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Diving into Legionella

Background, Reporting, Investigations

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Agenda

Legionella Overview

Reporting

Investigations and Outbreaks

Legionella Overview

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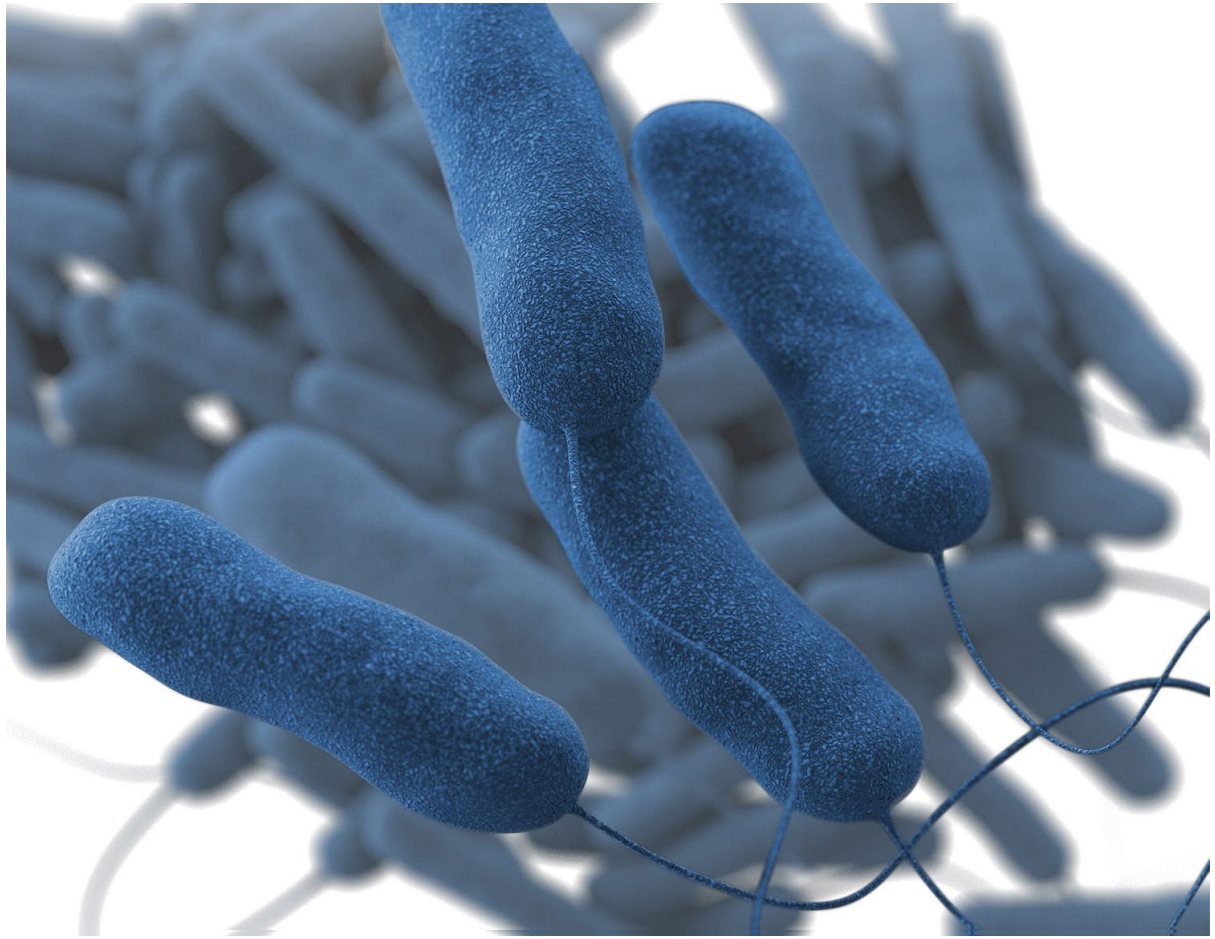
Background of Legionella

-Legionellosis is caused by *Legionella* Bacterium

-Transmitted to humans via inhalation of aerosolized water.

-Infections can manifest themselves in several different forms:

- Legionnaires' Disease (LD): An infection associated with pneumonia
- Pontiac Fever (PF): Fever and myalgia without pneumonia
- Extrapulmonary Legionellosis (XPL): An infection outside the of lungs (heart, wound).

