## Legionellosis

| Signs and Symptoms | Two clinically distinct illnesses fall under the category of legionellosis. Legionnaires’ disease: characterized by cough, shortness of breath, muscle aches, headache, fever and clinical or radiographic pneumonia. Pontiac fever: a milder flu-like illness *without* pneumonia. CDC has extensive information about legionellosis: [https://www.cdc.gov/legionella/index.html](https://www.cdc.gov/legionella/index.html) |
| Incubation         | Legionnaires’ disease: 2-10 days; Pontiac fever: 24-72 hours |
| Source of Infection| Caused by *Legionella* bacteria which are found naturally in freshwater environments like lakes and streams. *Legionella* can become a health concern when the bacteria proliferate in human-made water systems like cooling towers, hot tubs, decorative fountains, water tanks and heaters and large plumbing systems. The bacteria are often associated with biofilms. People can acquire legionellosis when they breathe in aerosolized contaminated water. Person-to-person transmission has been only extremely rarely documented. |
| Case classification| **Confirmed case:** A clinically compatible case that meets at least one of the confirmatory laboratory criteria. **Suspect case:** A clinically compatible case that meets at least one of the suspect laboratory criteria. |
| Differential diagnosis| Consider other causes of pneumonia, including viral, bacterial and fungal agents. |
| Treatment          | Antibiotics for Legionnaires’ disease, supportive care for Pontiac Fever. |
| Laboratory         | Clinicians should collect urine (for urine antigen) and respiratory specimen (for *Legionella* culture) for *all* suspected legionellosis cases. [https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html](https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html) Clinical testing should be ordered commercially. *Legionella* clinical isolates must be submitted to the Washington state Public Health Laboratories (PHL). Note that the urine antigen test only identifies *Legionella pneumophila* serogroup 1, but other species and serogroups of *Legionella* cause illness. Thus a negative urine antigen test does not rule out *Legionella*. Respiratory culture is necessary in order to obtain a clinical isolate. **In the event of a cluster or nosocomial investigation, it is crucial to have a clinical isolate for comparison to environmental and other patient isolates.** |
| Laboratory         | Environmental testing for *Legionella*, if indicated, should occur at a commercial Environmental Legionella Isolation Techniques Evaluation (ELITE) lab. [https://www.cdc.gov/legionella/labs/elite.html](https://www.cdc.gov/legionella/labs/elite.html) 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 for connection to appropriate Environmental Public Health staff. If environmental *Legionella* isolates are obtained during a case or cluster investigation, the isolates should be sent to PHL. Whole genome sequencing and other testing to compare the clinical and environmental isolates can occur at CDC. |
| Public Health investigation| For all cases, interview using the DOH WDRS form and enter into WDRS: [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) In cluster investigations, consider using the CDC hypothesis generating questionnaire: [https://www.cdc.gov/legionella/downloads/hypothesis-generating-questionnaire.pdf](https://www.cdc.gov/legionella/downloads/hypothesis-generating-questionnaire.pdf) 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. In the event of a nosocomial infection or cluster of illness, environmental assessment, testing and remediation may be indicated. Note that most cases are deemed sporadic and the source of infection never identified.
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 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).

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 “flu-like” illness without pneumonia. 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, 2–10 days; for Pontiac fever, 24 to 72 hours.

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.
3. CASE DEFINITIONS

A. Clinical Criteria for Diagnosis

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.

B. Laboratory Criteria for Diagnosis

1. **Suspect:**
   - 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.

2. **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.

C. Case Definition (2005)

- **Suspect:** a clinically compatible case that meets at least one of the presumptive (suspect) laboratory criteria.
- **Confirmed:** a clinically compatible case that meets at least one of the confirmatory laboratory criteria.

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](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):** Note that PCR can also be performed on respiratory specimens, but culture is the preferred method. 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 is working to bring on diagnostic and environmental testing for *Legionella*, but those services are not yet available. At present, urine and respiratory specimens from patients with suspected legionellosis should be sent for urine antigen and culture commercially.

If an environmental testing is indicated, environmental specimens should be sent for *Legionella* testing commercially. 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.

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 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 results are necessary in order to identify illness due to non-\textit{L. pneumophila} serogroup 1 and in order to match patient isolates to each other, or to an environmental source.

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 \textit{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 2–10 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.

A definite healthcare-associated case is defined as a patient who spent the entire exposure period in a healthcare setting, without ever leaving the facility. This includes hospitalization or being a resident of long-term care in the event the case never left the facility during the exposure period.

A possible healthcare-associated case is defined as a patient who was in a healthcare setting (including hospital, outpatient settings and long term care, among other healthcare settings) for part but not all of the exposure period.

CDC recommends that if one definite healthcare-associated case is identified at any time or if two or more possible healthcare-associated cases are identified within 12 months, a full public health investigation should be conducted.


Per the document linked above, CDC notes that key elements of a full public health investigation (recommended if there is one definite healthcare associated case or two possible healthcare associated cases in a 12 month period) include:

- Working with healthcare facility leaders
- Performing a retrospective review of cases in the health department surveillance database to identify earlier cases with possible exposures to the healthcare facility
- Developing a line list of possible and definite cases associated with the healthcare facility
- Working with infection control and clinical staff to actively identify all new and recent patients with healthcare-associated pneumonia and test them for *Legionella* using both culture of lower respiratory secretions on selective media and the *Legionella* urinary antigen test
- Obtaining postmortem specimens, when applicable
- Considering recommendations for restricting water in the facility or other immediate control measures
• Performing an environmental assessment to evaluate possible environmental exposures
• Performing environmental sampling, as indicated by the environmental assessment
• Decontaminating possible environmental source(s)
• Subtyping and comparing clinical and environmental isolates, if available
• Working with healthcare facility leaders to determine how long heightened disease surveillance and environmental sampling should continue to ensure the outbreak is over
• Working with healthcare facility leaders to review and possibly revise the water management program, if indicated

Contact CDE for template letters and other materials that can be useful in the context of a full public health investigation, as well as for consultation and engagement of appropriate partners.

Note that if there is one possibly healthcare associated case, the facility should be notified. Contact CDE for template letters that can be used for this purpose. Share with the facility the signs and symptoms of Legionnaires’ disease, and ensure that healthcare providers are aware of appropriate clinical testing methods (collection of urine for urine antigen and respiratory specimen for culture). The identification of one possibly healthcare-associated case is also a good opportunity to remind healthcare facilities of the importance of having a water management program. For more about water management, see https://www.cdc.gov/legionella/water-system-maintenance/wmp-fact-sheet.html

CDC has extensive information for healthcare providers. In the context of healthcare associated investigations (both definite and possible), it may be useful to share with healthcare providers the following materials:

• CDC guidance for clinicians: https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html
• Quick sheet for clinicians: https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf
• CDC Vital Signs: https://www.cdc.gov/vitalsigns/pdf/2017-06-vitalsigns.pdf

B. Travel-Associated Case

A travel-associated case is defined as a case who has a history of spending at least one night away from home, either in the same country of residence or abroad, during the exposure period.

• Report travel-associated cases promptly to CDE via the CDC case report form and 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 recommend that hotels be notified in the event a Legionnaires’ disease case is identified who had spent time at the facility. This is a good opportunity to educate accommodation owners about the importance of water management programs. Contact CDE for consultation, connection with DOH EPH (within that division, the Office of Transient Accommodations licenses hotels and other transient accommodations facilities) and for template letters that can be used for notification purposes.

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.


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. For more information, see [https://www.cdc.gov/legionella/water-system-maintenance.html](https://www.cdc.gov/legionella/water-system-maintenance.html)

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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.