

Canine leptospirosis: A One Health approach for improved surveillance, prevention, and interdisciplinary collaboration

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Canine leptospirosis and One Health

Leptospirosis is a global zoonotic disease that causes morbidity and mortality in dogs, humans, and other mammals (1). This disease is caused by pathogenic bacteria of the genus *Leptospira*, which are excreted in the urine of infected animals. Direct transmission occurs through contact with infected animal urine, whereas indirect transmission occurs through contact with urine-contaminated water, soil, or food (Figure 1) (1). Over 300 serovars exist, ranging in pathogenicity and host species (2).

Dogs are traditionally regarded as the maintenance host for *Leptospira interrogans* serovar Canicola, but are susceptible to infection from, or can be a carrier for, other serovars (3). Disease may present with a wide range of clinical signs and can be fatal (2). Accurate diagnosis of canine leptospirosis can be difficult, as dogs often present with non-specific clinical signs such as fever, lethargy, vomiting, and diarrhea (2,4). In addition, diagnostic testing has many limitations, including limited availability of resources and expertise in developing regions, varying sensitivities of testing methods, cross-reactivity in serological testing to vaccine-induced antibodies, and timeliness of diagnosis (2,4,5). In humans, leptospirosis is considered a neglected zoonotic disease due to these and other challenges (5).

Many factors are suspected in emergence and reemergence of leptospirosis in humans, including climate change, urbanization, land-use changes, and increased interactions among humans, wildlife, and domestic animals (6,7). However, changes in the epidemiology of canine leptospirosis due to anthropogenic and climatic influences are poorly understood (8). Due to multifaceted interactions among humans, animals, and the environment, effective surveillance and control of canine leptospirosis

demands a One Health approach to reduce risk and improve health outcomes for dogs.

Global seroprevalence of canine leptospirosis was recently estimated at 18.5% (9). However, the true prevalence is likely higher as estimates are primarily based on studies using owned dogs, excluding the burden in unowned dogs where animal access and data are limited. Of the few studies that have examined unowned populations, stray and shelter dog populations have an estimated 27.6% average prevalence of leptospirosis globally (10). Stray dogs also have a higher *Leptospira* prevalence when compared to owned dog populations (11), possibly due to a lack of veterinary care, increased environmental exposures, etc. (10).

Studying canine leptospirosis using a One Health approach presents a unique opportunity to improve understanding of leptospirosis in animals and humans, surpassing its singular impact on canine health (12). Dogs have a distinct role in the transmission cycle of *Leptospira*, acting as both a host and a vector, due to their frequent interactions with humans, other animals, and the natural environment (13). Earlier work using a One Health approach to study canine leptospirosis demonstrated the potential for dogs to act as sentinels for leptospirosis and to detect early risk of disease in humans (14). Additional opportunities exist to assess risk factors and prevention strategies for canine leptospirosis within a One Health research context, such as completing environmental risk assessments, improving vaccine effectiveness, and evaluating social and behavioural determinants of canine leptospirosis. Increased communication among veterinary practitioners, diagnostic laboratories, veterinary epidemiologists, and other stakeholders invested in canine health is essential to identify areas where collaborative action can reduce the risk of leptospirosis in dogs. In this article, we highlight some opportunities for applying a One Health approach to inform effective surveillance, prevention, and control of canine leptospirosis.

Opportunities for a One Health approach Environmental modelling and surveillance

The environment is critical to transmission and survival of *Leptospira*. Climatic factors are known to influence *Leptospira* transmission, with higher temperature and precipitation promoting bacterial survival in soil and water environments (1,6), contributing to greater burden in tropical and subtropical regions (15). Canine leptospirosis has a higher occurrence in low-income countries within Latin America and South Asia (9), and 73% of human cases occur in tropical regions (15).

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risk of exposure. Vaccine protection also depends on local serovar distribution, as commercial canine vaccines may not protect against all circulating pathogenic serovars in an area (29). This remains a large concern, as climate change may influence serovar distribution worldwide (30). Monitoring *Leptospira* serovar distribution can inform more effective vaccine development (31), provide more complete protection, and reduce risks of transmission to other animals, the environment, and humans.

Maintaining protective leptospirosis vaccination status can also be difficult due to owner socioeconomic factors (e.g., household income and education level), concern over adverse effects, and the inconvenience of annual boosters (32). In 2024, the World Small Animal Veterinary Association updated their vaccination guidelines to include leptospirosis as a core vaccine for dogs in areas where canine leptospirosis is endemic (33), and regional vaccine protocols often vary depending on local environmental risks and individual lifestyle. However, the likelihood a dog would never become exposed to wildlife, natural water sources, or other high-risk areas is quite low, and cases of canine leptospirosis have been documented even when no apparent exposure was observed (4). In their consensus statement on canine leptospirosis, the American College of Veterinary Internal Medicine declared that “all dogs are at risk of leptospirosis, regardless of signalment, geographic location, lifestyle, and the time of year” (2). However, adding leptospirosis vaccination to core vaccines will not necessarily increase vaccination levels. Even countries that do consider leptospirosis a core vaccine for dogs have suboptimal vaccination rates (~50%) (34). Many other factors may influence an owner’s decision to vaccinate their dog against leptospirosis, such as whether the vaccine is offered routinely or promoted by veterinarians, veterinary practice commitment to client education, owner risk perception, owner financial position, and the perceived value of the vaccine. Qualitative investigations of the social and behavioral elements influencing canine leptospirosis vaccination are required to better inform veterinary-client communication to improve vaccine uptake.

Improving disease reporting and data accessibility

Interdisciplinary and multisectoral collaboration are essential components of One Health (35). To improve understanding of the animal, human, and environmental risk factors for canine leptospirosis, advancements in disease reporting and data accessibility are necessary. The current lack of reliable and accessible epidemiological data is a major limitation to conducting adequate surveillance and modelling of canine leptospirosis. Veterinary diagnostic laboratories maintain considerable diagnostic data, which can be shared to conduct collaborative research. However, these data are usually not linked to corresponding case medical and activity history, which are essential to establish risk factors. This information is typically held by veterinary clinics or other practice-management software companies, with access subject to privacy and confidentiality regulations. Developing a system that integrates these data sources, along with improving communication and collaboration among

veterinary, academic, and private animal-health stakeholders, would lead to more coordinated surveillance and improve understanding of individual, environmental, and socioeconomic risk factors for canine leptospirosis.

Conclusion

We have highlighted several potential benefits of applying a One Health approach to canine leptospirosis research. Knowledge gaps in canine leptospirosis transmission and epidemiology need to be comprehensively addressed by combining expertise from multiple disciplines in animal, environmental, and human sectors. Collaborative efforts from stakeholders such as veterinarians, animal shelters, and academia must also be made to increase knowledge and awareness of canine leptospirosis and communicate the importance of surveillance and prevention. Due to numerous interactions among dogs, humans, and the environment, the One Health opportunities we have outlined may also benefit our understanding of human leptospirosis. Employing a One Health approach provides a holistic understanding of canine leptospirosis that is essential for effective disease surveillance and risk-factor analysis, and for creating sustainable prevention and control strategies to reduce disease burden.

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