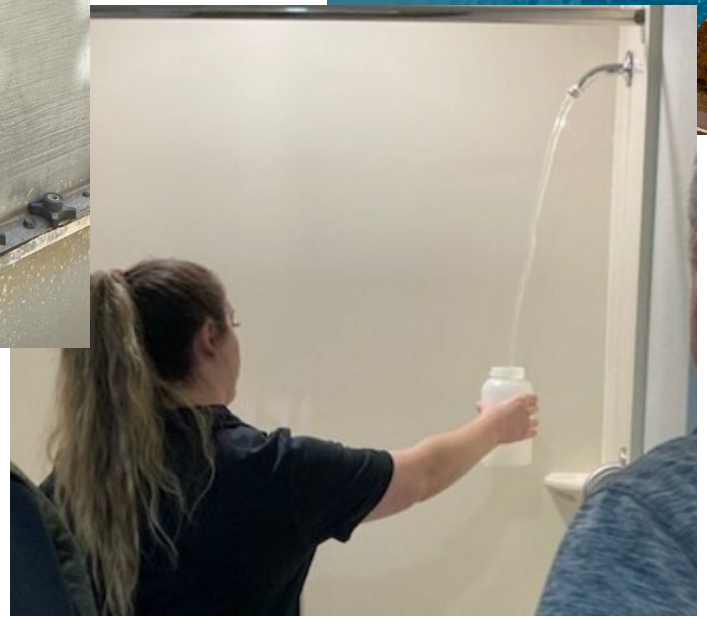


Comparison of Legionnaires' and Pontiac Fever

	Legionnaires' Disease	Pontiac Fever
Clinical features	Illness with pneumonia. Clinical symptoms of pneumonia may vary but include acute onset of lower respiratory illness with fever and/or cough. Additional symptoms (e.g., myalgia, shortness of breath, headache, malaise, chest discomfort, confusion, nausea, diarrhea, or abdominal pain) may be present	A milder illness, self-limited, without pneumonia, often a flu-like illness (fever, chills, myalgia, malaise).
Pneumonia	Yes	No
Pathogenesis	Replication of organism	Possibly an inflammatory response to endotoxin
Incubation period	2-14 days after exposure	24-72 hours after exposure
Treatment	Antibiotics	Supportive care
Isolation or organism	Possible	Not possible
Case-fatality rate	10% (25% for healthcare-associated)	Nearly 0%

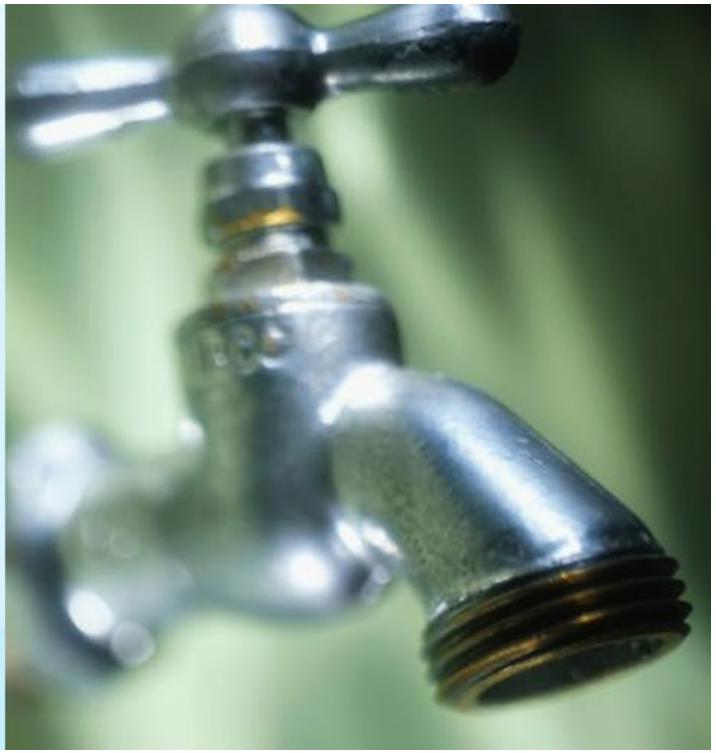
Legionellosis

Transmission occurs by inhalation of aerosolized water containing Legionella bacteria



Transmission via Aerosolized Water

Legionella is found naturally in fresh water, BUT natural environments (lakes, rivers) do NOT have sufficient quantities of Legionella to cause transmission



