

LEGIONELLOSIS

I. DESCRIPTION AND EPIDEMIOLOGY

A. Overview

Legionella spp. are gram-negative bacteria that are found naturally in freshwater sources, where they are not usually present in sufficient numbers to cause disease. However, *Legionella* can grow and multiply within the built environment, especially in large buildings with complex water systems (e.g., hospitals, hotels, etc.) or devices that use water (e.g., cooling towers, hot tubs, respiratory therapy equipment, etc.). Within these built water environments, *Legionella* can live and multiply within biofilms, or as intracellular parasites within protozoa. Factors contributing to *Legionella* growth in the built environment include temperature, water age, disinfectant residual, and presence of sediment or biofilm.

There are more than 60 species of *Legionella*, several of which can cause disease in humans. *Legionella pneumophila* serogroup 1 is the most commonly identified strain among laboratory-confirmed legionellosis patients and causes the majority of reported cases. Of note, *Legionella longbeachae*, which can also cause disease, is primarily found in soil and compost rather than water sources. Exposure to *Legionella* occurs primarily through inhalation of contaminated water droplets; aspiration of contaminated water or exposure to potting soil containing *Legionella* can also cause infection.

Legionellosis refers to three distinct clinical and epidemiological presentations of infection with *Legionella* bacteria: Legionnaires' disease, Pontiac fever, and extrapulmonary legionellosis. Legionnaires' disease (LD) is a serious illness characterized by pneumonia. Pontiac fever (PF) is a milder, acute, self-limited illness characterized by fever and muscle aches. Extrapulmonary legionellosis (XPL) occurs when *Legionella* infects and causes disease at sites outside of the lungs. All three conditions are reportable in California, though the focus of this chapter will be LD, which accounts for approximately 98% of reported legionellosis cases.

B. Legionnaires' Disease in California

Approximately 500 laboratory-confirmed cases of LD are reported each year in California. Most LD cases in California appear to be sporadic rather than outbreak-associated. However, outbreaks in California have been associated with healthcare and congregate living facilities, hotels, hot tubs, and cooling towers.

C. Symptoms

Patients with LD develop disease clinically and radiographically similar to other forms of pneumonia. Typical symptoms include cough, shortness of breath, fever, muscle aches, and headaches. Other symptoms can include diarrhea, nausea, and confusion. Laboratory features may include hyponatremia, elevated hepatic transaminases, and high C-reactive protein levels. Complications may include respiratory failure and death.

At least 95% of reported cases of LD result in hospitalization, and about 10% result in death. Case fatality rates are higher among patients with healthcare-associated LD (i.e., approximately 25%). People over the age of 50, current and former smokers, and people with chronic lung disease, cancer, or weakened immune systems are at increased risk for LD.

Patients with PF develop a milder illness characterized by an abrupt onset of fever and can also include headache, muscle aches, vomiting, and diarrhea; signs and symptoms of lower respiratory tract involvement are absent. PF usually lasts less than a week and does not require treatment.

Patients with XPL are diagnosed when there is clinical evidence of disease at an extrapulmonary site where *Legionella* have been identified via laboratory testing. Examples of XPL include infections associated with endocarditis, or wound, joint, or graft infections, and can occur as a complication of LD or independently.

D. Transmission

Legionella can grow and spread particularly within biofilms and as intracellular parasites in a variety of building water systems and devices, including potable water systems and hot water tanks, cooling towers, hot tubs, decorative fountains, and respiratory therapy equipment. Contamination of water sources with high concentrations of *Legionella* can occur when changes in water flow or pressure disrupt biofilms and release large numbers of the pathogen. Then, aerosols emitted directly from devices or via water fixtures or features can expose susceptible persons when they inhale small water droplets or aspirate *Legionella*-contaminated water. Most people who are exposed to *Legionella* bacteria do not become ill; as mentioned above, people at increased risk for LD have risk factors including age over 50, smoking, chronic lung disease, or weakened immune systems. In general, LD is not spread from person to person.

Most LD cases are sporadic, with an unclear source of transmission. However, approximately 15% of all LD cases are thought to be associated with travel, and about 5% are thought to be healthcare-associated. Thus, recent travel with an overnight stay away from home and overnight stays in healthcare facilities are considered risk factors for illness. Outbreaks have been associated with hotels, healthcare facilities, cooling towers, and cruise ships.

