

Legionella...The Basics

BACKGROUND

There are some 40+ identified species of *legionella* bacteria. The LDB (Legionnaires' Disease Bacteria) species most commonly associated with disease is *legionella pneumophila*. There are some 15 "serogroups" within this species, (which identifies the type of antigens). Serogroup 1 is most often involved in disease, and serogroups 4 and 6 are secondary.

The *legionella* organism can be found almost everywhere. This includes natural reservoirs and water sources, potable water systems, drinking fountains, decorative fountains, soils, cooling tower systems, etc.

Legionnaires' Disease is a pneumonia-like disease which, if it is not detected and treated immediately, can become fatal in particularly susceptible persons. It is difficult to predict the contraction of disease, but it is known that persons who have compromised immune systems or respiratory systems, heavy smokers, elderly and even children are more susceptible than the normal population. It is not generally considered communicable, nor is it likely to be contracted through drinking the water. Rather, it is contracted by inhalation or aspiration of contaminated water droplets into the lungs. The incubation range is 2-10 days.

In most situations, Legionnaires' Disease, (or related diseases such as Pontiac Fever), is not contracted unless the following conditions are met **in combination**;

- Presence of sufficient **specific *legionella* bacteria types** in a water source
 - There is no data to confirm the necessary level for infection, since it differs widely from patient to patient
- **Aerosolization or misting** of this water source
- **Inhalation of such aerosols or mists** into the lungs OR
- **Aspiration of such waters** into the lungs
- Some **degree of susceptibility** of the individual

It is thought that less than 5% of those exposed to the water contaminated with the bacteria will develop the disease. Pontiac Fever, a lesser version of Legionnaires Disease, affects as many as 90% of those exposed, with a 1-3 day incubation rate.

Technically Speaking...

Conditions Required for Possible Contraction of Disease - at a minimum;

- An **innoculator** – which introduces the bacteria to the location
 - Could often be the potable water
 - Could be cooling tower makeup
 - Could be from soils, excavation, etc.
- An **amplifier** – which causes or allows it to populate
 - Could often be deadlegs, hot water heaters, or other temperate zones
 - Could be cooling tower sumps, hot wells
- A **disseminator** – which causes aerosolization of very small water droplets
 - Could often be showerheads, aerators, cooling tower mists, etc.

Conditions Under Which the Bacteria Tend to Propagate More Readily Include;

- Stagnant water
- Temperate water – >68 to $<122^{\circ}$ F
- Sediment such as mud, silt, scale, corrosion products, organics, etc.
- Other microorganisms, such as protozoa, amoebae, etc., harbor LDB
- Biofilm (bacterial and algal slime secretions) can harbor LDB

System Design and/or Operation Parameters can determine the potential for amplification of growth and/or dissemination of contaminated aerosols;

- **Domestic or potable water systems**
 - Stagnant or infrequently used sections
 - “Temperate” water which is inadequately treated or heated
 - Hot Water Heater which cannot provide $>140 - 150^{\circ}$ F, and a distribution system which cannot provide $>122^{\circ}$ F water at outlet
 - City water chlorination procedures are typically inadequate
 - Storage tanks which have scale or other sediment
 - Inadequate corrosion and scale control program
 - Inadequate “turnover” of such storage tanks
 - Certain rubber or other organic based gaskets, fittings, etc.
 - Infrequently used shower heads, with temperatures $<122^{\circ}$ F
 - Softeners, Carbon Filters, Drip Pans, Fountains – (all potential)
- **Cooling systems**
 - Inefficient mist eliminators by design or through aging process
 - Tower location near building air intakes
 - Insufficient filtration or solids removal
 - Inadequate corrosion, scale and/or biocontrol program
 - New or shutdown systems show more susceptibility than others do
 - Stagnant or infrequently used sections
 - Storage tanks which have scale or other sediment
 - Certain rubber or other organic based gaskets, fittings, etc.