemia consists of treating the underlying disease, dialysis where appropriate, or oral administration of calcium carbonate, but not without first checking the serum calcium levels (these two levels are related). Corticosteroids administration in gradually reduced doses (e.g., prednisolone starting from 30-60 mg) during 7-10 days is recommended by some specialists in cases of severe haemorrhagic effects. Organ specific care and treatment are essential in cases of renal, liver or heart involvement.

Research

In the past decade, leptospirosis has emerged as a globally important infectious disease. It occurs in urban environments of industrialised and developing countries, as well as in rural regions worldwide. People living in city slums who wade through dirty water are mostly affected. Agricultural labour, rice planters, sewer cleaners and workers cleaning canals easily contract this disease. Mortality remains significant, related both to delays in diagnosis due to lack of infrastructure and adequate clinical suspicion, and to other poorly understood reasons that may include inherent pathogenicity of some leptospiral strains or genetically determined host immunopathological responses. Pulmonary haemorrhage is recognised increasingly as a major, often lethal, manifestation of leptospirosis, the pathogenesis of which remains unclear. The completion of the genome sequence of *Leptospira interrogans* serovar lai, and other continuing leptospiral genome sequencing projects, promise to guide future work on the disease. Mainstays of treatment are still tetracyclines and beta-lactam/cephalosporins. No vaccine is available. Prevention is largely dependent on sanitation measures that may be difficult to implement, especially in developing countries.

In a study of 38 dogs diagnosed and properly treated for leptospirosis published in the February 2000 issue of the Journal of the American Veterinary Association, the survival rate for the dialysis patients was slightly higher than the ones not put on dialysis, but both were in the 85% range (plus or minus). Of the dogs in this study that did not die, most recovered adequate kidney function, although one had chronic renal problems.

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