

# Legionellosis

<b>Signs and Symptoms</b>	<p>Three clinically distinct illnesses fall under the category of legionellosis. Legionnaires' disease (characterized by pneumonia), Pontiac Fever (a mild illness without pneumonia) and extrapulmonary legionellosis (infection at a site other than lungs).  <a href="https://www.cdc.gov/legionella/index.html">https://www.cdc.gov/legionella/index.html</a> (CDC) and  <a href="https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf">https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf</a> (case definition effective 1/1/2020)</p>	
<b>Incubation</b>	<p>Legionnaires' disease: the 14 days before symptom onset          Pontiac fever: 24-72 hours before symptom onset          Extrapulmonary legionellosis: no standardized incubation period defined</p>	
<b>Source of Infection</b>	<p>Caused by <i>Legionella</i> bacteria which are found naturally in freshwater environments. <i>Legionella</i> can become a health concern when the bacteria proliferate in human-made water systems. People can acquire legionellosis when they breathe in aerosolized contaminated water. Extrapulmonary legionellosis is rarely described but can be acquired in a variety of manners such as infection of a wound. Person-to-person transmission has been only extremely rarely documented.</p>	
<b>Case classification</b>	<p><b>Confirmed case:</b> A clinically compatible case that meets at least one of the confirmatory laboratory criteria.  <b>Suspect case:</b> A clinically compatible case that meets at least one of the suspect laboratory criteria.</p>	<p><b>Probable case:</b> A clinically compatible case with an epidemiologic link to a setting with a confirmed source of legionella or an epidemiologic link to a setting with a suspected source of <i>Legionella</i> associated with at least one confirmed case before onset of symptoms. (New CSTE category in 2020; unclear how this will be used in practice.)</p>
<b>Differential diagnosis</b>	<p>For Legionnaires' disease, consider other causes of pneumonia, including viral, bacterial and fungal agents.</p>	
<b>Treatment</b>	<p>Antibiotics for Legionnaires' disease, supportive care for Pontiac Fever.</p>	
<b>Laboratory</b>	<p><b>Clinicians should collect urine (for urine antigen) and respiratory specimen (for <i>Legionella</i> culture) for all suspected legionellosis cases.</b> <a href="https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html">https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html</a></p> <p>Environmental testing for <i>Legionella</i>, if indicated, should occur at a certified Environmental Legionella Isolation Techniques Evaluation (ELITE) lab. <a href="https://www.cdc.gov/legionella/labs/elite.html">https://www.cdc.gov/legionella/labs/elite.html</a> Technical assistance with environmental assessment and sampling during nosocomial and cluster investigations is available from the Department of Health—contact DOH CDE at 206-418-5500.</p>	
<b>Public Health investigation</b>	<p>For all cases, interview using the DOH WDRS form and enter into WDRS:  <a href="https://www.doh.wa.gov/Portals/1/Documents/5100/210-034-ReportForm-Legion.pdf">https://www.doh.wa.gov/Portals/1/Documents/5100/210-034-ReportForm-Legion.pdf</a></p> <p>In cluster investigations, consider using the CDC hypothesis generating questionnaire:  <a href="https://www.cdc.gov/legionella/downloads/template-hypothesis-generating-questionnaire-508.docx">https://www.cdc.gov/legionella/downloads/template-hypothesis-generating-questionnaire-508.docx</a></p> <p>Goal of public health investigation is to determine if cases are possibly healthcare or travel associated, and to collect exposure information in order to identify possible clusters of illness and remediate source.</p>	

# Legionellosis

## 1. DISEASE REPORTING

### A. Purpose of Reporting and Surveillance

1. To identify sources of transmission (e.g., contaminated water source) and prevent further transmission from such a source.
2. To identify outbreaks and educate potentially exposed persons and healthcare providers about signs and symptoms of disease, thereby facilitating early diagnosis and treatment.

