
	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 1 of 8

## Legionellosis Table of Contents

- Overview
- [About the Disease \(CDC\)](#)
- [Clinician Information \(CDC\)](#)
- 2013 Nationally Notifiable Condition and Case Definitions
- Information Needed for Investigation
- Public Health Partner Notification
- Control Measures
- Laboratory Procedures
- Reporting Requirements
- References
- Disease Case Report (CD-1)    [PDF format](#)    [Word format](#)
- [Legionellosis Case Report \(CDC 52.56\)](#)
- [Missouri Outbreak Surveillance Report \(CD-51\)](#)
- [Sample Letter to Hotel Owners \(CDC\)](#)

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 2 of 8

## Legionellosis

### **Overview** <sup>1, 2, 3, 5</sup>

Legionellosis is associated with two clinically and epidemiologically distinct illnesses: Legionnaire's disease and Pontiac fever. Legionnaire's disease is caused by gram-negative bacilli called *Legionella*. The bacteria received its name in 1976, when people attending a convention of the American Legion at the Bellevue-Stratford Hotel in Philadelphia suffered from an outbreak of pneumonia. The presentation ranged from mild flulike symptoms to multisystem organ failure. Of the 182 people infected, 29 died.

Legionnaire's disease varies in severity from mild to severe pneumonia characterized by fever, cough, and progressive respiratory distress. Legionnaire's disease can be associated with chills, myalgia, gastrointestinal tract, central nervous system, and renal manifestations. Respiratory failure and death can occur. The incubation period for Legionnaire's disease is 2 to 14 days.


Pontiac fever is a milder febrile illness without pneumonia that is characterized by an abrupt onset and a self-limited, influenza-like illness. The incubation period for Pontiac fever is 1 to 2 days.

There are at least 20 different species implicated in human disease, but the most common species causing infections in the U.S. are *Legionella pneumophila*, with most isolates belonging to serogroup 1. However, there have been multiple cases of community-acquired *Legionella longbeachae* associated with exposure to potting soil in Australia and the U.S.<sup>3</sup>

The *Legionella* bacteria are found naturally in the environment, usually in water. The bacteria grow best in warm water; like the kind found in; hot tubs, cooling towers, hot water tanks, shower heads, humidifiers, respiratory therapy equipment, water misters, warm water plumbing systems, and decorative fountains. Free-living amebas in the same waters support the intracellular growth and survival of the *Legionella* bacteria.<sup>3</sup> The illness is transmitted when people breathe in a mist or vapor (small droplets of water in the air) containing the bacteria. Person-to-person transmission of legionellosis has not been demonstrated.

Most healthy individuals do not become infected with *Legionella* bacteria after exposure. Persons at increased risk of infection are:<sup>5</sup>

- Older people (usually 50 years of age or older).
- Current or former smokers.
- Those with a chronic lung disease (like COPD or emphysema).
- Those with a weak immune system from diseases like cancer, diabetes, or kidney failure.
- People who take drugs that suppress (weaken) the immune system (like after a transplant operation or chemotherapy).

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 3 of 8

For a complete description of legionellosis, please refer to the following texts:

- *Control of Communicable Diseases Manual*. (CCDM), American Public Health Association. 19<sup>th</sup> ed. 2008.
- American Academy of Pediatrics. *Red Book: 2012 Report of the Committee on Infectious Diseases*. 29<sup>th</sup> ed. 2012.

## **2010 Case Definition – Legionellosis (*Legionella pneumophila*)<sup>4</sup> - (12/13)**

### ***Clinical Description***

Legionellosis is associated with two clinically and epidemiologically distinct illnesses: Legionnaires' disease, which is characterized by fever, myalgia, cough, and clinical or radiographic pneumonia; and Pontiac fever, a milder illness without pneumonia.

### ***Laboratory Criteria for Diagnosis***

#### ***Suspected:***

- By seroconversion: 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: 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.

#### ***Confirmed:***


- 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: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

### **Case Classification**

#### **Suspected**

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

- 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.

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 4 of 8

**Case Classification** (continued)

**Confirmed**

A clinically compatible case that meets at least one of the confirmatory laboratory criteria.


- 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.

**Information Needed for Investigation**

**Verify the diagnosis.** Obtain demographic, clinical, laboratory information, and other epidemiological information necessary to complete the [Disease Case Report \(CD-1\)](#) and the [Legionellosis Case Report](#) from the attending physician, hospital, laboratory, and/or patient, or a knowledgeable family member.

**Establish the extent of illness.** Determine if household or other close contacts are, or have been ill, by contacting the health care provider, patient or family member. Review surveillance data to determine whether any other cases of legionellosis have been reported in the same geographic area or institution. More than 20% of Legionnaires' disease cases reported to CDC are travel-associated. *COMMENT: Determine if the case traveled, spending at least one night away from the home during the 14 days prior to onset of disease. Identify traveling companions or others that may have congregated with the case (at meetings, conventions, etc.) during that travel.* Because of the public health importance of timely reporting, please provide the [CDC Legionellosis Case Report Form](#) to the [District Communicable Disease Coordinator](#) as soon as possible. The CDC will be notified of any travel-associated cases promptly. CDC will notify the state health departments where the patient traveled.

