Leptospirosis

Disease Plan

Contents:

Last updated: June 26, 2015, by JoDee Baker.

Questions about this disease plan?

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✓ WHY IS LEPTOSPIROSIS IMPORTANT TO PUBLIC HEALTH?

Leptospirosis infects a variety of wild and domestic mammals, especially rodents, cattle, swine, dogs, horses, sheep, and goats. Animals can be asymptomatic or develop clinical infection, which can be fatal. Reservoir animals may shed the organism in their urine intermittently or continuously throughout life, resulting in contamination of the environment, particularly water. Humans most often become infected after exposure to environmental sources, such as animal urine, contaminated water or soil, or infected animal tissue through cuts or abraded skin, mucous membranes, or conjunctiva. The clinical course is variable. Leptospirosis may manifest as a subclinical illness followed by seroconversion, a self-limited systemic infection, or a severe, potentially fatal illness accompanied by multiorgan failure.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Leptospirosis is a bacterial zoonotic disease with varied manifestations that affects both humans and animals. Synonyms for the disease include Weil's disease, Weil-Vasilyev disease, Swineherd's disease, rice-field fever, waterborne fever, nanukayami fever, cane-cutter fever, swamp fever, mud fever, Stuttgart disease, and Canicola fever. Severity of illness can range from asymptomatic, to a mild and self-limiting febrile illness, to fulminant fatal disease. The disease typically presents as one of the following four clinical categories: mild, influenza-like illness; Weil’s syndrome, characterized by jaundice, renal failure, hemorrhage and myocarditis with arrhythmias; meningitis or meningoencephalitis; and pulmonary hemorrhage with respiratory failure.

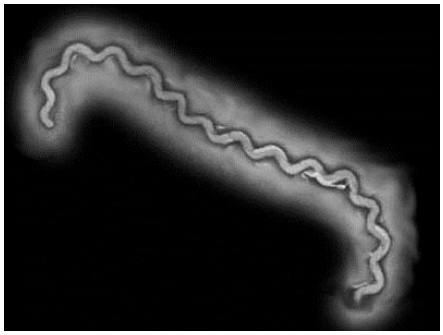
Clinical illness generally lasts from a few days to three weeks or longer. Most of the time, there are two phases in the illness: the febrile stage (otherwise known as leptospiremic stage) lasting 5-7 days, followed by the convalescent or immune phase, which generally lasts 4-30 days. Occasionally the two phases are separated by a 3-4 day abatement of fever. Sometimes the distinction between the two phases is not apparent, so patients may seek medical care only in the second phase. Without treatment, recovery can take several months.

The first phase is characterized by the abrupt onset of high fever, myalgias (in the calves and lumbar region) and headache (retro-orbital and frontal). Occasionally, nausea, vomiting,

abdominal pain, diarrhea, cough, photophobia and rash will be present. The second phase is characterized by prolonged fever and systemic complications such as jaundice, renal failure, bleeding, respiratory insufficiency with or without hemoptysis, hypotension, myocarditis, meningitis, mental confusion, and depression. Unilateral or bilateral uveitis, characterized by iritis, iridocyclitis, and chorioretinitis may develop up to 18 months after acute illness and last for years.

In the majority of cases, leptospirosis is a self-limiting and clinically inapparent illness. Leptospirosis during pregnancy may result in fetal death, abortion, stillbirth or congenital infection.

Causative Agent



The infection is caused by a spiral-shaped bacterium (spirochete) of the genus *Leptospira.* The spirochetes can be associated with animal hosts or be free-living; they persist well in water, soil, and mud. Multiple pathogenic species exist, including *Leptospira interrogans*, and are subdivided into serovars. More than 200 serovars have been identified within these species. Common pathogenic serovars in the United States in the *L. interrogans* species are *pomona*, *icterohaemorrhagiae, canicola*, and *autumnalis.*

Differential Diagnosis

The differential diagnosis for leptospirosis should include consideration of dengue, malaria, influenza, aseptic meningitis, rickettsial diseases, hantavirus, enteric fevers, viral hepatitis, Gram-negative sepsis, and encephalitis.

