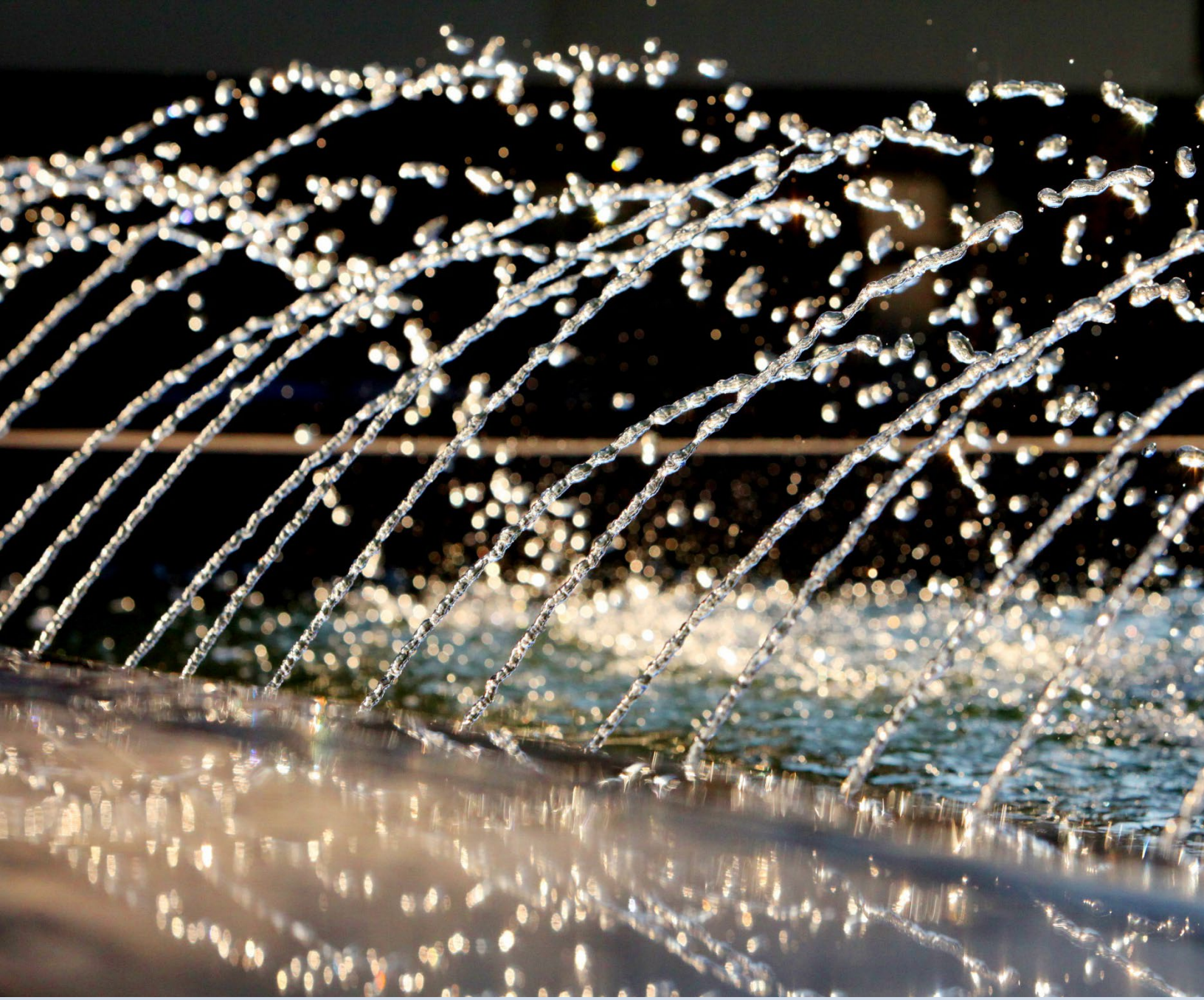


Wisconsin Legionellosis Case Investigation Protocol

A guide for public health professionals

Wisconsin Department of Health Services | Division of Public Health | Bureau of Communicable Diseases

P-03635 (07/2024)

Table of Contents

Disclaimer & Purpose Statement

Disclaimer

These materials were prepared based on guidelines from the Centers for Disease Control and Prevention (CDC) and are relevant as of **May 2024**. CDC, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the Wisconsin Department of Safety and Professional Services (DSPS), the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP), the Wisconsin Department of Natural Resources (DNR), and other national and state organizations continue to release updated recommendations and guidance. Therefore, the policies and recommendations outlined in this document are subject to change as more information and updated guidance become available. Please contact your local health department, the Wisconsin Department of Health Services (DHS), or other relevant state agencies for most current resources or guidance.

Purpose of this protocol

This protocol is designed to provide local and Tribal health department (LTHD) public health staff and environmental health (EH) staff resources to respond to case reports of Legionnaires' disease.

Contributors

Frances Goglio, DVM: Legionellosis Surveillance Coordinator, Wisconsin DHS

Anna Kocharian, MS: Multipurpose/Outbreak Response Epidemiologist, Wisconsin DHS

Bruce Meiners: *Legionella* Industrial Hygienist

Frequently used acronyms

BCD: Bureau of Communicable Diseases

DPH: Division of Public Health

HAI: Healthcare-Associated Infections

LIH: *Legionella* Industrial Hygienist

LSC: Legionellosis Surveillance Coordinator

LTHD: Local and Tribal Health Department

UAT: Urine Antigen Test

WEDSS: Wisconsin Electronic Disease Surveillance System

WOHL: Wisconsin Occupation Health Laboratory

WSLH: Wisconsin State Laboratory of Hygiene

Legionellosis Background: Clinical Features, Microbiology & Epidemiology

Clinical Features

Legionellosis is an illness caused by *Legionella* bacteria. It presents itself as one of three clinical presentations: **Legionnaires' disease**, which is characterized by pneumonia; **Pontiac fever**, which is characterized as a milder febrile illness without pneumonia; and **Extrapulmonary legionellosis**, a rarely reported condition that occurs when *Legionella* is detected outside of the lungs (for example, from a wound or an abscess). Patients diagnosed with Legionnaires' disease typically require inpatient care and antibiotics (see guidelines for treatment of severe community-acquired pneumonia from the American Thoracic Society and Infectious Disease Society of America), while patients with Pontiac fever typically recover after a brief illness with home care only.

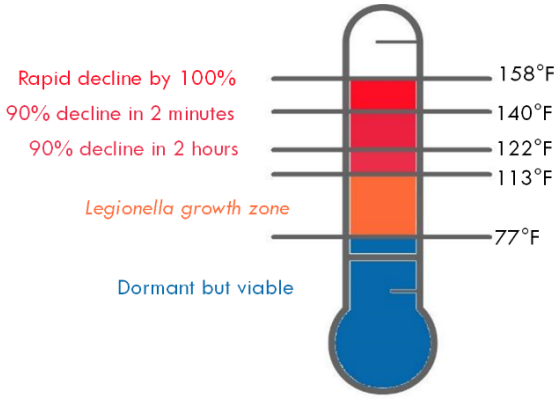
Microbiology

Legionella are gram-negative, facultatively intracellular waterborne bacteria that occur naturally in freshwater sources. Complex plumbing systems and other human-made water features can create conditions favorable to *Legionella* growth.

This can occur when:

- **Water temperature** is in the preferred *Legionella* growth zone (approximately 77°F and 113°F)
- A reduction in water flow causes **stagnation** (often due to disruptions, dead legs, oversized pluming, or side-stream plumbing equipment).
- **Biofilm** accumulation occurs from stagnation or sedimentation.
- **Corrosion** of piping materials provides nutrients for bacterial growth.
- A water distribution system has **cross connections** between non-potable and potable water sources.
- A recirculating water system has **insufficient residual disinfectant** or **elevated pH.**

Exposure and illness can occur when this water is **aerosolized.**



If *Legionella* have grown and amplified sufficiently to cause illness, people are most likely to become ill from inhaling aerosolized water (although microaspiration of over-colonized water or ice can also occur). Illness from *Legionella* is generally not transmitted from person to person. While not an exhaustive list, outbreaks have been previously linked to:

- **Aerosolized potable water**, like showerheads, sink faucets, and humidifiers.
- **Cooling towers**, which use water to cool air temperatures in large buildings. (This is different than home or car air conditioners, which do not use water and are not typically a risk for *Legionella* exposure.) See more examples of cooling towers, including satellite imagery, in CDC's Photos of Cooling Towers.
- **Hot tubs** or **whirlpool spas**, which typically generate aerosols and use water temperatures in the preferred *Legionella* growth zone.

- **Decorative fountains**, which aerosolize water and may use a recirculating water system.

Epidemiology

If a person develops Legionnaires' disease, symptoms begin to develop **within 14 days** (most often 2–10 days) of exposure to *Legionella*. With prompt diagnosis, care, and treatment with antibiotics, most patients with Legionnaires' disease recover from their illness. However, 5–10% of people diagnosed with Legionnaires' disease ultimately die as a result of their illness (Barskey, Lee, Hannapel, Edens, & Smith, 2022). If a person develops Pontiac fever, symptoms begin to develop within 3 days of exposure to *Legionella*. Pontiac fever patients are generally expected to recover with supportive care only.

Not all people who are exposed to *Legionella* will become ill with Legionnaires' disease or Pontiac fever. Due to the mild course of illness with non-specific symptoms, the epidemiology of Pontiac fever is not well understood. However, it is understood that a relatively low percentage of exposed people become ill with Legionnaires' disease—5% or less, even in large outbreaks (DeBoer, Yzerman, Schellekens, Lettinga, & Boshuizen, 2002) (Fraser, Tsai, Orenstein, Parkin, & Beecham, 1977).

