

CANINE LEPTOSPIROSIS

- PREVALENCE
- DIAGNOSIS
- TRANSMISSION
- PREVENTION

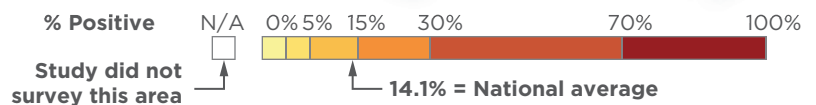
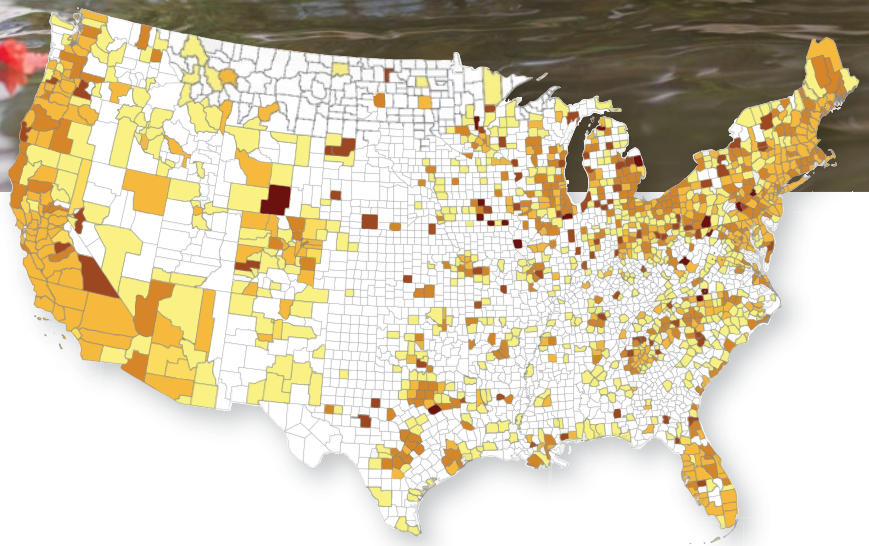
Leptospirosis is a potentially fatal zoonotic disease, with a wide geographic distribution, occurring in many mammalian species including humans.^{1,2} It is a **RE-EMERGING THREAT** in the US, with an increasing incidence over the past 20 years.^{3,4}

THE PREVALENCE MIGHT SURPRISE YOU!

In a US prevalence study of 87,355 microscopic agglutination tests (MAT) performed from 2000-2014:

14.1% of dogs

tested POSITIVE for leptospirosis.⁵



NOT JUST A “HUNTING DOG’S DISEASE” ANYMORE.

Historically, large, young adult male dogs of sporting or working breeds were at increased risk of leptospirosis, presumably due to increased exposure risk from reservoir hosts or contaminated rural environments.⁶ However, with urban centers expanding into wildlife environments, **urban/suburban dogs of any breed may be at greater exposure risk than rural dogs due to higher density of urban wildlife.^{7,8}**

SIGNALMENT CHANGES IN THE PAST 40 YEARS⁹

- ✓ Increased prevalence of leptospirosis in **small breed dogs** (under 15 lbs), especially in terrier groups
- ✓ Increased incidence young adult dogs (2-3.9 years old), compared to puppies (<1 year old)

THE DIFFICULT DIAGNOSIS

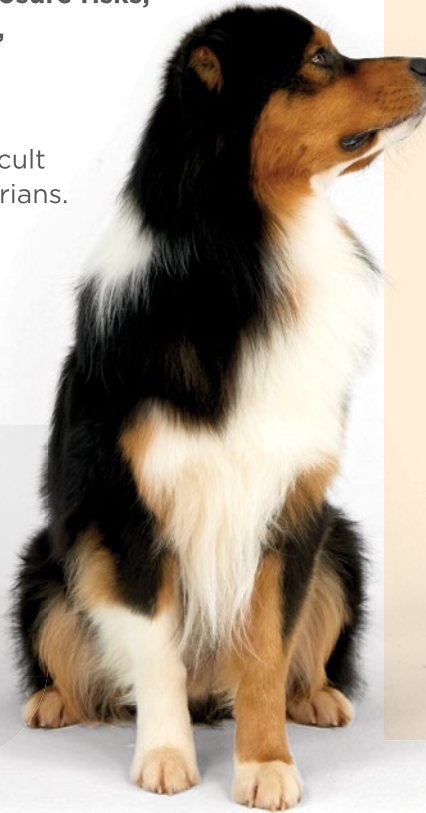
Despite the increasing prevalence and exposure risks, leptospirosis tends to be underrecognized, underdiagnosed, and undertreated.¹⁰

