Leptospirosis

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Leptospirosis

1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Leptospirosis is caused by pathogenic spirochetes, spiral-shaped bacteria belonging to the genus *Leptospira*. The spirochetes can be found in animal hosts or can be free-living. The organisms survive well in moist environments such as fresh water, soil, and mud, and are antigenically complex with over 250 pathogenic serovars reported.

B. Clinical Description and Laboratory Confirmation

The clinical course of leptospirosis is highly variable, ranging from asymptomatic or self-limited febrile illness to severe disease. There are generally two phases to the disease, but many patients may not present until the second phase. The usual presentation is an acute febrile illness with fever, headache, myalgia, and vomiting. Left untreated, it can cause kidney damage, meningitis, liver failure, and respiratory distress. Symptoms may be biphasic. After the first phase (with fever, chills, headache, muscle aches of the calves and lumbar region, vomiting or diarrhea) the patient may recover for 3-4 days but become ill again. This occurs in roughly 5-15% of cases.

Approximately, 10% of leptospirosis cases progress to severe illness. Weil's disease is a severe form of leptospirosis that includes both renal and liver failure. Clinical illness lasts from less than one week to 3 weeks or longer. Without treatment, recovery may take several months. The case fatality rate is 5 -15% among patients with severe illness but may exceed 50% for those with severe pulmonary hemorrhagic syndrome.

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

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.

C. Reservoirs

Leptospira has been identified in wild and domestic animals, such as rodents, livestock, canines, and wild mammals. Many infected animals appear asymptomatic; however, leptospires are still shed in urine and may survive in water or moist soil for weeks to months.

D. Modes of Transmission

Humans can become infected through contact with urine (or other body fluids, except saliva) from infected animal, or contact with water, soil, or food contaminated with the urine of infected animals. The organism (usually found in contaminated urine, carcasses of infected animals, or water or soil in contact with contaminated urine) enters the body through mucus membranes (eyes, nose, mouth) or through contact with abraded skin. Water and soil exposures typically occur during recreational events (e.g., swimming, camping, rafting) or occupational activities such as farming or mining. Infections can also occur by swallowing contaminated water or food. Human-to-human transmission is very rare but has been documented through sexual intercourse and breastfeeding.

E. Incubation Period

The incubation period range of leptospirosis is 2 to 30 days (usually 5-14 days). Most patients become ill 7 days after exposure.

F. Period of Communicability or Infectious Period

Human-to-human transmission is very rare but has been documented through sexual intercourse and breastfeeding.

G. Epidemiology

In the United States and US territories, 100 – 200 cases are identified annually, with approximately 50% of cases occurring in Puerto Rico; Hawaii typically reports the second-highest number of cases annually. Although the incidence of disease in the continental United States is relatively low, leptospirosis is considered to be the most widespread zoonosis worldwide, particularly in tropical areas with heavy rainfall and neutral or alkaline soils which promote survival of leptospires in the soil. The greatest numbers of cases are seen in summer months after heavy rain with periods of flooding. Incidence rates of 10-100/100,000 are seen in tropical regions of the world.

Outbreaks in the United States have been connected with adventure races and triathlons. The largest outbreak in the United States on record was in 1998, when 775 people were exposed to *Leptospira* bacteria, leading to 110 cases following a triathlon. More recently, 23% of runners in the Florida Adventure Race of 2005, which took place in a swamp, were found to have contracted leptospirosis.

During a hurricane or heavy rain, animal urine in the soil or on other surfaces can run into floodwater, contaminating it. Streams and other natural water sources can also be contaminated. After floods or heavy rains, anyone who has been in contact with

floodwater, contaminated freshwater (rivers and streams) or soil could be at risk for infection. It is important to avoid drinking from potentially contaminated water sources, including floodwater, streams, rivers, or unsafe tap water, avoid bathing or wading in floodwater or contaminated fresh water, especially when putting your head under water or if you have an open wound or scratch, and avoid eating food that has been exposed to contaminated water or potentially urinated on by rodents.

2 CASE DEFINITION

The NJDOH Zoonotic Disease Program follows the most current case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website.

Leptospirosis Case Definition: https://wwwn.cdc.gov/nndss/conditions/leptospirosis/

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

A. Clinical Description

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, reddened conjunctiva without purulent discharge, or rash (i.e. maculopapular or petechial); OR at least one of the follow 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

B. Laboratory Criteria for Diagnosis

Confirmatory:

- Fourfold or greater increase in *Leptospira* agglutination titer between acute- and convalescent-phase serum specimens studied at the same laboratory; 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; OR
- Demonstration of *Leptospira* in tissue by direct immunofluorescence; OR
- Isolation of *Leptospira* from a clinical specimen

Supportive:

- *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 acute phase serum specimen.

