

Local Health Department Guidelines for Epidemiologic Investigation and Control of Legionnaires' Disease

Maryland Department of Health
Infectious Disease Epidemiology and Outbreak Response Bureau
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Introduction

Legionellosis is a respiratory disease caused by *Legionella* bacteria. Sometimes the bacteria cause a serious type of pneumonia (lung infection) called [Legionnaires' disease](#).¹ The bacteria can also cause a milder illness characterized by fever and muscle aches called [Pontiac fever](#).¹

Legionella are rod-shaped, Gram-negative bacteria that are naturally found in fresh water environments, like lakes and streams. *Legionella* can become a health concern when the bacteria colonizes and amplifies in man-made water systems (e.g., building plumbing systems). There are at least 60 different species of *Legionella*; most are considered to be potentially pathogenic in humans, but [most disease is caused by *Legionella pneumophila*, particularly serogroup 1 \(Lp1\)](#).²

This document provides general guidance on the investigation of legionellosis cases and outbreaks. However, legionellosis outbreaks should be evaluated on an individual basis with the consultation of local and state public health professionals to determine the appropriate steps for prevention and control.

Questions regarding this document can be directed to:

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Disease Description

Mode of Transmission: [People are exposed to *Legionella* when they breathe in mist \(small droplets of water in the air\) containing the bacteria](#).³ Hot water distribution systems are more frequently implicated in disease transmission, as *Legionella* thrive in warm water. However, cases and outbreaks have been associated with cold water systems and other types of water features (e.g., ice machines, decorative fountains, cooling towers).

Less commonly, Legionnaires' disease can be acquired by the aspiration of drinking water that is contaminated with *Legionella*. This may occur when water "goes down the wrong pipe," into the trachea (windpipe) and lungs. People at increased risk of aspiration include individuals with swallowing difficulties and those who are in a supine position.

Generally, legionellosis is not transmitted from person to person.

Incubation Period: For patients with [Pontiac fever](#), symptoms typically begin 24 to 72 hours after exposure.⁴ For those with [Legionnaires' disease](#), symptoms begin 2-10 days after exposure, with an average of 5-6 days, though in rare cases the incubation may be much longer.⁴

Clinical Characteristics: [Pontiac fever](#) is the milder form of legionellosis, generally resembling influenza-like illness (ILI). Typical symptoms include fever and muscle aches. Notably, pneumonia is not present in patients with Pontiac fever. People with Pontiac fever rarely require hospitalization and the illness is not known to be life-threatening, with symptoms typically resolving naturally after a few days. Due to the mild nature of the illness, most cases go undetected.⁴

[Legionnaires' disease](#) is a more severe manifestation of legionellosis, characterized by pneumonia (diagnosed clinically or by radiography). Other common signs and symptoms include cough, shortness of breath, headaches, muscle aches, and fever. Some people with Legionnaires' disease also report nausea, vomiting, and diarrhea.⁴ [Less than 5% of those exposed to the bacteria go on to develop Legionnaires' disease](#), but among those who do, hospitalization is common. The [case-fatality rate ranges from 10-25%](#) but may be higher in situations where diagnosis and/or treatment is delayed.¹

Most healthy people do not get Legionnaires' disease after exposure to *Legionella*. [People at increased risk of contracting the illness are](#)²:

- People 50 years or older;
- Current or former smokers;
- People with a chronic lung disease;
- People with weak immune systems or who take drugs that weaken the immune system;
- People with cancer;
- People with underlying illnesses such as diabetes, kidney failure, or liver failure.

Communicability Period: In general, Legionnaires' disease and Pontiac fever are not spread from one person to another. However, this may be possible in [rare cases](#).²

CDC/CSTE Surveillance Case Classifications and Definitions

CDC/CSTE Surveillance Case Classification of Legionellosis (2005)⁵

1) Clinical Case Definitions:

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

2) Laboratory Criteria for Diagnosis:

Confirmed:

- By culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid.
- By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.
- By seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

Suspect:

- By seroconversion: fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6).
- By seroconversion: fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents.

- By the detection of specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid by direct fluorescent antibody (DFA) staining, Immunohistochemistry (IHC), or other similar method, using validated reagents.
- By detection of *Legionella* species by a validated nucleic acid assay.

3) Case Classification:

- **Confirmed:** A clinically compatible case that meets at least one of the confirmatory laboratory criteria.
- **Suspected:** A clinically compatible case that meets at least one of the presumptive (suspected) laboratory criteria.

