LEGIONELLOSIS

(Legionnaires' disease, Pontiac fever)

REPORTING INFORMATION

- **Class B:** Report by the close of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism: The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the Ohio Confidential Reportable Disease form (HEA 3334).
- The Centers for Disease Control and Prevention (CDC) Legionellosis Case Report form should be completed. The fields are incorporated in the ODRS record. It is not necessary to send the form to ODH. In addition to reporting through ODRS, local health departments should call the Ohio Department of Health (ODH) Outbreak Response and Bioterrorism Investigation Team (ORBIT) at 614-995-5599 during regular business hours to report suspected travel-associated cases of Legionellosis.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module. Please try to determine if the patient had pneumonia (see Clinical, Diagnosis in ODRS).

AGENT

Legionella spp. are gram-negative bacilli. Thirteen species have been implicated in causing human disease. The most common species causing infection is *Legionella pneumophila* serogroup 1.

CASE DEFINITION

Clinical Case Definition

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.

Laboratory Criteria for Diagnosis

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) *or*
- By seroconversion: Fourfold or greater rise in antibody titer to multiple species of *Legionella* using pooled antigen and validated reagents *or*
- 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 *or*
- By detection of *Legionella* species by a validated nucleic acid assay.

Confirmed:

- By culture: Isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid or other normally sterile fluid *or*
- By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents *or*

- By seroconversion: Fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

Case Classification

Suspect: A clinically compatible case that meets at least one of the presumptive (suspect) laboratory criteria.

- Travel-associated: A case that has a history of spending at least one night away from home, either in the same country of residence or abroad, in the ten days before onset of illness.

Confirmed: A clinically compatible case that meets at least one of the confirmatory laboratory criteria.

- Travel-associated: A case that has a history of spending at least one night away from home, either in the same country of residence or abroad, in the ten days before onset of illness.

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

Comment

The previously used category of "probable case," which was based on a single IFA titer, lacks specificity for surveillance and is no longer used.

SIGNS AND SYMPTOMS

There are two distinct clinical manifestations associated with *Legionella* infections.

Legionnaires' disease

Initially characterized by anorexia, malaise, myalgia and headache. Within a day, there is usually a rapidly rising fever associated with chills. Temperatures commonly reach 39-40ºC (102-105ºF). A nonproductive cough is common. Abdominal pain and diarrhea occur in many patients. Chest x-ray may show patchy areas of consolidation, which can progress to bilateral involvement and ultimately to respiratory failure.

Immunocompromised hosts are generally at higher risk for acquiring Legionnaires' disease.

Pontiac fever

Characterized by anorexia, malaise, myalgia and headache. Mild respiratory symptoms are usually present. Symptoms usually resolve in a few days with no further sequelae.

DIAGNOSIS

Legionnaires' disease is most commonly diagnosed with the urine antigen test. It can also be diagnosed by culture of a respiratory specimen (e.g. BAL), direct immunofluorescent test of a respiratory specimen, or a 4-fold rise in antibody titer. Antibody titers in single serum specimens reflect exposure that may or may not relate to current disease. Cases with single antibody titers as the only positive lab finding do not meet the current CDC case definition for Legionnaires' disease.

EPIDEMIOLOGY

Source

The reservoir for *Legionellae* is water. The bacteria are ubiquitous in fresh water sources. They grow well in warm water, such as hot tubs, cooling towers, hot water tanks, water features, plumbing systems and air conditioning systems in buildings.

Growth or amplification of *Legionella* can occur under different environments in water systems. Conditions that promote amplification include:

- Water stagnation
- Warm temperatures (25 - 51°C [77° - 124°F])
- Presence of scale and sediment
- Presence of organic matter (biofilms)
- Presence of protozoa in the water
- Lack of residual disinfectant

Occurrence

Sporadic cases and outbreaks are more common in the summer and autumn. Immunocompromised hosts have a higher risk for acquisition of Legionnaires' disease than the general population. Those at highest risk for legionellosis include: persons ≥50 years of age, smokers, people with 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.

Mode of Transmission

The airborne route appears to be the mode of transmission, most commonly by inhalation of aerosolized contaminated water. Aspiration is another route of transmission, though probably less common.

Period of Communicability

Person-to-person transmission has not been documented.

Incubation Period

Legionnaires' disease: range 2-10 days, most often 5-6 days.
Pontiac fever: range 5-72 hours, most often 24-48 hours.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Reported cases should be investigated. For the 10 days prior to onset, try to determine the activities of the case. Of special interest are cases with exposure during the 10 days prior to onset to healthcare settings (e.g. hospitals, clinics, nursing homes), cases who have traveled away from home, cases who work in industrial or manufacturing settings, and situations in which there is more than one case exposed to the same residence, health care site, work site or other location.

