



Legionella Case and Outbreak Response for Local Health Districts

Bryce Kerr
Environmental Specialist 2
Ohio Department of Health

At-risk facilities

- Facilities housing sensitive populations such as hospitals and long-term care facilities
- Buildings with more than 10 stories
- Buildings with cooling towers
- Building with large, complex hot water distribution systems
- Hospitals
- Nursing Homes
- Senior living/assisted living facilities
- Hotels
- Office buildings
- Commercial operations using misting/spray
- Churches
- Dental equipment

CDC Outbreak Definition

- CDC defines outbreaks associated with:
 - Travel
 - Healthcare facilities
 - Potable water systems in other buildings at increased risk for *Legionella* growth and transmission

As two or more cases associated with the same possible source during a 12-month period.

- This definition increases sensitivity of outbreak detection, especially for outbreaks involving potable water, and helps account for periodic changes in risk (e.g., due to seasonality).
- The timeframe for defining an outbreak may vary depending upon the circumstances and is ultimately deferred to the public health jurisdiction performing the investigation.

Coordination is Key

Legionella Cases/Outbreaks

- Ohio Department of Health
 - Bureau of Infectious Diseases
 - Bureau of Environmental Health
- Local health district – Epidemiological and Environmental program areas MUST work together
- CDC

Role of ODH

Bureau of Infectious Diseases

- Legionnaires' Disease is a class B reportable disease.
- Responsible for case surveillance and disease monitoring.
- Supports epidemiology investigations and gives training to local health districts.
- Provides clinical assistance in case and outbreak response.
- Can request EPI-Aid from CDC.
- National reporting of disease occurrence.

Role of ODH

Bureau of Environmental Health and Radiation Protection

- Provides technical assistance to local health districts, healthcare facilities, building managers on *Legionella* prevention.
- Provides environmental technical assistance on cases and outbreaks.
- Provides training and outreach to local health districts and facilities.
- Organize and distribute resources for *Legionella* prevention.

Local Health District Role

In the event of a case or outbreak, local health districts should:

- Conduct epidemiological evaluation
- Determine what category the case or outbreak belongs to- travel, healthcare, community acquired.
- Investigate potential sources and contact facility managers.
- Inform and work with facility managers in investigating *Legionella* cases.
- Determine if a full investigation is needed.
- Make recommendations and document all actions taken by both the facility and the LHD.
- Communicate with ODH on case/outbreak information.
- Request ODH or CDC assistance if needed.

Healthcare Facilities

- The CDC defines a healthcare facility as a hospital, long-term care facility, clinic, pharmacy, or outpatient laboratory.
- Due to the nature of these facilities, many patients have impaired immune systems which increases susceptibility to Legionnaires' Disease.
- Identifying facilities as a definite source is important to reducing future outbreak risk.

Defining Healthcare-associated Legionnaires' Disease

It is important to understand the CDC case definitions for healthcare facilities and be current with CDC recommendations on how to respond to each.

- **Definite healthcare-associated:** the patient spent the entire 10 days before date of symptom onset in a healthcare facility.
- **Possible healthcare-associated:** the patient spent a portion of the 10 days before date of symptom onset in a healthcare facility.

Healthcare Associated Outbreaks - Conducting a Full Investigation

- For healthcare-associated outbreaks, conduct a full investigation when:
 - There is 1 or more definite healthcare associated cases at any point.
 - There are 2 or more possible healthcare associated cases within a 12 month period.
 - Even if it is determined that a full investigation is not needed, facilities should still consider performing an environmental assessment to identify potential risk areas.
 - This step is strongly recommended if there have been past cases in the facility, cases in the area, a disruption in the facility's water system, or recent positive *Legionella* identification in the water system.

Travel-related Exposures

- The majority of reported outbreaks are associated with either travel or healthcare.
- Hotels, resorts and cruise ships are common sources of exposures.
- Dispersal and movement of people to different locations during the incubation period can make identifying the source difficult.

Travel Associated Outbreaks

Conducting a Full Investigation

- For travel-associated outbreaks, conduct a full investigation when:
 - Two or more cases within a 12 month period stayed overnight in the same accommodation during the exposure period for Legionnaires' disease.
 - Also consider conducting an investigation when multiple cases stayed at the same accommodations over a several year period, there is a single case that stayed overnight at an accommodation associated with a previous outbreak, or cases that spent time on location but were not overnight guests.

Community Associated Outbreaks

Conducting a Full Investigation

- For community-associated outbreaks, conduct a full investigation when:
 - One or more cases of Legionnaires' disease at a correctional facility or other facility where people cannot leave the premises have been identified.
 - In general, outbreaks of Legionnaires' disease at such facilities should follow the same considerations as healthcare-associated outbreaks
 - Also consider conducting an investigation when available data reveals an increase in Legionnaires' disease in a certain geographic area.

