

Canine Leptospirosis: How can I get up-to-date information on diagnosis and treatment?

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ABSTRACT

Leptospirosis is a zoonotic disease of worldwide distribution that commonly affects dogs and to a lesser extent cats, cows and pigs, is caused by free-living spirochetes. Endo flagellates, the most common clinical signs of the disease are fever, acute kidney and liver failure, it is transmitted through contact of mucous membranes with contaminated urine, through venereal route and bites among other ways, it is reported throughout the world and especially in tropical and temperate areas where the presence of streams and water courses promote the activity of rodents that are asymptomatic carriers of the bacteria, the diagnosis is complicated by the variety of clinical signs that can occur and is achieved through laboratory tests such as the microscopic agglutination test (MAT), through indirect hemagglutination assays or through enzyme-linked immunosorbent assays (ELISA) and in urine cultures it can be identified by dark field microscopy and PCR. Hematological findings commonly include thrombocytopenia, vasculitis and endothelial damage caused by circulating bacteria. Platelet adhesion and activation of the coagulation cascade are also generated. Mild to moderate anemia may be found as a result of generalized inflammation of the system or due to blood loss at the level of the respiratory or gastrointestinal system. In the white series, leukocytosis with neutrophilia is present as a result of systemic inflammation. The disease is prevented through vaccination, which is useful but limited to the available serovars. The duration of immunity is one year, so it is recommended to revaccinate year after year. In puppies, it can be started from one month of age with a booster at 2 to 4 weeks. Treatment depends on the severity of the symptoms but is based on the use of antibiotics to reduce or eliminate the bacterial load. This document can help generate a collection of important data to understand the pathophysiology, diagnosis, treatment and prevention of leptospirosis. Using this methodology, valuable literature from different geographic areas can be investigated and the best guidelines for the management of leptospirosis cases can be compared, thus providing up-to-date information for use by veterinary medical professionals.

Keywords: Teacher Education, Life-long learning, Professional development.

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BACKGROUND

Leptospirosis is a potentially serious, re-emerging zoonotic disease of worldwide distribution that is caused by pathogenic serovars of the *Leptospira* genus (1, 2, 3).

Leptospira is a free-living aerobic spirochete that measures 6 to 20 micrometers, has a membrane composed of a lipid bilayer, so they have gram-positive and gram-negative characteristics. They are organisms with endoflagella, which is why they are considered mobile (4)

Leptospirosis is a zoonosis that affects domestic animals, commonly dogs, cows, and pigs. It is characterized by fever, kidney and liver failure, and can also cause pulmonary manifestations and reproductive failure (5, 6). In tropical countries, this zoonosis generates large epidemics after heavy rains and both wild and domestic animals are reservoirs (7, 8).

Etiopathogenesis. It is transmitted through urine, via venereal route, during pregnancy, by bites or ingestion of infected tissues, the spirochete penetrates the mucous membranes or damaged skin, the elimination of spirochetes is generally through urine, dogs that recover from the disease can release microorganisms for months up to 4 years after infection (9).

Once excreted into the environment, the bacteria can live from months to years if kept in favorable conditions with a temperature range of 28 to 38 degrees Celsius and a pH of 6.2 to 8.0. Humans can be infected through contaminated urine and tissues. There is transmission between humans through breastfeeding or sexual intercourse, but it is rarely reported. Infection during pregnancy can affect fetuses, causing death in the middle of pregnancy, as well as healthy babies after the administration of specific antibiotics (10).

Dogs and cats can disperse the bacteria contained in urine without clinical signs. After entering the host, *Leptospira* establishes a rapid systemic infection through the hematogenous route. In this process, unlike other Gram-negative bacteria, *Leptospira* does not cause a fulminant disease. This is attributed to the low endotoxic potential of its lipopolysaccharides (11).

The release of bacteria from the host can begin within 24 to 48 hours and last up to a week. During this time, leptospires can be isolated from the blood and most internal organs, and also from the cerebrospinal fluid. This is the primary phase, which ends when circulating antibodies appear, which is usually detected within 10 to 14 days. There is also a second period of bacteremia that is reported within 15 to 26 days, but it is rarer (12).

Dogs can act as sentinels to alert the presence of pathogenic leptospires that can affect humans, because their level of environmental exposure is higher, and they are more susceptible to infection.

Leptospirosis is present throughout the world. In southern Chile, there is an estimated prevalence of 14.8% to 21.3%. Southern Chile, due to its environmental conditions, favors the presence of pathogenic leptospires. These environmental conditions include the presence of wild animals that act as potential reservoirs, as well as domestic animals kept semi-extensively or on farms, which facilitates contact with wild fauna, the abundance of streams,

backwaters and water courses (13). Rats and mice are common reservoirs of leptospira and in these they do not generate symptoms, the bacteria colonizes their renal tubules and spreads to the environment through urine (14).