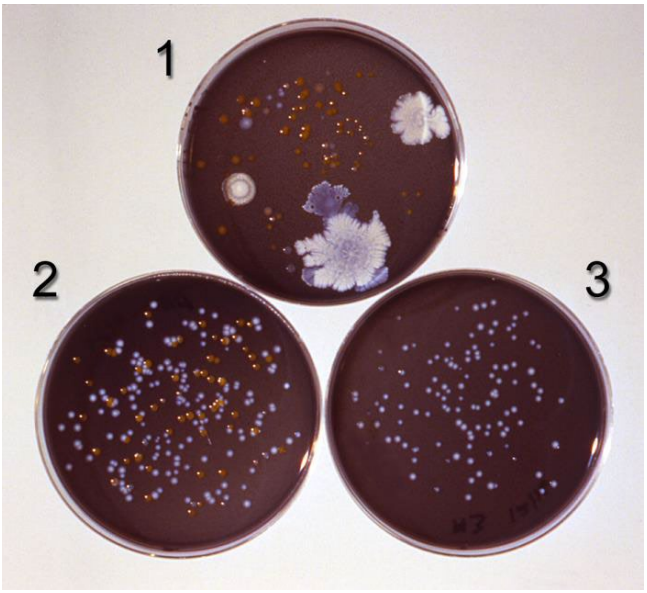
Tip: Most cases of Pontiac fever that are reported to public health are discovered during legionellosis outbreak investigations—which is likely only a small percentage of Pontiac fever cases.

Risk factors that increase the likelihood of becoming ill with Legionnaires' disease after exposure:

- Age >50
- A history of smoking
- Chronic lung disease (for example, chronic obstructive pulmonary disease [COPD]), emphysema, or obstructive sleep apnea [OSA])
- Other underlying illness (for example, cancer, liver or kidney failure, or diabetes)
- A compromised immune system (for example, an organ transplant recipient or a patient taking immunosuppressive medications for a chronic autoimmune condition)

***Legionella pneumophila* serogroup 1** is associated with most reported cases of Legionnaires' disease in the United States and Wisconsin, estimated to account for approximately 80% of cases. However, other serogroups of *Legionella pneumophila*, as well as other species of *Legionella*, can cause illnesses in people. A diagnosis of Legionnaires' disease caused by other species or serogroups can be confirmed by culture or PCR (polymerase chain reaction) of a **lower respiratory specimen** (such as sputum or bronchoalveolar lavage). Diagnosis by culture requires buffered charcoal yeast extract (BCYE) media and takes 5–14 days to grow.

Legionella cannot typically be isolated on routine sputum cultures. A diagnosis of Legionnaires' disease caused by *Legionella pneumophila* serogroup 1 can also be confirmed by urinary antigen test (UAT). However, UAT will not detect other species or serogroups of Legionella, meaning that approximately 20% of cases cannot be diagnosed using this method.

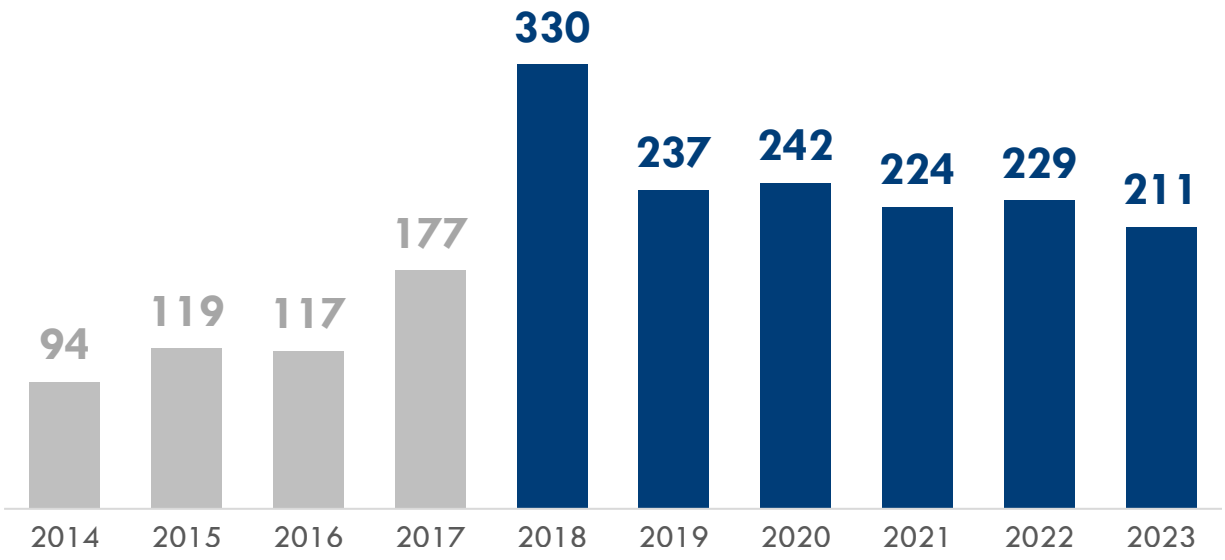


This image shows test plates of environmental (water) samples for *Legionella* using BCYE agar (plate 1) and BCYE agar and with antimicrobial supplementation (plates 2 and 3), with *Legionella* colonies most clearly isolated on plate 3. Even with specialized media, *Legionella* can be difficult to isolate with recommended culture methods due to overgrowth of other bacteria. CDC's Laboratory Guidance also describes using amino acids cysteine and glycine to select for *Legionella* growth.

Legionellosis Background: Surveillance Trends in Wisconsin

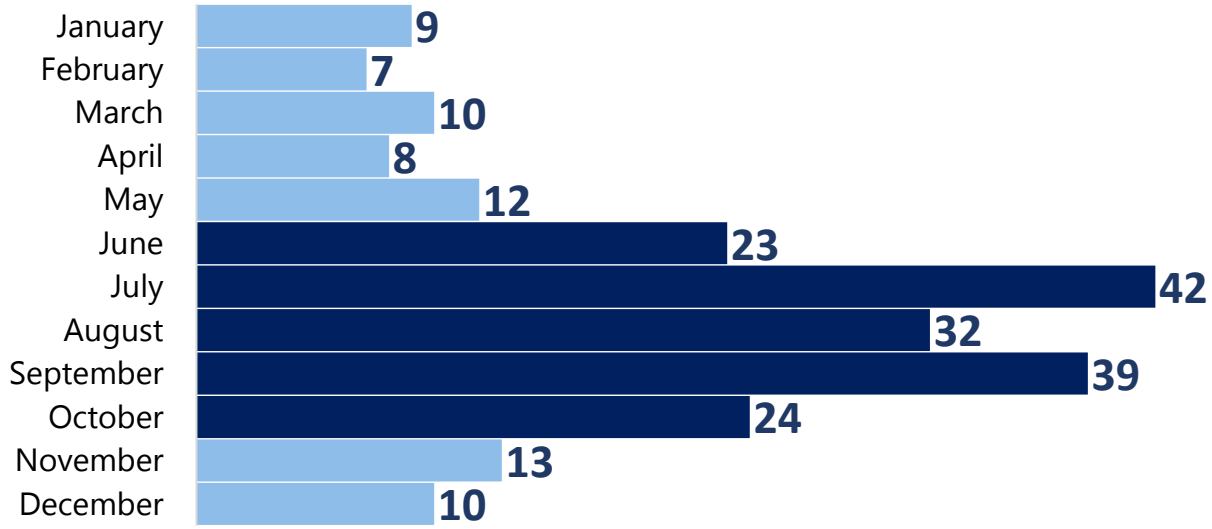
The Bureau of Communicable Diseases (BCD) monitors statewide legionellosis surveillance trends. In the previous 10 years, Wisconsin had annual legionellosis case counts ranging from 94–330, with an average of approximately 183 cases per year (excluding 2018, which had significantly more cases than reported in previous years or since). However, annual confirmed cases reported to public health have increased significantly since 2018, with an average of 228 cases reported per year since 2019. This represents a 70% increase in reported cases when compared to the 5-year period prior to 2018 (133 cases per year).

Lab-confirmed legionellosis cases in Wisconsin, 2014-2023



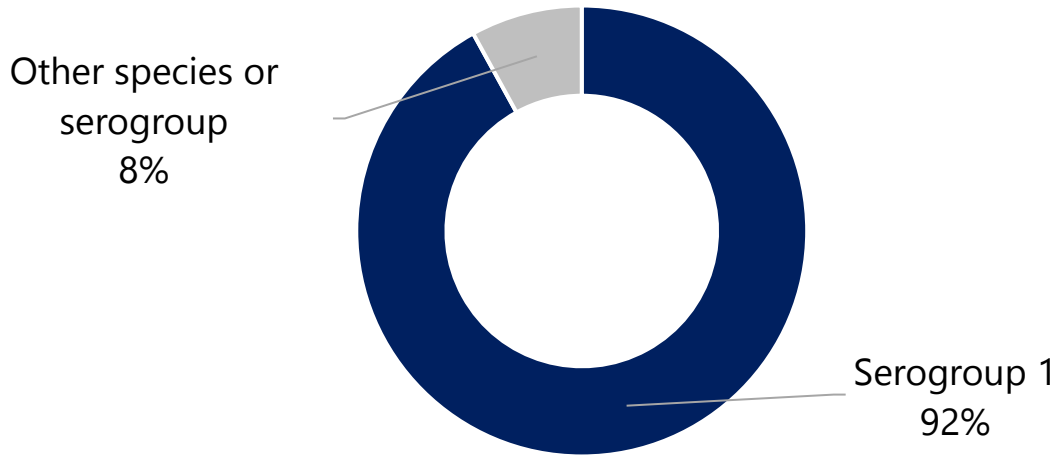
Additionally, BCD has observed seasonal trends of increased legionellosis detection in Wisconsin, with lower case activity in winter and spring months and increased activity in summer and fall months. This trend is consistent with seasonal trends observed in the Midwest (Barskey, Derado, & Edens, 2022).

Average lab-confirmed legionellosis cases in Wisconsin by month, 2019-2023



Among confirmed cases reported to public health, almost all cases of legionellosis reported in Wisconsin have a clinical presentation of Legionnaires' disease. Additionally, almost all reported cases from 2019–2023 were positive via UAT (96%), with approximately 93% of cases being reported only having a positive UAT.

