

# Legionellosis

## Summary

Legionellosis is an acute bacterial disease with two distinct clinical and epidemiological manifestations: Legionnaires' disease and Pontiac fever. It was first recognized following a 1976 outbreak of pneumonia involving delegates at an American Legion convention and was named in the media as 'Legionnaires' disease'. Pontiac fever was named during an outbreak in 1968 in Pontiac, Michigan and it occurs in people of all ages and is often identified during outbreaks. Legionnaires' disease is a potentially fatal form of pneumonia and Pontiac fever is a self-limited 'flu-like' illness without pneumonia. Extrapulmonary *Legionella* has also been reported.

Legionellosis is seen most commonly in the elderly, immunocompromised, current and former smokers, and those with underlying lung disease such as emphysema. Infection in children is rare: it is usually unrecognized, asymptomatic or mild though severe disease has been seen in children with immunocompromising conditions and as healthcare-associated infection in newborns. Legionnaires' disease also commonly affects those with hotel or cruise ship stay reported during the two weeks prior to illness.

## Agent

*Legionella* are Gram-negative bacilli. In all, over 60 species and 74 serogroups have been recognized to date; *L. pneumophila* is responsible for >80% of infections. There are 18 serogroups of *L. pneumophila* are currently recognized; serogroup 1 causes much of the disease reported in the U.S. *Legionella* thrives in warm, aquatic environments and it is relatively resistant to the effects of chlorine and heat. *Legionella* grows in a variety of places such as soil and both man-made and natural water sources. They do not colonize the human respiratory tract.

## Transmission

Reservoir:

Water is the primary reservoir. *Legionella* can survive for months in tap and distilled water. The optimal temperatures in which *Legionella* organisms can multiply in water are between 25 – 42 °C (77 -108 °F) A variety of natural and man-made aqueous sources have been implicated, including warm, stagnant water such as that found in, or aerosolized from:

- Shower heads and faucets.
- Respiratory therapy equipment.
- Ultrasonic misters.
- Cooling towers, evaporative condensers, and fluid coolers using evaporation to reject heat. domestic hot-water systems with water heaters that operate below 60°C (140°F) and deliver water to taps below 50°C (122°F.)
- Humidifiers and decorative fountains that create a water spray and use water at temperatures favorable to growth.
- Spas and whirlpools.
- Dental water lines which are frequently maintained at temperature above 20°C (68°F) and sometimes as warm as 37°C (98.6°F) for patient comfort.

- Other sources including stagnant water in fire sprinkler systems and warm water for eye washes and safety showers.
- Potting soil and potting compost have been associated with *L. longbeachae*, a serogroup uncommon in the US. Foreign travel may be associated with acquisition of infection.

Mode of Transmission:

*Legionella* is generally spread through the air by aerosolized water which is then inhaled or microaspirated. Infection has also occurred by contamination of surgical wounds with potable water.

Period of Communicability:

It is not transmitted from person to person.

## Clinical Disease

Incubation period:

For Legionnaires' disease, 2–10 days (usually 5–6 days); for Pontiac fever, 24–48 hours (can be as short as 4 hours).

Illness:

Legionnaires' disease includes mild to severe pneumonia characterized initially by fever, cough, with or without chest pain, and progressive respiratory disease. Legionnaires disease can also be associated with chills, myalgia, and gastrointestinal, renal, and central nervous system manifestations. Respiratory failure and death can occur. Pontiac fever is a much milder syndrome--notable for the absence of pneumonia--and characterized by abrupt onset and a self-limited influenza-like illness. The influenza-like symptoms may include low-grade fever, headache, weakness, nausea, and a dry cough.

## Laboratory Diagnosis

For diagnostic testing, a combination of both culture of a lower respiratory tract specimen (e.g., sputum, swab, or bronchial washing) and urine antigen test should be performed. Culture of respiratory secretions on buffered charcoal yeast extract agar (BCYE) is required to isolate *Legionella sp.* The urine antigen screen is the most used diagnostic test available and it detects the most common cause of Legionnaires' disease, *L. pneumophila*, serogroup 1. The urine is positive for antigen on day one of illness and continues to be positive for weeks. Serologic tests are neither highly sensitive nor specific and should be interpreted with caution. A single acute serologic test is not sufficient to diagnose Legionnaires' disease. See laboratory criteria for diagnosis below. A new PCR test (BD ProbeTec ET™) will detect *L. pneumophila* serotypes 1 through 14 in sputum. Although approved for use by the FDA, extensive published clinical experience using this test is lacking.

## Treatment

For Legionnaires' disease, initially intravenous azithromycin or levofloxacin followed by oral administration as the patient improves is recommended. Fluoroquinolones (e.g., levofloxacin) are the drugs of choice for immunocompromised patients. Alternative drugs for treatment are doxycycline and trimethoprim-sulfamethoxazole. Treatment is recommended for 5-10 days for azithromycin and 14-21 days for other drugs. Treatment duration is longer with immunocompromised patients. Most patients will require management in an intensive care unit. Delay in treatment is associated with increased mortality rates.

