



# Technical Bulletin

## Leptospirosis Update

### Leptospirosis in the Northwest: An Update

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In April 2006, the King County/Seattle Public Health Department posted a community advisory regarding an increase in canine leptospirosis in Washington in the previous two years. Western Washington experienced the most cases, with Vashon/Maury Islands showing an epizootic pattern of 32 cases in the first four months of 2006. This has many veterinarians asking, "Is leptospirosis a reemerging zoonotic disease?" "How is it diagnosed?" "Is there a 'new leptospira' and can the 'new leptospirosis' be prevented?"

The facts are that leptospirosis has been diagnosed more frequently throughout the entire country over the last ten years. In Washington, there had been no cases of human leptospirosis from 1985-1995, but from 1995-2005 there have been 13 cases. At this time, there has been no direct correlation with human and canine cases, but the Washington Department of Health is continuing to monitor this situation and asks that veterinarians with confirmed cases of leptospirosis inform the Zoonotic Disease Program (see Figure 3).

**Background:** Leptospirosis is caused by *Leptospira interrogans*, a motile, filamentous, spiral bacteria with zoonotic potential. Over 200 variants or serovars have been identified which usually have a preferred host, but can infect multiple species. *Leptospira spp* have a worldwide distribution, but are primarily problematic in tropical countries with heavy rainfall.

**Mode of Transmission:** After a week of organisms in the bloodstream (leptospiemia), an infected animal sheds the leptospire into the urine. If untreated, an infected animal may be contagious intermittently for months to years. This is especially true of wild animals (rats, mice, raccoons, skunks) that may be perfectly adapted to leptospire and develop no lesions or clinical illness. Transmission to a new host may occur by direct contact: bite wounds, mucous membrane contact with urine, ingestion of contaminated meat, venereal or placental routes. Indirect transmission by exposure to contaminated soil, water or bedding may also occur.

**Washington:** In Washington, water-covered ground, ponds and streams are ideal for survival of the organism in the environment for periods of up to six weeks. The major wildlife carriers in our region are likely to be raccoons, skunks, mice, rats and squirrels for multiple serovars. In evaluating samples submitted to Phoenix Central Laboratory (Figure 1) in the last three years, it is evident that the total number of canine leptospirosis cases diagnosed has risen each year and that veterinarian awareness for this potential pathogen is also increasing. There has been a substantial increase in total number of animals tested in this time period. Overall, the percentage of dogs positive for disease did not increase in 2006 compared to the previous two years. Interestingly, leptospirosis is traditionally considered a disease of the late summer/early fall. This certainly was not the pattern in Washington in 2006 (Figure 1). The incidence rate by month, correlated with rainfall, would need to be evaluated for several years to make a clear statement regarding seasonality of leptospirosis in Washington.

Figure 1 **Canine Leptospirosis in Washington 2004-2006**

	2004	2005	2006
# of dogs evaluated	101	284	445
# of dogs with MAT consistent with active infection	24	34	66
% dogs tested positive for leptospirosis	24%	12%	15%

A clear serology pattern has not yet emerged for the region, but that antibodies to three serovars (*autumnalis*, *bratislava*, *pomona*) are identified at a much higher rate than the others tested (*grippityphosa*, *canicola*,

*icterohaemorrhgiae*, *hardjo*) in the isolated area of Vashon Island and the state in general is clear (Figure 2). Traditional vaccines have been against *icterohaemorrhgiae* and *canicola*. Do the current serovars of clinical cases show us vaccine protection against specific serovars or simply a regional pattern of serovar frequency? Evaluating past serovar records does not yield easy answers because testing for *autumnalis* and *bratislava* is a fairly recent event, and *autumnalis* and *pomona* have a very high cross-reaction rate.