[Cases of legionellosis are reportable in Maryland](#), and healthcare providers and laboratories are required to report cases **immediately**.⁶

The most current CDC/CSTE legionellosis case definitions can be found at: <https://wwwn.cdc.gov/nndss/conditions/legionellosis/>

4) Outbreak Definitions:

MDH defines an outbreak of legionellosis as two or more cases associated with the same possible source during a 12-month period. This applies to both healthcare settings (e.g., nursing homes, hospitals) and non-healthcare settings (e.g., hotels, condominiums). Additionally, a single confirmed case of Legionnaires' disease that was definitely acquired in a healthcare setting may be considered an outbreak. **All outbreaks should be reported immediately to the local health department (LHD).**

Testing/Laboratory Diagnosis

Testing for legionellosis should be considered in patients with community-acquired pneumonia and is recommended for patients with healthcare-associated pneumonia, defined as having an onset of pneumonia symptoms >48 hours after admission. Legionnaires' disease can be acquired year-round, but [clinicians should be particularly vigilant for possible Legionnaires' disease during the summer and early fall](#).⁷

Listed below are [indications that warrant testing for Legionnaires' disease](#) in individuals with community-acquired pneumonia:

- Patients who have failed outpatient antibiotic therapy for community-acquired pneumonia
- Patients with severe pneumonia, in particular those requiring intensive care
- Immunocompromised patients with pneumonia
- Patients with pneumonia in the setting of a legionellosis outbreak
- Patients with a travel history (patients that have traveled away from their home within ten days before the onset of illness)

[Clinicians should test patients with healthcare-associated pneumonia for Legionnaires' disease](#). This is especially important among patients at increased risk for developing Legionnaires' disease, among patients with severe pneumonia (in particular those requiring intensive care), or if any of the following are identified in a healthcare facility:

- Other concurrently admitted patients with Legionnaires' disease, no matter where they acquired the infection

- Positive environmental tests for *Legionella* in the 2 months prior to onset
- Changes in water quality that may lead to *Legionella* growth (such as low chlorine levels)

The *Legionella* urinary antigen test (LUAT) is the most common test performed; however, collection of respiratory specimens for *Legionella*-specific culture and polymerase chain reaction (PCR) testing is strongly recommended as a means to detect all species and subgroups of *Legionella* and enable strain identification in the event of an outbreak. LUATs only detect the presence of one serogroup of *Legionella* (Lp1), while other pathogenic species and serogroups can be detected in sputum. [LUATs and Legionella-specific culture also are recommended for suspected cases of healthcare-associated Legionnaires' disease.](#)⁸ In certain scenarios, it may be recommended that paired sera be collected for *Legionella* serologic testing at the MDH laboratory, which can also detect pathogenic serogroups other than Lp1.

Table 1. [Specimens and diagnostic tests for legionellosis, along with advantages & disadvantages of each test.](#)

What to collect	Test	Advantages	Disadvantages
Urine	<i>Legionella</i> urinary antigen test	<ul style="list-style-type: none"> • Rapid (same day) 	<ul style="list-style-type: none"> • Only detects Lp1 • Does not allow for molecular comparison to environmental isolates
Lower respiratory specimens (i.e. sputum, bronchoalveolar lavage (BAL), lung biopsy, etc.)	<i>Legionella</i> culture*	<ul style="list-style-type: none"> • Clinical and environmental isolates can be compared • Detects all species and serogroups 	<ul style="list-style-type: none"> • Technically difficult • Slow (>5 days to grow) • Sensitivity highly dependent on technical skill • May be affected by antibiotic treatment • Requires BCYE agar, which some laboratories may not have readily available
	DFA	<ul style="list-style-type: none"> • Can be performed on pathologic specimens • Possible to detect species and serogroups other than Lp1 	<ul style="list-style-type: none"> • Technically difficult • Reagents may be difficult to obtain
	PCR	<ul style="list-style-type: none"> • Can be performed on pathologic specimens • Rapid • Possible to detect species and 	<ul style="list-style-type: none"> • Assays vary by laboratory and are not FDA-approved

		serogroups other than Lp1	
Serum	<i>Legionella</i> serology	<ul style="list-style-type: none"> • Not affected by antibiotic treatment • Possible to detect species and serogroups other than Lp1 	<ul style="list-style-type: none"> • Must have paired sera (with a convalescent specimen drawn 2-7 weeks after the acute specimen) • 5-10% of population has titer 1:≥256 • Single acute phase antibody titers of 1:≥256 do not discriminate between cases of legionellosis and other causes of community-acquired pneumonia

