Legionnaires' Disease

Disease Recognition | Potential Disease Sources | Investigation Protocol | Outbreak Response | Facts and FAQs

Section I: What is Legionnaires' disease?

Legionnaires' disease is a common name for one of the several illnesses caused by Legionnaires' disease bacteria (LDB). Legionnaires' disease is an infection of the lungs and is a form of pneumonia. More than 43 species of *Legionella* have been identified and more than 20 linked with human diseases. Legionellosis is the term for the diseases produced by LDB. In addition to Legionnaires' disease, the same bacteria also cause a flu-like disease called Pontiac fever.

- Legionnaires' disease bacteria (LDB)
  - What are LDB?
  - What are the sources of exposure and transmission?
- Legionnaires' disease/Pontiac fever
  - What are the symptoms?
  - What are the incidence rates and risk factors?
  - How is Legionnaires' disease diagnosed and treated?

What are LDB? ^TOP

The Centers of Disease Control and Prevention (CDC) first identified *Legionella pneumophila* in 1977 as the cause of an outbreak of pneumonia that caused 34 deaths at a 1976 American Legion Convention in Philadelphia. *L. pneumophila* had undoubtedly caused previous pneumonia outbreaks, but the organism's slow growth and special growth requirements prevented earlier discovery. The species of Legionella that have been associated with cases of Legionnaires' disease are called Legionnaires' disease bacteria (LDB).

Fig. 1: *Legionella pneumophila* Bacterium

- *L. pneumophila* is a gram-negative rod that exists in a number of distinguishable serogroups.
- Other species of *Legionella* cause legionellosis but *L. pneumophila* causes the majority of cases.
- *L. pneumophila* is also implicated in wound infections, pericarditis, and endocarditis without the presence of pneumonia.

Additional information (App I:A) on serogroups and subtypes is also available.

What are the sources of exposure and transmission? ^TOP

Legionnaires' disease sources may include almost any warm water system or device including man-made or natural, that disseminates water, particularly as

aerosols, sprays or mists and provides favorable conditions for LDB growth and amplification.

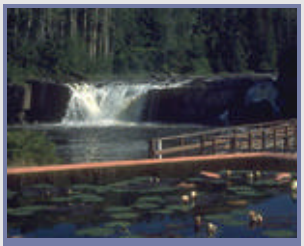

Fig. 2: Levels of LDB are low in natural environments.

- LDB are widely present at low levels in lakes, streams, rivers, freshwater ponds, and mud. However, the levels of LDB that are found in the natural environment are so low that it is unlikely that an individual will contract the disease from these sources.
- The risk of exposure increases when high concentrations of the organism grow in water systems.
  - Legionnaires' disease only occurs in the presence of a contaminated water source.
  - Domestic (potable water) plumbing systems, cooling towers, and warm, stagnant water can provide ideal conditions for the growth of the organism.

Disease transmission is most likely to occur via:

Fig. 3: Transmission may occur via inhalation or aspiration.

- **Inhalation:** of aerosols, fine sprays, mists or other microscopic droplets of water contaminated with LDB, providing direct access into the lungs.
- **Aspiration:** such as may occur when choking or spontaneously during the drinking, ingesting, swallowing process. This allows oral fluids and particles to by-pass natural gag reflexes and enter into the respiratory tract and lungs instead of the esophagus and stomach.
- There is no evidence that the diseases are transmitted from one person to another.

What are the symptoms?

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Legionellosis is associated with two distinct illnesses: Legionnaires' disease, which is characterized by fever, myalgia, cough, pneumonia, and Pontiac fever, a milder illness without pneumonia.

Legionnaires' disease has an incubation period (the time from exposure to the onset of symptoms) of 2 to 10 days. Severity ranges from a mild cough and low fever to rapidly progressive pneumonia, coma, and death. Not all individuals with Legionnaires' disease experience the same symptoms.

Fig. 4: Early symptoms may include fever, headache, and tiredness.

- Early symptoms include slight fever, headache, aching joints and muscles, lack of energy or tiredness, and loss of appetite.
- Later symptoms include:
  - High fever (102° to 105° F, or 39° to 41° C)
  - Cough (dry at first, later producing phlegm)
  - Difficulty in breathing or shortness of breath
  - Chills
  - Chest pain
  - Common gastrointestinal symptoms include vomiting, diarrhea, nausea, and abdominal pain.

