

The Clinician's Role in Identifying *Legionella*

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The Centers for Disease Control and Prevention (CDC) estimates that there are 8,000 to 18,000 individuals requiring hospitalization for *Legionella* annually in the United States. Since 2006, annual case reporting in Los Angeles County has increased 400%, from 20 to 100. The reasons for the increase are uncertain; however, it may be due in part to increased reporting as a result of changes in California laboratory reporting requirements as well as improved electronic laboratory reporting. Although case reports have increased, speculation of misdiagnosis, underutilization of diagnostic testing, and underreporting continue to underestimate true prevalence.

Legionella is a pathogenic Gram-negative bacterium with at least 50 species and 70 serogroups identified. It is found naturally in the water environment and thrives in temperatures between 25°C–45°C (77°F–113°F). Common sources include cooling towers, domestic hot water systems, and spas. Additional sources include central air conditioning systems, fountains, ponds, and swimming pools. Transmission occurs through the inhalation of aerosol droplets containing the bacteria, and aspiration of contaminated water. Rare cases of legionellosis caused by *L. longbeachae* have been associated with inhalation of dust from dry potting soil. Person-to-person transmission does not occur.

How a Patient Presents

Legionellosis is a potentially fatal infectious disease that is caused by *Legionella* and is associated with two clinically and epidemiologically distinct illnesses: Legionnaires' disease and Pontiac fever. Legionnaires' disease is the more severe

Table 1. Legionnaires' Disease and Pontiac Fever

Characteristics	Legionnaires' Disease	Pontiac Fever
Clinical features	Pneumonia: cough, fever, chest pain	Flu-like illness (fever, chills, malaise) without pneumonia
Radiographic pneumonia	Yes	No
Incubation period	2-14 days after exposure	24-48 hours after exposure
Etiologic agent	<i>Legionella</i> species	<i>Legionella</i> species
Attack rate*	<5%	>90%
Isolation of organism	Possible	Virtually never
Outcome	Hospitalization common Case fatality rate: 5%-40%**	Hospitalization uncommon Case fatality rate: 0%

* Percent of persons who, when exposed to the source of an outbreak, become ill.

** Percent of persons who die from Legionnaires' disease



CDC/Janice Haney Carr

This colorized scanning electron micrograph depicts a large grouping of Gram-negative *Legionella pneumophila* bacteria.

form of legionellosis and is characterized by fever, myalgia, cough, and clinical or radiographic pneumonia 2-10 days after exposure. Legionnaires' disease causes death in up to 5%-40% of cases, although most cases can be successfully treated with antibiotics. Pontiac fever produces a milder flu-like, non-pneumonic illness, occurring within a few hours to 2 days of exposure. It is a self-limited illness that requires no treatment and most commonly occurs in persons who are otherwise healthy. (Table 1)

Who Should Be Tested for Legionnaires' Disease?

The following people should be tested for the disease:

- Hospitalized patients with unknown cause of pneumonia
- Patient with enigmatic pneumonia sufficiently severe to require care in the ICU
- Compromised host with pneumonia
- Patients with pneumonia in the setting of a legionellosis outbreak
- Patients who fail to respond to treatment to β -lactam or cephalosporin
- Patients with a travel history within 10 days before the onset of illness
- Patients suspected of nosocomial pneumonia with unknown etiology.

How to Diagnose

The challenge of acceptable diagnostic testing to meet the CDC case definition of Legionnaires' disease still continues. The case definition states that a confirmed case should have a compatible clinical history of pneumonia diagnosed by radiography and one of the following criteria: 1) Culture positive for *Legionella* species; 2) demonstration of *Legionella*

species by direct fluorescent antibody testing; 3) fourfold or greater rise in immunofluorescent antibody titer to *Legionella* species to 128 or greater; 4) detection of *L. pneumophila* serogroup 1 antigen in the urine. Serology is valuable only when a paired serum is drawn 3-6 weeks from onset of symptoms and a fourfold increase of titers is observed. A single elevated antibody titer does not confirm a case of Legionnaires' disease. Despite this, our records indicate that providers continue to perform this test.