History of Legionella

Legionnaires' Disease

- 1976 outbreak at the American Legion convention in Philadelphia
- 221 cases of Legionnaires' disease
- 34 deaths
- Cooling tower suspected to be the source of outbreak

Pontiac fever

- Named after the city of Pontiac, Michigan
- In 1968, several county health department workers became ill with fever and flu symptoms
- After the 1976 outbreak, the Michigan Health Department discovered the workers had been infected with *Legionella pneumophila*

Reporting Criteria

Laboratory Criteria for Reporting

Confirmatory Lab Evidence

- Culture: Isolation of any *Legionella* organism from lower respiratory secretions (nasopharygeal swabs will be counted as “not as case”), lung tissue, pleural fluid, or extrapulmonary site.
- PCR: Detection of any *Legionella* species from lower respiratory secretions (nasopharygeal swabs will be counted as “not as case”), lung tissue, pleural fluid, or extrapulmonary site by a validated nucleic acid amplification test.
- Antigen: Detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents.
- Seroconversion: Fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

Supportive Lab Evidence

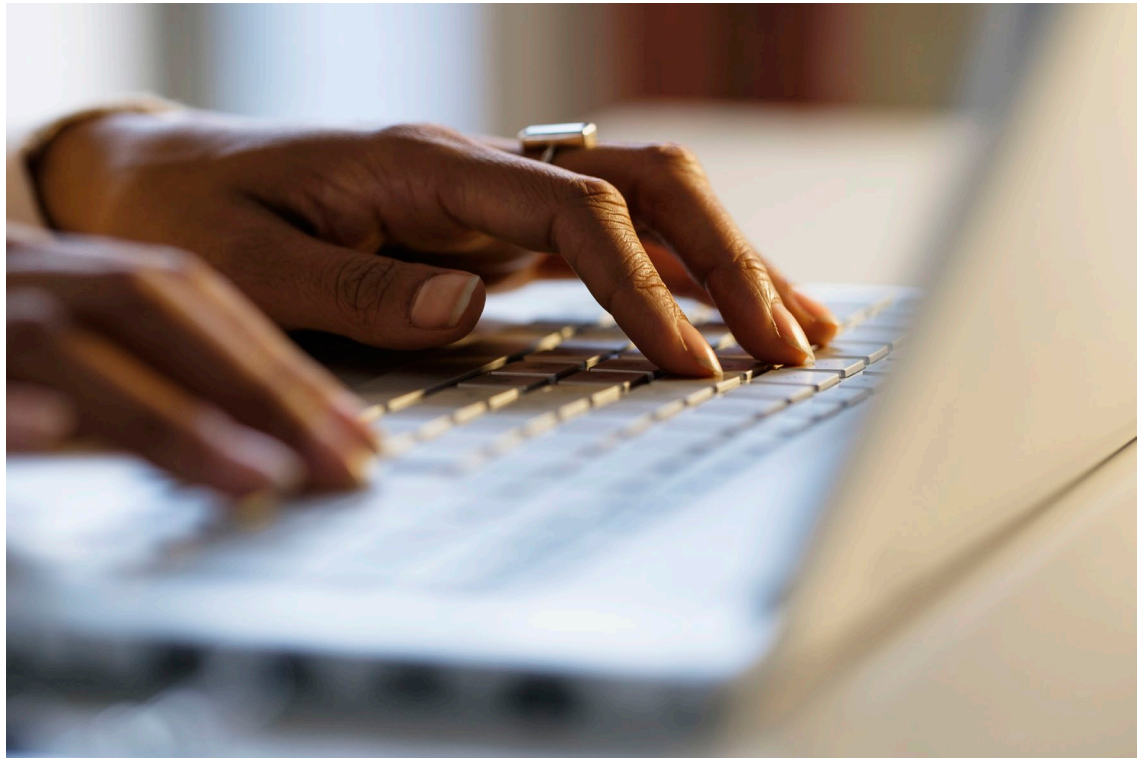
- Seroconversion: Fourfold or greater rise in antibody titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1 (e.g., *L. micdadei*, *L. pneumophila* serogroup 6)
- Seroconversion: Fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigens
- Detection of specific *Legionella* antigen or staining of the organism in lower respiratory secretions, lung tissue, pleural fluid, or extrapulmonary site associated with clinical disease by direct fluorescent antibody (DFA) staining, immunohistochemistry (IHC), or other similar method, using validated reagents

Instructions for Reporting

Cases of legionellosis must be reported to IDPR by secure web-based PHIDDO report, electronic data transmission, telephone, or by fax within one business day of diagnosis or positive test.