Although leptospirosis impacts a number of different organ systems,⁴ it may still be difficult to identify by pet owners and even veterinarians.

This is because identification requires a high clinical suspicion for the disease based on knowledge of the range of clinical presentations.¹⁰

“ All dogs with acute renal failure, including ‘acute-on-chronic’ renal failure, should be managed as leptospirosis suspects until an alternate diagnosis has been made.¹¹ ”

2010 ACVIM Small Animal Consensus Statement on Leptospirosis



In two studies that tested **HEALTHY DOGS** for the presence of *Leptospira* serovars using MAT,

9.1%¹² to **25.9%¹³**
TX, 2019 MI, 2007

had antibody titers against at least one *Leptospira* serovar.

Further, most infections are subclinical,¹⁰ while clinical manifestations are often varied and nonspecific. They depend on a variety of factors such as virulence, serovar, and strain of the *Leptospira*, as well as the individual immune response of the infected dog.⁴

CURRENTLY AVAILABLE DIAGNOSTIC TESTS¹⁰

In-clinic Serologic Assays

PURPOSE

- A qualitative test; detects the presence or absence of antibodies IgM or IgG and IgM (depending on the test)
- Does not provide antibody titers

INTERPRETING RESULTS

- Negative result: may be too early in course of disease; repeat test 1 week later to see if animal seroconverts
- Four-fold (or greater) rise in antibody titers between acute and convalescent sera: suggests leptospirosis
- It may be beneficial to retain samples to compare with a convalescent sample using MAT

Serology using Microscopic Agglutination Test (MAT)

PURPOSE

- A quantitative test; provide titers of the different *Leptospira* serovars

INTERPRETING RESULTS

- Positive titers within 1 week of illness: may reflect post-vaccinal titers or prior subclinical infection
- Low positive/negative titers after 1 week or more: leptospirosis unlikely
- Four-fold (or greater) increase in titers for over 1-2 weeks: suggests leptospirosis
- This test should not be used to identify the infecting serovar because a single serovar can yield high titers to different serovars over time due to cross-reactivity

Polymerase Chain Reaction (PCR)

PURPOSE

- A qualitative test; detects the presence of leptospiral DNA (from either dead or alive bacteria)¹⁴
- Does NOT identify the infecting serovar
- Best performed on blood and urine samples concurrently
- Urine samples can be more successful for early diagnosis than serum¹⁴ because urinary shedding begins 10 days after onset of infection

INTERPRETING RESULTS

- Sensitivity of PCR not well established
- May vary depending on the course of illness: higher specificity in early course of illness and in dogs that have not received treatment with antimicrobials

HOW IT IS TRANSMITTED

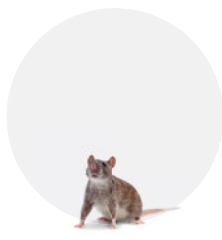
RESERVOIR HOSTS

Leptospirosis is caused by infection with leptospiral spirochetes of the species *Leptospira interrogans* sensu lato.⁶ There are two types of mammalian hosts when it comes to *Leptospira* infections. Each serovar is adapted to one or more mammals as a primary host, also called the definitive or reservoir host. These hosts can harbor a persistent infection without severe signs of disease.⁴

Many of these reservoir hosts can be found in urban environments and in high densities, such as rodents, raccoons, skunks, and opossums.¹⁵ Once infection takes place, the bacteria are maintained in the renal tubules of the host.⁴ They are then **shed in the hosts's urine for months to years after infection,**⁴ contaminating the surrounding freshwater, mud, and soil.^{4,16}



