

## Leptospirosis in Dogs

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Leptospirosis is a disease of worldwide significance that infects both animals and humans. The scientific name of the infecting organism is *Leptospira interrogans sensu lato*. Within this species there are many different strains (serovars). Of these different strains there are eight that are of importance for dogs and cats. These different strains produce different levels and types of disease depending on the animals they infect. While cats can be infected, they rarely show signs of disease. The disease is much more of a problem in dogs, people, and livestock. There are vaccines available, but usually only for one or two of the more common strains. Unfortunately, vaccination against one strain does not protect against the other strains. The current canine vaccines protect against the serovars *canicola* and *icterohaemorrhagiae*. These two serovars have been decreasing in total number of infections, but unfortunately, other serovars that infect dogs such as *grippityphosa*, *pomona*, and *bratislava* have increased.

<b><i>Leptospira</i> Serovars</b>	<b>Primary Host</b>	<b>Dog</b>	<b>Cat</b>	<b>Human</b>	<b>Other Domestic Animals</b>	<b>Wild Animals</b>
<b><i>Bratislava</i></b>	Rat, pig, horse	+	–	+	Cow, horse	Mouse, raccoon, opossum, vole, fox, skunk
<b><i>Autumnalis</i></b>	Mouse	+	–	+	Cow	Rat, raccoon, opossum
<b><i>Ictero- haemorrhagiae</i></b>	Rat	+	+	+	Cow, horse, pig	Mouse, raccoon, opossum, hedgehog, fox, woodchuck, ape, muskrat, skunk, civet
<b><i>Pomona</i></b>	Cow, pig, skunk, opossum	+	+	+	Horse, sheep, goat, rabbit	Mouse, raccoon, hedgehog, wolf, fox, woodchuck, deer
<b><i>Canicola</i></b>	Dog	+	+	+	Cow, horse, pig	Rat, raccoon, hedgehog, armadillo, mongoose, skunk

<b><i>Bataviae</i></b>	Dog, rat, mouse	+	+	+	Cow	Hedgehog, armadillo, vole, shrew,
<b><i>Hardjo</i></b>	Cow	+	-	+	Pig, horse, sheep	Wild bovidae
<b><i>Grippityphosa</i></b>	Vole, raccoon, skunk, opossum	+	+	+	Cow, pig, sheep, goat, rabbit, gerbil	Mouse, rat, fox, squirrel, bobcat, shrew, hedgehog, muskrat, weasel

#### Transmission

Leptospirosis is transmitted between animals through contact with infected urine; venereal and placental transfer; bite wounds; or the ingestion of infected tissue. Crowding, as found in a kennel, can increase the spread of infection. Indirect transmission occurs through exposure of susceptible animals to contaminated water sources, food, or even bedding. Stagnant or slow moving water provides a suitable habitat for *Leptospira*. As a result, disease outbreaks often increase during periods of flooding. In dry areas infections are more common around water sources.

Freezing greatly reduces the survival of the organism in the environment. This explains why infections are more common in summer and fall and why the infection is more prevalent in temperate areas.

#### Infection

*Leptospira* bacteria penetrate mucous membranes or abraded skin and multiply rapidly upon entering the blood system. From there they spread to other tissues including the kidneys, liver, spleen, nervous system, eyes, and genital tract. As the body fights the infection, the organism is cleared from most organs, but they may persist in the kidneys and be shed for weeks or months in the urine. The amount of damage done to the internal organs is variable depending on the serovar and the host it infects. After 7 or 8 days of infection, the animal will begin to recover, if the damage to the kidneys or liver is not too severe.

Infections in dogs with the serovars *canicola* and *grippityphosa* have been associated with kidney infections with minimal liver involvement. Whereas, the serovars *pomona* and *icterohaemorrhagiae* produce liver disease. Dogs younger than 6 months tend to develop more cases of liver disease regardless of the serovar.

#### Symptoms

In acute infections a fever of 103-104°, shivering, and muscle tenderness are the first signs. Then vomiting and rapid dehydration may develop. Severely infected dogs may develop hypothermia and become depressed and die before kidney or liver failure has a chance to develop.

In subacute infections, the animal usually develops a fever, anorexia, vomiting, dehydration, and increased thirst. The dog may be reluctant to move due to muscle or kidney pain. Animals with liver involvement may develop icterus. Dogs that develop kidney or liver involvement may begin to show improvement in organ function after 2 to 3 weeks or they may develop chronic renal failure. Despite the possibility of severe infection and death, the majority of leptospiral infections in dogs are chronic or subclinical. Dogs that become chronically infected may show no outward signs, but may intermittently shed bacteria in the urine for months or years.

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#### Diagnosis

A positive diagnosis can be made through a blood test. A blood sample of the suspected animal is drawn and sent into the laboratory where a microscopic agglutination test is performed. This can test for individual serovars (strains) and the level of antibody (titer) against these strains. Depending on the level of the titer, a positive diagnosis to the specific serovar can be made. Titers may be negative in the first 10 days after initial infection, so many times additional samples must be drawn and tested to get a positive diagnosis. Previous vaccination can give an elevated titer and this must be taken into consideration when interpreting the titers.

Acutely infected or chronically infected dogs will most likely be shedding *Leptospira* organisms in their urine. It is possible to culture a urine sample and get a positive diagnosis. However, because of intermittent shedding and bacterial contamination this is not always the best way to diagnose the disease.

#### Treatment

Treatment consists of antibiotics, fluid replacement, and controlling the vomiting and the problems associated with the corresponding kidney or liver infections. Penicillin, or one of its derivatives is the antibiotic of choice for treating the initial infection. After the initial infection is controlled, doxycycline is often used to cure and prevent a potential long-term carrier state. Intravenous or subcutaneous fluids are often given to correct dehydration while the corresponding liver or kidney problems are treated.

#### Vaccination and Prevention

Prevention involves keeping animals out of contact with potential sources of infection including contaminated water sources, wildlife reservoirs, or domestic animals that are infected or chronic carriers. Humans can contract leptospirosis and any potentially infected animal should be handled very carefully to avoid human exposure.

There are currently many different vaccines available on the market for a wide variety of species and serovars. The ones currently available for dogs are chemically inactivated (killed) whole culture vaccine, which unfortunately, make them much more likely to cause vaccine reactions as opposed to most viral vaccines. Leptospiral vaccines are blamed for many of the vaccine reactions we see in dogs. Until the beginning of the year 2000, leptospiral vaccines only protected against *L. canicola* and *L. icterohaemorrhagiae*. A new vaccine by Fort Dodge now also protects against the serovars *L. grippityphosa* and *L. pomona*. Due to the low infection rate in cats, there are currently no vaccines available for them.

Leptospiral vaccines for dogs offer about 6 to 8 months of protection. Dogs that are at high risk of contracting Leptospiral infections should be vaccinated twice a year. Vaccine manufacturers generally recommend that puppies less than 8 weeks of age should not be vaccinated with vaccines containing *Leptospira*. Many veterinarians recommend waiting until 12-16 weeks of age for the first vaccination against *Leptospira*. If Leptospiral vaccines are used, the animal should receive two to three doses of the vaccine spaced several weeks apart. Be sure to follow the recommendations of the vaccine manufacturer and your veterinarian. Because of the lack of cross protection between strains, the high incidence of reactions, and the need for frequent vaccination many veterinarians have begun to recommend leptospiral vaccinations only for those dogs at higher risk. Because this can potentially be a very serious disease, I recommend that all pet owners consult with their local veterinarian to determine if leptospiral vaccination is necessary for their pet.