* Note that *Legionella* are not detected by routine clinical respiratory cultures and must be specially ordered

Recommended steps for testing:

For most routine, sporadic cases of legionellosis, specimens do not need to be submitted to MDH; however, as outlined in the [Code of Maryland Regulations \(COMAR\) 10.06.01.03 C](#), if *Legionella* is isolated from a clinical specimen, the isolate must be sent to the MDH lab (even for a sporadic case).⁹ Additionally, for outbreak investigations or case investigations involving a special setting, it may be requested that specimens be collected and submitted to MDH for testing for *Legionella* and other respiratory pathogens.

For *Legionella* testing at the MDH lab:

- Urine and sputum specimens should be collected in empty sterile containers and shipped on ice packs.
- Serum specimens should be collected in red top or marble top or “tiger” top vacutainer tubes, refrigerate between 2-8 °C and shipped on ice packs.

For detailed information on specimen submission, see the MDH [Guide to Public Health Laboratory Services](#).¹⁰

Laboratory test requisition forms may be found on the MDH Laboratories Administration website.

- For Sputum Specimens – Infectious Agents Culture Detection ([MDH Form 4676](#) or the “Yellow Lab Slip”)¹¹
- For Urine and Serum Specimens – Serological Testing ([MDH Form 4677](#) or the “Blue Lab Slip”)¹²

Treatment

[Legionellosis can be treated with commonly available antibiotics](#) (including macrolides or fluoroquinolones).⁸ Physicians can be directed to the [most recent Infectious Disease Society of America \(IDSA\) and the American Thoracic Society \(ATS\) guidelines](#) for the treatment of community-acquired pneumonia and the most recent IDSA-ATS guidelines for the treatment of hospital-acquired pneumonia.¹³ Note that first line treatment for pneumonia, however, does not always include *Legionella*-directed antibiotics (e.g., macrolides and respiratory fluoroquinolones). While it is preferred that a healthcare provider obtains diagnostic testing before antibiotic administration, antibiotic treatment should not be delayed to facilitate this process.

Antibiotic treatment should not be prescribed for Pontiac fever. It is a self-limited illness that does not benefit from antibiotic treatment. Patients usually recover within 1 week.

Prevention

There is no vaccine to protect against legionellosis. [The key to preventing Legionnaires' disease is to prevent the growth and spread of *Legionella* in building water systems.](#)¹⁴ Some building water systems have a higher risk for *Legionella* contamination than others. Measures can be taken to reduce the likelihood of *Legionella* growth and to reduce the aerosolization of water that susceptible individuals may inhale. A *Legionella* water management program is a plan to reduce the risk of *Legionella* growth and spread. Many different types of buildings need a water management program. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) [Standard 188-2018 "Legionellosis: Risk Management for Building Water Systems"](#) contains guidance for identifying buildings in need of *Legionella* water management programs, as well as for implementing and maintaining successful programs.¹⁵ The CDC has developed a [water management program toolkit](#) to help building operators interpret and implement the ASHRAE guidance.¹⁶

In addition to the guidance from ASHRAE and CDC, the Center for Medicare & Medicaid Services (CMS) has issued a [requirement](#) that all Medicare-certified healthcare facilities have water management policies and procedures to reduce the risk of growth and spread of *Legionella* and other waterborne pathogens.¹⁷

Case/Outbreak Investigation

Recommended case investigation procedures:

The case investigation should begin promptly to determine if the case is associated with a high-risk setting, such as a healthcare facility, and if control measures need to be immediately implemented. (Refer to the *Special Settings* Section, below, for additional guidance on case investigation procedures relevant to buildings commonly associated with outbreaks, such as healthcare and lodging facilities.)

1) Confirm legionellosis diagnosis:

Confirm the diagnosis of legionellosis by collecting the following:

- Laboratory results for *Legionella* (e.g., LUAT, serology, cultures) and results of testing for other infectious agents.

- Relevant clinical information, including past medical history, history of present illness, and signs or symptoms of pneumonia (i.e., clinical diagnosis or other chest imaging).

