Organisms are transmitted by direct contact with infected urine, or indirectly, such as through contact with contaminated water or soil. There are over 150 pathogenic serovars of the spirochete, which are grouped into antigenically-related serogroups. Each serovar is adapted to a one or more mammalian host species (maintenance hosts). For example, a variety of wild animal species can harbor serovar Grippotyphosa, and rats are considered maintenance hosts for serovar Icterohaemorrhagiae. Other hosts act as incidental hosts. Disease in incidental hosts tends to be more severe and the duration of shedding is shorter. Incidental hosts are relatively ineffective at transmitting leptospirosis to other animals (or humans). An increased incidence of leptospirosis often correlates with periods of increased rainfall or flooding.

Over the last decade, there have been increasing reports of disease associated with seroconversion to serovars Pomona, Grippotyphosa and Bratislava. Vaccine pressure, increased testing, and increasing contact between dogs and skunks, raccoons and opossums, have been suggested as reasons for this change.

Pathogenesis and Clinical Manifestations
Pathogenic leptospires penetrate abraded skin or mucus membranes and multiply in the bloodstream and tissues, causing hepatic and/or renal failure and vasculitis. Many infections are subclinical. When illness develops in dogs, acute leptospirosis has a characteristic clinical picture that strongly resembles the disease in human beings.

Leukocytosis, thrombocytopenia, azotemia, hypoalbuminemia, increased liver enzyme activities, isosthenuria, proteinuria, glucosuria, and cylindruria are common laboratory abnormalities. Thoracic radiography may show diffuse interstitial to bronchointerstitial patterns. Alveolar patterns may occur in dogs with leptospiral pulmonary hemorrhage syndrome, which has been most often reported in European dogs.

Diagnosis
Diagnosis is usually based on serologic testing using the microscopic agglutination test (MAT). Respective titers are provided for each of several different
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Although organism with the highest titer has been traditionally considered to reflect the infecting serogroup (lower titers representing cross reactions), this is an unreliable way of predicting the infecting serovar. Titers are usually negative in the first week of illness, and demonstration of a fourfold rise in titer is required over a 1-4 week interval. Postvaccinal titers against Icterohemorrhagiae, Canicola, Grippotyphosa and Pomona occasionally rise as high as 1:3200 for months after vaccination, and these can interfere with interpretation. Results can vary considerably between laboratories.

Culture is difficult because of the fastidious growth requirements of leptospires, but currently is the only way of accurately identifying the infecting serovar. PCR assays are becoming more widely available, and have potential to be rapid, sensitive and specific. PCR should be performed on blood and urine simultaneously in dogs suspected to have leptospirosis, because urinary shedding does not generally occur until 7-10 days after infection, at which time leptospiremia dissipates.

Treatment
For vomiting dogs, specific treatment involves initial use of parenteral penicillin derivatives. Once vomiting has stopped, treatment should be changed to doxycycline (5 mg/kg PO q12h) for two weeks, which more effectively eliminates organisms from the renal tubules. The use of hemodialysis can dramatically improve survival in dogs with severe renal failure, and early referral of these dogs is recommended if client finances allow.

Prevention
Vaccines are now available for serovars Canicola, Icterohemorrhagiae, Pomona and Grippotyphosa. Annual revaccination is required. Vaccination is recommended for dogs living in endemic areas that are likely to be exposed, such as those contacting farm animals or wild mammalian species, and dogs that participate in recreational activities involving water.

Public Health Risk
Human leptospirosis is typically a ‘flu-like illness,’ but in some cases may be associated with renal and hepatic failure, pulmonary hemorrhage, meningitis, or abortion. Dogs have the potential to transmit leptospires to humans, and care is warranted when handling dogs suspected to have the disease. Fortunately leptospires are easily inactivated with disinfectants and do not persist readily in the environment. The recently published ACVIM Consensus Statement on Leptospirosis provides detailed guidelines regarding the handling and treatment of dogs suspected to have leptospirosis.

Research
We are currently recruiting the assistance of California veterinarians who see leptospirosis in their practice to help us to better understand the epidemiology of the disease. Interested veterinarians should contact Janemarie Hennebelle at jhcatto@ucdavis.edu.

Dr. Sykes co-founded the International Society for Companion Animal Infectious Diseases. Her research interests include canine and feline hemotropic mycoplasma infections, tick-borne infectious diseases, leptospirosis and deep mycoses of dogs and cats. Dr. Sykes earned her veterinary degree and PhD (in molecular diagnostics for feline upper respiratory tract diseases) at the University of Melbourne, Australia, in 1993. Dr. Sykes will be speaking at the 2011 Pacific Veterinary Conference in Anaheim on June 30, July 1, and July 2.