### B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 24 hours
2. Health care facilities: notifiable to local health jurisdiction within 24 hours
3. Laboratories: *Legionella* species notifiable to local health jurisdiction within 24 hours; submission of *Legionella* isolates required (2 business days)
4. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (CDE) within 7 days of case investigation completion or summary information required within 21 days

### C. Local Health Jurisdiction Investigation Responsibilities

1. Begin follow-up investigation within one working day.
2. Ensure that laboratories forward the first isolate from each patient to the Public Health Laboratories for molecular studies in the event a subsequent cluster is detected.
3. Report all *confirmed*, *probable*, and *suspect* cases (see definition below) to CDE. Complete the legionellosis report form (available at <https://www.doh.wa.gov/Portals/1/Documents/5100/210-034-ReportForm-Legion.pdf>) and enter the data into the Washington Disease Reporting System (WDRS). Note that for cases with onset in CDC year 2019, use the 2019 wizard. For cases with onset in CDC year 2020, use the 2020 wizard.

## 2. THE DISEASE AND ITS EPIDEMIOLOGY

### A. Etiologic Agent

*Legionella* are Gram-negative bacilli. Numerous different species and serogroups can infect humans but most recognized infections are due to *L. pneumophila* serogroup 1. The extent to which this is due to testing bias is unclear (only *L. pneumophila* serogroup 1 is identified via commonly used urine antigen test; other species and serogroups must be identified via PCR or culture which is less commonly ordered). The bacteria thrive in warm aquatic environments and can survive for extended periods in potable water. Person-to-person transmission has only been extremely rarely documented.

## B. Description of Illness

Legionellosis was first recognized following a 1976 outbreak of pneumonia involving American Legion convention delegates, so was named by the press “Legionnaires’ disease.” Illness is usually associated with two clinically and epidemiologically distinct syndromes: Legionnaires’ disease, a potentially fatal form of pneumonia, and Pontiac fever, a self-limited illness without pneumonia.

Rarely, *Legionella* can cause disease at sites outside the lungs (for example, associated with endocarditis, wound infection, joint infection, graft infection); this is termed extrapulmonary legionellosis.

Note that a new case definition was adopted in June 2019 and goes into effect January 1, 2020. Legionnaires’ disease and Pontiac Fever clinical presentation were better defined, and a new category of extrapulmonary Legionellosis was added. See [https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04\\_Legionellosis\\_final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf)

Persons at increased risk for Legionnaires’ disease include those over 50 years of age, smokers, and those with certain medical conditions such as COPD, diabetes, and immunosuppression. For more, see <https://www.cdc.gov/legionella/clinicians/clinical-features.html>.

## C. Legionellosis in Washington

During recent years, 50 to 70 cases have been reported annually, with usually 10 percent of cases being fatal.

## D. Reservoirs

Water is the primary reservoir. *Legionella* can survive for extended periods in potable water.

## E. Modes of Transmission

Outbreaks have implicated contaminated plumbing systems including hot water tanks and shower heads and faucets, as well as mist from cooling towers, whirlpool spas, respiratory therapy equipment, and decorative fountains including water walls. The bacteria multiply in warm water and are often associated with biofilms. Sloughing of biofilms due to jarring of plumbing (such as may occur in construction) or changes in water chemistry (such as changes in chlorination procedures or water source) can cause *Legionella* bacteria, if present in the biofilm, to be released into the plumbing system. If a susceptible person breathes in aerosolized water containing the bacteria, infection can result. Attack rates are low for Legionnaires’ disease (CDC estimates that less than 5 percent of exposed persons develop Legionnaires’ disease in the context of an identified outbreak) but high for Pontiac fever (greater than 90 percent). See <https://www.cdc.gov/legionella/clinicians/clinical-features.html>

Potting soil has been associated with *L. longbeachae* infections, a serogroup uncommon in the United States.

Person-to-person transmission has only been extremely rarely documented.

