

## Dwelling in the Mist, Legionnaires' Disease

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By Cody Dingman

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## Outline

- I. Intro
  - A. One of the worst medical tragedies in the 20<sup>th</sup> century happened in the Bellevue-Stratford Hotel, one of the best places to stay in the city of Philadelphia. It started off while over 1000 members of the Pennsylvania state American Legion and World War II vets were celebrating the Legion's 58<sup>th</sup> annual convention. Little did they know many of them would die from the unexpected Legionnaire's disease.
  - B. Legionnaires' disease is from the bacterium *legionella* and is contracted most commonly through mist from water that contains the bacteria. It is like many types of fevers, but much worse.
  - C. Thesis: In order to stop the spread of *legionella* throughout cooling towers, it is important to create a better water distribution system to manage more of the chemicals and pollutants
- II. Body
  - A. Background
    - 1. First outbreak in 1976
    - 2. Problem areas and disease facts
  - B. Problems
    - 1. Symptoms common with fevers and pneumonia
    - 2. Different strands of *legionella* bacterium
    - 3. Thrives in air conditioning ducts
    - 4. Can infect a whole building
    - 5. No vaccines
  - C. Solutions
    - 1. Antibiotic treatment
    - 2. Screening
    - 3. Regular maintenance of water and air conditioning systems
- III. Conclusion
  - A. From the first outbreak of Legionnaires' disease in 1976 to the more recent outbreak in Philadelphia, its symptoms that mimic a common fever, areas that the bacteria thrive, and treatment options for the disease, Legionnaires' disease can be a death sentence if not treated thoroughly.
  - B. Legionnaires' disease affects many people all around the world, especially in third world countries where they don't have access to an ample amount of medicine. It can hide itself as many types of fevers, but the infected person has a form of deadly pneumonia.
  - C. It is important to prevent this serious disease by proper maintenance of air conditioning cooling towers.

Did you know that everyday elements like water and air could lead to your demise? There are tons of bacteria hiding in the mist and the air that can do you a lot of harm rather than good. One of them is a bacterium called *legionella*. The disease that comes from this bacterium is Legionnaire s' disease, which if not treated promptly, can be deadly. So how can someone go about preventing this bacteria from infecting him or her? There is not a vaccine for the disease that follows this bacterial infection, but there are many things that can be done to prevent it. One of the worst medical tragedies in the 20<sup>th</sup> century happened in the Bellevue-Stratford Hotel, one of the best places to stay in the city of Philadelphia. It started off while over 1000 members of the Pennsylvania state American Legion and World War II vets were celebrating the Legion's 58<sup>th</sup> annual convention (Denenea, n.d.). Little did they know that many of them would die from the unexpected Legionnaire s' disease. Legionnaires' disease affects many people all around the world, especially in third world countries, where they don't have access to an ample amount of medicine. It can hide itself as many types of fevers, but the infected person has a form of deadly pneumonia. In order to stop the spread of *legionella* throughout cooling towers, it is important to create a better water distribution system to manage more of the chemicals and pollutants that go in and come out.

In 1967, America was celebrating its freedom from Great Britain as an independent nation. There were over 4000 members of the American Legion gathered with friends and family to celebrate the 58<sup>th</sup> annual convention in Philadelphia. More than 600 of the legionnaires were staying at the Bellevue-Stratford Hotel. The day after the convention began, some of them began to get sick with pneumonia-like symptoms. After the disease spread rapidly among everyone at the hotel, people from everywhere came to report on this new

unknown epidemic. By the time it was over, 221 individuals contracted the still unknown disease, and 34 were deceased. Because it took a while for the health workers to identify the cause of the disease, some people thought it was caused by domestic terrorists, a Central Intelligence Agency (CIA) experiment that went wrong, and craziest yet, they thought it might have been an extraterrestrial force that was sickening them. After ruling out many other medical illnesses it could be, the Center for Disease Control (CDC) found the *legionella* bacterium in the cooling towers of the hotel's air conditioning units.