In LA County, approximately 99% of reported *Legionella* cases are diagnosed by urine antigen. Though urine antigen testing is the most common method of diagnosing *Legionella*, it only tests for serogroup 1. Patients infected with a different *Legionella* serogroup or species will be falsely negative if tested by this method alone. (Table 2)

To better understand the epidemiology and public health burden and impact of this important disease, all patients who present with pneumonia and have legionellosis in the differential diagnosis should have at least one *Legionella* diagnostic test performed. Obtaining cultures is also valuable for identifying the organism. During outbreaks, having available isolates allows for strain typing and molecular comparisons with other cases and environmental specimens, which will expedite public health intervention in any location.

In 2006, as part of a six-month retrospective review of a health care-associated Legionnaires' case in a large medical center in LA County, 145 medical records with community-acquired pneumonia listed as the discharge diagnosis


were audited. All of them were given empiric treatment for pneumonia upon presentation in the emergency department and subsequently admitted; however, testing for *Legionella* was not performed on any of these patients despite radiology-confirmed pneumonia.

What Physicians Need to Know

The Department of Public Health encourages all clinicians to know the specific pathogen they are treating. Increased awareness among physicians to utilize available noninvasive tests such as the urine antigen will improve recognition of *Legionella* cases. In addition, thorough history taking and review of medical records is valuable to determine a possible source of infection and potential outbreaks. Providers are encouraged to obtain a history of recent hospitalization, skilled nursing home and long-term residency, outpatient visits, travel, convention attendance, recreational water activities, and gym membership from all patients who present with clinical symptoms of pneumonia.

Notification of confirmed cases of legionellosis to the Department of Public Health is mandatory and is solely the responsibility of the provider. Approximately 50% of acute care facilities in LA County have reported Legionnaires' disease in the past 5 years. In 1985, Legionnaires' disease was made a reportable disease in California and, in 2009, it became a laboratory-notifiable disease. Cases must be reported within 7 days from the time of identification.

To report, complete the confidential morbidity report, available at www.publichealth.lacounty.gov/acd, and fax it to Communicable Disease Reporting at (888) 397-3778. Physicians may also call the Communicable Disease Reporting System at (888) 397-3993 or use the secured web-based reporting system. Any provider interested in the web-based reporting system should call the Acute Communicable Disease Control Program at (213)-240-7941.

By performing the diagnostic tests that aid in the prompt diagnosis and reporting of *Legionella* species and legionellosis, the medical community plays a vital role in identifying single cases and outbreaks in the community and hospital environment. 

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Table 2. *Legionella* Diagnostic Tests

Test	Advantages	Disadvantages
Culture	<ul style="list-style-type: none"> Clinical & environmental isolates can be compared Detects all species & serogroups 100% specific 	<ul style="list-style-type: none"> Technically difficult Slow (>5 days to grow) Sensitivity highly dependent on technical skill May be affected by antibiotic treatment
Urine Antigen	<ul style="list-style-type: none"> >99% specific Rapid (same day) 	<ul style="list-style-type: none"> Only for <i>L. pneumophila</i> serogroup 1 (Lp1) [which may account for up to 80% of cases] Limited utility when compared to environmental isolates
Serology	<ul style="list-style-type: none"> Not affected by antibiotic treatment 70%-80% sensitive; >90% specific 	<ul style="list-style-type: none"> Must have paired sera 5%-10% of population has titer ≥ 256 Single acute phase antibody titers of ≥ 256 do not discriminate between cases of Legionnaires' disease and other causes of community-acquired pneumonia
DFA	<ul style="list-style-type: none"> Can be performed on pathologic specimens 95% specific 	<ul style="list-style-type: none"> 25%-75% sensitive

REFERENCES

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- Murdoch, D.R. (2003). Diagnosis of *Legionella* Infection. *Clin Infect Dis*. 2003;36(1):64-69. Retrieved March 7, 2011, from cid.oxfordjournals.org.