E. Incubation Period

The incubation period for LD is 2 to 14 days. PF has a shorter incubation period of 24 to 72 hours.

F. Clinical Management

Clinical management decisions should be made by the patient's primary care physician, intensive care provider, pulmonologist, or infectious diseases specialist. LD and XPL are treated with antibiotics. PF is a self-limited illness that is managed with supportive care and does not benefit from antibiotics.

II. COUNCIL OF STATE AND TERRITORIAL EPIDEMIOLOGISTS (CSTE) SURVEILLANCE CASE DEFINITION

Legionellosis (Legionnaires' Disease, Pontiac Fever, or Extrapulmonary Legionellosis) 2020 Case Definition

Legionellosis has been a nationally notifiable condition since 1976. The [CSTE case definition](#) is available on the U.S. Centers for Disease Control and Prevention (CDC) website at: <https://ndc.services.cdc.gov/case-definitions/legionellosis-2020/>.

[CSTE Position Statement 19-ID-04](#) is available at: https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf

Clinical Criteria

Legionellosis is associated with three clinically and epidemiologically distinct illnesses: Legionnaires' disease, Pontiac fever, or extrapulmonary legionellosis.

Legionnaires' disease (LD): LD 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.¹

Pontiac fever (PF): PF is a milder illness. While symptoms of PF² could appear similar to those described for LD, there are distinguishing clinical features. PF does not present as pneumonia. It is less severe than LD, rarely requiring hospitalization. PF is self-limited, meaning it resolves without antibiotic treatment.

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

Laboratory Criteria

Confirmatory laboratory evidence

- 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.

Supportive laboratory evidence

- 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 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.

¹ Clinical symptoms of pneumonia may vary, but must include acute onset of lower respiratory illness with fever and/or cough. Additional symptoms could include myalgia, shortness of breath, headache, malaise, chest discomfort, confusion, nausea, diarrhea, or abdominal pain.

² Clinical symptoms may vary, but must include acute symptom onset of one or more of the following: fever, chills, myalgia, malaise, headaches, fatigue, nausea and/or vomiting.

**CDPH Clarification: this refers to a fourfold rise between acute and convalescent sera, not simply a fourfold elevation above the normal reference value on a single serum specimen.*

Case Classification*Confirmed Legionnaires' disease (LD)*

- A clinically compatible case of LD with confirmatory laboratory evidence for *Legionella*.

Suspect Legionnaires' disease (LD)

- A clinically compatible case of LD with supportive laboratory evidence for *Legionella*.

Probable Legionnaires' disease (LD)

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

Confirmed Pontiac fever (PF)

- A clinically compatible case of PF with confirmatory laboratory evidence for *Legionella*.

Suspect Pontiac fever (PF)

- A clinically compatible case of PF with supportive laboratory evidence for *Legionella*.

Probable Pontiac fever (PF)

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

Confirmed Extrapulmonary legionellosis (XPL)

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

Suspect Extrapulmonary legionellosis (XPL)

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

Epidemiologic Classification

Travel-associated Legionnaires' disease (LD)

- A case of LD 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.

Travel-associated Pontiac fever (PF)

- A case of PF 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.

Presumptive healthcare-associated Legionnaires' disease (LD)

- A case with ≥ 10 days of continuous stay at a healthcare facility during the 14 days before onset of symptoms.

Possible healthcare-associated Legionnaires' disease (LD)

- A case that spent a portion of the 14 days before date of symptom onset in one or more healthcare facilities, but does not meet the criteria for presumptive HA-LD.

Comment(s)

The updated case definition appearing on this page was published in the 2019 CSTE position statement 19-ID-04 and was implemented starting with the 2020 surveillance year. Key differences between the 2020 case definition and earlier versions include the addition of the extrapulmonary legionellosis condition, expansion of confirmatory laboratory criteria, extension of the incubation period for Legionnaires' disease, and amendment to the terminology of and criteria for healthcare-associated cases.

