

Legionellosis

(including Legionnaires' Disease and Pontiac Fever)

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Legionella pneumophila is the causative agent of Legionnaire's Disease (LD) and Pontiac Fever (PF); other *Legionella* species (spp.) produce clinical illness designated as legionellosis including pneumonia and a PF-like illness. *L. pneumophila* causes about 85-90% of reported human *Legionella* infections, with serogroup 1 accounting for about 80% of these (serogroups 4 and 6 also cause human infection). At least 18 species (spp.) of *Legionella* other than *L. pneumophila* have been documented to cause human infections, the vast majority of which are pneumonic. Of the reported non-*pneumophila* *Legionella* infections, approximately 60% are caused by *L. micdadei*, 15% by *L. bozemanii*, 10% by *L. dumoffii*, and 5% by *L. longbeachae*.

B. Clinical Description

Legionella infection manifests in two distinct forms: pneumonia (called LD when caused by *L. pneumophila*) and Pontiac fever (PF) which is a milder illness. LD includes a broad spectrum of illness, ranging from mild cough and slight fever to severe bilateral pneumonia with high fever and multisystem failure. Watery diarrhea is seen in 25-50% of cases, and change in mental status (lethargy to encephalopathy) is seen with more severe illness. LD is not easily distinguished from other causes of community-acquired pneumonia, although hyponatremia (serum sodium <130 mEq/L) is found significantly more often with LD than other pneumonias.

Most patients with legionellosis (i.e. pneumonia) caused by non-*pneumophila* *Legionella* spp. are immunocompromised secondary to drugs, organ transplantation, or malignancy.

PF is an acute, self-limited flu-like illness without pneumonia. The predominant symptoms are malaise, myalgias, fever, chills, and headache. Non-productive cough has also been noted. The attack rate among those exposed may be higher than 90%.

C. Reservoirs

The natural habitat of *L. pneumophila* appears to be bodies of water. *Legionella* is chlorine-tolerant and, therefore, it survives the water-treatment process and passes into water distribution systems in small numbers. Subsequent proliferation and colonization occurs under favorable conditions including warm water temperatures, physical protection, and nutrients. The presence of symbiotic microorganisms, including amoebas and water bacteria, appears to be necessary for optimal growth. Water distribution systems are the likely primary reservoir for the dissemination of *L. pneumophila*. Sources of *Legionella* contaminated aerosols have included cooling towers, evaporative condensers, whirlpools, spas, respiratory therapy equipment (e.g. nebulizers and humidifiers), decorative fountains, and ultrasonic mist machines. There is lack of agreement as to whether shower aerosols may be a source of infection (only small numbers of *Legionella* are aerosolized for very short distances). There is no evidence to suggest transmission of *Legionella* from auto air conditioners or household window air conditioning units that do not use water as their coolant.

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Non-*pneumophila Legionella* spp. are commonly found in aquatic habitats and soil. Water distribution systems, including hospital water systems, may become colonized with any of a number of these species.

D. Modes of Transmission

Evidence exists for multiple modes of transmission of *Legionella* to humans including aerosolization with subsequent airborne spread, aspiration of contaminated water, and even introduction into the lung during respiratory tract manipulation. *Legionella* are not known to be transmitted from person-to-person.

E. Incubation Period

The incubation period for LD ranges from 2 to 10 days, but most often is 5 to 6 days. The incubation period for PF ranges from 5 to 66 hours, but most often is 24 to 48 hours.

F. Period of Communicability or Infectious Period

Legionellosis is not communicable from person-to-person.

G. Epidemiology

Legionellosis is reported throughout the year in Colorado, however, cases peak in the summer months. From 1996 through 2003, a median of 12 cases (range: 8 – 18) was reported annually in Colorado. Most cases are \geq 40 years of age.

Colorado Legionellosis statistics are available at the CDPHE website:

www.cdphe.state.co.us/dc/CODiseaseStatistics/index.html

2) CASE DEFINITION

Clinical Description

Legionellosis is associated with two clinically and epidemiologically distinct illnesses: Legionnaire's 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).
- 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.

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- 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.
- 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.

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.

3) REPORTING CRITERIA

What to Report to the Colorado Department of Public Health and Environment (CDPHE) or local health agency

- Confirmed legionellosis cases.
- Legionellosis cases should be reported within 7 days of diagnosis or a positive laboratory test.
- Cases should be reported using the Colorado Electronic Disease Reporting System (CEDRS), or fax or telephone to CDPHE or local health departments. See below for phone and fax numbers.
- Suspected legionellosis outbreaks (including PF) should be reported to CDPHE or local health departments within 24 hours.