2) Interview the case-patient and determine if there was exposure to a high-risk setting:

The case investigation is generally the responsibility of the LHD of the case-patient's residence, regardless of where the disease was acquired or diagnosed. The investigation should begin within 24 hours of notification to the health department, to determine whether there is a healthcare-associated (healthcare visit) or travel-associated (overnight stay outside the home in a non-residential setting) risk. If such a risk is found, it should be reported immediately to MDH so that further action can be taken if necessary. Regardless of identified risk factors, the [CDC Legionellosis Case Report Form and MDH Supplemental Legionellosis Questionnaire](#) should be submitted to MDH as soon as possible, but no later than 5 working days after receipt of the report.¹⁸ If the case-patient or proxy is not able to be interviewed within 5 working days, MDH should be notified and the forms should be submitted with available information and updated and resubmitted once the interview has been completed.

If the case-patient is unable to be interviewed, the investigator should try to obtain collateral information, such as interviewing a healthcare provider or other proxy that is knowledgeable about the patient's exposure history. The investigator should inquire about any medical or dental visits, the patient's occupation, and any travel that occurred in the 2-10 days before onset. If the case-patient resides in a healthcare facility, nurses and/or check-in logs might be able to provide some of the required information.

Completed case report forms should be faxed to IDEORB at (410) 225-7615. If the case is travel or healthcare-associated, please immediately notify IDEORB at (410) 767-6700 during business hours, or after business hours, please notify the Epidemiologist On-call at (410) 795-7365.

3) Environmental assessment for sporadic cases of legionellosis:

For some sporadic single cases of Legionnaires' disease, it might be appropriate to assess or investigate facilities that could be potential sources of exposure. Actions may include inquiring about if the facility has a water management plan, requesting results from recent water testing for *Legionella*, coliforms or other targets, and/or documentation of water treatment (for facilities that regularly treat their water) or water maintenance (such as logs of temperature, pH, or free chlorine). If the facility's system had a break in maintenance or is not operating properly at the time of review, the facility may wish to pre-emptively remediate the potable water system (see *Water Remediation* Section). If water samples are to be collected as part of the investigation, sampling should be done before remediation. If the facility has a spa regulated by the LHD and MDH, a complaint investigation/inspection can be conducted to ensure compliance with spa regulations, and the following actions should be taken:

- Review the spa operating records to determine if any breaks in sanitization, filtration, or maintenance have occurred recently.
- Obtain a copy of the operating records for LHD records.
- If the facility's spa is out of compliance at the time of inspection, the inspector can require the facility to follow a spa remediation protocol. If the spa chemistry and filtration are in compliance at the time of inspection, the inspector can, as a precautionary measure, still recommend the facility follow a spa remediation protocol. [[See disinfection of Hot Tubs Contaminated with Legionella](#)]¹⁹

Outbreak or confirmed case of legionellosis associated with high-risk setting:

Outbreaks are commonly associated with buildings or structures that have complex water systems, like hotels and resorts, long-term care facilities, hospitals, and cruise ships. The most likely sources of infection include fixtures and features that aerosolize water at temperatures optimal for *Legionella* growth – such as showers, hot tubs, decorative fountains and cooling towers (parts of centralized air-conditioning systems for large buildings). Home and car air-conditioning units do not use water to cool the air, so they are not a risk for *Legionella* growth and transmission.

Legionellosis outbreaks can be difficult to identify, especially if people travel to a common location, are exposed to *Legionella*, and then return home before becoming sick. State and local health departments take the lead in investigating outbreaks and recommending control measures to reduce the risk of exposure to *Legionella* from potentially contaminated water sources. When a high-risk setting is associated with a confirmed case or outbreak of legionellosis, control measures should be instituted immediately and maintained **as determined by the Health Officer for the jurisdiction in which the facility is located.**

Outbreaks must be reported to the LHD immediately. According to COMAR 10.06.01, all licensed healthcare providers and administrators of facilities must report outbreaks of diseases of public health importance including outbreaks as defined in these guidelines.

Typically, a single confirmed case or an outbreak of legionellosis associated with a high-risk setting triggers a more intensive epidemiological investigation and environmental assessment of the implicated facility. An epidemiologic investigation should be initiated within 24 hours of notification to the LHD. Coordination between the epidemiologic investigation and the environmental health assessment should begin as early as possible. The objectives of the epidemiologic investigation are to identify any other potential cases (active case finding) and to determine the most likely source of exposure.