## F. Incubation Period

For Legionnaires' disease, the 14 days before onset; for Pontiac fever, the 24 to 72 hours before onset. There is no defined incubation period for extrapulmonary legionellosis.

## G. Period of Communicability

Person to person transmission has been only rarely documented.

## H. Treatment

Legionnaires' disease should be treated promptly with appropriate antibiotics. Delay in treatment is associated with increased mortality rates. Pontiac fever requires no specific treatment. For cases of extrapulmonary legionellosis, infection disease specialist consultation may be warranted.

# 3. CASE DEFINITIONS

## A. Clinical Criteria for Diagnosis

Note a new case definition was adopted that goes into effect January 1, 2020.

[https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04\\_Legionellosis\\_final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf)

Legionellosis is associated with three clinically and epidemiologically distinct illnesses:

Legionnaires' disease: Presents as pneumonia, diagnosed clinically and/or radiographically. Evidence of clinically compatible disease can be determined several ways: a) a clinical or radiographic diagnosis of pneumonia in the medical record OR b) if "pneumonia" is not recorded explicitly, a description of clinical symptoms that are consistent with a diagnosis of pneumonia<sup>1</sup>.

Pontiac fever: A milder illness. While symptoms of Pontiac Fever could appear similar to those described for Legionnaires' disease, there are distinguishing clinical features. Pontiac Fever does not present as pneumonia. It is less severe than Legionnaires' disease, rarely requiring hospitalization. Pontiac Fever is self-limited, meaning it resolves without antibiotic treatment.

Extrapulmonary Legionellosis: *Legionella* can cause disease at sites outside the lungs (for example, associated with endocarditis, wound infection, joint infection, graft infection). A diagnosis of extrapulmonary legionellosis is made when there is clinical evidence of disease at an extrapulmonary site and diagnostic testing indicates evidence of *Legionella* at that site.

## B. Laboratory Criteria for Diagnosis

### 1. Suspect:

- 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)
- Fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigens.

- Detection of specific *Legionella* antigen or staining of the organism in lower respiratory secretions, lung tissue, pleural fluid, or extrapulmonary site associated with clinical disease by direct fluorescent antibody (DFA) staining, immunohistochemistry (IHC), or other similar method, using validated reagents

2. *Confirmed:*

- Isolation of any *Legionella* organism from lower respiratory secretions, lung tissue, pleural fluid, or extrapulmonary site
- Detection of any *Legionella* species from lower respiratory secretions, lung tissue, pleural fluid, or extrapulmonary site by a validated nucleic acid amplification test
- Detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents
- Fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents

3. *Probable:*

- No lab criteria required for case classification

**C. Epidemiologic Linkage**

- 1) Epidemiologic link to a setting with a confirmed source of *Legionella* (e.g., positive environmental sampling result associated with a cruise ship, public accommodation, cooling tower, etc.)

OR

- 2) Epidemiologic link to a setting with a suspected source of *Legionella* that is associated with at least one confirmed case.

**D. Case Definition (goes into effect January 1, 2020)**

**Confirmed Legionnaires' disease:**

A clinically compatible case of Legionnaires' disease with confirmatory laboratory evidence for *Legionella*.

**Probable Legionnaires' disease:**

A clinically compatible case with an epidemiologic link during the 14 days before onset of symptoms.

**Suspect Legionnaires' disease:**

A clinically compatible case of Legionnaires' disease with supportive laboratory evidence for *Legionella*.

**Confirmed Pontiac fever:**

A clinically compatible case of Pontiac Fever with confirmatory laboratory evidence for *Legionella*.

**Probable Pontiac fever:**

A clinically compatible case with an epidemiologic link during the 3 days before onset of symptoms.

**Suspect Pontiac fever:**

A clinically compatible case of Pontiac Fever with supportive laboratory evidence for *Legionella*.

**Confirmed Extrapulmonary legionellosis:**

A clinically compatible case of extrapulmonary legionellosis with confirmatory laboratory evidence of *Legionella* at an extrapulmonary site.

