Legionellosis
Investigative Guidelines
August 2020

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To identify outbreaks and potential sources of transmission to prevent further exposure.
2. To educate potentially exposed persons about signs and symptoms of disease thereby facilitating early diagnosis and treatment.
3. To identify populations at high-risk of complications from infection.
4. To identify additional cases.

1.2 Laboratory and Physician Reporting Requirements

Physicians are required to report a case or suspected case within one working day of identification/diagnosis. Laboratories are to report all test results indicative of and specific for legionellosis within one working day.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive cases to PHD (see case definitions below) electronically by the end of the calendar week of initial report.
2. Begin follow-up investigation within one working day.
3. Submit case investigation data electronically.

2. THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Etiologic Agent

Legionellae are Gram-negative bacilli. In all, at least 50 species and at least 70 serogroups are identified;

L. pneumophila is responsible for >90% of infections. Eighteen serogroups of *L. pneumophila* are currently recognized; serogroup 1 causes the majority of disease reported in the U.S. *Legionellae* thrive in warm, aquatic environments and are relatively resistant to the effects of chlorine and heat. They do not colonize the human respiratory tract.

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2.2 Description of Illness

Legionellosis is a bacterial infection more common in adults >50 years of age and very unusual in persons <20, most of those being immunosuppressed. It was first recognized following a 1976 outbreak of pneumonia involving American Legion convention delegates, named by the press “Legionnaires’ disease” (LD). There are no reliable distinguishing clinical characteristics other than that the illness is primarily respiratory; diagnosis must come from the lab.

Illness is associated with three clinically and epidemiologically distinct syndromes:

- Legionnaires’ disease, a potentially fatal form of pneumonia;
- Pontiac fever, a self-limited “flu-like” illness without pneumonia; and
- extrapulmonary legionellosis, infection in sites outside the lungs.

Persons with Legionnaires’ disease may present early in the illness with nonspecific symptoms including fever, malaise, myalgia, anorexia, and headache. Cough may be only slightly productive, and chest pain, occasionally pleuritic, can be prominent. GI symptoms, especially diarrhea, occurs in 20 to 40 percent of cases. Chest x- rays usually show a pneumonia. Pontiac fever is a milder, self-limited illness. A diagnosis of extrapulmonary legionellosis is made when there is clinical evidence of disease at an extrapulmonary site and diagnostic testing indicates evidence of *Legionella* at that site. Illness includes endocarditis, wound infection, joint infection, and graft infections.

Persons at increased risk for infection include the elderly, smokers, those with chronic diseases such as COPD or diabetes, and the immunosuppressed.

2.3 Reservoirs

Water is the primary reservoir. *Legionellae* can survive for months in tap and distilled water. A variety of natural and man-made aqueous sources have been implicated, including warm, stagnant water such as that found in, or aerosolized from:

- plumbing systems and hot water tanks;
- shower heads and faucets;
- cooling towers;
- evaporative condensers of large air-conditioning systems;
- whirlpool spas;
- respiratory therapy equipment;
- ultrasonic misters;
- humidifiers; and
- decorative fountains.

Potting soil has been associated with *L. longbeachae*, a serogroup uncommon in the U.S. Approximately 10% of reported cases occur in people who have traveled during the 10 days before symptom onset.

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2.4 Modes of Transmission

Legionellae are generally spread through the air by aerosolized water which is then inhaled or microaspirated. Infection has also occurred by contamination of surgical wounds with potable water. It is not transmitted from person to person.

2.5 Incubation Period

For Legionnaires' disease, 2–10 days (usually 5–6 days); for Pontiac fever, 5–66 hours (usually 24–48 hours).

2.6 Period of Communicability

Person to person transmission has not been documented. *Legionellae* can survive for months in tap and distilled water.

2.7 Treatment

For Legionnaires' disease, the preferred treatment is a fluoroquinolone (such as levofloxacin) or azithromycin intravenously or orally; doxycycline is another alternative. Sanford's Guide suggests that the duration of therapy should be 7–10 days. Delay in treatment is associated with increased mortality rates.

Pontiac fever requires no specific treatment.

3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

"Legionnaires disease is more accurately described as an elusive diagnosis rather than an exotic disease." David R. Murdock, 2003 (CID 2003:36 [1 January]). Because of variable presentations, clinical diagnosis is often difficult. A dearth of sensitive and specific serologic tests makes laboratory confirmation problematic as well.

The best diagnostic combination is the urine antigen test and culture of lower respiratory secretions (e.g., sputum or bronchial washing). Urine antigen screen is the most sensitive diagnostic test available; it detects only *L. pneumophila*, serogroup 1, the most common detected cause of legionellosis. Under optimal conditions, about 80% of cases can be confirmed by nasopharyngeal culture.