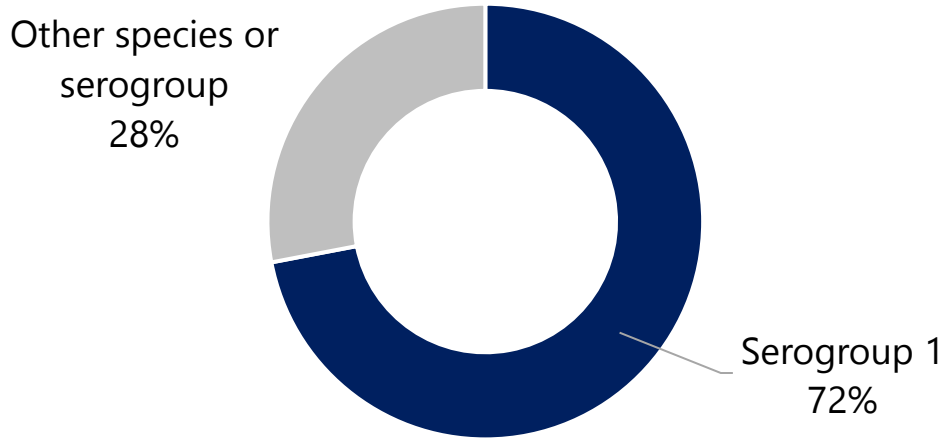
Legionella pneumophila serogroup 1 detections among cases among **all confirmed cases** in Wisconsin, 2023



In 2023, 92% of confirmed cases had a positive UAT result, 15% had a positive PCR result, and 8.5% of cases had a positive result on culture. Among PCR-positive case-

patients, nearly half (47%) also had a positive *Legionella* culture result and approximately half (56%) were identified as *Legionella pneumophila* serogroup 1. Among culture-positive case-patients, over half (61%) were positive on a urine antigen test and 72% were *Legionella pneumophila* serogroup 1. All confirmed cases reported in 2023 where species-level information was available were identified as *Legionella pneumophila*. In previous years, other species identified in clinical specimens include *Legionella micdadei* and *Legionella feelei*. These species have both been linked to outbreaks in other jurisdictions.

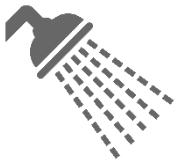
Legionella pneumophila serogroup 1 detections among cases with **positive *Legionella* culture** results in Wisconsin, 2023



In 2023, 85% of confirmed legionellosis cases were interviewed by public health to obtain further information on potential sources of exposure during the 14-day exposure period prior to experiencing symptoms of illness. Below highlights common findings from case-patients that were interviewed. Note that this is not an exhaustive list of potential exposure sources of community-acquired Legionnaires' disease.

Findings from public health interviews of Legionnaires' disease case-patients, 2023

29% of case-patients traveled and spent at least one night away from home during the exposure period.



24% showered away from home during the exposure period.

18% reported recent construction at or near their home or a place that they visited during the exposure period.

14% reported using a hot tub during the exposure period.

14% reported using either a personal humidifier or a respiratory therapy device with humidification.

Legionella is also a concern for health care facilities, since they often have complex plumbing systems, cooling towers, and serve patients with underlying medical conditions or compromised immune systems that may be at greater risk of severe illness of Legionnaires' disease. Below highlights findings from 2023 related to health care facilities.

Findings from Legionnaires' disease case-patients that visited health care facilities prior to illness, 2023

29% of confirmed cases visited a health care facility or assisted living facility during their exposure period. The majority of these visits were outpatient visits.

24% of case-patients visiting these facilities during the exposure period reported exposure to the building's water system.

18% of case-patients that visited a health care facility (or 5% of all confirmed cases) stayed overnight as either an **inpatient** or as a **resident** at a health care facility or assisted living facility during their exposure period.

36% of these cases died from their illness with Legionnaires' disease, compared to 4% of cases that were not an inpatient or resident in these facilities during the exposure period.

Legionellosis Case Investigation Protocol and Resources

Legionellosis Case Investigation Protocol Overview

Legionellosis is a Category II reportable disease in Wisconsin. Reporting of cases and suspect cases to the LTHD is required within 72 hours. After receipt of a case report, the LTHD is responsible for assigning an investigator, reviewing the record to ensure that the case definition criteria for legionellosis have been met, and performing a case investigation. Individual-level case investigations are a crucial step for legionellosis outbreak detection, as well as identifying additional situations that warrant further public health action (for example, an environmental assessment). This section will review

the case investigation process and provide external resources that may assist the case investigator.

Below are the steps that occur in a typical legionellosis case investigation:

- ✓ Import an electronic lab report (ELR) or web report from the staging area and assign a case investigator.
- ✓ Review information for the case in WEDSS as soon as possible and answer the following questions:
    - Does the case meet the criteria for a legionellosis case based on the most recent CSTE case definition?
    - Were any lower respiratory specimens (sputum, bronchoalveolar lavage [BAL], or pleural fluid) collected from the case-patient for any diagnostic testing?
    - Is there any evidence that the case-patient resides in a high-risk congregate living setting (such as a nursing home, assisted living, or correctional facility)?
        - **Note:** if information regarding the questions above are not available in WEDSS, consult medical records or reach out to the infection preventionist, health care provider, or laboratory at the facility treating the patient.
- ✓ When feasible, request that lower respiratory specimens be collected and submitted to WSLH for *Legionella* culture, including leftover specimen if already collected for another test, like a routine respiratory culture.

- ✓ In most situations, reach out to the case-patient to complete an interview, collect information on potential sources or exposure, and provide education.

- ✓ After the case investigation, complete data entry in WEDSS and send the record to state for Legionellosis Surveillance Coordinator (LSC) review as soon as practicable.

Legionellosis Case Investigation: Overview

Determination of a confirmed, probable, or suspect case of legionellosis is dependent on three factors:

1. Clinical signs
   - Legionellosis can cause one of three clinically distinct conditions: Legionnaires' disease, Pontiac fever, and Extrapulmonary legionellosis.

2. Epidemiological linkage
   - Probable cases only.

3. A positive laboratory test result
   - Confirmed and suspect cases only.

Test type and specimen source is important for appropriate case classification. Below is an overview of applying the case definition to reported legionellosis cases based on resolution status:

Confirmed Cases

- Clinical criteria are required.
  - For Legionnaires' disease, this requirement is met by a clinical or radiographic diagnosis of pneumonia, or a description of clinical signs consistent with pneumonia (examples include fever, cough, or shortness of breath).
- Confirmatory laboratory evidence is required.
  - This can include a UAT, isolating *Legionella* in culture or detecting *Legionella* using validated PCR test using validated reagents from an appropriate specimen source or observing a four-fold rise in convalescent titers for *Legionella pneumophila* serogroup 1.

Probable Cases

- Clinical criteria are required.
  - For Legionnaires' disease, this requirement is met by a clinical or radiographic diagnosis of pneumonia, or a description of clinical signs consistent with pneumonia (examples include fever, cough, shortness of breath, hypoxia).

- Epidemiologic linkage to a confirmed environmental source or suspect environmental source that is also connected to at least one confirmed case is required.
    - For example, a positive environmental result for *Legionella* (confirmed environmental source) or case used the same hot tub with insufficient residual disinfectant on environmental assessment as a confirmed case in absence of a positive environmental result (suspect environmental source).
- A clinical laboratory result is not required for probable cases.

Suspect Cases

- Clinical criteria are required.
    - For Legionnaires' disease, this requirement is met by a clinical or radiographic diagnosis of pneumonia, or a description of clinical signs consistent with pneumonia (examples include fever, cough, shortness of breath, hypoxia).
- Supportive laboratory evidence is required.
    - This can include direct fluorescent antibody staining (DFA), immunohistochemistry (IHC), or a four-fold rise in convalescent titers from a species or serogroup beside *Legionella pneumophila* serogroup 1 (or from pooled antigens).

Legionellosis Case Investigation: Clinical Criteria

Legionellosis presents as one of three clinically distinct conditions. Most reported cases of legionellosis in Wisconsin, as well as nationally, are for Legionnaires' disease. Below are considerations for determining whether clinical criteria are met for each of the three conditions:

Legionnaires' disease:

- The case-patient must have a clinical or radiographic diagnosis of pneumonia, or have clinical signs consistent with pneumonia (examples include fever, cough or shortness of breath).
- Other symptoms consistent with Legionnaires' disease include: altered mental status, chest pain or discomfort, gastrointestinal signs (such as abdominal pain, diarrhea, and nausea), headache, malaise, or myalgia. These symptoms may precede symptoms of pneumonia listed above during the course of illness.

Pontiac fever:

- Symptoms consistent with Pontiac fever include at least one of the following: fever, chills, fatigue, gastrointestinal signs (such as nausea or vomiting), headaches, malaise, or myalgia.
- Note that Pontiac Fever does not typically present as a respiratory illness. For case-patients presenting with respiratory disease, assess whether clinical criteria for Legionnaires' disease are met.
- Pontiac fever is typically a self-resolving illness that does not require inpatient care.

Extrapulmonary legionellosis:

- The case-patient must have signs of clinical illness at the site that *Legionella* was diagnosed (for example, a wound that cultures *Legionella*)—clinical manifestation may vary depending on location. Extrapulmonary legionellosis is rarely reported, and the initial diagnosis is typically not made using the optimal BCYE media for *Legionella* recovery.

Tip: If clinical criteria are not met for Legionnaires' disease for a case-patient, the Legionellosis Surveillance Coordinator (LSC) within BCD can assist with determining whether or not the case-patient meets the clinical criteria for Pontiac fever or Extrapulmonary legionellosis (or if the case should be sent to state with a resolution status of "**Not a Case**").