**Suspect Extrapulmonary legionellosis:**

A clinically compatible case of extrapulmonary legionellosis with supportive laboratory evidence of *Legionella* at an extrapulmonary site.

**4. DIAGNOSIS AND LABORATORY SERVICES****A. Laboratory Diagnosis**

Urinary antigen assay **and** culture of respiratory secretions on selective media are together the preferred diagnostic tests for confirming Legionnaires' disease. For more on clinical testing, see <https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html>

- Urine antigen tests: Rapid immunoassays are available commercially to detect *Legionella* antigens in urine. Urine antigen tests only pick up *L. pneumophila* serogroup 1. The duration of antigen excretion in urine varies, with some individuals excreting only transiently (allowing for the possibility of a positive urine antigen test followed by a negative results shortly thereafter, if repeat testing is ordered) and some excreting for weeks or months after illness. Per discussion with CDC note that if there is a single urine antigen positive result in a patient with illness clinically consistent with Legionnaires' disease or Pontiac Fever, this is sufficient to classify the case as confirmed. If a case subsequently tests urine antigen negative, the case would still be considered confirmed based on the initial result. Contact CDE to discuss any testing concerns.
- Culture: *Legionella* bacteria can be isolated from lower respiratory tract secretions, lung tissue, and pleural fluid by using special media. The sensitivity of culture is highly variable depending on the severity of illness, antibiotic initiation and the experience of the laboratorian performing the test. The advantage of culture is that it can be used to detect all species and serogroups and allow for comparison with environmental samples, if available. Note that per discussion with CDC, in individuals with a dry cough for whom little mucus is secreted, it is still useful to obtain a sputum sample as it may still be possible to culture *Legionella* from a specimen that is "more spit than mucus" (per CDC description). If a sputum sample is not feasible, a bronchial alveolar lavage (BAL) or bronchial wash can also be used to collect a respiratory specimen.
- Polymerase chain reaction (PCR): *Legionella* DNA can be isolated from lower respiratory tract secretions, lung tissue, pleural fluid and other specimens using PCR Nucleic Acid Amplification Testing (NAAT) methods. In some instances, respiratory specimens associated with a positive PCR result can be sent to PHL for attempt of culture from the respiratory specimen.

- Other testing methods, including direct fluorescent antibody (DFA) and paired serology are available, but are not preferred diagnostic methods.

## B. Services Available at the Washington State Public Health Laboratories (PHL)

PHL can perform diagnostic and environmental testing for *Legionella*.

Please see the PHL test menu:

<https://www.doh.wa.gov/ForPublicHealthandHealthcareProviders/PublicHealthLaboratories/MicrobiologyLabTestMenu>

In general, urine (for urine antigen) and respiratory specimens (for culture and/or PCR) from patients with suspected Legionnaires' disease should be sent commercially.

PHL can perform PCR and culture from clinical specimens; pre-approval is not required.

If an environmental testing is indicated, environmental specimens should be sent for *Legionella* testing at an ELITE lab. CDC maintains a list of labs certified to perform *Legionella* testing from environmental specimens (program is called Environmental *Legionella* Isolation Techniques Evaluation or ELITE). See

<https://www.cdc.gov/legionella/labs/elite.html>. PHL obtained ELITE status in 2019.

PHL can perform free environmental testing of water upon pre-approval of the LHJ and DOH. In general, such pre-approval for free environmental testing at PHL will be granted only for outbreak or other special circumstances. Please call CDE for consultation as needed at 206-418-5500.

Note that DOH Division of Environmental Public Health (EPH) may be able to provide consultation and technical assistance regarding the environmental health aspects of *Legionella* case and cluster investigations and primary prevention efforts. They also provide capacity building and training for local environmental health. Call CDE at 206-418-5500 to discuss your needs and to be connected to appropriate staff in EPH.