Laboratory Identification

Diagnostic testing should be requested for patients in whom there is a high index of suspicion for leptospirosis, based either on signs and symptoms, or on occupational, recreational, or vocational exposure to animals or environments contaminated with animal urine.

1. Serologic tests: The diagnosis of leptospirosis is most commonly confirmed by ELISA or microscopic agglutination test (MAT). Antibodies develop during the second week of illness. An acute serum specimen should be collected when the diagnosis is suspected and the convalescent serum should be collected at least 10-14 days after the acute specimen.

2. Real-time polymerase chain reaction (RT-PCR) testing of blood or urine specimens.
3. Culture: Requires special media. Leptospires can be isolated from whole blood (within 7 days of onset), cerebrospinal fluid (CSF) during the acute illness (4-10 days from onset), and from urine (after the 7th day, and only if inoculated into special media within 2 hours of voiding). Clinical or autopsy specimens (e.g., punch biopsy of kidney) should be submitted fresh or frozen.
4. Immunofluorescence (IF) and immunohistochemistry (IHC) techniques are used for detection of leptospires in clinical and autopsy specimens (e.g., kidney, liver). Tissue should be formalin fixed or paraffin embedded.
5. Darkfield microscopy can also be used to directly observe the spirochetes.

Treatment

Leptospirosis is treated with antibiotics, such as doxycycline or penicillin, which should be given early in the course of the disease. Intravenous antibiotics may be required for persons with more severe symptoms. In severe cases, supportive care with renal replacement therapy, ventilatory support, and blood products may also be required.

Case Fatality

The case fatality rate is reported to range from around 5%-30%.

Reservoir

Many different kinds of animals, including cattle, pigs, horses, dogs, rodents, and many wild animals, carry the bacteria. Some become sick while others have no symptoms. Leptospires are shed in urine and may survive in water or moist soil for weeks to months. In carrier animals with chronic renal infections, leptospiruria can persist for life.

Transmission

Leptospirosis is transmitted by exposure of skin (especially if abraded) or mucous membranes (e.g., eyes, mouth or nose) to urine or tissues from infected animals, or, more commonly, by contact with water or soil contaminated with the urine of infected animals. These water or soil exposures typically occur during recreational (e.g., swimming, wading, camping, rafting) or occupational activities. Infection can also occur by swallowing contaminated water or food. Person-to-person transmission is rare.

Susceptibility

Susceptibility of humans is general; serovar-specific immunity follows infection or (occasionally) immunization, but this may not protect against infection with a different serovar.

Incubation Period

The incubation period is typically 5-14 days (range: 2-30 days).

Period of Communicability

Direct transmission from person to person is rare. Leptospires may be excreted in the urine, usually for one month, but leptospiruria has been observed in humans for months, even years, after the acute illness.

Epidemiology

Leptospirosis is a widespread and prevalent zoonotic disease. It occurs in both temperate and tropical regions, though the incidence in the tropics is approximately 10 times higher than in temperate regions. Leptospirosis is an under-reported disease, and there are no reliable global incidence figures. A modeling exercise by the World Health Organization's (WHO's) Leptospirosis Burden Epidemiology Group estimated that there were 873,000 cases worldwide annually, with 48,600 deaths. It is estimated that 100-200 leptospirosis cases are identified annually in the U.S. About 50% of cases occur in Hawaii. The largest recorded U.S. outbreak occurred in 1998, when 775 people were exposed to the disease. Of these, 110 became infected. Although incidence in the U.S. is relatively low, leptospirosis is considered to be the most widespread zoonotic disease in the world. Significant increases in incidence have been reported from Peru and Ecuador following heavy rainfall and flooding in the spring of 1998. Thailand has also reported a rapid increase in incidence between 1995 and 2000.