III. CASE SURVEILLANCE, INVESTIGATION, AND REPORTING

A. Purpose of Surveillance, Investigation, and Reporting

- To understand the epidemiology of LD in California and to develop targeted interventions to decrease rates of illness
- To identify LD outbreaks and interrupt potential sources of ongoing transmission, with a focus on the early detection and investigation of travel-, healthcare-, and community-associated clusters
- To detect new and emerging *Legionella* species or serotypes, and monitor epidemiologic trends
- To educate people about how to reduce their risk of LD

B. Local Health Jurisdiction (LHJ) General Case Investigation Recommendations

- Begin case investigation as soon as a positive *Legionella* test is reported from a healthcare provider or clinical laboratory. Clinical laboratories and healthcare providers are required to report *Legionella* infections by electronic transmission (including FAX), telephone, or mail within seven days of identification.
- Case-patients should be interviewed using the California Department of Public Health (CDPH) Legionellosis Case Report Form (CRF) either in CalREDIE or the hard copy form (CDPH 8588). Please obtain detailed information about water, healthcare, residential/congregate living, travel, and occupational exposures in the 14 days prior to symptom onset. If the patient is unable to be interviewed or to recall exposure details, consider interviewing a proxy who is familiar with the patient's routine or recent activities.
- If a healthcare exposure occurred during part or all of their incubation period, obtain the facility name, address, and dates of stay or exposure. If the exposure was during an inpatient stay at a hospital, obtain medical records for review.
- If the patient resided in a congregate living setting (i.e., assisted or senior living, correctional facility, etc.) during part or all of their incubation period, obtain the facility name, address, and the patient's room number or specific location within the facility. Determine whether the patient spent time away from or was confined to the facility during the 14 days prior to illness onset.
- If the patient traveled during part or all of their incubation period, obtain dates and location(s) of travel, name and address of accommodation(s), dates of stay(s), room number(s), and other water exposures locations, if available.
- If the patient appears to be part of an outbreak, follow your protocol for outbreak investigations. This should include notifying CDPH about the outbreak.
- For assistance with travel- or community-associated LD, call the CDPH Infectious Diseases Branch (IDB) at 510-620-3434.
- For assistance with healthcare-associated Legionnaires' disease (HA-LD), call the CDPH Healthcare-Associated Infections (HAI) Program at 510-412-6060.

C. LHJ Reporting

LHJ Reporting Overview

Legionellosis has been a nationally notifiable disease since 1976. Both CDC's [Annual Tables of Nationally Notifiable Infectious Diseases and Conditions](https://wonder.cdc.gov/nndss/nndss_annual_tables_menu.asp) (https://wonder.cdc.gov/nndss/nndss_annual_tables_menu.asp) and California's final case count for the [Yearly Summary Reports](https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/YearlySummSelectedGeneralCommDisinCA.aspx) (https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/YearlySummSelectedGeneralCommDisinCA.aspx) include only confirmed cases of legionellosis.

Legionellosis cases that meet the confirmed, suspect, or probable CSTE case definitions should be reported to CDPH. The CDPH Legionellosis CRF (CDPH 8588) should be used to interview all patients and is available in CalREDIE (Legionellosis disease condition) or as a downloadable form in the CalREDIE document repository. This form collects data including demographic characteristics, and information regarding symptoms, underlying conditions, hospital course and outcome, laboratory testing, and radiologic studies. Detailed epidemiologic information is also collected to identify potential exposures related to healthcare, travel, occupation, community activities, and certain water-aerosolizing devices.

Please review the laboratory criteria necessary to meet the confirmed or suspect CSTE case definitions for legionellosis (probable cases do not require laboratory testing). Several different laboratory tests are available to diagnose legionellosis, including the urine antigen test (UAT), culture, nucleic acid amplification testing (i.e., PCR), and serology (see case definition above). While a positive culture, PCR, or UAT provides laboratory confirmation of infection, a single serology result of elevated antibody titer is not sufficient. As per the CSTE laboratory criteria above, both acute and convalescent (four to eight weeks after onset of illness) serology specimens must be tested and indicate a fourfold or greater rise in antibody titer for laboratory confirmation. If only a single antibody titer was collected for a patient, consider contacting the patient's provider to determine whether the specimen was collected during the acute phase of illness and whether collecting a convalescent titer is warranted to confirm the case. Alternatively, if suspicion for legionellosis is high, consider requesting that the provider order another confirmatory test. If no other laboratory testing was performed to meet the confirmed or suspect case definition, the investigator should close cases with a single elevated antibody titer as "Not a Case".