*Legionella* isolates from patients must be submitted by commercial labs to PHL. If an environmental investigation identifies *Legionella*, those isolates (if tested elsewhere than PHL) should also be submitted to PHL.

CDC is able to perform sequence based typing and whole genome sequencing to match patient and environmental isolates. Contact CDE to facilitate such testing.

Isolates shipped to PHL should include a completed DOH Microbiology form (<http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf>). Note that for environmental isolates, the same form should be used, with details of the environmental collection site in place of patient name.

## C. Specimen Collection

Isolates should be submitted to PHL on media that support their growth. It is highly preferred that urine *plus* respiratory specimen be collected for all suspected cases. Culture (preferred, as then there is a bacterial isolate) or PCR results are necessary in order to identify illness due to non-*L. pneumophila* serogroup 1. In addition, to match patient isolates to each other or to an environmental source, culture is preferred.

## 5. ROUTINE CASE INVESTIGATION

Interview the case and others who may be able to provide pertinent information. As most cases of legionellosis present as sporadic disease, routine case investigation is limited to collecting information on demographics, the basis of diagnosis, risk factors for disease, and potential sources of infection.

### A. Evaluate the Diagnosis

Using the case report form, itemize signs and symptoms and obtain copies of laboratory reports that support the diagnosis. Urinary antigen assay **and** culture for the organism are together the preferred diagnostic tests for confirming Legionnaires' disease. If *Legionella* is isolated from the patient, ensure that the laboratory sends the isolate to the Public Health Laboratories for molecular studies in the event a subsequent cluster is detected.

### B. Manage the Case

Hospitalized patients should be cared for using standard precautions.

### C. Identify Potential Sources of Infection

Ask about potential exposures in the 14 days prior to onset including:

- Time spent in a hospital or other healthcare setting including long-term care as an inpatient, outpatient or employee;
- Exposure to aerosolized water;
- Travel;
- Spending as least one night away from the home; and
- Exposure to soil.

Investigate all travel-associated cases and nosocomial cases, particularly persons hospitalized during the entire exposure period (See Managing Special Situations).

### D. Identify Other Potentially Exposed Persons

Promptly report travel-associated and possibly or definitely nosocomial cases to CDE.

### E. Manage Other Potentially Exposed Persons

Increased surveillance may be appropriate for others exposed to the same source.

### F. Environmental Evaluation

For consultation regarding environmental evaluation, contact CDE at 206-418-5500 for referral to appropriate EPH staff.

## 6. MANAGING SPECIAL SITUATIONS

### A. Healthcare-Associated Case

For consultation, contact CDE. If needed, CDE is able to arrange conference calls with CDC Legionnaires' disease epidemiology, laboratory and environmental health subject matter experts to discuss complex situations. Such calls can also include staff from across DOH and other state agencies to ensure coordinated response to healthcare associated cases.



Note that the CSTE case definition adopted in June 2019 and going into effect January 1, 2020 modified the definitions for healthcare associated Legionnaires' disease.

According to the CSTE case definition appendix

([https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04\\_Legionellosis\\_final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf)):

“Public health response to cases, including defining an outbreak or decisions regarding an environmental investigation, will be based on the local or state jurisdiction’s assessment of the *Legionella* exposure risk at the identified facility/facilities and evidence of epidemiologic links.

Standardized reporting definitions for healthcare-associated Legionnaires' disease:

**Presumptive healthcare-associated Legionnaires' disease:** A case with  $\geq 10$  days of continuous stay at a healthcare facility during the 14 days before onset of symptoms.

**Possible healthcare-associated Legionnaires' disease:** A case that spent a portion of the 14 days before date of symptom onset in one or more a healthcare facilities, but does not meet the criteria for presumptive healthcare-associated Legionnaires' disease.”

CDC will be modifying their website based on the above new definitions.