24/7 Epidemiologist-On-Call: 405-426-8710

Fax: 405-900-7591



Legionella Investigations

Investigations Steps

- Confirm the lab result meets CDC case definition.
- Contact the HCP or IP to confirm the clinical presentation, symptom onset, travel and healthcare visits.
- Interview patient when possible, focusing on possible exposures.

Interview Patient

CLINICAL INFORMATION AND OUTCOME

What date did you start experiencing symptoms of legionellosis?
* must provide value

Today M-D-Y

Interviewer note: If the patient has existing respiratory symptoms at baseline (e.g., chronic cough), use the date when symptoms got worse. If exact date is unavailable, enter the best guess based on medical records and patient/proxy interviews.

This illness can cause a variety of symptoms. While you were ill, did you experience any of the following symptoms?
* must provide value

- [ ] Fever
- [ ] Abdominal cramps
- [ ] Anorexia
- [ ] Chest pain
- [ ] Chills
- [ ] Cough
- [ ] Diarrhea
- [ ] Headache
- [ ] Malaise
- [ ] Myalgia
- [ ] Nausea
- [ ] Shortness of breath
- [ ] Vomiting
- [ ] Other symptoms
- [ ] No symptoms

Diagnosis:
* must provide value

- ○ Legionnaires' disease (pneumonia, clinical or X-ray diagnosed)
- ○ Pontiac fever (fever with myalgia, without pneumonia)
- ○ Extrapulmonary legionellosis

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Were you hospitalized for legionellosis?
* must provide value

- ○ Yes
- ○ No
- ○ Unknown

reset

TRAVEL EXPOSURES

In the 14 days before you became ill, did you spend any nights away from home (excluding healthcare)?
* must provide value

- ○ Yes
- ○ No
- ○ Unknown

reset

HEALTHCARE EXPOSURES

In the 14 days before symptom onset, did you visit or stay in a healthcare setting?
* must provide value

- ○ Yes
- ○ No
- ○ Unknown

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SENIOR OR ASSISTED LIVING FACILITY EXPOSURE

In the 14 days before symptom onset, did you visit or stay in an assisted living facility or senior living facility?
* must provide value

- ○ Yes
- ○ No
- ○ Unknown

reset

COMMUNITY WATER EXPOSURES

Legionella bacteria can become a health concern when they grow and spread in human-made water systems and features like: showerheads, sink faucets, hot tubs, decorative fountains, hot water tanks and heaters, large complex plumbing systems, cooling towers, misters, and infrequently used or inadequately maintained water devices. Home and car air-conditioning units don't use water to cool the air, so they aren't a risk for Legionella growth and spread. Legionella bacteria are found naturally in freshwater environments, although the low number of bacteria in freshwater usually don't lead to disease.

In the 14 days before onset, were you exposed (e.g., getting in, sitting/being near, or walking by, even briefly) to any of the following?

Outbreak Response

Legionellosis Outbreak Criteria

Travel-associated:

Two or more cases of legionellosis report an overnight stay at an accommodation during their exposure period within 12 months of each other.

Healthcare-associated:

One or more presumptive* healthcare-associated Legionnaires' disease at any time

Two or more cases of possible** health-care associated Legionnaires' disease within 12 months of each other. With only a single possible healthcare-associated case, available epidemiologic evidence may not be strong enough to warrant a full investigation.

