**LEPTOSPIROSIS**

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<th>Animal Group(s) Affected</th>
<th>Transmission</th>
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<td>Mammals</td>
<td>Contact with urine of shedding carrier animal or water contaminated by these carriers; organism can penetrate macerated or wounded skin and intact mucous membranes; potential, but limited, transmission transplacental or transmammary</td>
<td>None or modest in carrier animals; inapparent to severe in acute infections in non-adapted animals. Renal signs most typical and include acute failure; up to 20% of cases present concurrent hepatitis.</td>
<td>Fatal disease can occur in non-host adapted species.</td>
<td>Antibiotics – usually doxycycline.</td>
<td>Personal hygiene (especially hand-washing) and prevention of contact with carrier animal urine; control of free-ranging wildlife and pests which are often carriers.</td>
<td>Yes</td>
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**Fact Sheet compiled by:** Kathryn C. Gamble  
**Original date:** 12 March 2011; updated 14 July 2013  
**Fact Sheet Reviewed by:** Kenneth Harkin; Frances Gulland  

**Susceptible animal groups:** Mammals  

**Causative organism:** *Leptospira* spp. (250+ serovars) are spirochaete bacteria which share a common lipopolysaccharide antigen but differ by surface agglutinating antibodies. Currently, the most common pathogenic leptospiral serovars for U.S. mammals are identified as Grippotyphosa, Pomona, Bratislava, Icterohemorrhagicae, and possibly Autumnalis.  

**Zoonotic potential:** Infectious to people from animals; and though could be from people to animal, it generally comes from a common point source (i.e., rodents, contaminated water) when both animal and human are involved.  

**Distribution:** Worldwide distribution with moist environments most conducive; occupational and leisure activity risk factors; autumn seasonality observed.  

**Incubation period:** 7-14 days, up to 21 days  

**Clinical signs:** Carrier animals can have high prevalence of infection – up to 50%. Generally, these individuals do not develop disease or clinical signs, except perhaps mild signs at initial infection. Fatality would not be expected in this situation. These animals may shed the organism for a few weeks or intermittently for several years due to chronic infection of the renal tissue. Each serovar tends to have its certain host associations as potential natural reservoirs; wildlife and rodents are often implicated in this role during outbreaks. Acute infections can occur in susceptible – non-host adapted - species and include most captive
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Zoological species and humans; following infection with the organism, they become ill, moderately to severely. Fatality can occur, especially in untreated individuals. These animals generally do not become carriers. Once the infection has been resolved, especially if these animals are treated, prolonged shedding does not occur. Essentially any serovar could infect these individuals and produce disease. Endothelial damage is primary source of clinical signs. These signs are non-specific and many infected animals do not become clinically ill. The first signs appear as mild to moderate flu-like with fever, anorexia, malaise and fatigue. Rash may be present but is inconsistent. Other clinical signs are much more severe and related to systemic infection with signs of acute renal disease, including the non-specific, but consistent, clinical signs of infection in the kidneys. Concurrent clinical pathology changes of azotemia and hyperphosphatemia are present and may be accompanied by hemoglobinuria. Some infected animals (10-20%) progress to concurrent hepatic disease (Weil’s disease) with clinical signs of icterus and increasing hepatocellular enzymes. Pregnant animals may abort their fetus. The initial signs may wane with the more serious signs appearing in a biphasic time frame. Although any mammal can be infected and present this array of clinical signs, felids appear somewhat more resistant to infection although clinical disease and leptospiral shedding has been documented. Equids tend to present with recurrent uveitis rather than renal or hepatic disease; however, reports of acute pulmonary distress as a result of leptospirosis has been reported in foals. Additionally, black rhinoceros (Diceros bicornis) have been considered susceptible to leptospirosis in association with their predisposition to hemolytic anemia. Free-ranging California sea lions (Zalophus californianus) have a marked predisposition to infection with serovar Pomona with severe renal disease; limited other serovars have been identified in other pinnipeds and no serovars or disease issues have been identified in cetaceans.