Purpose of Surveillance and Reporting

- To identify cases for investigation and potential outbreaks
- To monitor trends in disease incidence

Important Phone Numbers and Web Resources

- CDPHE Communicable Disease Epidemiology Program
 - Phone: 303-692-2700 or 800-866-2759
 - Fax: 303-782-0338
 - After hours: 303-370-9395
- CDPHE Microbiology Laboratory: 303-692-3480

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- Communicable Disease (CD) Manual website:
http://www.cdphe.state.co.us/dc/epidemiology/dc_manual.html

4) STATE LABORATORY SERVICES

Laboratory Testing Services Available

- Diagnostic testing for legionellosis is typically performed by clinical laboratories.
- For investigations of hospital-acquired legionellosis and outbreak investigations, the CDPHE laboratory can perform isolation of *Legionella* spp. from environmental (i.e., water) samples.
- For investigations of hospital-acquired legionellosis and outbreak investigations, the CDPHE laboratory can perform Pulsed-Field Gel Electrophoresis (PFGE) testing (i.e., molecular typing) of human and environmental *legionella* isolates.
- Isolates from hospital-acquired legionellosis cases should be saved for molecular typing and comparison to environmental isolates.
- For more information or assistance with testing for *Legionella*, contact the CDPHE Microbiology Laboratory.
- Note: Authorization from the CDPHE Communicable Disease Program is required before submitting environmental samples for *legionella* testing to the CDPHE Microbiology Laboratory.

5) CASE INVESTIGATION

Interview all legionellosis cases to determine:

- Potential common (i.e., for multiple cases) environmental source of infection and to implement control measures to prevent further transmission from an implicated source
- Potential hospital-acquired infection and to implement control measures to prevent further transmission from an implicated source to high-risk patients

Organized local health departments have primary responsibility for interviews of sporadic cases in their jurisdictions. In other jurisdictions, public health nursing services should consult with regional epidemiologists to establish primary responsibility for interviews of sporadic cases.

If an outbreak is suspected, please contact CDPHE for assistance.

A. Case Investigation / Forms

- Complete the [CDC - Legionellosis Case Report Form](#) which can be found on the CD manual website.
- Enter any travel history information into CEDRS under “Case Notes” for all confirmed cases, and update other CEDRS record information as appropriate.
- Mail or fax completed forms to CDPHE (Attn: Communicable Disease Program)

B. Identify and Evaluate Contacts

Not applicable

C. Reported Incidence Is Higher than Usual/Outbreak Suspected

If the number of reported cases of legionellosis in your jurisdiction is higher than usual, an outbreak is suspected, or there is a potential hospital-acquired case, consult with the CDPHE Communicable Disease Epidemiology Program. CDPHE can assist local public health agencies

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with the investigation of hospital-acquired cases and legionellosis outbreaks, determine a course of action to prevent further cases, and coordinate surveillance of cases that cross county lines.

6) DISEASE CONTROL MEASURES

A. Treatment

The preferred treatment for Legionnaire's Disease for hospitalized patients is azithromycin or a fluoroquinolone (e.g., levofloxacin). For patients who do not require hospitalization, acceptable antibiotics include erythromycin, doxycycline, azithromycin, clarithromycin, or a fluoroquinolone. Pontiac fever requires no specific treatment.

B. Prophylaxis

Not applicable

C. Education

If appropriate, sporadic cases may be educated about the prevalence of *legionella* spp. in the environment, especially water; and about increasing age, smoking, and underlying disease as risk factors for acquiring legionellosis. It should also be explained that it is extremely difficult to determine the specific environmental source of sporadic cases and, therefore, environmental testing is not indicated.

D. Managing Special Situations

1. Single Case of Community-Acquired Legionellosis

One case of legionellosis does not require any further investigation other than interviewing the case and completing the [CDC - Legionellosis Case Report Form](#) (see Section 5). Since *Legionella* can be found in a wide variety of water sources at low levels, it is difficult to prove a particular source was the cause of illness unless another case occurs that also implicates the suspected "source". Alleged sources should not be tested or decontaminated based on one community-acquired case.

2. Hospital-Acquired Legionellosis

A laboratory-confirmed case of legionellosis that occurs in a patient who has been hospitalized continuously for >10 days before the onset of illness is considered a case of hospital-acquired (i.e., nosocomial) legionellosis. A cases that occurs in a patient who has been hospitalized continuously for 2-9 days before the onset of illness is considered a "possible" case of hospital-acquired legionellosis.

When one case of laboratory-confirmed, hospital-acquired legionellosis is identified, CDPHE should be contacted, and certain activities should be initiated, including enhanced surveillance within the facility and possibly an environmental investigation to determine the source of *Legionella* spp. Whether or not the facility treats severely immunocompromised patients (i.e., stem cell transplant or solid-organ transplant patients), may determine how aggressive a response is indicated. Further details of the recommended approach can be found in: "Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the

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Healthcare Infection Control Practices Advisory Committee (HICPAC)"; MMWR Recommendations and Reports, June 6, 2003.

http://www.cdc.gov/mmwr/indrr_2003.html

E. Environmental Measures

- Cooling towers should be drained when not in use and mechanically cleaned and maintained according to the manufacturer's recommendations.
- Tap water should not be used in respiratory therapy devices.
- Hotels and other owners of whirlpool spas and decorative fountains should maintain them according to the manufacturer's recommendations and keep current on protocols for public health safety.
- After outbreaks or hospital-acquired cases, vigilant monitoring of proven sources should be maintained.

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