Many cases are sporadic and isolated. However, if you find any of the following situations, please contact the ODH Bureau of Infectious Diseases Outbreak Response and Bioterrorism Investigation Team (ORBIT) at 614-995-5599 as soon as possible:

- A case is identified who has been a **hospital inpatient or resident of a long-term care facility** during the 10 days prior to onset of Legionnaires' disease;
- A case is identified who has been **exposed to spraying or misting water at their job** during the 10 days prior to onset of Legionnaires' disease. This may be in a manufacturing or industrial setting.
- A case is identified who has been away from home (that is, **traveling**) either in-state, out-of-state, or outside the U.S. in the 10 days prior to onset.
- **Two or more cases** who have been exposed to the same hospital, nursing home, clinic, job site, or had any other **shared exposure** (e.g. gym, hotel) or who work at the same location, as this may represent an outbreak.

Treatment
For Legionnaires' disease, recommended treatment is a respiratory fluoroquinolone (e.g. levofloxacin) or a macrolide (e.g. azithromycin). Penicillin, cephalosporins, and aminoglycosides are ineffective. Pontiac fever does not require antimicrobial treatment.

Isolation
There is no indication that person-to-person transmission occurs; therefore, there is no need to isolate cases.

Prevention and Control
Building owners can take steps to prevent the growth of *Legionella* in water distribution systems and heating/cooling/ventilation systems, and cooling towers through the development and use of water management plans, use of environmental controls and monitoring, and development of remediation or treatment plans if *Legionella* is detected.

High Risk Facilities
Certain types of building and facilities are at higher risk for the growth of *Legionella*. High risk facilities are those that house sensitive populations, have large complicated water systems, are more than 10 stories, and have cooling towers. The Centers for Disease Control and Prevention (CDC) recently identified that common settings for *Legionella* outbreaks include hotels, long-term care facilities and hospitals. The CDC has developed a worksheet to identify buildings at increased risk for *Legionella* growth and spread at https://www.cdc.gov/legionella/maintenance/wmp-risk.html.

Water Management Plans
The purpose of development and use of a water management plan, also called water safety plan, is to prevent *Legionella* growth, and to have a plan for remediation in case of an outbreak. The components of a water management plan include:

- Establish a water management program team
- Describe the building water systems using text and flow diagrams
- Identify areas where *Legionella* could grow and spread
- Decide where control measures should be applied and how to monitor them
- Establish ways to intervene when control limits are not met
- Make sure the program is running as designed and is effective
- Document and communicate all the activities

Water Management Plan Resources
ASHRAE (2015). Standard 188-2015, Legionellosis: Risk Management for Building Water Systems. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., Atlanta, Ga.

American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Guideline 12-2000 "Minimizing the Risk of Legionellosis Associated with Building Water Systems". www.ashrae.org

CDC (2017). Developing a Water Management Program to Reduce Legionella Growth & Spread in Buildings. Centers for Disease Control and Prevention.

CDC (2017) What Owners and Managers of Buildings and Healthcare Facilities Need to Know about Legionella Water Management Program

CDC (2018) Considerations When Working with Legionella Consultants

Environmental Assessments

Facility managers should conduct an environmental assessment of the facility identifying and documenting the areas of concern within the facility. Environmental assessments provide a complete understanding of a facility water system and helps identify areas of risk. These assessments can be used to help identify areas to implement environmental monitoring for temperature or chlorine residuals, or sampling for *Legionella* if needed. CDC has developed a tool kit for conducting environmental facility assessments which can be accessed at: https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment.pdf

Understanding factors that lead to *Legionella* growth will help facility managers successfully conduct an environmental assessment.

Proactive Environmental Monitoring

Based on the results of the environmental assessment, routine monitoring of parameters such as chlorine residual and temperature may be useful to provide measurable standards for ensuring that system is not conducive to *Legionella* growth. Proactive monitoring should include decision points on action levels with a corresponding plan of action when unacceptable levels are present.

CDC has developed a sampling data sheet for use with environmental monitoring or data collection: https://www.cdc.gov/legionella/downloads/sample-data-sheet.pdf

It is recommended that a CDC ELITE certified laboratory be used for any sample analysis for *Legionella*. Here is a link to CDC ELITE certified laboratories: https://www.cdc.gov/legionella/labs/elite.html

Long-Term Control Measures

An environmental assessment of the facility or the water management plan may identify risk factors that merit use of long term control measures for the water distribution system or HVAC system to prevent or reduce *Legionella* growth. Common long-term control measures for hot water distribution systems include, temperature control (maintaining temperatures above 120°F), continuous disinfection of the water system including chlorine, monochloramine, chlorine-dioxide, copper-silver ionization, ultraviolet radiation, and point of use/entry filtration. Control points include measurable factors that contribute to *Legionella* growth, like temperature, disinfectant residual level, and flow rate. Some of these treatment systems may require a licensure as a public water system with Ohio EPA; contact the Division of Drinking and Groundwaters to learn more. http://www.epa.state.oh.us/ddagw/DrinkingandGroundWaters.aspx

Long-term control measures for cooling towers and HVAC systems with exposed water sources need to ensure proper maintenance and physical cleaning of the tower or system as per the manufacturer's recommendations to prevent *Legionella* growth.