PCR and culture are the preferred tests for *Legionella* diagnosis. They can detect infection caused by all *Legionella* spp., thereby identifying cases that would otherwise be missed by the UAT. In addition, clinical isolates resulting from cultures can be compared to environmental isolates during outbreak investigations, and with repositories of *Legionella* surveillance data for improved understanding of trends. Therefore, culturing of primary respiratory specimens is encouraged whenever possible, as is reflex culturing of respiratory specimens positive via PCR.

All legionellosis reports are reviewed by the CDPH IDB or HAI Program *Legionella* Subject Matter Expert (SME). Legionellosis cases are not confirmed and closed by the

state until reviewed by a CDPH SME. All confirmed cases closed by the state SMEs are included in CDC's year-end national and CDPH's year-end state case counts.

Instructions for CalREDIE-participating Jurisdictions:

- Enter the patient information into CalREDIE upon notification of the case by the clinical laboratory or healthcare provider. Select "Legionellosis" as "Disease Being Reported".
- Please take a moment to verify ethnicity and race categories. These fields are critical for CDPH to be able to better track racial equity and address disparities.
- In the Clinical Information tab, enter the onset date and document the patient's clinically compatible symptoms. Under the Hospitalization Details section, enter related discharge diagnoses (e.g., pneumonia or LD).
- In the Laboratory Information tab, enter specimen type (i.e., urine, respiratory, etc.), type of test, and results. If *Legionella* antibody titers are being reported, verify that there is a fourfold or greater rise between acute and convalescent antibody titers. **A single antibody titer is not sufficient to fulfill either the suspected or confirmed case definition.** Enter serogroup information, if available. Chest radiology findings, evidence of clinically compatible symptoms, or a related discharge diagnosis **must** be included for a case to be counted.
- In the Epidemiologic Information tab, enter all healthcare, travel, residential, occupational, community, and specific water exposures. Include as much detail as possible. Designate the case as LD, PF, or XPL based on chest radiology findings, clinical course, and discharge diagnoses.
- For purposes of case classification for the final year-end case count, the CalREDIE report will NOT be reviewed by the CDPH SME and "Closed by State" unless the process status is "Closed by LHD", regardless of the resolution status. The "Closed by LHD" process status is the trigger for the CDPH SME to review the incident report. If data required to confirm the resolution status are missing, the CDPH SME will contact the LHJ investigator for additional information.

Instructions for Extended Data Exchange Jurisdictions:

- For jurisdictions currently not participating in CalREDIE, a Legionellosis Case Report Form (CDPH 8588) must still be submitted.
- If healthcare or travel exposures are identified, please notify the CDPH IDB and/or HAI Program SMEs via secure email or phone.

Reporting Travel-Associated Cases

Approximately 15% of LD cases are associated with travel, and clusters of LD associated with hotels and cruise ships have been well documented. Travelers may be exposed to *Legionella* at a hotel or other accommodations but may not become symptomatic and get diagnosed until they have returned home, often in another state.

To capture clusters and outbreaks of LD associated with travel, all potentially travel-associated LD cases are reported by state health departments to CDC, and CDC performs national-level surveillance for these cases. In addition, CDPH performs state-level surveillance for travel clusters occurring in California.

If a legionellosis case-patient has traveled or stayed overnight somewhere other than their usual residence during part or all of their incubation period, then the case meets the definition for travel-associated legionellosis. When interviewing the patient, the LHJ investigator should request the dates of travel, names and addresses of accommodations, room numbers, and water exposures, and report either by phone or by email within one working day to CDPH IDB staff. This includes collecting information on non-traditional accommodations such as vacation rentals, RV parks, etc. CDPH IDB will then notify the CDC *Legionella* Team by email of the travel-associated case. When two or more legionellosis case-patients report the same hotel/accommodations within a 12-month period, CDC classifies this as a travel-associated legionellosis cluster.

If a case-patient reports staying on a cruise ship during their incubation period, please consider completing [CDC's Legionnaires' Disease Cruise Ship Questionnaire](https://www.cdc.gov/legionella/health-depts/epi-resources/patient-interview-tools.html), available at <https://www.cdc.gov/legionella/health-depts/epi-resources/patient-interview-tools.html>. CDC's Vessel Sanitation Program is responsible for investigations related to cruise ships, and specific details and locations of on-board water exposures can help identify appropriate environmental sampling locations.