Leptospirosis became reportable in Utah in 2014, so true incidence is unknown.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.

Prevention

Prevention involves avoiding contact with potentially infected animals and contaminated water and soil.

1. Do not swim or wade in water that might be contaminated with animal urine.
2. Persons with occupational or recreational exposure to potentially infected animals, water, or soil should wear protective clothing, boots, and gloves.
3. Do not feed wildlife or attract wildlife to homes or yards.
4. Rodent-proof homes and out-buildings.
5. Vaccinate pets against leptospirosis. The vaccine for pets does not provide 100% protection, because the vaccine does not provide immunity against all strains of *Leptospira*. It is important to get your pet vaccinated even if it gets leptospirosis to prevent infection with a different *Leptospira* strain.
6. Dispose of animal carcasses properly.
7. Drain potentially contaminated waters and soil when possible.

Chemoprophylaxis

Antimicrobial prophylaxis for individuals at high risk of exposure may be useful in some settings. In a study including more than 900 soldiers deployed for jungle training in Panama, fewer cases of leptospirosis were observed among those who received doxycycline prophylaxis. In Utah, prophylaxis would rarely, if ever, be recommended.

Vaccine

No licensed vaccine for people exists in the U.S. There is a vaccine for animals.

Isolation and Quarantine Requirements

Isolation: Blood and body fluid precautions.

Hospital: Standard precautions.

Quarantine: None.

✓ CASE INVESTIGATION

Reporting

Report any suspect or confirmed case of leptospirosis.

Criterion	Reporting		
	1, 4, 5	2	3
Clinical Evidence			
History of fever > 38.0°C (100.4°F) within two weeks		N	N
Myalgia		O†	O†
Headache		O†	O†
Jaundice		O†	O†
Conjunctival suffusion without purulent discharge		O†	O†
Rash (i.e., maculopapular or petechial)		O†	O†
Aseptic meningitis		O	O
GI symptoms (e.g., abdominal pain, nausea, vomiting, diarrhea)		O	O
Pulmonary complications (e.g., cough, breathlessness, hemoptysis)		O	O
Cardiac arrhythmias, ECG abnormalities		O	O
Renal insufficiency (e.g., anuria, oliguria)		O	O
Hemorrhage (e.g., intestinal, pulmonary, hematuria, hematemesis)		O	O
Jaundice with acute renal failure		O	O
Healthcare record contains a diagnosis of leptospirosis	S		
Death certificate lists leptospirosis as a cause of death or a significant condition contributing to death	S		
Laboratory Evidence			
Isolation of *Leptospira* from a clinical specimen	S		
Fourfold or greater increase in *Leptospira* agglutination titer between acute- and convalescent-phase serum specimens	S		
Demonstration of *Leptospira* in a clinical specimen by direct immunofluorescence	S		
Leptospira total agglutination titer of ≥ 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens	S		
Detection of pathogenic *Leptospira* DNA (e.g., by PCR) from a clinical specimen.	S		
Demonstration of anti-*Leptospira* antibodies in a clinical specimen by indirect immunofluorescence		O	
Leptospira total agglutination titer of ≥ 200 but < 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens after onset of symptoms		O	
Demonstration of *Leptospira* in a clinical specimen by darkfield microscopy		O	

Detection of IgM antibodies against *Leptospira* in an in acute phase serum specimen.		O	
Epidemiological Evidence			
Involvement in an exposure event (e.g., adventure race, triathlon, flooding) with associated laboratory-confirmed cases			N

Notes:

S = This criterion alone is sufficient to report a case

N = This criterion in conjunction with all other "N" and any "O" criteria in the same column is required to report a case.

O = At least one of these "O" (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—in conjunction with all "N" criteria in the same column—is required to report a case.

O† =At least two of these "O" criteria in each category (e.g., clinical presentation and laboratory findings) in the same column—in conjunction with all other "N" criteria in the same column—is required to report a case.