Pontiac fever is a non-pneumonia disease with a short incubation period of one to three days. Full recovery usually occurs in two to five days without medical intervention and no deaths have been reported.

- Pontiac fever produces flu-like symptoms that may include fever, headache, tiredness, loss of appetite, muscle and joint pain, chills, nausea, and a dry cough.
- Pontiac fever has been associated with exposure to non-viable LDB and may be a hypersensitivity response to bacterial or other antigens rather than an infection.

What are the incidence rates and risk factors?

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Fig. 5: People with an underlying illness or weakened immune system are most at risk.

The likelihood of contracting Legionnaires' disease depends on the level of contamination in the water source, the susceptibility of the person exposed, and the intensity of exposure. Unlike Legionnaires' disease, which occurs in approximately 5 percent or less of people who are exposed, Pontiac fever will occur in approximately 90 percent of those exposed. The factors that cause the same organism to produce two illnesses with major differences in "attack rate" (the fraction of exposed persons who become infected) and severity are not known.

- In the United States, Legionnaires' disease is fairly common and serious. LDB are one of the top three causes of non-epidemic, community-acquired pneumonia.
- It is estimated that over 25,000 cases of the illness occur each year and cause more than 4,000 deaths.
- The fatality rate is similar to that of other forms of pneumonia, approximately 15 percent.
- It is difficult to distinguish this disease from other forms of pneumonia; so many cases go unreported.

Legionnaires' disease is characterized as an "opportunistic" disease that attacks individuals who have an underlying illness or weakened immune system. The most susceptible people include:

- The elderly, smokers, and those on immunosuppressive therapy.
- Individuals with chronic obstructive pulmonary disease (COPD), organ transplant patients, and people taking corticosteroid therapy.
- It is important to emphasize that relatively healthy individuals can be at risk of contracting disease.

For additional information and current statistics, see CDC Disease Information on Legionellosis: Legionnaires' disease and Pontiac fever.

How is Legionnaires' disease diagnosed and treated?

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Fig. 6: Macrolides are the current drug of choice.

Legionnaires' disease is difficult to diagnose because the pneumonia caused by LDB is not easily distinguished from other forms of pneumonia.

- **The Centers for Disease Control and Prevention (CDC) defines a confirmed case** of Legionnaires' disease as a clinically compatible case that is confirmed by a laboratory. A confirmed case requires a physician's diagnosis of pneumonia based on a chest x-ray and positive laboratory test results. A laboratory test is necessary for confirmation because the symptoms and x-ray evidence of Legionnaires' disease resemble those of other types of pneumonia.
- The CDC laboratory criteria for diagnosis are:
  - Isolation of LDB from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluids,
  - Demonstration of a fourfold or greater rise in the reciprocal immunofluorescence antibody (IFA) titer to greater than or equal to 128 against *Legionella pneumophila* serogroup 1 between paired acute- and convalescent-phaseserum specimens,
  - Detection of *L. pneumophila* serogroup 1 in respiratory secretions, lung tissue, or pleural fluid

by direct fluorescent antibody testing,
- Demonstration of *L. pneumophila* serogroup 1 antigens in urine by radioimmunoassay or enzyme-linked immunosorbent assay, and
- For current information on laboratory criteria for diagnosis, see CDC: Legionellosis (*Legionella pneumophila*).

Legionnaires' disease treatment requires the use of antibiotics. Early treatment reduces the severity of symptoms and improves chances of recovery.

- The drugs of choice belong to a class of antibiotics called macrolides. They include azithromycin, erythromycin, and clarithromycin.

Additional information (App I:B) on diagnostic methods, including culture, direct fluorescent antibody (DFA) staining, and serology is also available.

More: OSHA recommends a level one investigation when there is evidence of exposure to LDB. See Section III:A. Investigation Protocols: Level One. A single antibody titer of 256 or higher indicates that a person previously was exposed to *Legionella*. Such individuals may have had an illness clinically compatible with Legionnaires' disease or may have had milder or no symptoms. OSHA recommends a level two investigation when more than one confirmed or possible case of Legionnaires' disease has been reported at a facility. See Section III:B. Investigation Protocols: Level Two.

Additional Information:

- CDC Disease Information
- Legionella 2003: An Update and Statement by the Association of Water Technologies (AWT). This document includes collective information and data available from numerous research, investigative, and authoritative sources on *Legionella* and legionellosis.

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