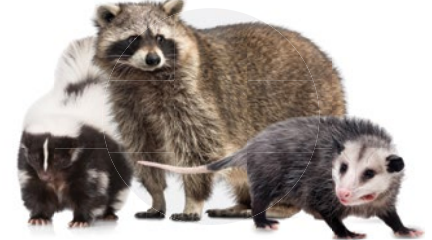
L. canicola



L. icterohaemorrhagiae



L. pomona



L. grippityphosa

INCIDENTAL HOSTS

When a specific serovar is not adapted to live chronically in a species of mammal, the mammal is considered an **incidental host.**⁴ **These hosts tend to develop clinical disease** – they either clear the pathogen or they die. Rarely do they develop a chronic carrier state.⁴

The dog serves as the reservoir host only for the pathogenic *L. interrogans* serovar *canicola.*⁴ However, dogs serve as incidental hosts for many other common and pathogenic serovars including *L. canicola*, *L. icterohaemorrhagiae*, *L. grippityphosa*, and *L. pomona.*¹⁰

Humans are incidental hosts to all of the above mentioned serovars.¹⁷

DID YOU KNOW?¹⁶

There was a large human outbreak of leptospirosis among triathletes in Illinois in 1998.



ZOOZOSIS

For humans, leptospirosis is a significant global disease and cause of death, especially in Asia and South America.⁴

In North America, leptospirosis in humans is primarily transmitted indirectly through exposure to contaminated water.¹⁰

Disinfection and exposure prevention protocols are recommended for veterinary practitioners when handling patients who are suspected to have leptospirosis.¹⁰

They became infected after swimming in a lake shortly after strong rains and flooding. It was likely that shallow puddles on the shore contaminated with infective racoon urine were washed into the lake.

TRANSMISSION

In the environment, *Leptospira* can survive from weeks to months, favoring ambient temperatures between 32°F and 77°F (0°C and 25°C) for survival.⁴ Along with temperature, rainfall and pH also has an impact. There is an increased incidence in the late summer and early fall in the southern, semitropical belt of the US, and in similar climatic regions worldwide.⁴

Infection occurs when the leptospire penetrate abraded skin or mucous membranes.¹⁰ **The most common mode of transmission is indirect, where the mammal comes in contact with contaminated water.**⁴

Transmission can also occur directly between hosts in close contact, through urine, venereal routes, placental transfer, bites, or ingestion or infected tissues.⁴

WHY IT IS IMPORTANT TO VACCINATE

While it would be ideal to limit the contact of pet dogs with animal reservoirs and sources of contaminated water, this is, of course, easier said than done.⁴ Especially now, given how close our pets come in contact with wild animals, such as rodents, even in urban environments.⁴

Thus vaccination is crucial to prevent the disease in at-risk dogs.⁴

In fact, vaccination with a *Leptospira* 4-serovar vaccine (*L. canicola*, *L. icterohaemorrhagiae*, *L. pomona*, and *L. grippityphosa*) is strongly recommended over a 2-serovar vaccine for all dogs living in areas where leptospirosis occurs, that is, throughout the US.^{11,18}

They are generally safe and effective, with studies suggesting they provide a 1-year duration of immunity.^{19,20}

Vaccination against leptospirosis is recommended even for small breed dogs confined to urban backyards due to the possibility of infection due to rodent exposure.⁴

AAHA GUIDELINES FOR ADMINISTRATION OF LEPTOSPIRA 4-SEROVAR VACCINE¹⁷

✓ Initial vaccination for dogs < 16 weeks of age:

Two initial doses, 2 to 4 weeks apart are required; the initial dose may be administered as early as 8 to 9 weeks of age (according to product label)

✓ Initial vaccination for dogs >16 weeks of age:

Two initial doses, 2 to 4 weeks apart are required regardless of the dog's age

✓ Revaccination (booster):

Where risk of exposure is sustained, administer a single dose 1 year following completion of the initial 2 doses, then annually thereafter