Case Definition
Leptospirosis (2013)

Clinical presentation criteria

An illness characterized by fever, headache, and myalgia, and less frequently by conjunctival suffusion, meningitis, rash, jaundice, or renal insufficiency. Symptoms may be biphasic.

Clinical presentation includes history of fever within the past two weeks and at least two of the following clinical findings: myalgia, headache, jaundice, conjunctival suffusion without purulent discharge, or rash (i.e. maculopapular or petechial); OR at least one of the following clinical findings:

- Aseptic meningitis
- GI symptoms (e.g., abdominal pain, nausea, vomiting, diarrhea)
- Pulmonary complications (e.g., cough, breathlessness, hemoptysis)
- Cardiac arrhythmias, ECG abnormalities
- Renal insufficiency (e.g., anuria, oliguria)
- Hemorrhage (e.g., intestinal, pulmonary, hematuria, hematemesis)
- Jaundice with acute renal failure

Laboratory criteria

Diagnostic testing should be requested for patients in whom there is a high index of suspicion for leptospirosis, based either on signs and symptoms, or on occupational, recreational or vocational exposure to animals or environments contaminated with animal urine.

Confirmatory:

- Isolation of *Leptospira* from a clinical specimen, *or*
- Fourfold or greater increase in *Leptospira* agglutination titer between acute and convalescent phase serum specimens studied at the same laboratory, *or*
- Demonstration of *Leptospira* in tissue by direct immunofluorescence, *or*
- *Leptospira* agglutination titer of > 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens, *or*
- Detection of pathogenic *Leptospira* DNA (e.g., by PCR) from a clinical specimen.

Probable/Presumptive:

- *Leptospira* agglutination titer of > 200 but < 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens, *or*
- Demonstration of anti-*Leptospira* antibodies in a clinical specimen by indirect immunofluorescence, *or*
- Demonstration of *Leptospira* in a clinical specimen by darkfield microscopy, *or*
- Detection of IgM antibodies against *Leptospira* in an in acute phase serum specimen.

Criteria for epidemiologic linkage

Involvement in an exposure event (e.g., adventure race, triathlon, flooding) with associated laboratory confirmed cases.

Case classification

Confirmed:

A case with confirmatory laboratory results, as listed above.

Probable:

A clinically compatible case with at least one of the following:

- Involvement in an exposure event (e.g., adventure race, triathlon, flooding) with known associated cases, *or*
- Presumptive laboratory findings, but without confirmatory laboratory evidence of *Leptospira* infection.

Case Classification Tables

Criterion	Case Definition		
	Confirmed	**Probable**	
Clinical Evidence			
History of fever > 38.0°C (100.4°F) within two weeks		N	N
Myalgia		O†	O†
Headache		O†	O†
Jaundice		O†	O†
Conjunctival suffusion without purulent discharge		O†	O†
Rash (i.e., maculopapular or petechial)		O†	O†
Aseptic meningitis		O	O
GI symptoms (e.g., abdominal pain, nausea, vomiting, diarrhea)		O	O
Pulmonary complications (e.g., cough, breathlessness, hemoptysis)		O	O
Cardiac arrhythmias, ECG abnormalities		O	O
Renal insufficiency (e.g., anuria, oliguria)		O	O
Hemorrhage (e.g., intestinal, pulmonary, hematuria, hematemesis)		O	O
Jaundice with acute renal failure		O	O
Laboratory Evidence			
Isolation of *Leptospira* from a clinical specimen	S		
Fourfold or greater increase in *Leptospira* agglutination titer between acute- and convalescent-phase serum specimens	S		
Demonstration of *Leptospira* in tissue by direct immunofluorescence	S		
Leptospira total agglutination titer of ≥ 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens after onset of symptoms	S		
Detection of pathogenic *Leptospira* DNA (e.g., by PCR) from a clinical specimen.	S		
Leptospira total agglutination titer of ≥ 200 but < 800 by Microscopic Agglutination Test (MAT) in one or more serum specimens after onset of symptoms		O	
Demonstration of anti-*Leptospira* antibodies in a clinical specimen by indirect immunofluorescence		O	
Demonstration of *Leptospira* in a clinical specimen by darkfield microscopy		O	
Detection of IgM antibodies against *Leptospira* in an in acute phase serum specimen		O	
Epidemiological Evidence			
Involvement in an exposure event (e.g., adventure race, triathlon, flooding) with known associated cases			N