Legionellosis Case Investigation: Laboratory Criteria

Considerations for confirmatory test type

There are several laboratory methods to confirm a diagnosis of legionellosis. While most cases of Legionnaires' disease in Wisconsin (and nationwide) are detected via UAT, lower respiratory specimens should be collected and submitted to WSLH for *Legionella* culture (and potentially PCR). Clinical isolates can be compared with other isolates (clinical and environmental) during a facility investigation, which is not possible when only a UAT is completed. For this reason, **fee-exempt** *Legionella* culture is available to enhance legionellosis outbreak response capabilities. Below are considerations for each confirmatory test type:

***Legionella* culture:**

- This test is highly specific but has variable sensitivity. Sensitivity can be affected by antimicrobial therapy; specimen storage and transit conditions to the laboratory; or technique of the laboratory or individual microbiologist.
- Turnaround time is expected to be approximately 5–10 days, or up to 14 days.
- *Legionella* is **not expected** to be detected on routine respiratory cultures—instead, the test must be specifically ordered (and is available at WSLH).
- This test allows for detection of many species (for example, *L. pneumophila, L. micdadei, L. feeleii*) and serogroups (for example, *L. pneumophila* serogroup 2-6) that cannot be detected on urine antigen test.
- This test requires a lower respiratory specimen (for example, sputum, BAL, lung biopsy, or pleural fluid) to be considered a confirmatory test for Legionnaires' disease.

***Legionella* PCR:**

- This test has high sensitivity and specificity. Sensitivity can be affected by specimen storage and transit, or if specimen collection occurred significantly after initiation of treatment.
- As for culture above, this test can detect *Legionella* species and serogroups that UAT cannot, and lower respiratory specimens are required. A positive result on nasopharyngeal swab does not meet the criteria for a confirmatory test.
- Leftover specimen, if there is any, should be forwarded to WSLH for *Legionella* culture for all positive results, since clinical isolates are valuable for outbreak and cluster investigations.

UAT:

- This test has high specificity and sensitivity but is only expected to detect *Legionella pneumophila* serogroup 1.
- Turnaround time is generally very fast, since hospital laboratories can often perform this test and do not need to send out to a reference laboratory.
- This test can be positive for over a month after initial symptom onset, with some patients testing positive for several months after initial illness (Sopena, et al., 2002). Clinical correlation is particularly important with this test.
- Collection of lower respiratory specimens and submission to WSLH for *Legionella* culture is recommended for all UAT-positive case-patients since clinical isolates

can be directly compared to environmental samples during outbreak investigations. In many cases, it may not be obvious that a case is linked to an outbreak until several months after their initial illness. If a lower respiratory specimen has already been collected for routine respiratory culture, remaining specimen should be sent to WSLH, since routine respiratory cultures are not expected to detect *Legionella.*

Tip: BCD approval is **not required** for fee-exempt Legionella culture (or PCR, if needed) at WSLH if the patient **already has a positive UAT**.

Titers:

- Convalescent titers demonstrating a four-fold rise in titers specific to *Legionella pneumophila* serogroup 1 meet the criteria for confirmatory laboratory evidence.
- A single titer value does not necessarily indicate a recent exposure to *Legionella.*
- Since convalescent titers need to be taken 2-3 weeks after initial titers, this test has limited value for guiding treatment.

Although uncommonly encountered, supportive laboratory evidence (DFA, convalescent titers with pooled antigens or titers not specific to serogroup 1) is sufficient for a suspect case designation if there is a clinically compatible illness. For cases with supportive laboratory evidence, lower respiratory specimen collection and submission to WSLH for *Legionella* culture and PCR is recommended. UAT would also be recommended, if not already performed as a part of the initial diagnostic workup.

Considerations for results that do not imply a confirmed or suspect case

For laboratory results that do not meet laboratory criteria for a confirmed or suspect case, these reports should be imported into WEDSS as legionellosis disease incidents. However, under most circumstances, resolution status on the Investigation tab of the record can be set as "Not a Case" and the record can be sent to state (if this is the only positive legionellosis test result for the patient). If capacity allows, consider the following before sending the record to state staff for review:

- If the test result is a **PCR test from a nasopharyngeal swab**, consider outreach to the provider to determine if the patient has **pneumonia**.

        - If so, determine if any alternative etiologies for pneumonia (for example, COVID-19, influenza, or *Streptococcus pneumoniae*) have been identified, if any lower respiratory specimens have been collected, and if any other *Legionella* diagnostic testing was performed.
        - If the patient has pneumonia and no alternative etiologies have been identified, **request that lower respiratory specimens** are collected and forwarded to WSLH for ***Legionella* culture and PCR**, if feasible. Request a *Legionella* UAT as well, if this test has not already been performed.
        - Note that BCD approval **is required** for fee-exempt *Legionella* testing at WSLH under these circumstances. Please reach out to the Legionellosis Surveillance Coordinator to determine if the case qualifies for approval.
        - If the patient does not have pneumonia, an alternative etiology has been identified for pneumonia, or no further testing for *Legionella* is pending or can be performed, send the record to state as **"Not a Case."** No further follow-up is required or expected in this situation.
    - If the test result is a **single antibody test**, the considerations above would also apply as capacity allows. An additional consideration would be determining if the provider is planning to collect **convalescent** titers.

Tip: If the patient has only a nasopharyngeal PCR or single antibody test result, they would not be considered a case—even if they have pneumonia. However, evaluating the presence of pneumonia will determine whether further diagnostics for Legionnaires' disease are warranted.

Legionellosis Case Investigation: Applying the Case Definition

Once clinical and laboratory testing information is gathered, there should be sufficient information to determine if the criteria for a confirmed or suspect case are met. The tables below can be used to assist with making this determination. The laboratory criteria table also provides the resolution status to use in WEDSS.

If the case meets criteria for a confirmed or suspect case, then a case interview should be performed to determine potential exposure sources and whether the patient's illness can be linked to an outbreak investigation.

Probable cases are typically associated with ongoing outbreak investigations and will not be further discussed in this section.

Table 1: Use this table to determine if the case meets clinical criteria for legionellosis. If it does, go to **Table 2** to determine if the case meets laboratory criteria and to determine the appropriate **resolution status.** Note that this table may not represent all possible clinical scenarios. In cases where it is unclear whether clinical criteria are met, consultation with the LSC is recommended.

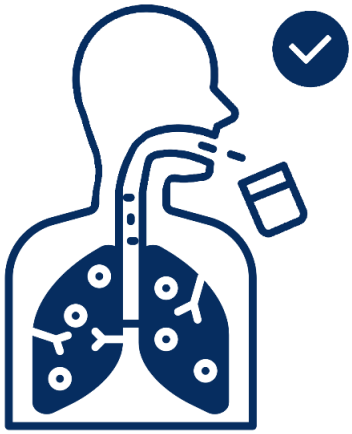
Determination of Clinical Criteria	
Clinical Attributes of Illness	**Meets Clinical Criteria**
Clinical diagnosis of pneumonia (for example, from medical record)	Yes, Legionnaires' disease
Radiographic (for example, chest CT report) interpretation of pneumonia	Yes, Legionnaires' disease
Clinical or radiographic signs consistent with pneumonia (for example, fever, cough, shortness of breath, hypoxia, consolidation on radiography)	Yes, Legionnaires' disease
Autopsy findings consistent with pneumonia	Yes, Legionnaires' disease
Altered mental status, chest pain, or fall without obvious respiratory symptoms	Possibly Legionnaires' disease, check with LSC
Self-resolving febrile illness with or without additional symptoms	Possibly Pontiac fever, check with LSC
Clinical description of illness outside of the lungs (for example, wound, abscess, septic arthritis)	Possible Extrapulmonary legionellosis, check with LSC
Upper respiratory symptoms (for example, nasal congestion, epistaxis)	No
Asymptomatic	No

Table 2: Use this table in conjunction with **Table 1** on the previous page to determine the appropriate resolution status for a case. Please note that **meeting laboratory criteria alone is not sufficient** for a case to be confirmed or suspect legionellosis. Clinical correlation is necessary for determining resolution status.

Determination of Laboratory Criteria and Resolution Status		
Laboratory Test	**Meets Laboratory Criteria**	**Resolution Status in WEDSS**
Urine antigen test	Yes, confirmatory	Confirmed, if clinical criteria met
Legionella culture of lower respiratory specimen (for example, sputum, lung biopsy)	Yes, confirmatory	Confirmed, if clinical criteria met
Legionella detection on validated nucleic amplification/PCR test of lower respiratory specimen	Yes, confirmatory	Confirmed, if clinical criteria met
Legionella detection on culture or PCR of extrapulmonary specimen	Yes, for extrapulmonary legionellosis only	Confirmed, if clinical criteria met
Paired antibody tests	Possibly confirmatory or supportive, check with LSC	Can be confirmed, suspect*, or not a case*, check with LSC
Direct fluorescent antibody staining or immunohistochemistry	Yes, supportive	Suspect, if clinical criteria are met*
Single antibody test result	No	Not a case*
Legionella detection on PCR test from upper respiratory specimen	No	Not a case*
No diagnostic testing	No	Not a case*
*In outbreak situations, the case may meet criteria for a probable case, if clinical criteria are met. In this situation, consultation with the LSC is recommended.		

Tip: It is not uncommon for a single antibody test result to be reported in WEDSS. Most single antibody test results will not be followed up with a convalescent titer.

Legionellosis Case Investigation: Requesting Testing at WSLH



Most positive legionellosis test results that are reported into WEDSS originate from a urine antigen test performed at a hospital or commercial laboratory. However, a urine antigen test does not provide a clinical isolate that can be used to directly compare to other clinical or environmental isolates. This is particularly important in outbreak investigations. In order to efficiently link cases to outbreaks, lower respiratory specimen collection should be requested for *Legionella* culture (and potentially PCR, depending on the situation) at WSLH for all cases. This testing is **fee-exempt** and does not require BCD approval **if the patient is already UAT-positive**. Please note that WSLH does not conduct UAT. Below are considerations for obtaining lower respiratory specimens for *Legionella* testing at WSLH:

- If the case only has a positive UAT result, reach out to infection prevention or the laboratory of the treating hospital to determine if a specimen was collected for any diagnostic testing, including a routine respiratory culture.
    - If so, and if there is leftover specimen, request that it is forwarded to WSLH for *Legionella* culture. This is because routine respiratory cultures are not expected to detect *Legionella.*
    - WSLH reference manual listings for the culture and PCR test can be shared with laboratory managers. WSLH Customer Service can provide requisition forms and answer further questions from submitting laboratories.
    - BCD approval is not required for fee-exempt *Legionella* testing at WSLH if there is already a positive UAT.
    - If the case has a positive *Legionella* PCR test from a lower respiratory specimen, request that leftover specimen be forwarded to WSLH for *Legionella* culture.
    - If the case has a positive *Legionella* culture result performed at a hospital or commercial laboratory, request that the isolate be forwarded to WSLH. WSLH can store the isolate if it is later needed for an outbreak.