If a case-patient from another jurisdiction, including another state, traveled within California, CDPH IDB will notify the LHJ where the potential exposure occurred. The LHJ investigator (of the case-patient's residence) must still complete and submit the CDPH Legionellosis CRF either in CalREDIE or as a hard copy (for Extended Data Exchange Jurisdictions).

Reporting Healthcare-Associated Cases

Approximately 20% of LD case patients report healthcare exposures during their incubation period, and about 5% of LD cases are “presumptively” associated with a healthcare facility. If a case-patient reports a stay of 10 or more continuous days at one or more licensed healthcare facilities (including long-term care facilities, such as skilled nursing) during their incubation period, then the patient meets the surveillance case definition for “presumptive” healthcare-associated Legionnaires' disease (HA-LD). A healthcare facility refers to any entity licensed by the CDPH Licensing and Certification Program (L&C), such as hospitals, skilled nursing facilities, and acute rehab facilities. The Healthcare Exposures / Risk Factors section of the Legionellosis CRF, collects information about healthcare exposures that occurred **prior to onset of symptoms in licensed healthcare facilities.**

Details, including the dates of hospitalization or long-term care/skilled nursing facility stay, facility name and address, and whether the patient is still at the facility, should be collected via patient/proxy interview and/or chart abstraction. It is important to attempt to estimate the onset date of illness to the extent possible to determine the incubation period, rather than using date of diagnostic testing. If the patient meets the criteria for

“presumptive” HA-LD, please notify the CDPH HAI Program at HAIProgram@cdph.ca.gov as soon as possible. Healthcare facilities must report the occurrence of a “presumptive” case of HA-LD to the L&C District Office. The LHJ investigator must still complete and submit the CDPH Legionellosis CRF either in CalREDIE or as a hard copy (for Extended Data Exchange Jurisdictions).

LHJs should contact the CDPH HAI Program if they have questions about a “possible” case of HA-LD; the likelihood of association with a healthcare facility and the need for further assessment can vary considerably from case to case, depending on numerous factors.

For exposures occurring in facilities not licensed by L&C, such as assisted living, retirement homes, and other residential care facilities, details should be recorded in the Residential Exposures / Risk Factors section of the Legionellosis CRF, either in CalREDIE or on a hard copy form (for Extended Data Exchange Jurisdictions) and be reported to CDPH IDB.

Recommendations for investigating HA-LD cases can be found in the CDPH [HAI Program's investigation quicksheet](#), which is available online at: https://www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/HA_Le_gionnairesDiseaseQuicksheet_12.20.19_final.pdf.

A list of [L&C District Offices](#) is available at: <https://www.cdph.ca.gov/Programs/CHCQ/LCP/Pages/DistrictOffices.aspx>.

Reporting Outbreaks and Clusters

Outbreaks are categorized by setting, and are defined as follows:

Travel-Associated Outbreak

- Two or more LD cases associated with the same travel accommodation in a 12-month period.

Community-Associated Outbreak

- An increase in LD cases in a certain geographic area beyond what one would normally expect for the same time and place.

Healthcare-Associated Outbreak

- A single case of presumptive HA-LD or multiple cases of possible HA-LD associated with the same facility.

Incidents that meet any of the above outbreak definitions warrant a full investigation. Note that single cases of LD associated with other congregate settings (e.g., correctional facilities, assisted living, etc.) also warrant a full investigation. Suspected outbreaks in any setting should be reported within 24 hours to CDPH.