Figure 2 **2006 Vashon Island Canine Leptospirosis**

Highest MAT serovar	<i>autumnalis</i>	<i>bratislava</i>	<i>pomona</i>	mixed	Total cases
	8	1	1	11	21

  

Mixed MAT defined	<i>autumnalis</i> , <i>bratislava</i> & <i>pomona</i> (a,b,p)	a & p	a & b	a & <i>canicola</i>	a, p & <i>grippityphosa</i>
11	4	2	3	1	1

**Clinical Signs:**

**In humans**, leptospirosis is incubated for one to two weeks and then causes sudden signs of fever, headache, conjunctivitis, vomiting and diarrhea. When the fever phase resolves, kidney and/or liver failure may then become apparent.

**In cattle, sheep, goats and swine**, leptospirosis infection can be variable from inapparent to acute fever, anorexia, conjunctivitis and diarrhea. Abortions are common and usually occur one to three weeks after the onset of the disease.

**In horses**, most infections are inapparent, although periodic opthalmia may occur in the latent period and last for several months.

**In dogs**, clinical signs may vary with serovar. The most typical clinical presentation is fever (103°-104° F), vomiting, muscle or abdominal pain, lymphadenopathy, conjunctivitis and acute renal failure seven days after exposure. Additional signs may include: liver disease, rhinitis, coughing, thrombocytopenia, and leukopenia followed by leukocytosis and vasculitis. Serovars *icterohaemorrhgiae*, *canicola* and *grippityphosa* had traditionally been the most common isolates of clinical disease in dogs. But recently, serovars *pomona*, *bratislava* and *autumnalis* have become prominent. The pathogenicity of *autumnalis* is uncertain, however, because it has a strong cross-reactivity with other serovars (especially *pomona*) and has only rarely been isolated from clinical cases, making direct interpretation of serology difficult.

**In cats**, clinical disease is thought to rarely occur, although positive antibody titers are not uncommon.

**Diagnosis:**

Most commonly, a diagnosis of leptospirosis is made on the basis of serum antibody titers by the microscopic agglutination technique (MAT). **A single titer >1:800 is diagnostic of the disease.** The titer may be absent or low in the first week of infection, but will reach maximum levels in the third or fourth week. Therefore, if the first titer is low in a suspect case, **a second titer should be evaluated three to four weeks later** (WADDL runs the convalescent titer at no additional charge to the acute sample, but there is a charge for shipping). A four-fold rise in titer is diagnostic for disease (Figure 3). Vaccination status does not usually interfere with disease diagnosis because vaccination antibodies rarely yield MAT titers greater than 1:400. It has been postulated that this is due to the MAT primarily identifying the IgM antibody. The vaccination creates only a temporary (three month) IgM response, but a long-term IgG response.

**Histopathology** can also be utilized as a diagnostic tool for leptospirosis. Kidney biopsies may have variable findings depending on the stage of the disease when sampled. Most commonly, leptospirosis is characterized by a diffuse interstitial renal inflammation without glomerular involvement, which is most severe at the corticomedullary junction. The infiltrate is primarily plasma cells with some neutrophils and necrotic epithelial cells within the tubules. Special stains can identify the leptospire organisms within the tissue in an untreated patient, but these organisms

disappear 12-24 hours after antibiotic therapy is initiated. Acutely, hepatic necrosis may occur, but in chronically infected dogs a chronic active hepatitis with fibrosis may develop.

Other tests, such as ELISA, PCR, hemagglutination assays, culture and darkfield microscopy are available for leptospirosis testing, but they are not routinely utilized in dogs at this time.

Figure 3 **Interpreting Titers**

A single microscopic agglutination technique (MAT) titer >1:800 is diagnostic of leptospirosis if the dog has not been recently vaccinated (within 3 months)
A four-fold rise in titer over a 2-4 week period is diagnostic of leptospirosis
The highest serovar is considered to be the infective one, but this is not absolute
Leptospira vaccines can cause multiple positive titers, but usually 1:400 or less by MAT
Confirmed cases of leptospirosis should be reported to the county and state board of health by the diagnosing veterinarian
Visit <a href="http://www.doh.wa.gov/notify/nc/leptospirosis.htm">www.doh.wa.gov/notify/nc/leptospirosis.htm</a> to download forms, then fax completed forms to <b>360-236-2261</b> .