Tip: This step should be done as soon as possible after receiving the case report or ELR in WEDSS. It is common for laboratories to dispose of leftover specimens 48 hours after collection.

Legionellosis Case Investigation: Case Interview Considerations

Once it has been established that the patient's illness meets the case definition for legionellosis and, when possible, lower respiratory specimens have been requested for WSLH *Legionella* culture (and potentially *Legionella* PCR, depending on the situation), a case interview to evaluate potential sources of exposure to *Legionella* is typically the next step in the case investigation process. Below are some general considerations regarding outreach to the client:

- It is common for Legionnaires' disease patients to be hospitalized for several days. If outreach to phone numbers provided in WEDSS are unsuccessful, consider whether the patient may still be an inpatient (and, if so, contacting the patient at the hospital).
- While less common, there are times when a Legionnaires' disease patient is too ill to complete a case interview. Consider whether it would be appropriate to complete the case interview with a suitable proxy: follow your agency's internal policy.
- Alternatively, if the patient is too ill to complete an interview and no appropriate proxy can be located, consider retaining the record in your caseload. The patient's status may improve with an extra week or two.
- In most situations, please make at least three attempts to contact before sending a record to state without an interview as "unable to locate."
- If the client cannot be interviewed (including if refused, unable to locate, or too ill to complete interview without an appropriate proxy identified), attempt to obtain an H&P and discharge summary from the hospital where the patient was treated, if this information is not already in WEDSS.
- If the client can be reached for an interview, complete all appropriate sections of the WEDSS form.
- If the patient has a known inpatient or residential stay at a health care facility, assisted living facility, or other congregate living setting prior to the case interview, consider reaching out to the LSC for additional interview considerations (if the above information is indicated in WEDSS, the LSC will likely prospectively reach out with additional considerations).

Legionellosis Case Investigation: LabClinical Tab Considerations

For most legionellosis case interviews, all interview questions are within the WEDSS form and data obtained from the interview can be directly entered into WEDSS. Below are considerations when interviewing the patient and completing WEDSS data entry:

LabClinical tab

- Most information on the LabClinical tab can be obtained prior to the case interview from the case report in WEDSS, the health care facility treating the patient, or from medical records.
- If information about symptoms, underlying conditions, or smoking history is absent, the case investigator should attempt to obtain this information during the case interview.
- Symptom onset date should be verified during the interview. Determining symptom onset date can be challenging for Legionnaires' disease cases. In general:
  - Use the date of acute onset of symptoms consistent with Legionnaires' disease (for example, fever, cough, shortness of breath, altered mental status), if available.
  - If the patient has a chronic respiratory illness, determine if there was an acute worsening from baseline or new symptoms that prompted the patient to seek care.
  - If necessary, use the date that pneumonia was diagnosed either clinically or radiographically.
  - If the diagnosis date and all other above considerations are unclear (for example, if patient has had numerous recent hospitalizations for pneumonia), it may be necessary to use the specimen collection date of the first positive confirmatory or supportive laboratory test.

Tip: For most reported cases of Legionnaires' disease, symptom onset date will be close to the clinical diagnosis date and specimen collection date of the first positive test.

Legionellosis Case Investigation: Case Interview Examples

Below are examples of case-patients that do not present with a clear and obvious

symptom onset date. Please note that the examples below are not inclusive of all situations that may be encountered. The Legionellosis Surveillance Coordinator can be consulted when symptom onset is unclear.

Examples	Symptom Overview	Suggested Onset Date	Comments
Patient #1: Altered mental status, fever, cough, consolidation on chest x-ray	Patient has gradual worsening from baseline confusion starting 1/1 and later is sent to the Emergency Room with acute onset of 102°F fever, cough, and chills on 1/9. Left lower lobe consolidation is identified on chest x-ray on 1/10.	1/9	Confusion is a non-specific symptom and, in this case, is gradual in presentation and starts long before an acute onset of symptoms consistent with pneumonia.
Patient #2: Found unconscious, hypoxic, consolidation on chest x-ray	Patient lives alone and was found unconscious at home on 1/16. Patient was severely hypoxic with identified right lobar consolidation on chest x-ray upon hospital admission that day.	1/16	Information about symptoms prior to clinical diagnosis is not available. If this information can be found during a proxy interview, a more accurate onset date may be possible to determine.
Patient #3: Diarrhea, abdominal pain, fever, shortness of breath	Patient has an acute onset of severe diarrhea and abdominal pain starting 2/14, followed by a fever of 101.5°F and shortness of breath on 2/15. Right-sided opacities are noted on chest x-ray on 2/16.	2/14	While non-specific, gastrointestinal symptoms are common with Legionnaires' disease, and this patient has an acute onset shortly before clinical signs of pneumonia.
Patient #4: Nasal congestion, fatigue,	Patient has an acute onset of nasal congestion, fatigue, and sneezing on 3/22 and reported a worsening of back pain the following day. Patient began to	3/25	Upper respiratory symptoms such as nasal congestion and sneezing are not typical symptoms of Legionnaires' disease. While fatigue is

backache, afebrile, productive cough, shortness of breath	have a productive cough on 3/25 and shortness of breath on 3/27. Patient was hypoxic upon hospital admission on 3/29 and diagnosed with pneumonia. Patient denied fevers.		common for Legionnaires' disease patients, it is non-specific and presented along with the upper respiratory symptoms.

Legionellosis Case Investigation: Risk Tab

Risk tab

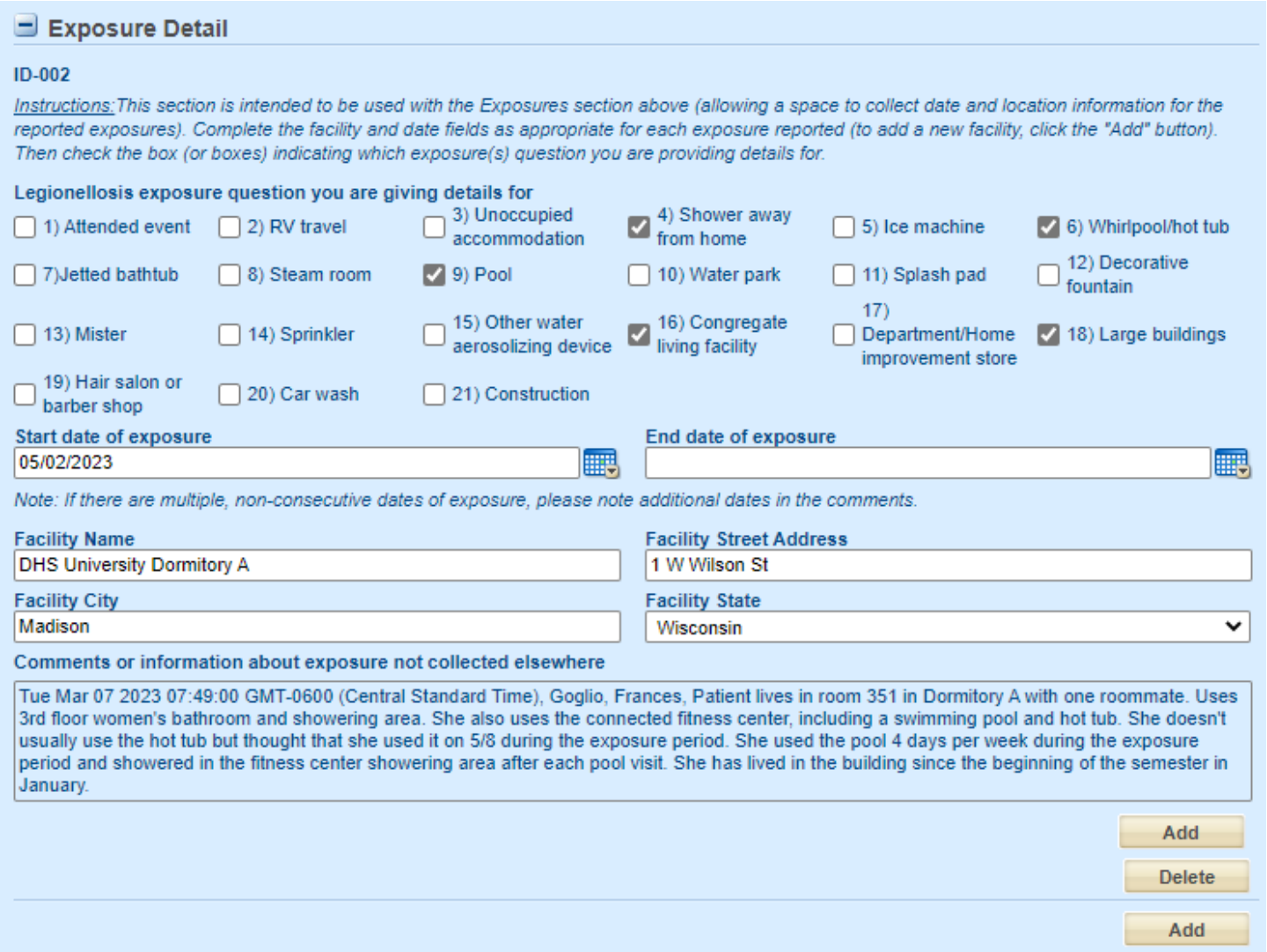
- The High Risk Settings section is to assess whether the patient was exposed settings that are associated with outbreak or facility investigations. These settings often, but not always, have centralized water distribution systems.
- If any of these settings apply to the patient, expand and complete the appropriate section(s) to supply additional information, such as facility name and location, dates attended, and types of exposure to water the patient had at the facility.
- In the Health Care and Assisted/Senior Living sections, there are questions about Water Management Programs at the bottom of the section. These are not intended to be asked during the patient interview.
    - If your patient is a resident, inpatient, or staff member at a nursing home, assisted living facility, or hospital, contact the LSC to determine if further facility follow-up is necessary after the interview.
- For lodging facilities, obtain address information and room number whenever feasible. If necessary, ask if the patient is willing to check their records for their reservation history. If obtaining accurate address information is not possible, ask if the client recalls any landmarks or an approximate location, since these details may be sufficient to determine where the patient stayed.
- Collect room number information for overnight stays in nursing homes, assisted living/senior living facilities, lodging facilities, and cruise ships, when feasible. If patient cannot obtain room number information for a lodging facility or cruise ship, ask if they remember which floor they stayed on.

