

Leptospirosis in dogs and cats

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Summary

Leptospirosis is a worldwide zoonotic disease affecting most mammalian species. Prevalence of *Leptospira* species (spp.) infection is associated with certain environmental conditions and shows an association with increased rainfall and temperatures. While dogs and humans are prone for the development of severe clinical disease, such as renal and hepatic failure, the reservoir hosts, most importantly rodents, that shed leptospires via urine do not develop clinical signs. So far, there has been a lack of knowledge about the importance of *Leptospira* spp. as feline pathogen as well as the role of asymptomatic but shedding dogs and cats and their zoonotic potential.

Research Objectives

Objectives of our research are to evaluate infection with and shedding of pathogenic *Leptospira* spp. in dogs and cats in Germany and different other geographic areas worldwide, to determine the importance of *Leptospira* spp. infection in cats as a pathogen, and to evaluate the zoonotic potential of asymptotically infected shedding dogs and cats. Further studies evaluate the value of new point-of-care (POC) tests to detect IgM antibodies in order to diagnose acute disease.

Leptospirosis is categorized as a neglected zoonotic disease, affecting both humans and animals. To date, there are more than 260 different *Leptospira* serovars worldwide. Almost all mammalian species and marsupials can become renal carriers, and human infections originate from animal carriers. Dogs are considered an important reservoir of *Leptospira* spp., and thus play a major role in human infections, and dog ownership was identified as a potential risk factor for humans. Worldwide, prevalence of urinary shedding of *Leptospira* spp. in dogs ranges

between 0.2 and 31.1%. We could demonstrate that shedding can also occur in healthy dogs. Thus, dogs recently gained interest as potential source of human infection. Not only dogs, but also cats can get infected and shed viable *Leptospira* spp. in their urine. Many cats have antibodies indicating that infection is common, although most cats do not show clinical signs. According to our studies, about twice as many cats shed *Leptospira* spp. in their urine when compared to dogs in the same area. Further research concentrates on the role of carrier cats as a source of contamination and the importance of *Leptospira* spp. infection as a cause of acute and chronic disease in cats.

Rapid confirmation of the diagnosis leptospirosis is important in order to apply appropriate treatment and to reduce zoonotic risk. However, diagnosis poses a major challenge, especially since the introduction of new 4-serovar vaccines. Microagglutination tests (MAT) detecting antibodies are currently still the recommended confirmatory test for diagnosing leptospirosis, despite its numerous limitations (e.g., negative results in early infection, positive results due to vaccine-associated antibodies, cross-reactivity). New POC tests detecting IgM antibodies have recently been developed for use in private practice that would allow to obtain easy and immediate diagnosis; however, comparison studies on the quality of these tests are still missing. Evaluation of the sensitivity and specificity of these tests for use in veterinary practice is also part of our present research.

Key Findings

Leptospira spp. infection is an important infection in dogs in Germany and worldwide. We could show that not only sick, but also healthy dogs, especially if unvaccinated, shed *Leptospira* spp. in their urine and thus, pose a potential risk for their owners and veterinarians. The role of cats has been neglected in the past. However, we confirmed that a considerable proportion of cats shed not only DNA of pathogenic *Leptospira* spp. but also viable leptospires as demonstrated by their growth in culture, and therefore, cats could act as source of infection for humans and livestock. Hereby, new separation and concentration techniques can help to increase sensitivity of PCR and isolation, especially in feline urine in which viability of the bacteria is negatively affected by the hostile environment, e.g. the relatively high osmolality of feline urine. New diagnostic POC test the detect IgM antibodies could help veterinarians to quickly diagnose acute infections.

Selected Publications

1. Dorsch R, Ojeda J, Salgado M, Monti G, Collado B, Tomckowiack C, Tejeda C, Müller A, Eberhard T, Klaasen HLBM, Hartmann K. Cats shedding pathogenic *Leptospira* spp. – an underestimated zoonotic risk? PLOSone 2020; 15: e0239991.
2. Altheimer K, Jongwattapanisan P, Luengyosluechakul S, Pusoonthornthum R, Prapasarakul N, Kurilung A, Broens EM, Wagenaar JA, Goris MGA, Ahmed AA, Pantchev N, Reese S, Hartmann K. *Leptospira* infection and shedding in dogs in Thailand. BMC Vet Res 2020; 16: 89.
3. Boonciew P, Kurilung A, Altheimer K, Hartmann K, Prapasarakul N. Draft Genome Sequence of *Leptospira interrogans* Serovar Bataviae Strain D64, Isolated from the Urine of an Asymptomatic Dog in Pathum Thani, Thailand. Microbiol Resour Announc 2020; 9: e00361-20.
4. Sprißler F, Jongwattapanisan P, Luengyosluechakul S, Pusoonthornthum R, Prapasarakul N, Kurilung A, Goris M, Ahmed A, Reese S, Bergmann M, Dorsch R, Klaasen HLBM, Hartmann K. *Leptospira* infection and shedding in cats in Thailand. Transbound Emerg Dis 2019; 66: 948-56.
5. Weis S, Hartmann K. *Leptospira* infections in cats. Tierarztl Prax 2017; 45: 103-8.
6. Weis S, Rettinger A, Bergmann M, Llewellyn JR, Pantchev N, Straubinger RK, Hartmann K. Detection of *Leptospira* DNA in urine and presence of specific antibodies in outdoor cats in Germany. J Feline Med Surg 2017; 19: 470-6.
7. Llewellyn JR, Krupka-Dyachenko I, Rettinger AL, Dyachenko V, Stamm I, Kopp PA, Straubinger RK, Hartmann K. Urinary shedding of leptospires and presence of *Leptospira* antibodies in healthy dogs from Upper Bavaria. Berl Munch Tierarztl Wochenschr 2016; 129: 251-7.
8. Preiß-Jägeler C, Müller E, Straubinger RK, Hartmann K. Prevalence of antibodies against *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Leptospira interrogans* serovars in Bernese Mountain Dogs. Tierarztl Prax 2016; 44: 77-85.
9. Schuller S, Francey T, Hartmann K, Hugonnard M, Kohn B, Nally JE, Sykes J. European consensus statement on leptospirosis in dogs and cats. J Small Anim Pract 2015; 56: 159-79.

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Funder	Project title	Start date	End date
Pharmaceutical company	Comparison of different <i>Leptospira</i> spp. antibody tests in healthy dogs after vaccination	2020	2022
Pharmaceutical company	Comparison of different <i>Leptospira</i> spp. antibody tests in sick dogs	2017	2019
Pharmaceutical company	The role of <i>Leptospira</i> spp. in cats as a pathogen causing disease and role of cats in transmission of the zoonotic agent	2016	2017