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 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

Table 1. Legionnaires’ Disease and Pontiac Fever

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

* Percent of persons who, when exposed to the source of an outbreak, become ill.
** Percent of persons who die from Legionnaires’ disease
species by direct fluorescent antibody testing; 3) fourfold or
greater rise in immunofluorescent antibody titer to
Legionella species by direct fluorescent antibody testing; 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
Legionnaires’ disease. Despite this, our records indicate that
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 avail-
able isolates allows for strain typing and molecular compari-
sions 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

Table 2. Legionella Diagnostic Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>• Clinical &amp; environmental isolates can be compared</td>
<td>• Technically difficult</td>
</tr>
<tr>
<td></td>
<td>• Detects all species &amp; serogroups</td>
<td>• Slow (&gt;5 days to grow)</td>
</tr>
<tr>
<td></td>
<td>• 100% specific</td>
<td>• Sensitivity highly dependent on technical skill</td>
</tr>
<tr>
<td>Urine Antigen</td>
<td>• &gt;99% specific</td>
<td>• Only for L. pneumophila serogroup 1 (Lp1) (which must account for up to 80% of cases)</td>
</tr>
<tr>
<td></td>
<td>• Rapid (same day)</td>
<td>• Limited utility when compared to environmental isolates</td>
</tr>
<tr>
<td>Serology</td>
<td>• Not affected by antibiotic treatment</td>
<td>• Must have paired sera</td>
</tr>
<tr>
<td></td>
<td>• 70%-80% sensitive; &gt;90% specific</td>
<td>• 5%-10% of population has titer ≥256</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Single acute phase antibody titers of ≥256 do not discriminate between cases of Legionnaires’ disease and other causes of community-acquired pneumonia</td>
</tr>
<tr>
<td>DFA</td>
<td>• Can be performed on pathologic specimens</td>
<td>• 25%-75% sensitive</td>
</tr>
<tr>
<td></td>
<td>• 95% specific</td>
<td></td>
</tr>
</tbody>
</table>

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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2. CDC website: Legionellosis: Legionnaires’ Disease and Pontiac Fever.

oxfordjournals.org.