- For larger lodging facilities (a multi-building resort, for example), additional information may be required, such as a building or villa number or specific location of a hot tub used. For such investigations, ask the patient if they would be willing to be contacted again with further questions.
- If none of the High Risk Settings questions apply to a client, skip to the Occupation and Industry questions.
- The legionellosis WEDSS form incorporates the standardized Occupation and Industry module. There is a guidance document available on WEDSS SharePoint to assist with data entry considerations for this module.
- There is also an Occupational-Additional section, intended to capture employment settings that may be an increased risk of aerosolized water exposure. Please include applicable volunteer work that the patient did during the exposure period.
    - These questions can be filled in as "no" if the patient indicates that they did not work and did not do volunteer work during the exposure period.
    - If any of the additional questions are answered as "yes," please provide a brief note in the comment box.
- The remainder of the exposure questions on the form are intended to capture potential sources of exposure to aerosolized water that may not be otherwise captured during previous questions on the form. This information can be particularly helpful for informing facility investigations or if a community cluster of unknown origin is detected at a later time.
    - Question one (events) is intended to capture potential exposure events that may affect a large number of people. The risk of *Legionella* exposure at any given event would depend on a variety of factors, so ask about potential exposures to water at the event.
    - Questions two and three (RV travel and previously unoccupied buildings) attempt to capture settings where exposure to stagnant water is more likely.
    - Questions four through 11 (personal care and recreational water): For recreational water (such as a hot tub), it is helpful to characterize whether the patient used the device or was just nearby.
    - Questions 12 through 15 address other sources of aerosolized water.
    - Question 16 (congregate setting): Consider that showering facilities may be shared in these settings.

        - Question 17 (department and home improvement stores): In these settings, it is helpful to determine if the patient went into a gardening section or encountered a display of an operating water feature.
        - Question 18 (cooling towers): Although many patients will not be familiar with cooling towers, examples are provided for large buildings that they may have visited. These examples do not need to be used but may be useful for prompting the patient. Do note that this question is not referring to home or car air conditioners, which are not thought to be a significant risk for *Legionella* growth and transmission.
        - Question 19 and 20 (salons and car washes): Risk of exposure to aerosolized water may vary in these settings. For salons, consider whether hair was washed or if there was any other likely exposure to water. For car washes, note whether the car wash was automatic or not.
        - Question 21 (construction): Consider asking whether the patient recalls any water disruptions during the construction period.
        - Question 22 is a space to note other locations that the patient reported visiting, but otherwise aren't captured on the WEDSS form.
    - For questions 1-22 in the exposure section, with a "yes" response, please complete the exposure detail section to capture dates, location, and notes about the exposure. There only needs to be one entry per facility (see Data Entry Example for additional help, if needed).
    - For the remaining questions (primarily related to household and personal devices): If the patient uses respiratory therapy equipment or a humidifier, note that filling these devices with tap water is not recommended. Additionally, consider whether the patient cleans their device. It is recommended that these devices are cleaned and maintained per manufacturer's instructions.
    - The Shared Exposure question can be asked at any time during the case interview when the case investigator feels that it is most relevant or appropriate. Situations when the case investigator may ask this question may include, but are not limited to:
        - The patient resided in a nursing home, assisted living/senior living, or a congregate living setting (such as a correctional facility).
        - The patient reported travel or attending a large event with other people.
        - Occupation-Additional questions were answered "yes," where additional co-workers may be exposed to the same setting.

- The patient used a whirlpool or other aerosolizing water device with other people.

Data entry example of Exposure-Detail section



Legionellosis Case Investigation: Case Interview Practice Scenarios

These practice scenarios include elements that are beyond the general expectations for typical case investigation follow-up. Case investigators are encouraged to review these scenarios to form connections between the case investigation process and future investigations.

Examples	Interview Question Responses	Tips for Follow-Up Questions
Patient #1	This patient reports staying at a vacation rental (using a shower at the home) before embarking on a cruise. On the cruise, the patient reported showering and using a hot tub multiple times. The patient stayed overnight and showered at the same vacation rental after disembarking.	○ The patient may have records of vacation rental registration details (or cruise manifest) in their email, if any dates and locations are unclear. ○ The cruise ship may have community showering areas (for example, near on-board waterpark) in addition to cabin showers. ○ The patient may have used multiple hot tubs on the ship—consider asking if they remember where on the ship the hot tub(s) were located.
Patient #2	This patient reports using a CPAP at home with distilled water. They traveled for 7 days of the exposure period, camping in their RV with a group of friends.	○ Consider asking the patient whether they brought their CPAP during their travel (and if they continued to use distilled water like they did at home). ○ There may have been stagnant water in the RV if it was not recently used.
Patient #3	This patient reports living in an assisted living facility.	○ Consider whether the patient is able to shower. If so, consider whether residents have private showers or use community showering areas. ○ Consider whether the patient used a therapy tub.

Patient #4	This patient provides custodial services for the local university and used a jetted tub at home to ease recent leg pain.	○ Large university buildings may use cooling towers—the client may recall which specific buildings they cleaned at during the exposure period. ○ The jetted tub may be a source of water stagnation and biofilm accumulation if the client only began to use it recently after an extended period of disuse.

Legionellosis Case Investigation: Conclusion

After the case interview, the case investigator should provide resources about transmission and prevention. This can be challenging for Legionnaires' disease since clients do not have control over water management practices of many building water systems that could have made them sick. In addition to the DHS legionellosis fact sheet, consider sharing CDC's *Legionella* webpage, which has information on transmission.

CDC also provides a helpful resource for homeowners with prevention strategies for a variety of waterborne pathogens, including *Legionella.*

Tip: Case-patients may ask whether they should test the water in their home for *Legionella*. If they proceed with home testing, it may be difficult for them to find a contractor to assist with remediation. Regardless, do recommend prevention methods as outlined in the above resource.

Legionellosis Case Investigation: Sending the Case to State

In most situations, a legionellosis WEDSS record can be closed by the local case investigator by changing the **process status** to "**Sent to State**" in the Investigation tab shortly after the case interview. The following are considerations when closing a case investigation in WEDSS:

- Verify that information obtained during the case investigation process (clinical and patient interview information) is documented in the WEDSS record.
- If there is a pending test result (for example, sputum culture at WSLH), please indicate this by selecting "Unknown" for the corresponding "Test Result" field in the LabClinical tab so the LSC can monitor for a result.

- Complete the Healthcare Disposition section in the Intervention tab. If presumptive or possible (see Defining Healthcare Settings for more information) is selected for either a health care setting or assisted living/senior living, please notify the LSC. Further facility follow-up may be warranted, particularly for inpatient stays, residents, or staff in these settings.
- Review the record to determine if any of the following circumstances apply. If so, please notify the Legionellosis Surveillance Coordinator, since additional facility follow-up may be warranted:
    - The patient traveled during exposure period and stayed overnight in a lodging facility, vacation rental, or went on a cruise.
    - The patient resides or works at a high-risk congregate living setting (for example, correctional facility).
    - The patient resided at a single facility without leaving for the entire 14-day exposure period.
    - If the patient is otherwise suspected to be linked to an outbreak.
- Once these steps are completed, change the process status to "Sent to State" to send the record to the LSC for review and closure.

Tip: For clients unable to be interviewed, wait for at least 24 hours after the last attempt to contact by phone or at least 5 days after sending a letter before sending the record to state.

DHS Resources

- Legionellosis web page
- Legionellosis fact sheet
- Diagnosing Legionnaires' Disease fact sheet
- Legionellosis case investigation training

CDC Resources

- 2020 Legionellosis Case Definition
- *Legionella* Home Page
- How Legionella Affects Building Water Systems and People
- Causes, How it Spreads, and People at Increased Risk
- Clinical Features

- Diagnosis, Treatment, and Prevention
- Preventing Waterborne Germs at Home

Additional Resources

- WEDSS SharePoint-Disease Specific Resources
- WSLH Customer Service
- WSLH Reference Manual

References

Barskey, A. E., Derado, G., & Edens, C. (2022). Rising Incidence of Legionnaires' Disease and Associated Epidemiologic Patterns, United States, 1992–2018. *Emerging Infectious Diseases*, 527-538.

Barskey, A., Lee, S., Hannapel, E., Edens, C., & Smith, J. (2022). *Legionnaires' Disease Surveillance, 2018-2019.* Atlanta: Centers for Disease Control and Prevention.

DeBoer, J. W., Yzerman, E. P., Schellekens, J., Lettinga, K. D., & Boshuizen, H. C. (2002). A Large Outbreak of Legionnaires' Disease at a Flower Show, the Netherlands, 1999. *Emerging Infectious Diseases*, 37-43.

Fraser, D. W., Tsai, T. R., Orenstein, W., Parkin, W. E., & Beecham, J. (1977). Legionnaires' Disease — Description of an Epidemic of Pneumonia. *New England Journal of Medicine*, 1189-1197.

Sopena, N., Sabria, M., Pedro-Botet, M. L., Reynaga, E., Garcia-Nunez, M., Dominguez, J., & Matas, L. (2002). Factors related to persistence of Legionella urinary antigen excretion in patients with legionnaires' disease. *European Journal of Clinical Microbiology and Infectious Diseases* , 845-848.

Appendix A: Legionnaires' Disease Case Investigation Checklist

The purpose of this document is to provide a quick reference of best practices for legionellosis case investigations. Case investigators may also reach out to the legionellosis surveillance coordinator (**LSC**) with additional questions.