Leptospira is capable of generating biofilms that protect it from external factors such as UV radiation, temperature and antibiotic compounds, 37% of rats could have a leptospira biofilm, in chronic wounds leptospira can also bind to other bacteria such as staphylococcus in the same biofilm (14).

Diagnosis. Due to the wide spectrum of clinical signs that leptospirosis can generate, diagnosis is complicated and is achieved through laboratory tests such as the detection of specific antibodies by microscopic agglutination tests (MAT), by indirect hemagglutination assays (IHA), or by immunoenzymatic assays (ELISA), and it can also be detected in urine or tissue cultures by dark field microscopy, immunostaining, and PCR (15)

It is common to find thrombocytopenia in hematological examinations, the pathophysiological mechanisms of this include vasculitis and endothelial damage generated by circulating bacteria with the consequent adhesion of platelets and the activation of the coagulation cascade, other mechanisms are by immune-mediated destruction or splenic sequestration, mild or moderate anemia may be the result of generalized inflammation of the system or by blood loss at the respiratory or gastrointestinal level, in the white series there is a leukocytosis with neutrophilia that is a reflection of systemic inflammation (16).

Treatment. Most cases of leptospirosis infection are of moderate severity and resolve spontaneously, antimicrobial drugs such as doxycycline, azithromycin, amoxicillin and ampicillin are used depending on the severity of the infection, and azithromycin and doxycycline are the most commonly used drugs

Treatment is based on the use of antibiotics to reduce the bacterial load or to eliminate it, at the same time supportive care should be given for the damage generated in the most affected organs, acute kidney injury or liver disease can be treated, in dogs with suspected leptospirosis infection should be treated with antibiotics with laboratory results pending, the most commonly used medications are penicillin in case the patient is not fit for oral treatment, the doses of penicillin are 20 thousand to 40 thousand U / kg every 8 hours (16)

Amoxicillin is also useful with a dose of 20 to 30 mg/kg every 8 hours, to cleanse the kidneys of bacteria, a treatment of doxycycline at 5 mg every 12 hours or 10 mg every 24 hours for 14 days is indicated (17).

Prevention. Serovar determination is important to employ prophylactic measures and improve disease control. The control strategy through vaccination is useful, but it is limited since there are few heat- or formalin-inactivated leptospira serovars available. Vaccines with *Canicola* and *Icterohaemorrhagiae* serovars as well as *Pomona* and *Grippotyphosa* serovars are generally used (18). The immunity generated by leptospira vaccines is considered to be serovar-specific and has been shown to be preventive or drastically reduce infection and renal carriage of bacteria up to one year after vaccination. Annual revaccination is recommended after vaccination of puppies from 8 weeks with a booster at 2 to 4 weeks later (17, 19).

With this background, this document proposes the bases for preparing an updated document in relation to canine Leptospirosis and its molecular detection, pathophysiology, treatment and prevention.

MATERIALS AND SOURCES OF INFORMATION.

The information needed to carry out this study can be obtained from various bibliographic sources and the following keywords will be used for the search: canine leptospirosis, detection in dogs. The databases can be PubMed and ScienceDirect, electronic scientific journals, Digital Library of universities, Scielo, Genbank® and others, both for general information and for molecular detection.

The search operators (Boolean operators) to be used can be ((Leptospira) OR Leptospirosis) AND (Dog) AND (dogs) AND (Canine) AND (canines) and (canine parvovirus) OR (Leptospirosis) AND (diagnosis) OR (treatment) OR (therapy). This search for articles will be temporarily restricted, for example with a maximum age of 15 years.

Obtaining information may include undergraduate and graduate theses and dissertations from different national and international universities

METHODOLOGY

The methodology may include a systematic search for information in the last 15 years in the sources mentioned and others outside the date range that are relevant to canine leptospirosis with emphasis on its origin, etiology, pathophysiology, and clinical signs. Then, the search will be based on information regarding the appropriate treatments for patients with leptospirosis.

In the first selection of articles, all those whose title is not relevant to the treatment and detection of canine leptospirosis and also those articles that are older than 15 years will be excluded.

Finally, the question guiding this research could be: *What is the current state of knowledge regarding the treatment and diagnosis of leptospirosis, based on the last 15 years of scientific publications?*

DISCUSSION AND CONCLUSIONS

The proposed methodology can be extrapolated to any pathogen of veterinary interest, that is, it covers disciplines such as parasitology, microbiology or virology. Our third world countries cannot be left behind today, especially regarding new molecular techniques such as the application of Kary Mullis' fabulous idea (20) or our approach to computer programs that are still freely available.

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CONFLICT OF INTEREST

None.

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