**Therapy:**

Aggressive intravenous fluid therapy is usually indicated for the supportive care of dehydration, shock and renal or liver failure which may occur in the acute canine leptospirosis patient. If oliguria (<2ml urine/kg/hour) is evident after the rehydration is complete, intravenous mannitol over 30 minutes may be indicated. **Antibiotics** need to be administered **immediately in leptospirosis suspects** to inhibit organism multiplication and rapid progression to organ failure. The fever and organisms in the urine usually resolves within hours of initiating antibiotic therapy. Penicillin G (25,000-40,000 units/kg IM, SC or IV twice daily) and its derivatives (ampicillin, amoxicillin) are the drugs of choice to eliminate leptospiremia, but they do not eliminate the carrier state. Therefore, **after two weeks of amoxicillin therapy (22mg/kg po bid-tid), it is recommended that the carrier state be treated with two weeks of doxycycline (5mg/kg po bid), erythromycin or azithromycin.** Quinolones and cephalosporins **have not** been successful in eliminating the carrier state in dogs.

**Prevention:**

Ideally, dogs, people and livestock would have minimal exposure to leptospire and thus infection would not occur. Measures to maximize sanitation and minimize contamination of drinking water are certainly recommended. However, the ubiquitous nature of this bacteria and the asymptomatic carrier state that occurs in many mammal species makes elimination of this pathogen in the environment impossible. Therefore, vaccination of pet dogs against four serovars of leptospira (*icterohemorrhagiae, canicola, pomona, grippityphosa*) is recommended. Young, large-breed dogs appear to be at highest risk, probably due to outdoor activities increasing risk of exposure. There is the potential that vaccinated dogs may still be at risk for *bratislava, autumnalis* and other serovars, but there is evidence that some cross-protection occurs (i.e. between *pomona* and *autumnalis*).

Certainly, acute allergic reaction to vaccination does occur. The adverse reaction rate to leptospire vaccines is reported to be less than one percent, and such reactions may occur more frequently in small breeds and puppies. Some clinicians pre-treat animals with antihistamines and/or corticosteroids, but this is not currently a standard recommendation for animals with no previous history of allergic reaction. After completion of an initial vaccine series of two vaccines in an immunocompetent dog, IgG protective antibodies against leptospirosis have been proven to last at least one year. Such IgG immunity is best evaluated by ELISA, but this test is not widely available.

## Public Health Issues:

Certainly, leptospirosis has zoonotic potential and whenever a suspect patient occurs, the owners need to be counseled regarding this concern for themselves and other pets. Additionally, all hospital staff should be trained in proper handling and sanitation techniques for suspected cases. *Leptospira* are easily killed by iodophor-based disinfectants, 10 percent bleach solutions and strong, drying sunlight. *Leptospira* will temporarily cease to be shed in the urine if the patient is treated with an appropriate antibiotic for 24 hours or more, and will be cured of the infection with appropriate therapy over four weeks. All tissue, blood and urine samples need to be labeled as suspect so that laboratory workers are aware of the zoonotic potential of the specimen.

Once a diagnosis is confirmed (Figure 3), the primary care veterinarian should report the case to the Washington Department of Health by completing the proper form (available at [www.doh.wa.gov/notify/nc/leptospirosis.htm](http://www.doh.wa.gov/notify/nc/leptospirosis.htm)) and faxing it to **360-236-2261**. This information is used to monitor the epidemiology of the disease in this state, in an effort to decrease the future risk to people, pets and livestock.

## Conclusions:

Leptospirosis of canines is being recognized with increasing frequency in Washington and throughout the country. Whether this is a true increase in disease incidence or an improvement in recognition and testing methods is uncertain. Large-breed dogs in rural settings are at highest risk, but urban/suburban cases are significant and are likely related to the success of raccoons and rats in these areas. Vaccinating dogs against four serovars of leptospirosis is believed to offer the greatest protection at this time.

Due to the zoonotic potential of leptospirosis and its potentially fatal consequences to pets, veterinarians should keep a high index of suspicion for this disease, testing early and treating aggressively. Confirmed cases of leptospirosis should be reported to county and state health officials in an effort to understand and prevent this threat to animal and human health.

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