1. Confirm that the patient meets the current **CSTE case definition** criteria for a legionellosis case.

Laboratory criteria: Review the **electronic lab report**. Did the patient test positive on a:

- ☐ Urine antigen test
- ☐ PCR test from a **lower respiratory** specimen source (for example, sputum or BAL)
- ☐ Culture from a **lower respiratory** specimen source (for example, sputum or BAL)
- ☐ Other test or specimen source:_____

Note: If the client has not tested positive on a laboratory test that meets the criteria for confirmatory of supportive laboratory evidence, then they are not a confirmed or suspect case. However, they may meet the criteria for a probable case.

Clinical Criteria: If available, review the **web report** or electronic **medical record** (if not available, contact infection prevention or the provider that diagnosed the patient). In the record, is there:

- ☐ Radiographic evidence of pneumonia
- ☐ A clinical diagnosis of pneumonia
- ☐ A description a symptoms consistent with a lower respiratory infection
- ☐ Other clinical presentation does not meet any of these descriptions: _____

_____

Note: If the client did not have an illness consistent with pneumonia, they would not meet the case definition for Legionnaires' disease. However, their illness may be consistent with Pontiac Fever or Extrapulmonary Legionellosis.

If you checked boxes *besides other* for both questions, then your client is a *confirmed case of Legionnaires' disease*—proceed to step 2. If "other" is checked for at least one question, see the *Less Common Legionellosis Case Investigation Scenarios Checklist*.

2. Determine if it will be possible to obtain a clinical isolate, in the event that the case is later linked to an outbreak.

If the client was diagnosed by a **lower respiratory culture or PCR**, check the lab report to determine the **laboratory that conducted the test**.

Testing was conducted at Wisconsin State Laboratory of Hygiene (WSLH).

- ☐ If test was a PCR test, reach out to WSLH Customer Service to determine if a *Legionella* **culture** was also ordered.

Testing was conducted at a different laboratory in Wisconsin.

- ☐ If test was a culture, reach out to the lab to have the isolate sent to WSLH.
- ☐ If test was a PCR, reach out to the lab to determine if there is any **specimen left over**. If so, request that the specimen be sent to WSLH for ***Legionella* culture**.

Note: If a specimen is being forwarded from a clinical lab to WSLH, notify the LSC if possible to facilitate fee-exempt testing. If testing was conducted in another state, DHS staff will attempt outreach to obtain an isolate, if appropriate.

If the client was diagnosed via urine antigen test, review available medical records (if not available, contact infection prevention or the provider). Is it noted that:

- ☐ A lower respiratory specimen was collected or ordered for *Legionella* culture.
- ☐ A lower respiratory specimen was collected or ordered for another test (e.g. routine sputum culture, which does not typically detect *Legionella*).
    - If box above is checked, attempt outreach to the lab to determine if there is any **specimen left over**. If so, request that the specimen be sent to WSLH for ***Legionella* culture**.
- ☐ A test requiring lower respiratory specimen was **not ordered** (or specimen could not be collected).
    - If client is still **inpatient** and test was not ordered, consider outreach to infection control to evaluate the possibility of sputum collection (and sending of specimen to WSLH for *Legionella* culture).

Note: Obtaining a clinical isolate, when possible, is very helpful for outbreak investigations. Characterizing isolates with sequencing techniques can assist with matching a clinical case to a suspected environmental source, or two cases to one another.

3. Collect information on potential exposure sources by completing the patient interview form fields in WEDSS.

- ☐ Complete the patient interview form fields in WEDSS with the patient (or a suitable proxy, if necessary).
- ☐ Offer resources for *Legionella* prevention, including the Preventing Waterborne Germs at Home webpage from CDC.
- ☐ If any of the below boxes are checked, additional investigation may be warranted: please **notify the LSC** to determine if additional steps are recommended.
    - ○ The client worked or resided in a **nursing home, assisted living facility**, or **senior living facility** during their exposure period.
    - ○ The client worked at or was an **inpatient** at a health care facility during their exposure period.
    - ○ The client had **overnight travel** during their exposure period.
    - ○ The client resided or worked in a **congregate living** setting (for example, a correctional facility or dormitory)
    - ○ The client resided in the same facility and did not leave at all during their **entire 14-day exposure period**.
    - ○ The client's case is suspected to be part of an outbreak.
- ☐ Complete documentation in WEDSS as soon as practicable and change the Process Status to "Sent to State" to facilitate review by the LSC.

Note: Additional investigation may include, but are not limited to: completing a supplemental questionnaire, obtaining additional medical records, facility notification, or a full environmental assessment of the facility with sampling for Legionella.

Appendix B: Guidance for Less Common Legionellosis Case Investigation Scenarios Checklist

This document is intended to address a limited scope of situations that are not covered in the Legionellosis **Case Investigation Checklist**. For scenarios not addressed here, the legionellosis surveillance coordinator (**LSC**) may be able to provide further guidance.

1. The patient **does not have** a positive **PCR** or **culture** result from a lower respiratory specimen (for example, sputum or bronchoalveolar lavage) or a positive urine antigen test (**UAT**).

- ☐ **The patient has a report of a single positive antibody test, or a positive PCR test from a nasopharyngeal (NP) swab.**
    - Single antibody tests and PCR tests from NP swabs do not meet the laboratory evidence criteria for legionellosis and can be sent to state with a **resolution status** of "**Not a Case**."

  However, if capacity allows, consider these steps:

  - ☐ Review clinical information to determine if pneumonia was diagnosed.
      - If pneumonia was diagnosed, consider reaching out to infection prevention to determine if a lower respiratory specimen was collected for *Legionella* culture or PCR. Consider determining if a UAT was performed.
  - ☐ If clinical information indicates that a **routine sputum culture** was ordered, determine if there is **remaining specimen** that can be sent to Wisconsin State Laboratory of Hygiene (WSLH) for ***Legionella* culture and PCR**.

Note: If a patient demonstrates four-fold increase in convalescent titers taken at least 2–3 weeks after the initial test, then they may meet the criteria for a confirmed or suspect case.

- ☐ **The patient has a positive DFA result.**
    - ☐ This would be considered supportive laboratory evidence. If the patient's illness meets clinical criteria, this would be a "Suspect" case.
- ☐ Determine if other *Legionella* testing (UAT, PCR, culture) has been performed
- ☐ Attempt to complete a **case interview** as indicated in Step 3 of the Case Investigation Checklist.

- ☐ **The patient has a positive PCR or culture result that is from a non-respiratory specimen (such as an extrapulmonary abscess or wound).**
    - ☐ Determine whether the patient had a **clinical illness** from the specimen site (for example, pain from cellulitis or an abscess). If so, the patient may meet the case definition for Extrapulmonary legionellosis. Consultation with the LSC is recommended(follow-up will be determined case-by-case).
- ☐ **Only a negative test result is available for this patient.**
    - ☐ In the absence of a positive test, this can be sent to state with a resolution status of "Not a Case."

2. The patient has a confirmatory diagnostic test result, but was not diagnosed with pneumonia.

- If the test result is from a PCR or culture from an extrapulmonary specimen and there is clinical illness at that site, the patient may meet the case definition for Extrapulmonary legionellosis. Consultation with the LSC and DPH is recommended (follow-up will be determined case-by-case).
- If the test result is from a lower respiratory PCR, culture, or UAT, consider the following:
    - ☐ Does the patient have any symptoms consistent with **Legionnaires' disease**, including (but not limited to): cough, shortness of breath, fever, increased oxygen dependence, or altered mental status?
    - ☐ Did the patient have any **abnormal chest radiography** results?
    - ☐ Has the patient been **diagnosed with pneumonia** in the past **six months**?
    - ☐ Does the patient live in a **congregate or high-risk setting**?

- If none of the above apply, then the case can be sent to state with a resolution status of "Not a Case."
- If at least one of the above applies, consultation with the LSC is recommended as needed to determine resolution status.

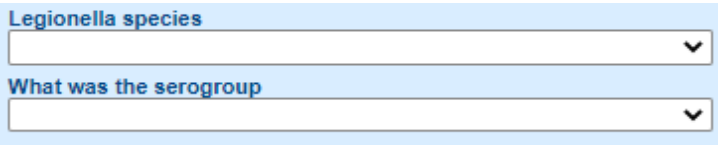
Appendix C: Legionellosis Case Investigation Form Data Elements Supplemental Fact Sheet

The goal of this resource is to provide a detailed description and explanation for the data elements in the Legionellosis WEDSS form. This guide will go through the form section by section in the order that they appear in WEDSS. Note that this guide is not a comprehensive review of every field in the form—if further clarification is needed, please reach out to the legionellosis surveillance coordinator (**LSC**) with the specific concern.

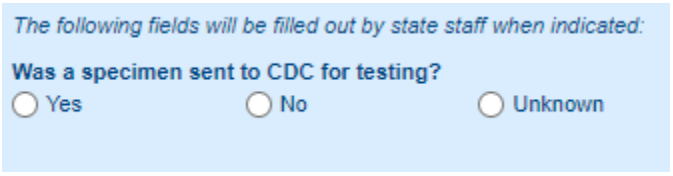
Labclinical tab: Laboratory

This tab contains fields for pertinent laboratory and clinical data collection, similar to other communicable disease WEDSS forms. New features in the 2023 updates include an in-form reference to both the laboratory and clinical criteria to the CSTE legionellosis case definition and the **lab widget summary** to assist with documentation.

For most reported cases of legionellosis, the diagnostic test type will be "Urine Antigen" with a Specimen Type of "Urine." However, this should be verified with electronic lab reports (ELRs) in the file cabinet or with information in the lab widget summary.



If the patient's positive test result is from a urine antigen test, **species** will be "***pneumophila***" and **serogroup** will be "**Serogroup 1**." PCR and culture can detect non-pneumophila species (and non-serogroup 1 *pneumophila*), so species and serogroup will need to be verified with the lab report for culture and PCR tests. Serogroup information is typically only available for *Legionella pneumophila.* For cases where a different species is indicated, serogroup can usually be marked "unknown."

