Dealing with leptospirosis in dogs

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Introduction
Leptospirosis is an important bacterial infection which can cause disease in dogs and is zoonotic. Bivalent vaccination (serogroups Canicola and Icterohaemorrhagiae) had been effective at controlling disease, but leptospirosis appears to be re-emerging worldwide, with additional serovars implicated.

Leptospirosis is a differential diagnosis in dogs with acute hepatic and kidney disease, but should also be considered in any acute presentation. Chronic infection and carrier status exist and treatment is aimed at reducing chronic shedding which contributes to environmental contamination.

Maintenance and reservoir hosts shed bacteria in their urine without showing clinical signs of disease. The bacteria can persist in renal tubules, thus contributing to environmental contamination and can then remain viable in moist soil or stagnant water for months. Incidental hosts can be infected via direct contact with mucous membranes or damaged skin, or via indirect contact with urine-contaminated soil or surface water.

Clinical signs
Leptospires commonly affect the kidney and liver but can affect most organs, which results in a wide variety of disease presentations. Leptospiral pulmonary haemorrhage syndrome (LPHS) is an emerging severe form of the infection reported in people and in dogs.1

Clinical signs vary from subclinical to severe and acute to chronic. They can be multisystemic and include:

- Pyrexia,
- Vomiting, diarrhoea, altered appetite, abdominal pain,
- Shivering,
- Muscle pain/weakness,
- Dehydration, oliguria, anuria (sometimes polyuria/polydipsia),
- Shock, tachycardia, arrhythmias,
- Lethargy,
- Bleeding disorders,
- Coughing, dyspnoea/tachypnoea,
- Icterus, hepatic encephalopathy,
- Conjunctivitis, scleral injection, uveitis.

The most commonly presented signs I see are haemorrhagic diarrhoea and vomiting.

Diagnostic tests
Non-specific changes in the minimum database are common and identify organ involvement.

Haematology
Reported haematological abnormalities include:

- Leukocytosis or leukopenia in the acute phase,
- Mild to severe thrombocytopenia, which may be caused by consumption, phagocytosis, immune-mediated destruction or sequestration of the platelets in the spleen,
- Mild to moderate anaemia due to haemolysis, or more commonly secondary to blood loss via the gastrointestinal tract or via respiratory tracts. It may also occur secondary to chronic inflammation.

Biochemistry
Typical biochemical abnormalities in infected dogs include:

- Increased urea and creatinine,
- Increased alanine aminotransferase, alkaline phosphatase, bilirubin,
- Hypokalaemia or hyperkalaemia,
- Hyperphosphataemia,
- Hypoalbuminaemia.

Urinalysis
Urinalysis of infected dogs can show:

- Isothecinuria,
- Glucosuria,
- Haematuria,
- Pyuria,
- Granular casts,
- Proteinuria.

Coagulation tests
Coagulation tests of infected dogs can be abnormal, possibly secondary to disseminated intravascular coagulation.

Imaging findings
Thoracic radiology/computed tomography can show: caudodorsal interstitial infiltrate progressing to reticulonodular and then alveolar infiltrates consistent with LPHS.

Abdominal ultrasonography can show: non-specific changes such as hyperchoic renal cortices, renomegaly, hepatomegaly and lymphadenopathy.

Confirming the diagnosis
Serological tests, in particular the microscopic agglutination test (MAT), are commonly used against a variety of serovars (current recommendations are that serovar panels in Europe should include australis, autumnalis, canicola, grippotyphosa, icterohaemorrhagiae, pomona, pyrogenes and sejroe). Positive titres can reflect vaccination, acute or chronic infection and carrier status; a titre of greater than 1:800 for one or more serogroups, or a four-fold (two-titre steps) increase in MAT on paired samples is diagnostic. Patient-side tests to detect anti-leptospiral IgM and/or IgG are available, as is an immunofluorescence antibody test for pathogenic leptospires.

PCR tests for pathogenic Leptospira species can be used in a variety of samples (blood, urine and tissue biopsies). The European consensus panel recommends that PCR should be performed on blood and urine before administration of antibiotics.2 Urine PCR is the test of choice for detection of renal carriers. Ideally, MAT is also...
performed, as commercial PCR tests for leptospirosis do not currently provide information on the infecting serovar nor the infectious load. Vaccination does not affect the results.

Fluorescent in-situ hybridisation (FISH) can also be performed on tissue to demonstrate leptospires.

**Treatment and management**

Supportive therapy includes intravenous fluids and clinical sign-based treatment.

The recommended treatment schedule is as follows:

- **Doxycycline** at 5 mg/kg given every 12 hours or 10 mg/kg given every 24 hours for 14 days for all patients and in-contact dogs to eliminate renal carriage.
- **Intravenous penicillin derivative** can be used initially in patients with gastrointestinal signs; for example, ampicillin at 20 to 30 mg/kg given every six to eight hours, or amoxicillin at 20 to 30 mg/kg given every six to eight hours, or penicillin at 25,000 to 40,000 u/kg given every six to eight hours.

**Prevention**

Vaccination can reduce the prevalence of clinical disease and shedding. The current European vaccines contain either two serogroups (*Canicola, Icterohaemorrhagiae*), three serogroups (*Canicola, Icterohaemorrhagiae*, and *Grippotyphosa*) or four serogroups (*Canicola, Icterohaemorrhagiae, Grippotyphosa* and *Bratislava*) and the European consensus statement recommends the use of quadrivalent vaccines. Vaccination is recommended as soon as clinical recovery is seen.

Concerns about quadrivalent vaccines and reactions to leptospirosis vaccination exist in the public domain, particularly in small dogs. A risk-based assessment of the individual animal and environment is recommended when considering the vaccination programme as this is a non-core vaccine.

Owners should aim to reduce reinfection and access to potential sources of infection, including external water sources and wildlife carriers.

**Challenges and considerations**

Leptospirosis presents with non-specific clinical signs and changes on minimum database but should be considered as a differential in acutely unwell dogs, particularly unvaccinated dogs. It is a potentially zoonotic infection and so appropriate handling of the patient in the practice and at home should be emphasised. Chronic kidney damage can become apparent weeks to months after infection and follow-up bloods and urinalysis are recommended.

**Conclusions**

Leptospirosis is an important disease and because of its multisystemic nature should be considered as a differential diagnosis in patients with consistent clinical signs. Early diagnosis and treatment can result in a favourable outcome but diagnosis has traditionally relied upon use of the MAT. Newer tests may allow more rapid diagnosis and treatment. Vaccination is recommended to reduce clinical disease and chronic shedding which contributes to environmental contamination. Further work on geographical variation in infecting serogroups may help to guide vaccination schedules.

**References**