

LEGIONELLA



GENERAL INFORMATION

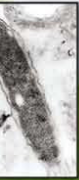
Legionella are small gram-negative rod-shaped bacteria. Over 40 individual species of Legionella are known. The majority of human infections are caused by the species *Legionella pneumophila*. *Legionella pneumophila* was first discovered following a pneumonia outbreak at the 1976 Convention of the American Legion in Philadelphia. The species *Legionella pneumophila* is divided into sixteen subgroups (called serogroups).

This Gram-stained micrograph reveals *Legionella pneumophila* bacteria found within a sample taken from a victim of the 1976 Legionnaires' disease outbreak in Philadelphia.



HEALTH EFFECTS IN HUMANS

There are two forms of Legionellosis, Pontiac fever and the more severe Legionnaires' Disease.



This photomicrograph depicts the bacterium *Legionella pneumophila*. An antibody (IFA) technique to confirm the presence of *Legionella pneumophila* bacteria in this human lung secretion specimen is a potential method to detect Legionnaires' disease.

Pontiac Fever: Pontiac fever is a less severe form of Legionellosis which is characterized by flu-like symptoms (fever, chills, headache, and muscle pain) lasting 2-5 days.

Legionnaires' Disease: Legionnaires' disease is a potentially fatal illness involving pneumonia.

OCCURRENCE: Legionella are relatively resistant to standard water disinfection procedures and can occur in potable water. Early symptoms include muscle pain, loss of appetite, headache, high fever, dry cough, chills, confusion, disorientation, nausea, diarrhea, and vomiting. Later symptoms include chest pain and difficulty breathing. It is difficult to distinguish this disease from other pneumonias. Early diagnosis and treatment are extremely important. Treatment consists of intravenous administration of antibiotics.

HEALTH EFFECTS IN ANIMALS

There are no reports of naturally infected animals. Scientists may critically infect experimental animals (such as guinea pigs and gerbils) with Legionella to study disease.

ENVIRONMENTAL PROFILE

ECOLOGY: Legionella are most commonly found in water, including groundwater, fresh and marine surface waters, and potable (treated) water. Legionella are protected against standard water disinfection techniques, by their symbiotic relations with other microorganisms.



These bacteria have been found in water distribution systems of hospitals, hotels, clubs, public buildings, homes, and factories. Other waters in which Legionella have been found include cooling towers, evaporative condensers and whirlpools. These bacteria may be transported from potable water to air by faucets, showerheads, cooling towers, and nebulizers.

TRANSMISSION TO HUMANS:

Legionella are transmitted directly from the environment to humans. There is no evidence of human-to-human or animal-to-human transmission of the bacteria. Potable water is the most important source of Legionella. Humans may inhale contaminated aerosols or aspirate small amounts of contaminated drinking water. No vaccine is available to prevent infection.



OUTBREAKS: Cases of legionellosis (any disease caused by Legionella) have been reported in North and South America, Asia, Australia, New Zealand, Europe, and Africa.

National surveillance programs are conducted in the United States, 24 European countries (including England), Australia, and New Zealand.

Legionellosis outbreaks most frequently have been attributed to contaminated potable water, cooling towers, or components of water distribution systems.

Outbreaks in hospitals have been linked to hospital potable water supplies, air conditioning systems, and cooling towers. Travelers can be exposed to Legionella in contaminated hotel potable water or contaminated whirlpool spas.

Community outbreaks are caused by exposure to a wide variety of sources, but potable water and cooling towers are the most common.



RISK FACTORS

The general population (healthy individuals) is fairly resistant to infection. Certain groups of people are at increased risk for contracting Legionnaires' disease, including:

- hospital patients who require intubation, have received ventilation assistance, or are receiving respiratory therapy (people taking corticosteroids or other immunosuppressive drugs);
- solid organ transplant patients, especially those requiring dialysis;
- people with certain chronic health conditions (chronic obstructive pulmonary disease, diabetes, head or neck cancer, or end-stage kidney disease);
- heavy smokers or drinkers.

Legionnaires' disease in these people may be associated with more severe illness and increased mortality.



ANALYTICAL METHODS

Environmental samples should be collected by swabbing areas where water flows (such as faucets and shower heads) or sampling the water itself. The specimen should be concentrated by filtration, treated with an acid buffer to enhance Legionella recovery, and cultured on a selective buffered charcoal yeast extract (BCYE) agar medium. Culture assays are the most common tests used to detect Legionella in environmental and biological samples. Rapid PCR-based methods are also available.



Charcoal-yeast extract agar plate culture of *Legionella pneumophila*.

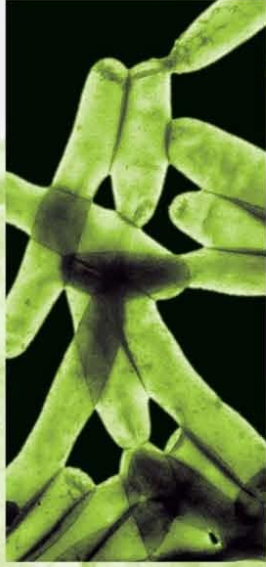
WATER TREATMENT

Control methods designed to disinfect an entire water distribution system include:

- thermal (super heat and flush)
- hypochlorination
- copper-silver ionization
- ozoneation

Control methods designed to disinfect only a specific portion of a water distribution system include:

- instantaneous steam heating
- selecting one or a combination of these two types of control methods would be best for eradicating Legionella colonies and preventing recolonization of the water distribution system.



Transmission electron micrograph of *Legionella pneumophila*.

REGULATORY INFORMATION

EPA has established a Maximum Contaminant Level Goal (MCLG) of zero organisms for drinking water. An MCLG is a non-enforceable guideline based solely on an evaluation of possible health risks, taking into consideration a margin for public safety.

ADDITIONAL HELP

- EPA has established the Safe Drinking Water Hotline, a toll-free number for further information on drinking water quality, treatment technologies, and for obtaining Health Advisories or other regulatory information.
- Safe Drinking Water Hotline: 800-426-4799
9:00 a.m. - 5:30 p.m. (Eastern Time)
Monday-Friday (excluding holidays)
- Your state or county health officials or experts in your state's Department of Environmental Protection or Natural Resources may also be of assistance.



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