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

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

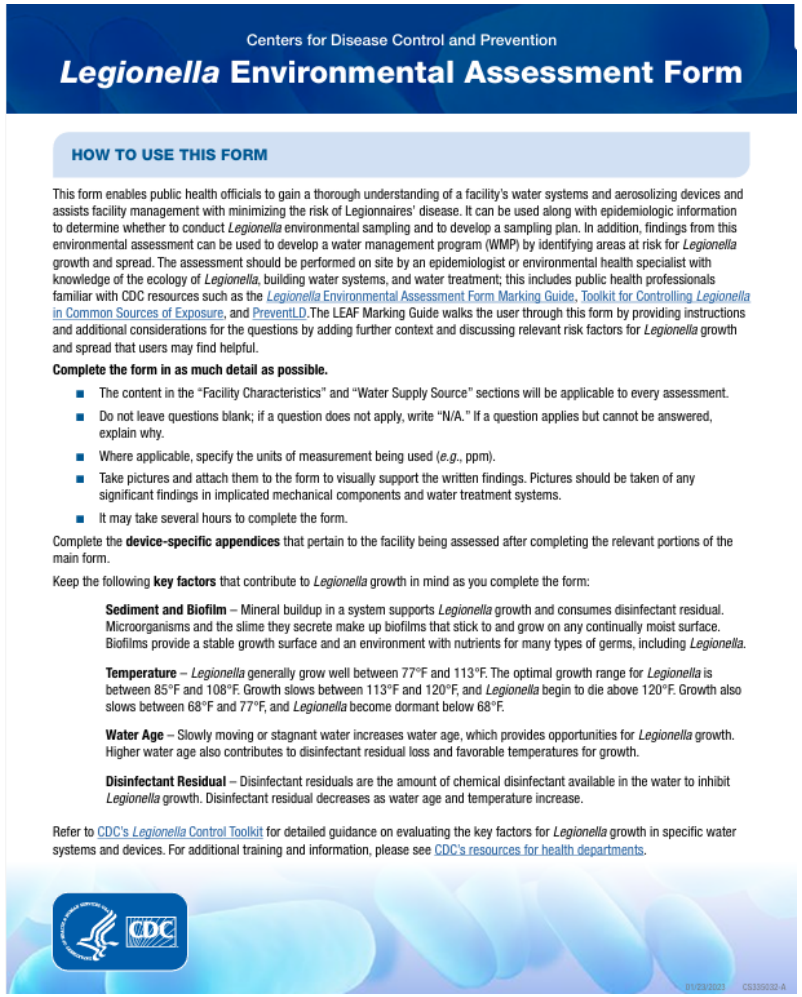
Responding to Healthcare Associated Outbreaks

- Healthcare facilities often have large, complex water systems and devices that produce aerosols.
- They also serve patients who often have risk factors for Legionnaires' disease.
- Acting quickly prevents additional illnesses.

General Steps in a Full Environmental Investigation

- Collect case information
- Test clinical specimens
- Take steps to prevent additional exposures
- Assess and test water sources
- Ensure the outbreak is over

Environmental Assessments



Centers for Disease Control and Prevention

Legionella Environmental Assessment Form

HOW TO USE THIS FORM

This form enables public health officials to gain a thorough understanding of a facility's water systems and aerosolizing devices and assists facility management with minimizing the risk of Legionnaires' disease. It can be used along with epidemiologic information to determine whether to conduct *Legionella* environmental sampling and to develop a sampling plan. In addition, findings from this environmental assessment can be used to develop a water management program (WMP) by identifying areas at risk for *Legionella* growth and spread. The assessment should be performed on site by an epidemiologist or environmental health specialist with knowledge of the ecology of *Legionella*, building water systems, and water treatment; this includes public health professionals familiar with CDC resources such as the *Legionella* Environmental Assessment Form Marking Guide, Toolkit for Controlling *Legionella* in Common Sources of Exposure, and PreventLD.The LEAF Marking Guide walks the user through this form by providing instructions and additional considerations for the questions by adding further context and discussing relevant risk factors for *Legionella* growth and spread that users may find helpful.

Complete the form in as much detail as possible.

- The content in the "Facility Characteristics" and "Water Supply Source" sections will be applicable to every assessment.
- Do not leave questions blank; if a question does not apply, write "N/A." If a question applies but cannot be answered, explain why.
- Where applicable, specify the units of measurement being used (*e.g.*, ppm).
- Take pictures and attach them to the form to visually support the written findings. Pictures should be taken of any significant findings in implicated mechanical components and water treatment systems.
- It may take several hours to complete the form.

Complete the **device-specific appendices** that pertain to the facility being assessed after completing the relevant portions of the main form.

Keep the following **key factors** that contribute to *Legionella* growth in mind as you complete the form:

Sediment and Biofilm – Mineral buildup in a system supports *Legionella* growth and consumes disinfectant residual. Microorganisms and the slime they secrete make up biofilms that stick to and grow on any continually moist surface. Biofilms provide a stable growth surface and an environment with nutrients for many types of germs, including *Legionella*.

Temperature – *Legionella* generally grow well between 77°F and 113°F. The optimal growth range for *Legionella* is between 85°F and 108°F. Growth slows between 113°F and 120°F, and *Legionella* begin to die above 120°F. Growth also slows between 68°F and 77°F, and *Legionella* become dormant below 68°F.

