

LEPTOSPIROSIS

Helio Autran de Moraes, MV, PhD
ACVIM (Internal Medicine & Cardiology)
Oregon State University

- Agent
 - Spirochete with more than 200 “serovars.” The pathogenic serovars do not replicate outside animal hosts
 - *Leptospira interrogans*
 - Serovars: *L. interrogans autumnalis*, *L. interrogans bratislava*, *L. interrogans canicola*, *L. interrogans icterohaemorrhagiae*, *L. interrogans pomona*
 - *Leptospira kirshneri*
 - Serovar *L. kirshneri gryppotyphosa*
 - *Leptospira borgpetersenii*
 - Serovar: *L. borgpetersenii hardjo*
 - Specific serovars are “hosted-adapted” to certain reservoir species and generally do not cause disease in those hosts, e.g.:

▪ <i>L. interrogans bratislava</i>	pigs, rats, small mammals
▪ <i>L. interrogans canicola</i>	dogs
▪ <i>L. interrogans icterohaemorrhagiae</i>	rats
▪ <i>L. kirschneri gryppotyphosa</i>	voles, raccoons, small mammals
- Epidemiology
 - Animals are critical to the maintenance of pathogenic leptospire in a given area. Leptospire can persist in the renal tubules of animals without causing disease, and can be excreted in the urine for prolonged periods of time.
 - Leptospire evade immune responses while sequestered in renal tubules.
 - Prevalence in dogs is increasing since 1983
 - Adult (4 – 7 years) intact male dogs
 - Herding, working dogs, and hounds
 - Endemic worldwide
 - Tropical and semitropical areas
 - Alkaline soil
 - Leptospire can survive in moist environments for months, but are killed by freezing
 - Summer or fall
 - Rainy periods
- Transmission
 - Leptospire are eliminated by urine and enter the body through abraded skin and intact mucous membranes
 - In dogs, leptospire concentrates in the liver and kidneys
 - Clinical signs – 7 days post-exposure
 - May clear the infection in 2 – 3 weeks
 - May develop chronic renal failure or chronic active hepatitis
 - In cats, infections are usually subclinical
 - Cats can shed leptospire in the environment
- Clinical Signs
 - Many, if not most, *Leptospira* infections in dogs are subclinical

CVDL 2010

- Hepatic disease and hemorrhage occur mostly with *L. interrogans icterohaemorrhagiae* (may also have sub-acute uremia)
- Renal disease predominates with *L. interrogans bratislava* (liver changes also can be present)
- Renal and liver disease mostly with *L. interrogans pomona*, and *L. kirschneri grippotyphosa*
- Experimental infection with *L. interrogans pomona* and *L. interrogans bratislava* causes hemorrhagic and inflammatory lesions in lungs kidneys and liver.
- Mostly renal changes with *L. interrogans canicola*

- Fever
- Uveitis
- Vomiting, diarrhea
 - Renal failure
 - Liver failure
- Jaundice
- Muscle pain

- Laboratory Abnormalities
 - CBC
 - Leukopenia (acute)
 - Leukocytosis (subacute)
 - Thrombocytopenia
 - Renal failure
 - Increased BUN and creatinine
 - Cillindruria
 - Pyuria
 - Hematuria
 - Liver failure
 - Increased activity of ALT and Alkaline phosphatase
 - ALP is usually higher than ALT
 - Increased bilirubin
 - Interstitial lung disease

- Diagnosis
 - Clinical Signs + Serology
 - Detection of antibodies
 - Antibodies from active infection, previous infection or vaccination
 - Active infection
 - MAT titer > 3200
 - 4 fold increase in titer over 2 – 4 weeks
 - Positive IgM ELISA
 - Titers can be negative in acute infection
 - Vaccine may induce antibodies against *L. interrogans automnalis*
 - Demonstration of the organism
 - Dark-field or phase-contrast microscopy in the urine
 - Intermittent shedding leads to false-negative
 - Culture
 - Before antibiotics
 - Place immediately in transport media
 - To the laboratory ASAP
 - Pre-treatment with furosemide may increase yield
 - PCR (urine)
 - Early positive
 - Very sensitive