- *CalREDIE-participating Jurisdictions:*

Create a new outbreak in CalREDIE. From the dropdown list for “Disease”, select the disease category “Respiratory, Waterborne”. In the Outbreak Report tab, from the “Disease/pathogen Identified” dropdown, select “Legionellosis”. In the Electronic Filing Cabinet, select “New Case Report” and complete the following forms:

 - Waterborne Outbreak Report – 01. General
 - Waterborne Outbreak Report – 02. Water General
 - And one of the following forms depending on the source of the outbreak
 - 03. Rec Water Treated
 - 04. Rec Water Untreated
 - 05. Drinking Water
 - 06. WNID/WUI (Water Not Intended for Drinking or Water of Unknown Intent)
- *Extended Data Exchange Jurisdictions:*

Complete and submit the applicable Waterborne Disease Outbreak form from the CalREDIE document repository (see list below):

 - Treated Recreational Water Form
 - Untreated Recreational Water Form
 - Water Intended for Drinking Form
 - Water NOT Intended for Drinking Form

D. Laboratory Considerations and Resources

Laboratory Testing Overview

The definitive method for diagnosing LD is through isolation of the organism, usually from respiratory specimens (e.g., sputum, bronchoalveolar lavage). However, *Legionella* spp. do not grow on standard media and require special media, buffered charcoal yeast extract (BCYE) agar, for growth. While the specificity of culture is 100%, the sensitivity is lower. The ability to isolate *Legionella* is affected by appropriate antibiotic treatment, so it is important to collect a respiratory specimen as soon as LD is suspected. Clinical isolates are of critical importance during outbreak investigations because they can be compared to environmental isolates to confirm outbreak causes. However, molecular analysis of clinical isolates from sporadic cases is also important to continuously expand repositories of *Legionella* surveillance data, allowing for improved understanding of virulence factors and other molecular epidemiologic patterns.

Nucleic acid amplification tests (NAAT), such as polymerase chain reaction (PCR) can rapidly detect *Legionella*, but sensitivity and specificity varies. NAAT detect infections caused by different *Legionella* spp. and serogroups, can rapidly establish the diagnosis, and are performed on lower respiratory secretions, lung tissue, or pleural fluid.

Most cases of LD are diagnosed using the urine antigen test (UAT). However, the UAT only detects *Legionella pneumophila* serogroup 1 and does not detect other serogroups

or species of *Legionella*. The test detects the *Legionella* lipopolysaccharide antigen which becomes detectable in 80% of patients on days one to three of illness. This test may remain positive for months after the resolution of illness, and it is not affected by antibiotic therapy.

Serological testing for antibody titers must be collected in the acute and convalescent stages to meet the case definition for LD. A four-fold rise in antibody titer must be demonstrated, which typically takes 4 to 8 weeks. Of note, a proportion of the healthy population has a chronically elevated *Legionella* antibody titer, and others do not mount an antibody response. Therefore, the four-fold increase in antibody titer is required to establish the diagnosis.

Direct fluorescent antibody staining (DFA) is a rapid test that may be available in some laboratories, but it has lower sensitivity and is less frequently used.

Whole Genome Sequencing

The CDPH Microbial Diseases Laboratory (MDL) is able to confirm and speciate both environmental and clinical isolates of *Legionella* spp. and conduct whole genome sequencing (WGS) on isolates, but does not perform primary isolation. MDL may assist LHJs in sending specimens and isolates to CDC for additional testing. CDC can perform the following tests:

[Legionella species identification and typing](http://www.cdc.gov/laboratory/specimen-submission/detail.html?CDCTestCode=CDC-10159): <http://www.cdc.gov/laboratory/specimen-submission/detail.html?CDCTestCode=CDC-10159>

[Legionella species molecular detection](http://www.cdc.gov/laboratory/specimen-submission/detail.html?CDCTestCode=CDC-10160): <http://www.cdc.gov/laboratory/specimen-submission/detail.html?CDCTestCode=CDC-10160>

Environmental Testing

The CDPH Drinking Water and Radiation Laboratory (DWRL) is certified by CDC's Environmental Legionella Isolation Techniques Evaluation Program (ELITE), and can isolate *Legionella* from environmental samples (i.e., water and swabs). DWRL may be able to assist with testing of environmental samples to support outbreak investigations. The complete list of [ELITE laboratories](#) is available at <https://wwwn.cdc.gov/elite/public/elitehome.aspx>.

IV. CASE MANAGEMENT AND PUBLIC HEALTH CONTROL MEASURES

A. Management of Cases

There are no specific regulations guiding the management of patients with legionellosis.

B. Management of Contacts

There are no specific regulations guiding the management of contacts of patients with legionellosis because *Legionella* are not transmitted from person to person.

C. Infection Control Measures

Hospitalized patients should be cared for using standard precautions.