Symptoms of Legionnaires' disease include coughing, fever, shortness of breath, muscle aches, and headaches. "Pontiac fever has the same symptoms as legionnaires but is not as violent and does not carry pneumonia" ("Legionella," 2016). Legionnaires' disease shows almost the same image as many other types of pneumonia on a lung x-ray, but the urine or sputum test is the deciding factor to test for the legionella bacterium. Healthy people who contract the disease usually can recover with hospital treatment and medication, but if you are older or you are immunocompromised, then there is a high possibility of lung failure or death. One out of ten people who have the disease will die due to complications of the illness. Because of the natural habitat of this disease, it is not communicable from person to person, but only through aerosols and wet soil or water. There are 35 species of *legionella*, other than *pneumophila*. The three main lower classifications of *legionella* are *legionella pneumophila*, *legionella longbeachae*, and *legionella erythra*. *Legionella longbeachae* and *legionella erythra* are found predominantly in potting soil and compost. *Legionella pneumophila* is the most common strand of *legionella* and is transmitted through water and aerosols. When cooling towers of buildings are not regularly maintained, then it allows bacteria to build up and move

through the ducts, and infect everyone in the building and outside. In Memphis, Tennessee, there was an incident where the build-up of the bacteria was formed in a cooling tower of a hospital and affected everyone who was connected to that specific cooling tower. All the people who were infected with the disease were in or near the hospital while the cooling tower was in use. How did this bacterium get into the cooling tower in the first place? Huge volumes of air are drawn from outside into the cooling towers and have contact with the water; therefore, it affects heat exchange ("Legionella," 2016).

Dust and other particulates are transferred from the air to water; in effect, the incoming air is "washed." It seems reasonable that airborne microorganisms could thus be introduced into the tower; moreover, cooling towers are open structures, exposed to the droppings and detritus of insects, birds, and possibly other animals (Dondero, 1980). Because the bacterium can remain in tap water for a year, it can survive in things like cooling towers and water systems and infect whomever meets the aerosols from it.

There is not a vaccine for the bacteria *legionella*, but there are ways we can make areas less hospitable to *legionella* and reduce the chances of the bacterium to form. A way of doing this is to use a better distribution system in the water systems when they are built. Water systems are vastly complex and can be vulnerable from damage of heat and chemicals. Even though this is possible, it would be a challenge. Human nature is sometimes not willing to put in the effort it takes to eradicate something as long as it doesn't happen too frequently and hurt too many people. A more affordable approach to this is to urge regular maintenance of water and cooling systems, and a proper pH and temperature (Millar, 1997). To treat Legionnaires' disease, antibiotics are commonly used. The most effective antibiotics used have

better intracellular penetration than most antibiotics. These antibiotics include macrolides, quinolones, tetracyclines, and rifampin. The state of the person at time of infection drives the type of antibiotic he or she will receive. Overall, the most effective is a quinolone called pefloxacin; in a study, 20 people with a severe case were given this drug, and none of them died (Dedicoat & Venkatesan, 1999).

From the first outbreak of Legionnaires' disease in 1976, the more recent outbreak in Philadelphia, symptoms that mimic a common fever, areas that the bacteria thrive, and treatment options for the disease, Legionnaires' disease has made an impact on the world we live in today. The disease thrives in aerosols from water, ducts in buildings, and potting compost. The gathering that included over 600 members of the American Legion at the Bellevue-Stratford Hotel, and the incident of the legionella bacterium getting into a cooling tower of a hospital in Memphis, Tennessee—could these have been prevented? If the antibiotics that are available today had been available in 1976, it would have saved many of the infected from death. If we had had a better water distribution or even a more regular maintenance, it could have stopped the hospital incident in Memphis, Tennessee. It is important that we stress the need for regular maintenance and proper pH and temperature in our cooling towers for prevention of this serious disease.

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