Legionellosis

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## Learning Objectives

1. Know the difference between Legionnaires’ Disease and Pontiac Fever
2. Identify high risk groups
3. List appropriate prevention and control measures
Mystery of the Killer Fever

Killer Bug That Puzzled Scientists

Disease Detectives Tracing the Philly Killer

CDC 1976  http://phil.cdc.gov/phil/home.asp
Legionnaires’ Disease
Legionellosis

- *Legionella spp*
- *Legionella pneumophila*
  - Causative agent of most cases of
    - Legionnaires’ Disease-pneumonia
    - Pontiac Fever-flu like illness
    - Implicated in wound infections, pericarditis and endocarditis
Legionella pneumophila

Legionnaires’ Outbreak, Philadelphia

Cluster of Gram negative *L pneumophila* bacteria within a pulmonary tissue sample from a 1976 case

http://phil.cdc.gov/phil/home.asp
Legionella live, grow and reproduce within amoeba and other protozoa.

Legionella pneumophila chains within two ciliated protozoa Tetrahymena pyriformis

CDC D Howard 1984
**Legionella pneumophila**

- Intracellular bacterial parasite
- Grows in protozoa in nature and tissue macrophages in humans (18 serogroups)
- **Serogroup 1** comprises 80-90% of clinically diagnosed cases
- **Serogroups 4 and 6** follow
Legionella pneumophila

- Identified in 1977 as the cause of Legionnaires’ Disease
- Difficult to culture
Legionellosis

Legionnaires’ Disease

Legionnaire Pneumonia

- Incubation Period: 2-10 days; most often 5-6 days
- Chills, nonproductive cough, abdominal pain, nausea, vomiting & diarrhea are common
- Clinical or radiographic pneumonia
- Case fatality rate about 10-15%
Legionnaires’ Disease

Anteroposterior CXR

Bilateral pulmonary infiltrates in a 1976 outbreak victim

CDC 1976

http://phil.cdc.gov/phil/home.asp
Pontiac Fever
Non-pneumonic Legionellosis

- Incubation Period: 5-66 hrs; most often 24-48 hours
- Same initial symptoms
- Not associated with pneumonia or death
- Recover spontaneously without treatment
- May represent response to inhaled Legionella antigens instead of bacterial invasion
Legionella pneumophila
Communicability

- Primarily airborne
- Other modes possible
- Person-to-person transmission has not been documented
- No outbreaks associated with swimming in rivers, lakes, or other natural bodies of water
Susceptibility/Risk Factors

- Older age
- Usually male
- Usually has chronic disease
- Malignancy (solid and leukemia)
- **Immunocompromised** (HIV/AIDS, chemo, organ transplant, immunosuppressants, corticosteroids)
Laboratory Testing

- Culture of *L. pneumophila/other Legionella spp*
- Urine antigen test
- Direct Fluorescent Antibody (DFA)
- Serology (Antibody titers)
Legionella Culture

Legionella colonies

Agar plate
UV illumination

CDC J Gathany 2005

http://phil.cdc.gov/phil/home.asp
Legionella Culture

*L pneumophila*
Charcoal-Yeast extract

Agar plate
36 degrees C

CDC J Feeley 1978

[http://phil.cdc.gov/phil/home.asp](http://phil.cdc.gov/phil/home.asp)
Legionella pneumophila

Indirect FA 400x
CDC WK Harrell 1978

Direct FA  Mag 400x
CDC W Cherry 1978

http://phil.cdc.gov/phil/home.asp
Laboratory Criteria
Confirmed Case

Culture:
Isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid or other normally sterile fluid

Urinary antigen:
Detection of *Legionella pneumophila* serogroup 1 antigen in urine

Seroconversion:
≥4x rise in serum antibody titer to *Legionella pneumophila* serogroup 1
Laboratory Criteria
Suspect Case

Seroconversion:

≥ 4x rise in Ab titer to specific species or serogroups of *Legionella* other than *L. pneumophila* serogroup 1

≥ 4x rise in Ab titer to multiple species of *Legionella* using pooled antigen

Detection:

Specific *Legionella* antigen or staining of the organism in respiratory secretions, lung tissue, or pleural fluid

*Legionella spp* by a validated nucleic acid assay
Case Definition

- **Suspected Case**
  - Clinically compatible illness
  - At least one of the suspect lab criteria

- **Confirmed Case**
  - Clinically compatible illness with clinical or radiological diagnosed pneumonia
  - At least one of the confirmatory lab criteria
Travel-associated case of Legionellosis

- 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 14 days before onset of illness
- May be used for either suspect or confirmed classification
Reservoirs

- Grow in slimes & biofilms on aqueous surfaces
- Survive within wide range of temp & pH
- Not eradicated with chlorine at levels used in domestic water
- Low levels can colonize a water source & grow to high concentrations under the right conditions
<table>
<thead>
<tr>
<th>Exposure</th>
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<tbody>
<tr>
<td>- Hot water heaters/systems</td>
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<tr>
<td>- Hot and cold water taps</td>
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<tr>
<td>- Showers, Hot tubs</td>
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<tr>
<td>- Air conditioning cooling towers</td>
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<tr>
<td>- Evaporative condensers</td>
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<tr>
<td>- Humidifiers</td>
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<tr>
<td>- Whirlpool spas</td>
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<tr>
<td>- Respiratory therapy devices</td>
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<tr>
<td>- Decorative fountains</td>
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<tr>
<td>- Dental water lines</td>
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<tr>
<td>- Grocery store mist machines</td>
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<tr>
<td>- Peat/Peat moss/potting soil/moist soil</td>
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</tbody>
</table>
Showers, water taps, misters, spas
Hot Water Heaters
Cooling Towers
Whirlpools/Spas/Pool Misters/ Outdoor Misters
Produce Misters/Foggers
1989 LA Outbreak - 28 cases
Humidifiers

Water Reservoirs
Ultrasonic Transducers
C-PAP Machines
Water Fountains
2005 Outbreak
Rapid City South Dakota

Slide Provided Courtesy of CDC
Car Washes
Case Investigation

Completing the Surveillance Form
Preventive Measures

- Cooling towers
- Hot water systems
- Hot tubs and spas
- Respiratory therapy devices
- Hospitals
Acknowledgements

Contributors/Reviewers

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CDC Link

http://www.cdc.gov/legionella/

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