Prevention and control measures:

1) Implementation of water restrictions:

Because the most likely sources of infection include fixtures and features that aerosolize water at temperatures optimal for *Legionella* growth, immediate control measures to prevent additional exposures focus on restricting activities that aerosolize the potable water or facilitate the inhalation of aerosolized water droplets by high-risk occupants (including employees). Building managers/administrators should immediately institute water restrictions for [high-risk individuals](#) throughout the facility at the direction of the LHD and MDH.²

If water restrictions are recommended, the management should immediately limit occupants' exposure to the potable water system, by either disabling or restricting access to:

- Showers
- Drinking fountains
- Tap water used for drinking
- Ice machines
- Decorative fountains
- High-powered spray hoses used in kitchens and beauty salons
- Whirlpools/spas

- Any other sources of water that may be easily aerosolized

It is important to note that water restrictions include:

- No drinking or brushing of teeth with domestic tap water
- No flushing of nasogastric tubes or preparation of medications with tap water
- No consuming ice from ice machines

High-risk individuals should use bottled water for all oral consumption of water.

Showering is not recommended while water restrictions are in place. Under some circumstances, building occupants may take baths. While bathing in a tub is considered to be lower-risk than showering, there may still be some risk, and individuals should take extra precaution. It is recommended that the occupant (or staff member, if in a healthcare setting) turn the faucet on and wait outside of the bathroom with the door closed as the tub fills. Then reenter the bathroom to turn the faucet off and exit again to allow time for water mists to settle before bathing.

Signs should be posted to make occupants and visitors aware of these restrictions.

The potable water supply should **NOT** be turned off, as occupants must be able to wash hands and flush toilets. Additionally, water may be used for cooking in commercial kitchens, washing fruits and vegetables, doing laundry (in a machine), and running a dishwasher (which is preferable over washing dishes by hand while water restrictions are in place).

While water restrictions should be implemented immediately following the recommendation of the LHD and MDH, certain accommodations may be granted to allow for portions of the water system to be used prior to water restrictions being lifted for the entire water system. Possible accommodations include:

- Temporary, portable showers may be used or individuals may shower in another area of the building/campus if that area does not use the affected water system. Use of such showers requires prior approval by the LHD and MDH.
- The LHD and MDH may allow facilities to install point-of-use filters meeting certain criteria (e.g., pore size <0.2 microns) in certain settings so that some water outlets may remain in use during water restrictions. Point-of-use filters should be considered only a short-term measure while system-wide remediation is ongoing. **Filters must be approved by the LHD and MDH prior to use.** Facilities should notify persons using showers with point-of-use filters that there may still be some risk of *Legionella* transmission, as no prevention measure is 100% effective. Facilities should always follow the manufacturer's instructions for filter installation and maintenance.

The feasibility of these accommodations should be discussed with a water consultant prior to seeking approval from the LHD and MDH.

2) Lifting of water restrictions:

Water restrictions may be lifted by the LHD and MDH if *Legionella* bacterial cultures of pre-remediation water samples are negative, or if samples taken post-remediation show that the bacteria have been eliminated or reduced to levels deemed acceptable by the LHD and MDH. Factors that are considered in the decision to lift water restrictions include: the concentration of *Legionella* present in the water, the number and proportion of sites that are positive, and the

types of sites that are positive. Following the lifting of water restrictions, the facility may be expected to conduct follow-up testing.

Water restrictions will remain in place at least until **final** culture results are available for the pre-remediation water samples (typically, 7-10 days after receipt at the lab). If no pre-remediation samples were taken or the results of pre-remediation cultures are positive, water restrictions will remain in place until the culture results of post-remediation samples demonstrate that the bacteria are absent or reduced to levels deemed acceptable by LHD and MDH.

According to CDC, [there is no known safe level of *Legionella*](#).²⁰ Guidance from other government agencies, such as the Occupational Safety and Health Administration (OSHA), regarding actionable *Legionella* levels is not to be used in the context of a case/outbreak investigation.

Multiple rounds of remediation (and post-remediation sampling) may be required before restrictions can be lifted if the bacteria persist.

After water restrictions have been lifted, the facility may be required to conduct follow-up testing of the water system to ensure the sustained suppression of *Legionella*. The typical schedule for post-remediation water sampling is biweekly testing for 3 months after restrictions are lifted, followed by monthly testing for another 3 months. This schedule may be altered by the LHD and MDH based on test results (e.g., if results show an increase in the number of sites positive for *Legionella* and/or an increase in the concentration of *Legionella*, it may be necessary to extend this schedule).