C. 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
- Supportive laboratory findings, but without confirmatory laboratory evidence of Leptospira infection.

POSSIBLE

A case with supportive laboratory evidence but no clinical information available (e.g., a laboratory report)

3 LABORATORY TESTING SERVICES AVAILABLE

The Division of Public Health and Environmental Laboratories (PHEL) does not provide testing for leptospirosis, but testing is available at commercial laboratories.

Types of testing:
In the acute phase of illness, leptospires are present in the blood (septicemia) for approximately the first 4–6 days of illness. Leptospires may be shed intermittently in the urine after approximately the first week of illness onset. Due to the transience of leptospires in body fluids, a negative PCR test does not rule out leptospirosis. It is best to test as many specimen types as possible. Whole blood and serum are the preferred

specimens during acute illness (first week). Serum and/or urine is recommended after the first week of illness.

Antibodies for leptospirosis develop between 3-10 days after symptom onset, thus any serologic test must be interpreted accordingly – negative serologic test results from samples collected in the first week of illness do not rule out disease, and serologic testing should be repeated on a convalescent sample collected 7-14 days after the first. Serological tests such as a Microscopic Agglutination Test (MAT) are valuable, especially when paired sera show a four-fold rise in antibody titer. Most cases of active infection have agglutination acute serum titers of ≥800 by MAT. MAT has the best serovar/serogroup specificity. MAT will include a small panel of commonly occurring serovars. There is the possibility that if the serovar is missing from the panel, that the serodiagnoses will be inaccurate or there will be a false negative. Since serology cannot differentiate between current, recent or past infections, two consecutive serum samples taken several weeks apart are ideal.

Isolation of *Leptospira* species from a clinical specimen is considered a confirmed diagnosis. Leptospires can be isolated from the blood (days 0-7) or CSF (days 4-10) during the acute illness. Afterwards, they can be isolated from the urine. It is difficult to culture the organism once antibiotic treatment is initiated.

4 PURPOSE OF SURVEILLANCE AND REPORTING AND REPORTING REQUIREMENTS

A. Purpose of Surveillance and Reporting

- To identify cases and clusters of human illness that may be associated with an exposure event (e.g., adventure race, triathlon, flooding)
- To determine whether the source of infection may be a major public health concern (e.g., infected animals) and stop transmission from such a source.
- To identify where leptospirosis occurs in New Jersey.
- To focus preventive and control measures.

B. Reporting Requirements

Leptospirosis is not currently in N.J Communicable Disease Regulations (N.J.A.C. 8:57), but starting in 2014, NJDOH has requested that clinicians and laboratories report suspected and confirmed cases to the local health department where the patient resides.

5 CASE INVESTIGATION

A. Investigation

Leptospirosis is considered a priority level 3 disease. Local health departments are asked to investigate reports of leptospirosis as soon as possible but within 2 business days. Initial information should be entered into CDRSS within 2 business days and all criteria details entered within 5 days. The NJDOH Leptospirosis Disease Investigation Worksheet may be used to help guide the patient or physician interview. All information collected using the worksheet should be documented in CDRSS. Worksheets should not be sent to NJDOH.

A minimum of 3 attempts should be made to obtain information, including at least 1 attempt to contact the patient. After 3 attempts, enter what is known into CDRSS, including attempts to obtain information (dates and results of the attempts), and classify/close the case according to the case definition.

B. Key CDRSS Fields Specific for Leptospirosis

CDRSS Screen	Required Information
Disease Information	• Enter date reported to the LHD
Patient Personal Information	• Enter demographic information, including country of birth. If patient is under the age of 18, enter parent or guardian information under Patient Relation Information.
Address	• Enter complete address and phone number.
Laboratory and Diagnostic Information	• If there is only a single serological test result, ask healthcare provider if an acute (or convalescent) test was ordered; request that negative test results be sent to LHD, and then enter into CDRSS.
Clinical Status	• Enter date of illness onset, if patient was hospitalized as aa part of this investigation, and mortality information (including date of death).
Medical Facility and Provider Information	• Enter contact information for healthcare provider. • If hospitalized, enter medical facility, patient status (inpatient or ED only), admission and discharge dates, and medical record number.
Risk Factors and Additional Requirements: Leptospirosis	• Complete the entire section. • If the case is associated with an outbreak or an exposure event (e.g., adventure race, triathlon, flooding), notify CDS by email at zoonoticrn@doh.nj.gov. Include dates and location of exposure.

CDRSS Screen	Required Information
Signs and Symptoms	• Enter a response for each sign/symptom, including onset dates. • In addition to asking about clinical symptoms, ask healthcare provider about other lab work, specifically thrombocytopenia and elevated liver enzymes.
Treatment Information	• Enter all treatment provided to patient for leptospirosis. Required information includes name of treatment, start date and duration (# of days).
Case Comments	• Enter reason for testing • Enter any additional information from the Investigational Worksheet that does not have a specific entry field in CDRSS.