Additional Case Finding

It may be helpful to look at facility history to determine if any potential cases remained unreported:

- Determine if the facility routinely conducts surveillance for healthcare-associated pneumonia and if the facility tests any identified patients for Legionella.
- Perform chart review of patients for the past 12 months to identify pneumonia cases that could have been healthcare-associated.
- Review facility laboratory records for all Legionella testing and any positive results.
- Consider evaluating trends in infections due to other water-related pathogens, this step may help investigators evaluate the facility's water management.

Cases and Outbreaks

- Outbreaks are commonly associated with buildings or structures that have complex water systems.
- Environmental conditions such as low disinfectant residual levels and temperatures in ranges that cause multiplication within a water system are often linked to confirmed outbreaks.

Preparing an Investigation

- Investigations allow public health to take a closer look at cases or outbreaks and offer a number of benefits.
- Further examination of facility records could help identify additional cases that might have been missed.
- By investigating a facility, local health districts can help identify potential sources for exposure and reduce future disease risk.
- Even without identifying the exposure source, investigations give local health districts the opportunity to review facility practices and provide feedback in reducing risk.

Investigation Considerations

- As mentioned previously, sometimes a full investigation is not needed. In these cases, some investigative steps should still occur, since the facility could still be a health risk.
- Environmental facility assessments are useful tools in assessing whether a system promotes *Legionella* survival.
- Past assessments or sampling, even if nothing was found, indicate that the facility water system was suspect before. In these cases, new assessments provide a valuable comparison to know what has changed or insight into what was missed.
- If an environmental assessment reveals any suspect environmental parameters, consider recommending *Legionella* sampling (both water and swab) of the highest risk areas.

Clinical Testing for LD

During investigations or outbreaks:

- The CDC recommends use of both a lower respiratory culture and a urine antigen test.
- Whenever possible, obtaining clinical cultures during an outbreak is strongly recommended.
- The results of cultured clinical tests can be compared to culture results from water samples to help identify sources of legionella exposure.

Clinical Testing for LD

- The CDC has additional recommendations for clinical testing of cases with suspected healthcare-associated illnesses:
 - Other patients with healthcare-associated Legionnaires' disease diagnosed in the past 12 months.
 - Positive environmental tests for Legionella in the past 2 months.
 - Recent changes in the quality of potable water or environmental conditions that may lead to Legionella growth that the patient was exposed to recently.

Steps of a Full Investigation

1. Perform a retrospective review of the cases in the health department surveillance database to identify earlier cases with possible exposures to the same setting or geographic area.
2. Develop a line list of cases associated with common exposure settings or geographic area.
3. Work with appropriate parties to identify additional cases (e.g., through retrospective review of medical or laboratory records) and facilitate testing for Legionella using both culture of lower respiratory secretions and the Legionella urinary antigen test. Obtain post-mortem specimens, when applicable

Steps of a Full Investigation

4. Consider recommendations to restrict aerosol exposures, install point-of-use- filters, or other immediate control measures.
5. Facilitate environmental assessment to evaluate possible environmental exposures.
6. Conduct environmental sampling, focus on areas determined to be higher risk by the environmental assessment data.
7. Make recommendations for remediation of possible environmental sources.

Steps of a Full Investigation

8. Develop a risk communications plan.
9. Determine how long heightened disease surveillance and environmental sampling should continue to ensure the outbreak is over.
10. Work with appropriate parties to develop or review and possibly revise the water management program.
11. Subtype and compare clinical and environmental isolates, if available.
12. Follow up to assess the effectiveness of implemented measures to control the hazard.

Environmental Facility Assessments

- When a potential facility has been identified as an exposure source, an environmental assessment should be performed.
- Environmental assessments include detailed water system information and environmental parameters that can be used to identify exposure sources.
- Indicators of a potential source include:
 - Low residual disinfectant
 - Hot water maximums or cold water minimums within *Legionella* range

Finding Exposure Sources

- Water system flow diagrams allow investigators to determine places where aerosols may generate and potential risk factors such as the absence of a backflow preventer
- Any locations with aerosol generation and lower max temperatures should get special attention. These areas should be identified in the environmental facility assessment.
- Knowledge of patient history during the incubation period makes locating potential exposures easier.
- Locations should also be investigated for any previous case history or other hospitalized individuals with pneumonia who may share the same source.

Environmental Sampling

- The environmental assessment should be used along with epidemiological information to determine whether to conduct *Legionella* environmental sampling and to develop a sampling plan.
- The objective of *Legionella* environmental sampling during an outbreak is to characterize the extent of *Legionella* colonization within the building water system(s).
- Environmental sampling is important for verifying that remediation activities are working to control the hazard. Environmental sampling is also important to establish the distribution within the building water system(s) and the type of *Legionella* present for the purpose of future monitoring.