If, during follow-up testing, *Legionella* bacteria or additional cases are identified, water restrictions as an immediate control measure may be reinstated at the discretion of the LHD in consultation with MDH.

3) Water treatment for remediation:

As soon as a *Legionella* issue is suspected, the facility's management should engage a water consultant qualified to advise on matters relating to *Legionella* remediation and environmental sampling. MDH maintains a list of water consultants that have been used in past *Legionella* investigations. This list is not comprehensive and MDH does not endorse any consultant. LHDs may reach out to MDH to obtain the most up-to-date version of this document.

The facility is not required to remediate the potable water system immediately, but doing so may shorten the amount of time the facility remains on water restrictions, should pre-remediation sampling indicate concerning levels of *Legionella* in the facility's water system. **Any remediation must wait until AFTER pre-remediation samples have been collected.**

Remediation should be performed under the guidance of a water consultant and only occur after consultation with the LHD and MDH and after pre-remediation samples have been collected. (For more information about pre-remediation sampling, see "Environmental sampling and testing for *Legionella*")

If a facility wishes to install a permanent secondary disinfection system for the long-term control of *Legionella*, the facility must first contact the [Maryland Department of the Environment's Water Supply Program](#) to acquire the proper permits and ensure that the system complies with state and federal regulations.²¹

Environmental Assessment:

In outbreak settings, an environmental assessment should be initiated within 24 hours of notification to the health department. The coordination and receipt of appropriate sample collection materials may take up to several days, but initial steps to gather information and coordination of efforts can begin in the interim period. The objective of the environmental assessment is to determine the most likely source of an outbreak of legionellosis. The known epidemiological data of the cases (such as which areas of the building they stayed in or frequented) should be obtained and considered during the environmental assessment.

1) Gather general information:

- Inquire about any interim remedial measures that may have been taken by the facility manager that could impact the sampling plan.
- Identify possible amplification sites that also pose the risk of aerosolizing water droplets.
- Request and review floor plans and plumbing diagrams for the building if available.
- Request and review water treatment reports for cooling towers if present or available.
- Identify the locations of outside air intakes for HVAC systems in relation to cooling towers or fountains.
- Inquire about or review “as-built” mechanical plans for the presence of humidifiers within HVAC systems or stand-alone humidifiers.
- Request that someone with a thorough understanding of the facility’s water distribution system complete the [CDC’s Legionella Environmental Assessment Form](#).²²
- If applicable, the LHD and MDH may request results from recent water sampling and/or documentation of water treatment (for facilities that regularly test and treat their water).

2) Environmental assessment for *Legionella* amplification sites:

Legionella bacteria are widely distributed in water systems. They tend to grow in biofilms or slime on the surfaces of plumbing systems, and they are not always eradicated by the chlorination used to treat public water systems. Low and even undetectable levels of the organism can colonize a water system and grow to high concentrations under the right conditions.

[Conditions that promote growth of the organism](#) include moderate heat, sediment, scale, and supporting (commensal) microflora in water.²³ Common water organisms including algae, amoebae, and other bacteria appear to amplify *Legionella* growth by providing nutrients or harboring the organism. Because of its ability to remain viable in domestic water systems, it is capable of rapid multiplication under the proper conditions.

Other common factors that tend to promote the growth of *Legionella* include:

- Stagnation (e.g., due to “dead end” piping, seasonal use of building, etc.)
- Temperatures between 77° and 108°F
- pH between 5.0 and 8.5
- Sediment that tends to promote growth of commensal microflora
- Microorganisms including algae, flavobacteria, and *Pseudomonas*, which supply essential nutrients for growth of *Legionella* or harbor the organism

3) Environmental sampling and testing for *Legionella*:

Environmental sampling may be indicated by the LHD and MDH as part of an epidemiologic investigation to detect contamination of the water system and to verify the effective remediation of the source.

Facilities must arrange for the collection of appropriate samples and to have those samples sent for *Legionella* bacterial cultures at an [ELITE certified lab](#).²⁴ Samples should be collected in accordance with CDC's recommendations for sampling [potable water](#), [cooling towers](#), and [spas & fountains](#).

MDH may be able to provide assistance with the collection and/or testing of pre- and post-remediation water samples in certain circumstances. If a facility requests assistance, the LHD and MDH will evaluate the need on a case-by-case basis. All other testing will be done at a private ELITE certified lab at the expense of the facility. If water is tested at the MDH lab, MDH does not provide remediation services and a water consultant will be needed to address any positive findings.