1. Farr RW. Leptospirosis. *Clin Infect Dis*. 1995;21:1-6. 2. Pappas G, Papadimitriou P, Siozopoulou V, Christou L, Akritidis N. The globalization of leptospirosis: worldwide incidence trends. *Int J Infect Dis*. 2008;12:351-357. 3. Ward MP, Glickman LT, Guptill LE. Prevalence of and risk factors for leptospirosis among dogs in the United States and Canada: 677 cases (1970-1998). *J Am Vet Med Assoc*. 2002;220:53-58. 4. Goldstein RE. Canine Leptospirosis. *Vet Clin Small Animal*. 2010;40:1091-1101. 5. White AM, Zambrana-Torrelia C, Allen T, Rostal MK, Wright AK, et al. Hotspots of canine leptospirosis in the United States of America. *Vet J*. 2017;222:29-35. 6. Greene CE, Sykes JE, Moore GE, et al. Leptospirosis. In: Greene CE, ed. *Infectious Diseases of the Dog and Cat*. St. Louis, MO: Elsevier; 2012:402-416. 7. Ward MP, Guptill LF, Wu CC. Evaluation of environmental risk factors for leptospirosis in dogs: 36 cases (1997-2002). *J Am Vet Med Assoc*. 2004;225, 72-77. 8. Alton GD, Berke O, Reid-Smith R, Ojick D, Prescott JF. Increase in seroprevalence of canine leptospirosis and its risk factors, Ontario 1998-2006. *Can J Vet Res*. 2009;73, 167-175. 9. Lee HS, Guptill L, Johnson AJ, Moore GE. Signalment changes in canine Leptospirosis between 1970 and 2009. *J Vet Intern Med*. 2014;28:294-299. 10. Sykes JE. Leptospirosis: A new era of diagnosis and prevention. Presented at an event hosted by the Central California Veterinary Medical Association; March 21 2018; Fresno CA, USA. 11. Sykes JE, Hartmann K, Lunn KF, Moore GE, Stoddard RA, Goldstein RE. 2010 ACVIM Small Animal Consensus Statement on Leptospirosis: Diagnosis, Epidemiology, Treatment, and Prevention. *J Vet Intern Med*. 2011;25:1-13. 12. 2019, Boehringer Ingelheim data on file. 13. Stokes JE, Kaneene JB, Schall WD, Kruger KM, Miller R, Kaiser L, et al. Prevalence of serum antibodies against six *Leptospira* serovars in healthy dogs. *J Am Vet Med Assoc*. 2007;230:1657-1664. 14. Bal AE, Gravekamp C, Hartskeerl RA, Meza-Brewster J, Korver H, Terpstra WJ. Detection of leptospires in urine by PCR for early diagnosis of leptospirosis. *J Clin Microbiol*. 1994;32(8):1894-1898. 15. Ghneim GS, Viers JH, Chomel BB et al. Use of a case-control study and geographic information systems to determine environmental and demographic risk factors for canine leptospirosis. *Vet Res*. 2007;38:37-50. 16. Morgan J, Bornstein SL, Karpati AM, et al. Outbreak of leptospirosis among triathlon participants and community residents in Springfield, Illinois, 1998. *Clin Infect Dis*. 2002;34(12):1593-9. 17. Greene CE, Sykes JE, Moore GE, et al. Leptospirosis. In: Greene CE, ed. *Infectious Diseases of the Dog and Cat*, 4th ed. St. Louis, MO: Elsevier; 2012:431-447. 18. AAHA Canine Vaccination Task Force. AAHA Canine Vaccination Guidelines. https://www.aaaha.org/guidelines/canine_vaccination_guidelines/practice_vaccination.aspx. Published September 7, 2017. Updated February 3, 2018. Accessed February 1, 2019. 19. Minke JM, Bey R, Tronel JP, et al. Onset and duration of protective immunity against clinical disease and renal carriage in dogs provided by a bi-valent inactivated leptospirosis vaccine. *Vet Microbiol*. 2009;137:137-145. 20. Klaassen HL, Molkenboer MJ, Vrijenhoek MP, et al. Duration of immunity in dogs vaccinated against leptospirosis with a bivalent inactivated vaccine. *Vet Microbiol*. 2003;95:121-132.