Water Age – Slowly moving or stagnant water increases water age, which provides opportunities for *Legionella* growth. Higher water age also contributes to disinfectant residual loss and favorable temperatures for growth.

Disinfectant Residual – Disinfectant residuals are the amount of chemical disinfectant available in the water to inhibit *Legionella* growth. Disinfectant residual decreases as water age and temperature increase.

Refer to CDC's *Legionella* Control Toolkit for detailed guidance on evaluating the key factors for *Legionella* growth in specific water systems and devices. For additional training and information, please see CDC's resources for health departments.

APPENDIX A. HEALTHCARE, ASSISTED LIVING, AND SENIOR LIVING FACILITIES

Complete for all facilities, including but not limited to hospitals, long-term care/rehab/skilled nursing facilities, assisted or senior living facilities, or clinics.

A1. Type of healthcare facility (check all that apply):

- ☐ Acute care hospital
  - If YES, does the facility have a solid organ or bone marrow transplant program?
    - ○ YES
    - ○ NO
- ☐ Long-term care facility (*i.e.*, nursing home, long term acute care)
- ☐ Rehabilitation facility or other skilled nursing care
- ☐ Assisted living facility
- ☐ Senior living facility
- ☐ Outpatient surgical center
- ☐ Other outpatient clinic (describe): _____
- ☐ Other facility (describe): _____

A2. Number of beds: _____

A3. Are ice machines used to provide ice for patient consumption or processing medical equipment?

- ○ YES
- ○ NO

If YES, list manufacturer and model or catalog number: _____

A4. Do patients or residents at this facility use respiratory therapy equipment (*e.g.*, CPAP, bronchoscopes)?

- ○ YES
- ○ NO

If YES, describe (*e.g.*, source of water used in devices, source of water used to clean devices, and cleaning and drying procedures):

A5. Has this facility experienced previous Legionnaires' disease cases that were "presumptively" or "possibly" facility-associated?
Note: *"Presumptive" healthcare-associated disease is defined as a case in which the person spent greater than or equal to 10 days of continuous stay at a healthcare facility during the 14 days before onset of symptoms. "Possible" healthcare-associated disease is defined as a case in which the person spent a portion of the 14 days before date of symptom onset in one or more healthcare facilities, but does not meet the criteria for presumptive healthcare-associated Legionnaires' disease.*

- ○ YES
- ○ NO

If YES, describe (*e.g.*, number of cases, dates):

Legionella-Environmental-Assessment-Form.pdf

Immediate Control Measures

Examples of immediate control measures for potable water systems include:

- Restricting showers (using sponge baths instead)
- Installing point-of-use microbial filters
- Halting new admissions
- Temporarily closing the building, affected area, or device
- Distributing notification letters to the appropriate audience(s)

Examples of immediate control measures for devices include:

- Turning off devices such as cooling towers or decorative fountains
- Restricting access to areas with devices such as hot tubs

Legionellosis in a SNF

- 1 lab-confirmed case of Legionnaires' Disease.
- No additional cases were identified amongst residents and staff.
- Collaboration occurred between state and local partners to complete a Legionella Environmental Assessment Form (LEAF).
- A sampling plan was created from the findings of the LEAF and sampling occurred within 1 week after the outbreak was identified.
- 18/25(72%) samples were positive for *Legionella pneumophila.*
- Facility worked with a Legionella consultant company for remediation and post-remediation testing to ensure Legionella was eliminated

25 environmental samples collected throughout the facility

POSITIVE SAMPLES
14 positive for *L. pneumophilia* serogroup 1
4 positive for *L. pneumophilia* non-serogroup 1

Remediation

- Suspended new admissions.
- Suspended any shower usage.
- Suspended use of ice machine.
- Assessed all residents at risk for aspiration. Those residents received bottled water or prepackaged thickened water.
- Removed all aerators in resident care areas.
- Installed point of use microbial filters on resident showers.
- Remove and replace sink hardware in resident rooms.
- Remove and replace facility sink hardware in common areas, closets and bathroom.
- Drain, sanitize and install microbial filter on ice machine.
- Drain and flush heater tanks.
- Review WMP process.

Legionellosis Resources

- OSDH Legionellosis Fact Sheet
- Controlling Legionella in Healthcare Facilities
- Legionella (Legionnaires' Disease and Pontiac Fever) | Legionella | CDC
- CDC Legionellosis Fact Sheet

Thank you!

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