Environmental Sampling

- *Legionella* environmental sampling plans during an investigation are unique to each investigation and can be based on many factors such as:
 - Findings from the environmental assessment
 - Building characteristics (e.g., size, age, complexity, populations served)
 - Sites of possible exposure to aerosolized water as determined by the epidemiologic investigation
 - Available resources and supplies to support sampling

Water sampling for Legionella

- Sampling can be expensive so sites should be selected based on risks identified in the environmental assessment and the location of cases.
- It is recommended to take both water and swab samples at high-risk sites.
- Refer to CDC sampling training videos for proper sampling protocols. <https://www.cdc.gov/legionella/videos.html>.
- See CDC list of ELITE certified labs to send samples at <https://wwwn.cdc.gov/elite/public/memberlist>.

Selection of Environmental Sampling Sites

The selection of where and how to collect samples should be based on a combination of the following:

- Available epidemiologic information, such as possible case exposures to particular showerheads, sink faucets, or other devices
- If sampling devices, such as hot tubs, sink faucets, or showerheads, in response to possible case exposures, biofilm swab results can provide information about amplification potential within a device.
- Locations that are representative of the building water system(s), guided by the environmental assessment and a comprehensive understanding of the building water system(s) (e.g., near the building water entry, water heaters and/or storage tanks, representative points-of-use, hot water return line, associated devices) °
- Multiple factors (e.g., environmental assessment results, trends in water management program performance, including previous *Legionella* sampling results) should be considered when deciding whether to sample hot versus cold water systems (or both).

Selection of Environmental Sampling Sites

- Where multiple individual water systems are present, each water system should be represented separately in the sampling plan.
- If sampling cooling towers, hot tubs, or decorative fountains, always collect swab samples of the waterline, inside the jets, and of visible biofilm.
- Presence of filters (e.g., sand, cartridge)
- Locations where water parameters measured during the environmental assessment indicate risk for Legionella growth and transmission exist (in order to evaluate the potential for amplification/transmission)
- Feasibility given time and resource constraints of the group performing the investigation

Subtyping and Comparing Isolates

- *Legionella* is a diverse genus, although *L. pneumophila* serogroup 1 causes most cases of Legionnaires' disease. *The urine antigen test only identifies infection from L. pneumophila serogroup 1.*
- During an investigation, it is common to find more than one type of *Legionella* in several possible sources.
- If *Legionella* strains are identified other than the presumptive outbreak strain through environmental sampling, this should be considered as evidence that conditions supporting *Legionella* growth and transmission exist within the building water system(s).

ELITE Certified Laboratories

- Most ELITE certified laboratories will be able to provide identification of *Legionella* to the species and serogroup level (if *L. pneumophila*).
- It is necessary to characterize *Legionella* found in the environment to help confirm the source of the outbreak..
- Molecular comparisons of *Legionella* isolates recovered from clinical specimens and possible environmental sources are useful aspects of Legionnaires' disease outbreak investigations.
- In particular, genome sequence data can provide high-resolution information on the relatedness of such isolates.
- Combined with patient exposure information, these data can further support the identification of a specific environmental source

End of an Outbreak

- The end of an outbreak should be reviewed on a case-by-case basis.
- Consider if either of the following have occurred before declaring an outbreak over:
 - No new cases of Legionnaires' disease identified during a period of careful monitoring for new cases.
 - No detection of Legionella in post-remediation environmental samples.

End of an Outbreak

- An effective water management program to prevent ongoing transmission of *Legionella* should be in place before the outbreak is determined to be over.
- The timeframe for enhanced environmental and clinical surveillance following an outbreak can be extended at any point if there is concern for the potential for ongoing transmission of *Legionella*, based on factors such as *Legionella*-positive environmental cultures, new cases of Legionnaires' disease, or suboptimal performance of the water management program.

End of an Outbreak

- If there is a confirmed outbreak strain, efforts to monitor the building water system(s) can focus on the outbreak strain.
- However, identification of other *Legionella* species or serogroups, particularly if identified consistently, suggests conditions support the growth of *Legionella*.
- Therefore, you should consider needed adjustments to the water management program and on-going remediation efforts.

Other Considerations

- If facilities need further assistance than the LHD can provide, it is recommended that the facility hire a *Legionella* consultant.
- If the building water system is large and complex, it is strongly recommended that the facility hire a *Legionella* consultant.
- Since not all facility managers will be experts on the subject, consider looking over their water management program details to ensure control points and intervention methods are appropriately set.
- **Negative sampling results do not necessarily indicate that *Legionella* is not present.**
- **Water sampling is ONLY a snapshot in time.**

Reporting and Following Up

- Keep records of any assessment or sampling results.
- Maintain communications with facility and consider following-up on water management program design and implementation.

Further Training

Register for the CDC “Prevent LD Training” at

<https://www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html>

This training provides a detailed overview of *Legionella* and water management program development for both facilities and public health officials

Resources

Refer to CDC guidelines and recommendations for any further information of *Legionella* and case management

<https://www.cdc.gov/legionella/index.html>

Further ODH trainings, factsheets and resources can be found on the ODH *Legionella* webpage

www.odh.ohio.gov/legionella

Contact Information

Bryce Kerr

bryce.kerr@odh.ohio.gov

Bureau of Environmental Health and
Radiation Protection

Ohio Department of Health

(614) 466-4801

BEH@odh.ohio.gov