6 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements/Protection of Contacts of a Case

There are no isolation or quarantine restrictions.

B. Managing Special Situations

Hurricanes/Flooding

In the event of hurricanes/flooding, preventive measures should be taken to prevent exposures.

- Do not wade, swim, bathe, or put your head in, or swallow floodwater or any fresh water source that may be contaminated by floodwater or animal urine.
- Cover cuts or scratches with waterproof bandages or other coverings that seal out water.
- Do not walk outside barefoot. Wear waterproof protective clothing, gloves, closed shoes, or boots near water or wet soil that may be contaminated by animal urine or floodwater.
- Treat potentially contaminated water to make it safe for drinking by boiling or chemically treating.
- Prevent rodent infestation by keeping food and trash in closed containers and trapping rodents.

Infected pet

If a confirmed or probable case reports owning a pet infected with or that has clinical signs of leptospirosis, notify CDS via email at zoonoticrn@doh.nj.gov. Pets with clinical signs of leptospirosis should be assessed by a veterinarian. Clinical signs of leptospirosis in pets can include fever, decreased energy, loss of appetite, vomiting or diarrhea, changes in the amount or frequency of urination, dehydration, and yellowing of the skin and mucous membranes (jaundice). Leptospirosis is a reportable disease in domestic companion animals. LHDs should work with the treating veterinarian to complete the Zoonotic Disease Incident Report Form (CDS-32) and send a copy of the completed form via secure email to zoonoticrn@doh.nj.gov or via fax at 609-826-4874.

A Fact Sheet on leptospirosis in pets is available on the NJDOH website: https://www.nj.gov/health/cd/reporting/when/dcard.shtml

Households with an infected pet should take the following protective measures:

- Avoid any contact with the animal's urine, blood, or tissues. If the owner must clean up the animal's urine, wear appropriate protective equipment including gloves and boots.
- Thoroughly wash hands after handling the animal, or after touching materials with the animal's urine or excrement on it.
- Frequently wash pet bedding and surfaces with which the animal has contact.

Reported Incidence is Higher than Usual/Outbreak Suspected

If more than one case of leptospirosis is reported or suspected in a city or town, or if an outbreak is suspected, NJDOH IZDP should be notified at 609.826.5964. IZDP staff will help to investigate to determine the source of infection and mode of transmission. A common vehicle, such as infected animals or water, should be sought and applicable preventive or control measures should be instituted. IZDP staff can also help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and therefore be difficult to identify at a local level.

C. Preventive Measures

Environmental Measures

- Identify potentially contaminated waters and soil; when feasible, drain such waters and create physical barriers to prevent exposures to potential transmission sources
- Control rodents in and around homes, yards, and recreational areas

Preventive Measures/Education

To prevent future exposures, advise the following:

- Educate the public on sources of infection.
- Educate workers at occupational risk (such as farmers, sewer workers, slaughterhouse workers, or veterinarians and animal caretakers) about the symptoms of the disease,

and how it is spread. They should know the proper way to reduce exposure, such as wearing protective clothing, especially footwear, and covering cuts and abrasions with occlusive dressings.

- Restrict access to potentially infected water or land areas.
- Counsel persons at highest risk for leptospirosis
- Vaccinate dogs and livestock (effective against some serovars of leptospirosis)

Additional Information

A leptospirosis fact sheet is available at the NJDOH website at http://www.nj.gov/health/cd/leptospirosis/.

CDC fact sheet: https://www.cdc.gov/leptospirosis/resources/leptospirosis-fact-sheet.html

Prevention in pets: https://www.cdc.gov/leptospirosis/pets/prevention/index.html

References

American Academy of Pediatrics. *2015 Red Book: Report of the Committee on Infectious Diseases.* 30th ed. Elk Grove Village, IL: Academy of Pediatrics; 2015.

Centers for Disease Control and Prevention. Leptospirosis. Available at: http://www.cdc.gov/leptospirosis. Accessed May 1, 2017.

Massachusetts Department of Public Health, Division of Epidemiology and Immunization. *Guide to Surveillance and Reporting.* Jamaica Plain, MA: Author; January 2001.

Chin J, ed. *Control of Communicable Diseases Manual*. 20th ed. Washington, DC: American Public Health Association; 2014.

Notes from the Field: Investigation of Leptospirosis Underreporting—Puerto Rico, 2010. MMWR Weekly: June 8, 2012/61 (22); 421.

Outbreak of Leptospirosis among Adventure Race participants in Florida, 2005, Clin Inf Dis 2010 Mar 15;50(6): 843-9. https://www.ncbi.nlm.nih.gov/pubmed/20146629