- May be positive for years after recovery
 - 8% of dogs (regardless of health status) shed pathogenic leptospirosis
 - Serology is a poor predictor of leptospirosis
 - 22% sensitivity, 79% specificity
- Therapy
 - Fluid therapy
 - Maintain hydration
 - Preserve renal function
 - Antibiotics
 - Ampicillin or penicillin G
 - Initially IV
 - Doxycycline for 2 weeks after penicillin to eliminate the carrier phase
 - Decreases shedding, but may not eliminate it
- Prevention
 - All serovars can potentially infect humans
 - Wear gloves
 - Vaccines
 - Can reduce severity of the disease but do not eliminate the carrier state
 - May not protect against all serovars
- Public health
 - Leptospirosis can occur as either sporadic cases or in epidemics
 - Infection occurs through mucosal contact with water or soil contaminated with the urine of infected animals
 - Risk occupations
 - Veterinarians, farmers and abattoir workers
 - Recreational activities in water
- References
 - Adin CA & Cowgill LD. Treatment and outcome of dogs with leptospirosis: 36 cases. JAVMA 216():371-5, 2000.
 - Bal AE et al. Detection of leptospires in urine by PCR for early diagnosis of leptospirosis. J Clin Microbiol 32(8):1894-8, 1994
 - Barr, S.C. et al. Serologic responses of dogs given a commercial vaccine against *Leptospira interrogans* serovar pomona and *Leptospira kirschneri* serovar grippityphosa. AJVR. 66:1780-1874. 2005
 - Birnbaum N et al. Naturally acquired leptospirosis in 36 dogs: serological and clinicopathological features. JSAP 39(5):231-6, 1998
 - Brown CA et al. *Leptospira interrogans* serovar grippityphosa infection in dogs. JAVMA 209(7):1265-7, 1995.
 - Forrest, L.J. et al. Sonographic renal findings in 20 dogs with leptospirosis. Vet. Radiol. Ultrasound 39:337-340. 1998
 - Greenlee, J.J. et al. Clinical and pathologic comparison of acute leptospirosis in dogs caused by two strains of *Leptospira kirschneri* serovar grippityphosa. AJVR. 65:1100-1107. 2004
 - Greenlee JJ. Experimental canine leptospirosis caused by *Leptospira interrogans* serovars pomona or bratislava. AJVR 66(10):1816-22, 2005
 - Harkin KR & Gartrell CL. Canine leptospirosis in New Jersey and Michigan: 17 cases (1990-1995). JAAHA 32(6):495-501, 1996.
 - Harkin, K.R. et al. Clinical application of a polymerase chain reaction assay for diagnosis of leptospirosis in dogs. JAVMA. 222:1224-1229. 2003
 - Harkin, K.R. et al. Comparison of polymerase chain reaction assay, bacteriologic culture, and serologic testing in assessment of prevalence of urinary shedding of leptospires in dogs. JAVMA. 222:1230-1233. 2003

CVDL 2010

- Levett, P.N. Leptospirosis. *Clin. Microbiol. Rev.* 14:296-326. 2001
- Ward, M.P. *et al.* Evaluation of environmental risk factors for leptospirosis in dogs: 36 cases (1997-2002). *JAVMA.* 225:72-77. 2004
- Ward, M.P. *et al.* Prevalence of and risk factors for leptospirosis among dogs in the United States and Canada: 677 cases (1970-1998). *JAVMA.* 220:53-58. 2002
- Ward, M.P. *et al.* Serovar-specific prevalence and risk factors for leptospirosis among dogs: 90 cases (1997- 2002). *J.VMA.* 224:1958-1963. 2004

CVDL 2010