See the ODH website at www.odh.ohio.gov/legionella and also the CDC website for additional information: http://www.cdc.gov/legionella/index.html

What is legionellosis?
Legionellosis is an infection caused by the bacterium *Legionella pneumophila*. The disease has two distinct forms: Legionnaires' disease, the more severe form of infection which includes pneumonia and Pontiac fever, a milder illness. Legionnaires' disease acquired its name in 1976 when an outbreak of pneumonia occurred among persons attending a convention of the American Legion in Philadelphia. Later, the bacterium causing the illness was named *Legionella*.

How common is legionellosis in the United States?
An estimated 8,000 to 18,000 persons get Legionnaires' disease in the United States each year. An additional unknown number are infected with the *Legionella* bacterium and have mild symptoms or no illness at all. Outbreaks of Legionnaires' disease have received the most media attention; however, most often the disease occurs as single, isolated cases not associated with any recognized outbreak. Outbreaks are usually recognized in the summer and early fall, but cases may occur year-round. Approximately 5%-15% of known cases of Legionnaires' disease have been fatal.

In Ohio from 2013-2017, the median number of reported cases was 503 (range 409-601).

What are the symptoms of legionellosis?
Patients with Legionnaires' disease usually have fever, chills and cough, which may be dry or may produce sputum. Some patients also have muscle aches, headache, tiredness, loss of appetite and occasionally, diarrhea. Laboratory tests may show decreased function of the kidneys. Chest x-rays often show pneumonia. It is difficult to distinguish Legionnaires' disease from other types of pneumonia by symptoms alone; other tests are required for diagnosis. Persons with Pontiac fever experience fever and muscle aches and do not have pneumonia. They generally recover in 2-5 days without treatment. The time between exposure and onset of illness for Legionnaires' disease is 2-10 days; for Pontiac fever, it is shorter, generally a few hours to 2 days.

How is legionellosis diagnosed?
The diagnosis of legionellosis requires special tests not routinely performed on persons with fever or pneumonia. Therefore, a physician must consider the possibility of legionellosis in order to obtain appropriate tests. Several types of tests are available. The most useful are detecting the bacteria in sputum, finding *Legionella* antigens in a urine sample and comparing antibody levels to *Legionella* in two blood samples obtained 3-6 weeks apart.

Who gets legionellosis?
People of any age can develop Legionnaires' disease, but the illness most often affects middle-aged and older persons, particularly those who smoke cigarettes or have chronic lung disease. Also at increased risk are persons whose immune system is suppressed by diseases such as cancer, kidney failure requiring dialysis, diabetes, or AIDS. Persons who take drugs that suppress the immune system are also at higher risk.

Pontiac fever most commonly occurs in persons who are otherwise healthy.

What is the treatment for legionellosis?
Levofloxacin and azithromycin are among the drugs usually recommended for the treatment of Legionnaires' disease. Pontiac fever requires no specific treatment.

How is legionellosis spread?
Outbreaks of legionellosis have occurred after persons have inhaled aerosols that come from a water source (e.g. air conditioning cooling towers, whirlpool spas, showers) contaminated with *Legionella* bacteria. Persons may be exposed to these aerosols in homes, workplaces, hospitals or public places. Infection cannot be acquired from another person with legionellosis, and there is no evidence of persons becoming infected from auto air conditioners.

Where is the *Legionella* bacterium found?
Legionella organisms can be found in many types of water systems; however, the bacteria reproduce to high numbers in warm, stagnant water, such as that found in certain plumbing systems and hot water tanks, cooling towers and evaporative condensers of large air-conditioning systems and whirlpool spas. Cases of legionellosis have been identified throughout the United States and in several other countries. The disease likely occurs worldwide.

What is being done to prevent legionellosis?
The development and implementation of water management plans, environmental facility assessments, monitoring of control measures, and subsequent improvements in the design and maintenance of cooling towers and plumbing systems to limit the growth and aerosolization of *Legionella* organisms are the foundations of legionellosis prevention. During outbreaks, CDC and health department investigators seek to identify the source of disease transmission and recommend appropriate prevention and control measures, such as decontamination of the water source. Current research will likely identify additional prevention strategies.

See the CDC website for additional information: http://www.cdc.gov/legionella/index.html