Please reference <https://www.cdc.gov/legionella/health-depts/healthcare-resources/index.html>

For template letters that may be modified and used in special circumstances, please see <https://www.cdc.gov/legionella/health-depts/communications-resources.html>

## B. Travel-Associated Case

A travel-associated Legionnaires' disease case is defined as a case of Legionnaires' disease in a patient who has a history of spending at least one night away from home (excluding healthcare settings) in the 14 days before onset of illness.

A travel-associated Pontiac fever case is defined as a case of Pontiac fever in a patient who has a history of spending at least one night away from home (excluding healthcare settings) in the 3 days before onset of illness.

- Report travel-associated cases promptly to CDE in WDRS.
- Obtain lodging or cruise ship information including facility name, address, room number, and dates spent at the facility, and if a spa was present even if not used.
- Ask about others in the travel group who may be ill.

CDC does have a template letter that LHJs can choose to modify and send to hotels regarding a single Legionnaires' disease case possibly associated with the hotel. Note that this letter does not imply that the hotel is the source of illness (scroll to hotels):

<https://www.cdc.gov/legionella/health-depts/communications-resources.html>

### C. Clusters of illness

If a cluster of legionellosis is suspected, confirmation and investigation are warranted, as morbidity may be significant and mortality high, and reservoirs may be found and eliminated. Contact CDE for consultation and connection to appropriate resources.

Note that DOH EPH may be available to assist with environmental investigations, including consultation on sampling, remediation, and capacity building. Contact CDE for assistance, and we will facilitate involvement of DOH EPH and other partners as appropriate. It is important to also consult with the LHJ EH program when undertaking environmental investigations in order to ensure a coordinated response.

CDC does have extensive information about environmental assessment and sampling on its website, including instructional videos demonstrating appropriate water sampling methods.

See <https://www.cdc.gov/legionella/health-depts/inv-tools-cluster/environmental-inv-tools.html>.

## 7. ROUTINE PREVENTION

**A. Immunization Recommendations:** None

### B. Prevention Recommendations

CDC has a strong emphasis on primary prevention via educating building owners and operators about the importance of water management programs.

Healthcare facilities are required by CMS to have water management programs. See <https://www.cdc.gov/legionella/wmp/healthcare-facilities/federal-requirement.html>

For more information about water management programs, see <https://www.cdc.gov/legionella/wmp/index.html>

## ACKNOWLEDGEMENTS

This document is a revision of the Washington State Guidelines for Notifiable Condition Reporting and Surveillance published in 2002 which were originally based on the Control of Communicable Diseases Manual (CCDM), 17<sup>th</sup> Edition; James Chin, Ed. APHA 2000. We would like to acknowledge the Oregon Department of Human Services for developing the format and select content of this document.

## UPDATES

April 2010: The guideline was reviewed. Changes were made to Section 7A.

January 2011: The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision.

June 2012: The guideline was reviewed. No significant changes were made.

June 2014: The guideline was reviewed. No significant changes were made.

November 2014: A change was made to Section 1C: Local Health Jurisdiction Investigation Responsibilities, directing LHJs to complete the CDC Legionellosis Case Report form for all confirmed and suspect cases and fax the completed CDC form to DOH CDE.

October 2017: Front page added, extensive updates to the managing special situations section and increased information about appropriate laboratory testing and water management.

March 2018: Edited to change mentions of PHIMS to WDRS. Removed mention of CDC Legionnaires' disease case report form, as sending such form to CDE is no longer required given that WDRS contains all of the questions on the CDC form.

December 2019: Edited in accordance with the CSTE case definition adopted in June 2019 that goes into effect January 1, 2020. Case definition is here: [https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04\\_Legionellosis\\_final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf) Edits made in accordance with the updated case definition include addition of extrapulmonary legionellosis, inclusion of a new probable epi-link category, updating PCR positive cases from suspected to conformed, updating of travel-associated and healthcare-associated case definitions and updating of the Legionnaires' disease incubation period from 2-10 days to the 14 days before onset.