Pontiac fever requires no specific treatment. Antimicrobial treatment is not recommended because the disease is not from bacterial replication. The disease results from host inflammation.

## Surveillance

Case Definition:

*Clinical Case Definition:*

Legionellosis is associated with two clinically and epidemiologically distinct illnesses:

- Legionnaires' disease: Characterized by fever, myalgia, cough, and clinical or radiographic pneumonia.
- Pontiac fever: Milder illness with flu-like symptoms (low-grade fever, headache, tiredness) and absent of pneumonia.

*Laboratory Criteria:*

*Confirmed*

A clinically compatible case that meets at least one of the confirmatory laboratory criteria listed below:

- By culture isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid.
- By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.
- By seroconversion with fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

*Suspected*

A clinically compatible case that meets at least one of the presumptive (suspected) laboratory criteria listed below:

- By seroconversion with fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6).
- By seroconversion with fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents.
- By the detection of specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody (DFA) staining, Immunohistochemistry (IHC), or other similar method, using validated reagents.
- By detection of *Legionella* species by a validated nucleic acid assay.

Reporting:

- Report all suspected or confirmed cases of legionellosis to the Epidemiology and Response Division (ERD) at 505-827-0006. Information needed includes: patient's name, age, sex, race, ethnicity, home address, home phone number, occupation, and health care provider.

- Travel-associated: a case that has a history of spending at least one night away from home, either in the same country of residence or abroad, in the ten days before onset of illness. These should be reported to CDC immediately.

#### Case Investigation:

- Complete the Legionella Case Form and fax the completed form to 505-827-0013. Investigation information should also be entered in NM-EDSS per established procedures.
- If the case is associated with travel (within two weeks of illness onset) the case should be reported within 24 hours to [travellegionella@cdc.gov](mailto:travellegionella@cdc.gov)

## Control Measures

### 1. Case management

- 1.1. Isolation: Standard precautions recommended.
- 1.2. Prophylaxis: Not applicable.

### 2. Contact management

- 2.1. Isolation: None required.
- 2.2. Prophylaxis: Not applicable.

### 3. Prevention

3.1. Monochloramine treatment of municipal water supplies has been associated with a decrease in health care-associated Legionnaires' disease. Hospitals should maintain hot water at the highest temperature allowable by state regulations or codes (preferably 60 degrees Celsius (140 degrees Fahrenheit) or greater and maintain cold water temperatures at less than 20 degrees Celsius (68 degrees Fahrenheit) to minimize waterborne *Legionella* contamination.

Appropriate biocides should be used to limit the growth of slime-forming organisms in cooling systems and the systems should be mechanically cleaned periodically. Tap water should not be used in respiratory therapy devices.

If there has been an identified outbreak of legionellosis, Occupational Safety and Health Administration (OSHA) requires that investigators "wear appropriate respiratory protection in the form of a half-face piece respirator equipped with a high-efficiency particulate absorption (HEPA) filter or a similar type of filter media capable of effectively collecting particles in the one micron size range during the examination of water systems if a significant potential exposure exists for high concentrations of contaminated aerosols." ([http://www.osha.gov/dts/osta/otm/otm\\_iii/otm\\_iii\\_7.html](http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_7.html))

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) also have recommendations regarding Prevention of Legionellosis Associated with Building Water Systems.

The investigation should include searching for common exposures among cases and possible environmental sources of infection, including inquiry regarding the following sources of exposure in the past two weeks: a) receiving dental work b) inpatient or outpatient hospital stay c) travel on a cruise ship d) recent hotel stay e) whirlpool, hot tub or Jacuzzi use. CDC maintains information for travelers and decontamination of hot tubs on their *Legionella* webpage. If a cluster of legionellosis is suspected, confirmation and

investigation are warranted, as morbidity may be significant and mortality high (up to 30%), and reservoirs may be found and remediated.

## References

American Academy of Pediatrics. In: Kimberlin, DW, et al eds. Red Book: 2018 Report of the Committee on Infectious Diseases. 31st ed. Itasca, IL: American Academy of Pediatrics; 2018.

Heymann, DL, ed. Control of Communicable Diseases Manual. 19<sup>th</sup> edition. Washington, DC: American Public Health Association; 2008.

Clin Infect Dis. (2007) 44 (Supplement 2): 527-572. doi: 10.1086/511159

Technical Manual Legionella [http://www.osha.gov/dts/osta/otm/otm\\_iii/otm\\_iii\\_7.html](http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_7.html)

Tijet N, Tang P, Romilowych M, Duncan C, Ng V, David N, et al. New endemic *Legionella pneumophila* serogroup 1 clones, Ontario, Canada. Emerg Infect Dis 2010 Mar. Available from <http://wwwnc.cdc.gov/eid/article/16/3/08-1689.htm>

See Legionellosis Fact Sheets ([English](#)) ([Spanish](#)).