D. Special Considerations

Though environmental investigation is typically not warranted for sporadic cases of LD, there may be situations where investigation is encouraged if local resources allow (e.g., a high-risk device in a public setting). During an LD outbreak, however, an environmental investigation is critical. Once a suspected source is identified (e.g., a hotel or healthcare facility), environmental investigation includes onsite evaluation of the water system and collection of samples (e.g., water samples and swabs). If *Legionella* bacteria are isolated, remediation is recommended. Implementation of a water management program (WMP) or revision of an existing WMP is also recommended during investigations, to promote long term prevention measures. A *Legionella* consultant may be helpful during the environmental investigation, remediation, and WMP development or revision processes.

Specific details of environmental investigations, sampling protocols, and remediation are beyond the scope of this document. Additional resources are available below.

V. APPLICABLE STATE STATUTES/REGULATIONS

[Title 17, California Code of Regulations \(CCR\) Section 2500 Reportable Diseases and Conditions](https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ReportableDiseases.pdf) available at:
<https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ReportableDiseases.pdf>

[Title 17, CCR Section 2505 Reportable Conditions: Notification by Laboratories](https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/LabReportableDiseases.pdf) available at:
<https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/LabReportableDiseases.pdf>

VI. ADDITIONAL RESOURCES

A. General Information/Patient Education

- [CDPH Legionellosis webpage:](https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Legionellosis(Legionella).aspx)
https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Legionellosis(Legionella).aspx
- [CDC Legionella webpage:](http://www.cdc.gov/legionella/index.html) http://www.cdc.gov/legionella/index.html

B. Environmental Sampling and Remediation

- [CDC Environmental Investigation Resources:](https://www.cdc.gov/legionella/health-depts/environmental-inv-resources.html)
https://www.cdc.gov/legionella/health-depts/environmental-inv-resources.html

C. References

- World Health Organization. [Legionella and the Prevention of Legionellosis](https://www.who.int/publications/i/item/9241562978). 2007. Available at https://www.who.int/publications/i/item/9241562978.
- [CDC Legionella \(Legionnaires' Disease and Pontiac Fever\) website:](https://www.cdc.gov/legionella/index.html)
https://www.cdc.gov/legionella/index.html

VII. UPDATES

Previous version finalized May 2017. Completely revised March 2023.

VIII. SUMMARY OF ACTION STEPS

Action	Specific Steps
<ul style="list-style-type: none"> □ Begin case investigation as soon as a positive <i>Legionella</i> test is reported from a clinical laboratory or healthcare provider. 	<ul style="list-style-type: none"> • Obtain and review clinical documentation, medical records, and lab reports as applicable. • Contact patient for interview.
<ul style="list-style-type: none"> □ Confirm case definition. 	<ul style="list-style-type: none"> • In order to count as a confirmed case of legionellosis, both clinical illness and laboratory criteria must be fulfilled. <ul style="list-style-type: none"> ○ If PCR was done, attempt to order a reflex culture. ○ Request that any clinical isolates be sent to public health for molecular analysis. ○ If serological testing was done, verify that both acute and convalescent specimens were collected and results reflect the case definition. ○ Document chest imaging results and/or symptom details or clinical information supporting a diagnosis of pneumonia.
<ul style="list-style-type: none"> □ Attempt to identify source of exposure. 	<ul style="list-style-type: none"> • Use the CDPH Legionellosis CRF in CaREDIE or the hard copy from (CDPH 8588) to guide your interview. • Include as many details as possible about water, travel, and healthcare exposures. <ul style="list-style-type: none"> ○ If the patient has a history of travel with an overnight stay or longer away from home in the 14 days prior to illness onset, notify CDPH IDB within one working day. ○ If the patient meets the surveillance criteria for “presumptive” HA-LD (either in an acute inpatient setting or long term care/skilled nursing facility), notify the CDPH HAI Program as soon as possible. • If the patient appears to be part of an outbreak, follow your protocol for outbreak investigations, and attempt to request a respiratory specimen for culture. Notify CDPH IDB or HAI Program about suspected outbreaks within 24 hours.

If you require assistance with your investigation, call the CDPH IDB at 510-620-3434. If the investigation involves HA-LD, call the CDPH HAI Program at 510-412-6060.