**Identifying the source of infection.** People get Legionnaires' disease or Pontiac fever when they breathe in a mist or vapor (small droplets of water in the air), usually from warm water sources that have been contaminated with *Legionella* bacteria. The bacteria are not spread from one person to another person. After confirming a case of legionellosis and completing the [CDC Legionellosis Case Report Form](#), the [CDC Legionellosis Hypothesis-Generating Questionnaire](#) can be used to collect additional epidemiologic data that may be useful in detecting outbreaks or may be used in future cluster/outbreak investigations. The [CDC Legionellosis Cruise Ship Questionnaire](#) can be used to collect additional epidemiological data for cases that may be cruise ship associated. The information obtained through the use of the above investigation tools are used to identify possible sources of infection and to characterize persons or geographic areas in which additional efforts are needed to raise awareness and reduce disease incidence. *NOTES: Sometimes the source of infection is not identified. Since Legionella can be found in a wide variety of water sources at low levels, it is difficult to prove a particular source was the cause of illness unless multiple cases occur that implicate the*

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 5 of 8

suspected “source”. Alleged sources should not be tested based on a single community-acquired case.

**Provide information about legionellosis to persons at risk for infection and the general public.** Efforts should be made to promote *Legionella* awareness and provide prevention information to the public to reduce the risk of legionellosis. Information on legionellosis prevention can be found on CDC’s website at:

<http://www.cdc.gov/legionella/about/prevention.html>.

**Legionellosis Surveillance.** Review WebSurv to determine whether there have been other cases in the same geographic area or institution. *NOTE: When cases are related by person, place, time, or serogroup, efforts should be made to identify a common source.*

**Travel-Associated Legionellosis Cases**


It is estimated that more than 20% of cases of legionellosis are associated with travel. Many of these cases occur among cruise ship passengers or persons staying overnight in large hotels. Like other travel-related infectious diseases, the identification of any given outbreak is hindered by the difficulties inherent in detecting clusters of infections among persons who have recently dispersed from a point source and returned to their homes. Timely reporting of travel-associated cases with complete travel information is essential to the early identification and control of such sources of infection. Use of the Hypothesis Generating Questionnaire from CDC's [Legionellosis Resource Site](#) may be helpful when interviewing cases.

1. Within 7 days of the notification of a legionellosis case, the investigating health department should ascertain whether the case-patient spent at least one night away from home in the 2 weeks before onset of illness.
2. If a history of travel is present in the 2 weeks before onset of illness please complete the [CDC Legionellosis Case Report Form](#) and forward the report to the appropriate [District Communicable Disease Coordinator](#) for transmittal to CDC.
3. If the completed CDC Legionellosis Report Form cannot be submitted within 7days; please provide the following information at a minimum to the [District Communicable Disease Coordinator](#): onset date, laboratory results supporting the diagnosis, travel dates, travel location, hotel / resort name, or cruise ship name, and room number.
4. DHSS will notify CDC of the possibility of travel-associated cases.
5. Health departments may choose to notify the hotel (see [sample letter](#)).
6. CDC will notify the state health departments where the patient traveled.

**Notification**

- Contact the [District Communicable Disease Coordinator](#), the [Senior Epidemiology Specialist](#) for the District, or the Missouri Department of Health and Senior Services (MDHSS) - BCDCP, phone (573) 751-6113, Fax (573) 526-0235, or for afterhours notification contact the MDHSS/ERC at (800) 392-0272 (24/7) immediately if an outbreak\* of *Legionella* is suspected.



	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 6 of 8

- If a case(s) is associated with a childcare center, BCDCP or the LPHA will contact the BEHS, phone (573) 751-6095, Fax (573) 526-7377 and the Section for Child Care Regulation, phone (573) 751-2450, Fax (573) 526-5345.
- If a case(s) is associated with a lodging establishment's hot tub, Jacuzzi, or pool, BCDCP or the LPHA will contact BEHS, phone (573) 751-6095, Fax (573) 526-7377.
- If a case(s) is associated with a long-term care facility, BCDCP or the LPHA will contact the Section for Long Term Care Regulation, phone (573) 526-8524, Fax (573) 751-8493.
- If a case is associated with a hospital, hospital-based long-term care facility, or ambulatory surgical center BCDCP or the LPHA will contact the Bureau of Health Services Regulation phone (573) 751-6303, Fax (573) 526-3621.
- Contact the Department of Natural Resources, Public Drinking Water Branch, at (573) 751- 1187, Fax (573) 751-3110 if cases are associated with a public water supply, or BEHS, phone (573) 751-6095, Fax (573) 526-7377, if cases are associated with a private water supply.

\*Outbreak is defined as the occurrence in a community or region, illness(es) similar in nature, clearly in excess of normal expectancy and derived from a common or a propagated source.