Sampling plan:

- The number and location of samples will vary by facility, but should be representative of the entire potable water system.
- The LHD and MDH will work with a facility's water consultant to determine the number of samples and sampling sites. **Sampling plans must be reviewed and approved by LHD and MDH prior to collection.** [Refer to CDC's Sampling Procedure and Potential Sampling Sites guidance document for more information](#).²⁵
- Sampling conducted without approval and found by the LHD and MDH not to be representative of the water system(s) may result in a need to re-sample, likely raising costs and extending the time that the facility spends on water restrictions).

Pre-Remediation:

- **Pre-remediation samples must be collected before treatment of the water system begins.**
- Bulk water samples must be 1 liter in volume.
- Bulk water samples should be collected primarily from the "hot" water side after allowing the hot water to run until it approaches the maximum temperature.
- Environmental swabs must be collected at all sites, when feasible, and ideally prior to bulk water collection.

Post-Remediation:

- **Post-remediation samples must be drawn 24 hours (or more) after remediation is complete.**
- Post-remediation samples should be 1 liter in volume and be collected from the same sites as in the pre-remediation sampling, including environmental swabs.

Special Settings

In addition to following the recommended steps for case investigation described above, the following legionellosis control measures should be implemented for high-risk settings.

1) Healthcare Settings:

Enhanced surveillance

Legionellosis cases in high-risk settings, such as acute and long-term healthcare facilities, are of particular concern. When a case occurs, the facility should immediately implement enhanced surveillance for additional possible cases of pneumonia. An enhanced surveillance plan should be documented in writing and include at least the activities below:

- Instruct clinicians at the facility to evaluate residents with respiratory symptoms for pneumonia.
- Order chest x-rays to confirm pneumonia.
- Immediately notify LHD of any new cases of pneumonia and work with LHD to coordinate appropriate testing, which should include LUAT, *Legionella* sputum culture, *Legionella* sputum PCR (if available), and paired serology
- Create and maintain line list for residents with any respiratory illness and results of any relevant testing (i.e., testing for other pathogens that may cause respiratory illness).
- Designate a person to conduct and track such surveillance.
- Maintain surveillance for at least 6 months from the time of last facility-associated case.

Case management

As legionellosis is not generally transmitted person-to-person, isolation or quarantine is not warranted.

Contact management is not applicable. No additional precautions to standard precautions are necessary for care of patients.

Notifications and admissions

Upon notification from the LHD and MDH of water restrictions, healthcare facilities should inform residents and visitors about water restrictions.

New admissions to affected units may be allowed with the approval of the LHD and MDH. Incoming potential patients or residents and their families or proxies must be notified of the situation prior to admission.

2) Lodging/Hospitality Settings:

For **outbreaks** in lodging/hospitality facilities (e.g., hotels, condominium complexes):

The following groups must be notified about water restrictions, legionellosis cases and/or the detection of *Legionella* bacteria in potable water system, if applicable:

- Current and future/incoming guests
- Former guests who spent time at the facility up to four weeks prior to the earliest known onset of illness
- In a condominium complex- condo owners, real estate companies, and guest management companies

Notification shall occur until the LHD and MDH determine that the notifications can be discontinued.

Activation and Deactivation of Emergency Response Operations

The Infectious Disease Epidemiology and Outbreak Response Bureau (IDEORB), in consultation with the Director and Deputy Director of the Prevention and Health Promotion Administration, may activate emergency response operations when one or more of the following criteria are met:

- Existing staffing is inadequate to assign responsibilities to maintain critical operations for more than three operational periods

- Resources (financial or material or operational) required to mount and/or sustain an ongoing emergency response are needed from outside of the Bureau or Administration
- A non-infectious disease event substantially disrupts critical operations of the unit

Additionally, the health officer of a LHD may also activate an emergency operations center at the local level.

IDEORB, in consultation with the Director and Deputy Director of the Prevention and Health Promotion, will deactivate emergency response operations when one or more of the following criteria are met:

- Public health problem is contained or resolved
- Emergency response is incorporated into normal operations and adequate resources are available to sustain all ongoing responses
- Non-infectious event is over and disruption impacting critical operations no longer exists

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Appendix I: Sample staff/resident notification letter

<Date>

Dear Staff and Patients,

This letter serves to inform you that the <County Health Department> and the Maryland Department of Health are investigating a case of Legionnaires' disease possibly associated with our facility. Legionnaires' disease is a serious form of pneumonia that persons may acquire after being exposed to water containing *Legionella* bacteria. While it has not been definitively determined where this individual was exposed to the bacteria, the health and safety of our patients is our top priority and we are fully cooperating with the health department's investigation, and working with experts to <Insert Actions Taken/Planned>.