Under the usual conditions encountered in outbreak investigations, only 25-50% of cases are confirmed. PCR testing has become available, but diagnosis is best confirmed by culture or urine antigen screen. Urinary antigen assay and culture of respiratory secretions on selective media **are the preferred diagnostic tests for legionellosis.**

3.1 Confirmed Case Definition (reportable to PHD)

A confirmed case of legionellosis meets one or more of the following laboratory criteria:

- Culture: Isolation of any *Legionella* organism from respiratory secretions (e.g., sputum, BAL, bronchial washing), lung tissue, pleural fluid, or other normally sterile fluid;

- PCR: Detection of *Legionella* species by a nucleic acid assay;
- Urine antigen: Detection of *Legionella pneumophila* serogroup 1 antigen in urine (Note: Urine antigen detects only serogroup 1. The good news is that:
  - >70% of cases are serogroup 1. *Legionella* urine antigen can be detected for several weeks or months after acute infection and can persist for up to one year in some cases. For our surveillance purposes, recurrent *Legionella* infections are those characterized by a new clinically compatible illness and a
  - positive urine antigen test at least six months (180 days) following the last positive urine antigen test.
- Seroconversion: Four-fold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1. (If serology is performed, every effort must be made to collect paired serologies. The acute sample should be taken at point of care. The convalescent sample should be taken 3–4 weeks after the acute sample is obtained. Please note a single antibody titer of ANY level is not diagnostic of legionellosis.)

3.2 Presumptive Case Definition (reportable to PHD)

A presumptive case of legionellosis meets the following criteria:

- A clinically compatible case with an epi link during the 14 days before onset of symptoms for Legionnaires disease or 3 days before onset of symptoms for Pontiac fever cases

3.3 Suspect Case Definition (not reportable to PHD)

A suspect case of legionellosis meets one or more of the following criteria:

- DFA or IHC: 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;
- Seroconversion (non-Lp1): Four-fold 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 four-fold or greater rise in antibody titer to multiple species or serogroups of *Legionella* using pooled antigen (e.g., *L. pneumophila* serogroups 2-6).

3.4 Services Available at the Oregon State Public Health Laboratory (OSPHL)

None.

4. ROUTINE CASE INVESTIGATION

As most cases of legionellosis present as sporadic disease, routine case investigation is limited to collecting basic demographics, information about the basis of diagnosis, and risk factors which may shed light on susceptibility to disease. Please complete the risk factor section in Orpheus in addition to the CDC Supplemental Form (also in Orpheus). Unless

circumstances indicate that an outbreak may be occurring (§ 5 and 6), further investigation is not indicated. Identification of a nosocomial (hospital/institution-acquired) case warrants additional case finding at the implicated institution as clusters/outbreaks have been reported having such common environmental sources of exposure (§ 6).

5. CONTROLLING FURTHER SPREAD

No prophylaxis is indicated for household/contacts; person-to-person transmission has not yet been demonstrated.

5.1 Environmental Investigation

An environmental investigation would only be undertaken during an outbreak investigation (§ 6).

6. MANAGING SPECIAL SITUATIONS 4

Many outbreaks, community and nosocomial, have been attributed to *Legionella* spp. in the decades since the 1976 American Legion Convention in Philadelphia. Several have been described retrospectively. If a cluster of legionellosis is suspected, confirmation and investigation are warranted, as morbidity may be significant and mortality high (up to 30%), and reservoirs may be found and eliminated. Contact ACDP epidemiologists to discuss possible outbreaks. Such investigations may involve complex questionnaires and detailed environmental evaluations.

REFERENCES

1. Revision to the Case Definition for National Legionellosis Surveillance. 2020. https://cdn.ymaws.com/www.cste.org/resource/resmgr/2019ps/final/19-ID-04_Legionellosis_final.pdf. Accessed 26 August 2020.

UPDATE LOG

August 2020. Updated case definition to align with CSTE case definition (added presumptive case classification and updated suspect case classification), clarified different types of infections associated with legionellosis, sundry edits. (Meagan McLafferty and Tasha Poissant)

May 2018. Added clarifying language regarding risk factor collection (i.e., complete risk factor template in Orpheus and completed the CDC Supplemental Form). (Tasha Poissant).

October 2017. Put in new template. Updated treatment recommendations. (Tasha Poissant and Ann Thomas)

August 2011. Updated case definitions and diagnostic testing methods. (Jamie Thompson)