Notes:
S = This criterion alone is sufficient to confirm a case
N = This criterion in conjunction with all other “N” and any “O” criteria in the same column is required to confirm a case.

O = At least one of these "O" (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—in conjunction with all "N" criteria in the same column—is required to confirm a case.
O† = At least two of these "O" criteria in each category (e.g., clinical presentation and laboratory findings) in the same column—in conjunction with all other "N" criteria in the same column—is required to confirm a case.

Case Investigation Process

- Complete CMR in UT-NEDSS.
- Verify case status.
- Complete disease investigation form.
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere.
- If patient acquired disease in Utah, identify the source of transmission and provide recommendations to eliminate it.

Outbreaks

Disease in humans is often sporadic, although outbreaks may occur from common source exposures. Participation in a triathlon where the swimming portion was in fresh water was responsible for several outbreaks of leptospirosis in Illinois in 1998. Other outbreaks occurred following triathlons in Germany in 2006 and Austria in 2010.

Identifying Case Contacts

This infection is not routinely spread person-to-person.

Case Contact Management

Persons exposed to the same source as the case should be educated about symptoms of leptospirosis to facilitate prompt diagnosis and treatment if they become ill. If any are ill, inform them (or their physician) of possible exposure in order to facilitate proper diagnosis and therapy. Doxycycline may be effective in preventing leptospirosis in adults exposed in high-risk areas. Anyone meeting the probable case definition (i.e., clinically compatible illness sharing a common exposure with the case) should be reported and investigated in the same manner as the case.

✓ REFERENCES

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✓ VERSION CONTROL

Created May 2015: Entire plan was created.

✓ UT-NEDSS Minimum/Required Fields by Tab

Demographic
- ☑ Area code
- ☑ Birth Gender
- ☑ City
- ☑ County
- ☑ Date of Birth
- ☑ Ethnicity
- ☑ Race
- ☑ First Name
- ☑ Last Name
- ☑ Phone Number
- ☑ State
- ☑ State Case Status
- ☑ Street
- ☑ Zip Code

Clinical
- ☑ Died
- ☑ Disease
- ☑ Hospitalized
- ☑ Onset Date
- ☑ Pregnant
- ☑ Fever
- ☑ Myalgia
- ☑ Headache
- ☑ Jaundice
- ☑ Conjunctival suffusion without purulent discharge
- ☑ Rash
- ☑ Aseptic Meningitis
- ☑ GI Symptoms
- ☑ Pulmonary complications
- ☑ Cardiac arrhythmias
- ☑ ECG abnormalities
- ☑ Renal insufficiency
- ☑ Hemorrhage (intestinal, pulmonary, hematuria, hematemesis)
- ☑ Jaundice with acute renal failure

Laboratory
- ☑ Collection Date
- ☑ Lab Name
- ☑ Organism
- ☑ Specimen Source
- ☑ Test Result
- ☑ Test Type

Epidemiological
- ☑ Imported From

Investigation
- ☑ Contact with animal waste/manure/urine
- ☑ Was patient involved in an exposure event (e.g. adventure race, triathlon, flooding)
- ☑ Were laboratory confirmed cases associated with this event

Contacts
- ☑ NA

Reporting
- ☑ Date first reported to public health

Administrative
- ☑ Event Name
- ☑ Outbreak Name
- ☑ Outbreak Associated