Post mortem findings: These findings are specific to the body system infected and presenting clinical signs at time of illness. Usually, it is evidence of acute renal failure. Acute hepatitis is observed in those animals which had icterus. Scarring in affected organs in chronic cases with “white spots” observed macroscopically in the kidneys of pigs and dogs.

Diagnosis: Diagnosis is challenging and treatment must begin before diagnosis is conclusive. Although culture remains the defined gold standard of testing, the organism is markedly fastidious to culture and this approach has many disadvantages. Although direct observation with (silver or fluorescent antibodies (FA)) or without (darkfield microscopy) stain enhancement has been reported as useful, leptospires must be present sufficiently in the sample evaluated, usually urine. Therefore, serologic evaluation (microscopic agglutination testing - MAT) is relied upon for diagnosis with positive status assigned to a test result >1:100 in an unvaccinated animal as this test cannot differentiate vaccine and natural antibody production. Although in a clinical ill animal this serologic status is strongly suggestive of leptospirosis, it is confirmed by a four-fold rise in titre over 2-4 weeks. It must be recalled that cross-reactivity is quite common in this disease so a panel of likely serovars are assessed assigning the serovar with the highest titre as the most likely causative agent. More recent testing options include polymerase chain reaction (PCR) of urine or kidney and antibody-based dot-blot ELISA.

Material required for laboratory analysis: Serum is submitted for MAT or ELISA although only the former is used routinely. Urine can be submitted for PCR. Whole blood can be submitted for PCR or culture. Post-mortem tissues – ideally kidney - can be submitted for histology using special silver stains, culture, PCR, or FA.

Relevant diagnostic laboratories: Leptospire MAT is offered by many commercial and state diagnostic laboratories; Michigan State University Diagnostic Laboratory has an excellent serology panel and consultation services available. PCR testing is currently offered by Kansas State University. As an antibody, rather than antigen, based ELISA, this test would not be considered as useful in zoo medicine.
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**Treatment:** These organisms are generally quite sensitive to most antibiotics, except notably chloramphenicol and first generation cephalosporins, provided the treatment is initiated promptly and as early in the disease course as possible. Doxycycline for 14 days is most commonly used successfully to treat clinical signs. Supportive care for systemic signs may be needed in more severe cases.

**Prevention and control in zoos:** Although vaccines as killed whole cell bacterins are available for pigs, cattle, and dogs, it would be necessary to specifically target the serovar of concern in the particular area. It may therefore be preferred to leave this option to consideration in outbreak control or in areas with higher risk or increased urban wildlife or domestic stray interactions. Serologic testing can be monitored in these situations and during transfers between facilities. More importantly, pest control and exclusion of other carriers from contact with collection animals would be important. Once an animal is confirmed infected, prompt treatment will minimize or may eliminate shedding. In the treatment interval, appropriate staff protection and personal hygiene is to be utilized to prevent spread within the facility or to staff. Consideration of drainage of the area should be made in this control measure. If the situation were to occur in a contact program area, it is recommended to exclude guests until the situation is treated, monitored, and confirmed resolved.

**Suggested disinfectant for housing facilities:** Any standard disinfectant technique would be appropriate for cleaning of this organism.

**Notification:** In the US, Hawaii is the only state currently maintaining this disease as reportable in animals. Local health authorities would be alerted for human cases especially clusters.

**Measures required under the Animal Disease Surveillance Plan:** None

**Measures required for introducing animals to infected animal:** Infected animals should be maintained as isolated as possible from other mammals until treatment interval is completed. PCR testing on urine would be helpful to confirm that the infected animal was no longer shedding. Serologic monitoring of animals in adjacent areas would be considered prudent.

**Conditions for restoring disease-free status after an outbreak:** Serologic monitoring of adjacent areas would be considered prudent following return of infected animal to collection to assess for exposure.

**Experts who may be consulted:**
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**References:**