Legionella bacteria are spread by the release of small droplets of contaminated water into the air. People who have Legionnaires' disease are infected by breathing in these droplets of water, **NOT** through contact with a sick person. Therefore, to limit the risk of becoming ill, the <Health Department> recommends the following:

- i. No showering
- ii. No oral consumption of tap water
- iii. No brushing of teeth with tap water
- iv. No flushing of nasogastric tubes or preparation of medications with tap water
- v. No oral consumption of ice from the ice machines

There are common available antibiotics to treat Legionnaires' disease. Attached to this letter is a Legionnaires' disease Fact Sheet with additional information.

If you experience symptoms of pneumonia, such as fever, cough, or shortness of breath, please contact <Insert Contacts and Phone Numbers>.

If you have any questions or concerns, please contact <County Health department> during normal business hours at <Insert Phone Number>.

We will provide additional details regarding specific treatments and water interruptions as the information becomes available. Thank you for your patience and cooperation.

Sincerely,

Appendix II: Sample guest notification

INFORMATION FOR OUR GUESTS

<Facility> management was recently notified by the <County Health Department> and the Maryland Department of Health that <Number> people who were guests at our facility over the last <Time Frame> subsequently developed legionellosis, a form of pneumonia.

The bacteria that cause legionellosis are found in many different water sources - manmade and natural - and it is not certain that those guests who tested positive for legionellosis acquired the illness at our facility. **However, this facility always puts its guests first, so we want you to be aware of this possible association and provide you with some information about legionellosis so you can make an informed decision concerning your stay here.**

Who gets legionellosis?

Anyone can get this disease; however, certain people are more likely to get legionellosis. Individuals most at-risk are smokers, people over age 50, those with lung or kidney disease, diabetes, cancer, or weakened immune systems because of diseases or medications.

What is legionellosis?

Legionellosis is a form of pneumonia caused by *Legionella* bacteria.

What are the signs and symptoms of legionellosis?

Signs and symptoms include: fever, cough, shortness of breath, chills, and body aches. Some people with legionellosis also report gastrointestinal symptoms, like nausea, vomiting, and diarrhea.

How do you get legionellosis?

The disease is spread by inhaling aerosols of water containing the *Legionella* bacteria. The disease is generally **not** passed from person to person.

Is there a cure for legionellosis?

Yes. Legionellosis can be treated by commonly available antibiotics. However, hospitalization is common. The [case-fatality rate ranges from 10-25%](#) but may be higher in situations where diagnosis and/or treatment is delayed.¹

How soon do signs of legionellosis appear?

Signs of the disease commonly appear from two to ten days after coming in contact with these bacteria.

Why is the health department interested in cases of legionellosis?

Health care providers are asked to report to the health department all cases of legionellosis. The health department then makes inquiries to assure that exposure and risk to others are minimized.

Where can I get more information on legionellosis?

You can call <County Health Department & Phone Number>

You can also visit: <http://www.cdc.gov/legionella/index.html> or <https://phpa.health.maryland.gov/Pages/legionellosis.aspx>

What Persons Can Do to Reduce the Risk for Illness

- Persons at high risk for legionellosis may wish to consider not staying at the facility.
- Guests should reduce their risk of becoming ill by:
 - Not showering. If bathing in a tub, fill the tub slowly and carefully to minimize aerosol production. While the tub is filling, exit the bathroom and keep the bathroom door closed.

- Using bottled water for drinking and brushing teeth.

If you have questions about your risk for legionellosis or experience symptoms within 10 days following your stay, please contact <County Health Department & Phone Number>.

For questions or information regarding your stay, contact <Insert Facility Contact & Phone Number>



WATER RESTRICTIONS IN PLACE

Do **NOT**:

- **Drink water from taps or drinking fountains**
- **Use tap water when brushing teeth**
- **Consume ice from ice machines**
- **Use showers**



**PLEASE TALK TO YOUR
NURSE BEFORE USING THE SINK
AND/OR SHOWER.**



**DO NOT DRINK WATER
FROM
THIS SINK**