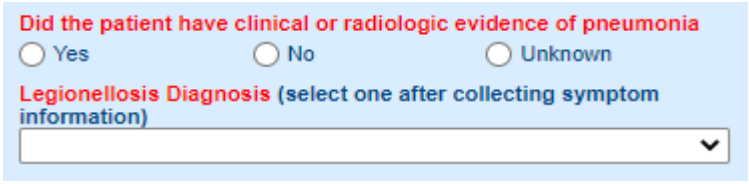


Specimens will **not be sent** to CDC for most case investigations. If the patient has multiple lab results (such as UAT or PCR), please use the "OK" button to complete documentation for all available test results.

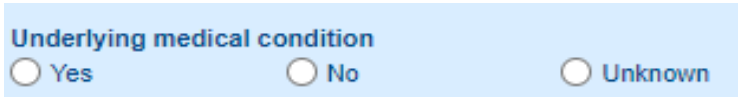
Labclinical tab: Clinical

Clinical information can be obtained from medical records, infection prevention, or from the patient interview. The symptom options listed in the form are symptoms that comprise the CDC clinical features of Legionnaires' disease or Pontiac Fever. When

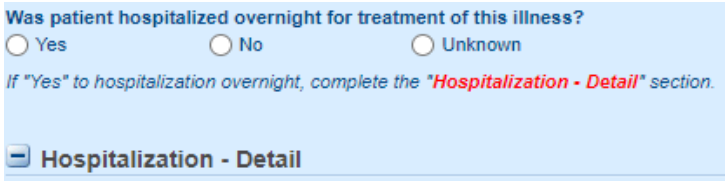
determining symptom onset date and symptoms, note that Legionnaires' disease patients often have underlying chronic respiratory conditions. In these cases, an acute worsening of respiratory symptoms, or other symptoms consistent with Legionnaires' disease, may be used. In cases where this cannot be determined, a clinical diagnosis date or the date from radiography consistent with pneumonia may also be considered as the onset date.



To meet clinical criteria of a Legionnaires' disease case, the patient must either have **radiographic evidence** of pneumonia, or have a **clinical** illness consistent with **pneumonia**. "Pontiac Fever" should only be selected for patients that do not have respiratory symptoms and have a mild illness with consistent clinical features. Not all patients that do not meet Legionnaires' disease criteria will meet the criteria for Pontiac Fever.



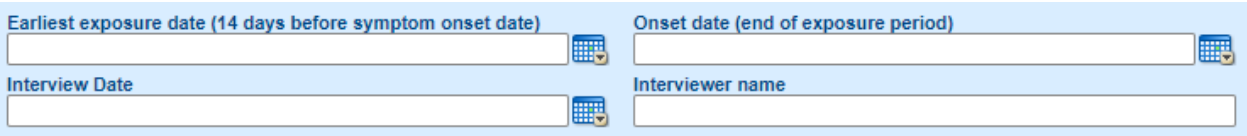
It is very common for Legionnaires' disease patients to have underlying conditions. These can often be obtained from **medical records** or **patient interview**. Regardless of whether or not the patient has any underlying medical conditions, please document whether they have a **smoking history**.



The questions about hospitalization on this tab refer to whether the patient has been hospitalized as an inpatient **for their current illness**—this is not a section to document a hospitalization that occurred during the exposure period. For hospitalizations that occurred prior to the current illness and during the exposure period, there is a separate section to document relevant details in the **Risk tab**.

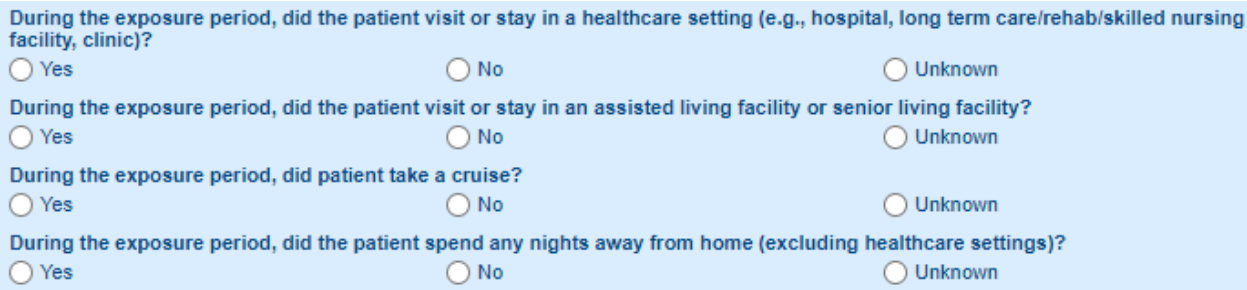
Risk tab

This tab facilitates data collection of potential exposure sources for the patient's illness. *Legionella* exposures are typically associated with **building water systems** and **human-made water fixtures**. Therefore, the majority of the questions solicit information about exposure to water. Note that the symptom onset date fields in this form are not linked to one another. Please use a **14-day exposure period**, unless the LSC recommends



otherwise.

Risk Tab: High Risk Settings



Residents of nursing homes, assisted living facilities, and senior apartments are more likely to have risk factors consistent with increased risk of severe illness with Legionnaires' disease. This is also true for patients with inpatient hospital stays. However, health care settings can also include other settings, including outpatient clinics, dental offices, and dialysis clinics. Cruise ships and other lodging facilities may be used by residents of several different states, making routine surveillance of legionellosis associated with these facilities more difficult. If any of these questions apply to the case, please expand and complete the supplemental questions for the appropriate setting. These supplemental questions are intended to assist with documenting timeline, location, and potential exposures to water in each setting. In any situation when a patient stays overnight, please ask for room number—if there is no dedicated field, please place this information in the comment. After these questions are completed, complete the remainder of the case interview as usual. At the conclusion of the interview, please notify LSC of the potential high-risk setting exposure.

If none of these questions apply to the case, then the next section of the form to complete for all patients is the Occupation and Industry module.

Risk Tab: Occupation and Industry

For the standardized Occupation and Industry module, please complete this section as for other communicable disease forms. This resource from BEOH can be consulted as needed for correct data entry in this section.

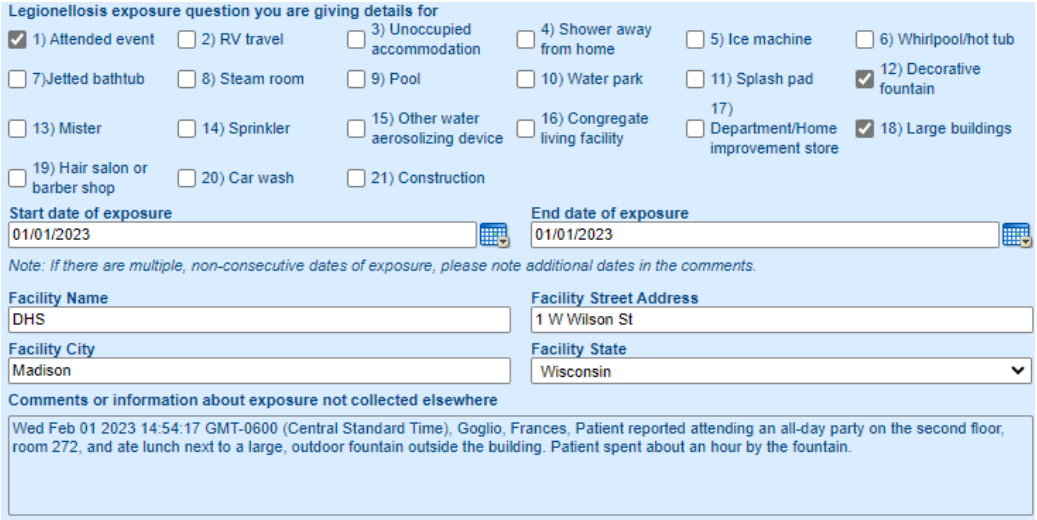
Risk Tab: Occupational-Additional

These are supplemental occupation questions specific to the legionellosis form—they should generally be completed for all clients: For example, if a client indicates that they are retired in the previous module but work in a kitchen washing dishes on a volunteer

basis, the volunteer information would be missed without the additional questions. Please enter additional information (details about exposure to water, name and location of facility, dates visited) in the comments if this information is not otherwise captured in the form.

Risk Tab: Exposure and Exposure-Detail

These two sections are designed to capture risk factors for legionellosis exposure that may not be captured in the high-risk and occupation questions. Answers to these questions can greatly assist our surveillance efforts, especially when there are increased cases in a community that are not clearly associated with a high-risk setting. For any "yes" responses in the exposure section, please scroll down to the Exposure-Detail section and supply facility information for that exposure. If several of the exposure questions apply to the same facility, please check the boxes in the Exposure-Detail section for all questions that apply to the facility. Below is an example of data entry in the Exposure-Detail section for a single facility.



Risk Tab: Shared Exposure

This question is designed for the case investigator to ask at their discretion during the interview process—there is no standardized approach to obtain this information. Instead, consider the following during the course of the interview (note that this is not a comprehensive list):

- Was a high-risk or congregate living setting, like long-term care or assisted living, identified?
- Did the case-patient report traveling or attending an event with other people?

- Were any of the Occupation-Additional questions answered “yes,” where additional co-workers may be exposed to the same setting?
- Did the case-patient report using a whirlpool or other aerosolizing water device with other people?

If a setting or situation that may be consistent with an outbreak is identified, please use the free-text field in this section to provide additional information that the patient is willing and able to provide for any others that they are aware of that have or had an illness consistent with Legionnaires’ disease or Pontiac Fever.

Intervention tab

The Attempts to Contact and Health Teaching sections should be completed as on other communicable disease forms. Please share the Preventing Waterborne Germs at Home webpage with all clients.

Intervention tab: Disposition

This is a section specific to the legionellosis form. These fields are completed after the interview with the client has concluded, in most situations. Please note that, when entering data regarding whether the patient spent their entire 14-day exposure period at a single facility, that “yes” should only be selected if the client did not leave the building. If “yes” is selected for this question, please provide information in the Investigation tab notes section indicating where the patient spent the 14-day exposure period, if it is not otherwise indicated on the form.