### **Control Measures**

The key to preventing legionellosis is maintenance of the water systems in which *Legionella* grow, including drinking water systems, hot tubs, decorative fountains, and cooling towers. There are no vaccines that can prevent legionellosis, and prior infection does not necessarily prevent infection.<sup>3</sup> Persons at **increased risk of infection** may choose to avoid high-risk exposures, such as being in or near a hot tub. Additional prevention information can be found on CDC's website at:


<http://www.cdc.gov/legionella/about/prevention.html>. *NOTES: For outbreaks or clusters, work with an environmental public health specialist to identify and isolate the source of the infection.* Environmental Specimen Collection and Management Tools are available on CDC's Website at: <http://www.cdc.gov/legionella/specimen-collection/index.html>.

### **Laboratory Procedures**

**Specimens:** The Missouri State Public Health Laboratory (MSPHL) does **not** test clinical specimens for *Legionella*. The MSPHL can test isolates to determine the following:

- *Legionella pneumophila* serogroup 1
- *Legionella pneumophila* serogroups 2-14
- *Legionella* species

*NOTES: Consult with the District Communicable Disease Coordinator prior to collecting or submitting specimens.* CDC laboratory testing is only done under special circumstances, (e.g., an outbreak investigation that CDC is involved with, or if CDC has

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 7 of 8

granted prior permission for submission of specimens). Routine laboratory submissions are not accepted by the CDC's laboratories.

Commercial clinical laboratory tests may include: <sup>2</sup>

- *Legionella* Species by culture. **COMMENT:** Sensitivity is laboratory dependent.
- *Legionella* DNA, using molecular amplification and detection technologies.
- *Legionella pneumophila* serogroup 1 by urine immunoassay is highly specific. **COMMENT:** This test will rarely detect species or serogroups other than *Legionella pneumophila* serogroup 1.
- *Legionella pneumophila* serogroup 1 by serologic evidence of a fourfold increase in titer of antibodies measured by indirect immunofluorescent antibody assay confirms a recent infection. The convalescent serum sample should be obtained 3-4 weeks after onset of symptoms. **COMMENTS:** The positive predictive value of a single titer of 1:256 or greater is low and does not provide definitive evidence of infection. False-positive reactions have been associated with several gram-negative organisms, including *Pseudomonas* species, *Bacteroides fragilis*, and *Campylobacter jejuni*.
- *Legionella pneumophila*, direct immunofluorescent assay. **COMMENT:** This test is less sensitive, and the specificity is technician dependent.


**Environmental samples:** Generally, it is unproductive to collect environmental samples without epidemiological evidence identifying a possible source. **NOTES:** Arrangements must be made with BEHS prior to environmental sample collection. When environmental samples are indicated, contact MSPHL prior to collection. This test is not routinely performed at the MSPHL, and special arrangements will have to be made.

### **Reporting Requirements**

Legionellosis is a Category 3 disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services within three (3) calendar days of first knowledge or suspicion.

As a Nationally Notifiable Condition, **confirmed and suspected** legionellosis cases are a **STANDARD** report to the Centers of Disease Control and Prevention (CDC). **STANDARD** reporting requires the Missouri Department of Health and Senior Services (MDHSS) to report to CDC by electronic transmission via WebSurv within the next normal reporting cycle.

1. For confirmed and suspected cases, complete a [Disease Case Report](#) (CD-1) and a [CDC Legionellosis Case Report Form](#) (CDC 52.56).
2. Entry of the completed CD-1 into the WebSurv database negates the need for the paper CD-1 to be forwarded to the District Health Office.
3. Send the completed Legionellosis Case Report to the District Health Office. The completed form will be faxed to CDC weekly.
4. MDHSS will submit weekly electronic reports to CDC.

	Division of Community and Public Health	
	<b>Section: 4.0 Diseases and Conditions</b>	Revised 12/13
	Subsection: Legionellosis	Page 8 of 8

5. All outbreaks or “suspected” outbreaks must be reported as soon as possible (by phone, fax or e-mail) to the District Communicable Disease Coordinator. This can be accomplished by completing the [Missouri Outbreak Surveillance Report](#) (CD-51).
6. If an outbreak is associated with the consumption or use of water for drinking, or with ingestion, contact, or inhalation of recreational water, a CDC 52.12 form ([National Outbreak Reporting System - Waterborne Disease Transmission](#)) is to be completed and submitted to the District Communicable Disease Coordinator at the conclusion of the outbreak.
7. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the District Communicable Disease Coordinator.

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1. Hicks L, *Legionellosis*. In: Heymann D Ed. *Control of Communicable Diseases Manual*: 19<sup>th</sup> ed. Washington, DC: American Public Health Association; 2008: 337-340.
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### **Other Sources of Information**

Butler J C, Breiman RF. Legionellosis. In Evans AS, Brachman PS, editors, *Bacterial Infections of Humans Epidemiology and Control*: 3rd Ed. New York: Plenum; c1998. p. 355-370.