White Paper

H2OMEYER
CONSULTING SERVICES, INC.

Legionella Pneumophila Bacterium

– Dangerous, but manageable, in cooling towers –

Introduction

Many facilities use cooling towers to provide a cost-effective method to cooling builds and manufacturing sites. Water treatment programs are used to prevent scale formation and minimize corrosion and biological fouling. The main purpose for water treatment programs is to protect the equipment assets, but there are other health risks that must be considered, such as Legionnaires disease.

There are too many poorly treated cooling systems, which potentially increase the risk for people to contract Legionnaires disease.

Legionella Pneumophila is a rod-shaped aerobic bacterium that has 42 species and includes over fourteen serogroups. Serogroup 1 is identified with 90% of Legionnaires' disease cases. Serogroups 5 and 6 seem to be the next most harmful types of bacteria.

History

Legionella was first detected in the 1976 American Legion Convention at the Bellevue Stratford Hotel in Philadelphia. A total of 34 attendees died and 221 people became ill as a result of Legionnaires disease, which was pneumonia-like symptoms such as high fever, headache, chills, and overall general discomfort.

History

Legionella most commonly infects those who are elderly, smokers, and individuals with respiratory problems. Those with weak immune systems or individuals who take drugs to suppress the immune system are more likely to become ill from the legionella bacteria. Most of the people who contract legionella do so by deeply inhaling droplets of water (less than five microns in size) that contain the bacteria. The incubation period is normally 2-10 days.

According to OSHA, it is estimated that over 25,000 cases occur each year and result in more than 4,000 deaths

Establishing Protocols

Legionella Risk Assessment Program: All organizations should implement a risk assessment program. This is an audit by qualified person(s) to determine the level or "risk" of all aerosolized water systems where legionella has a chance to amplify and then come in contact with people through exposure to that system.

Legionella Reaction Protocol: If you test, there is a good chance you will find legionella. However, before you test a system for legionella, you should have completed a risk assessment plan that includes a reaction protocol. A reaction protocol means "what are we going to do when we find it?" If testing is not done, we recommend following "Best Practices" when treating and maintaining the system.

"Best Practices" for biological control for cooling towers use a combination of two biocides: an oxidizing biocide, such as bromine or chlorine, and a non-oxidizing biocide, such as isothiazoline, glutaraldehyde, and quaternary amine compounds.

Just because you follow best practices, does not mean you do not have legionella present. However, the risk is much lower.

Homeyer Recommendations

We recommend the following microbiological levels be maintained for open cooling water systems

<10,000 cells/ml of aerobic bacteria (dipslides)

<50 cells/ml of anaerobic bacteria (laboratory analysis)

<50,000 cells/ml of aerobic bacteria (swab samples from piping surfaces)

<100 cells/ml of anaerobic bacteria (swab samples from piping surfaces)

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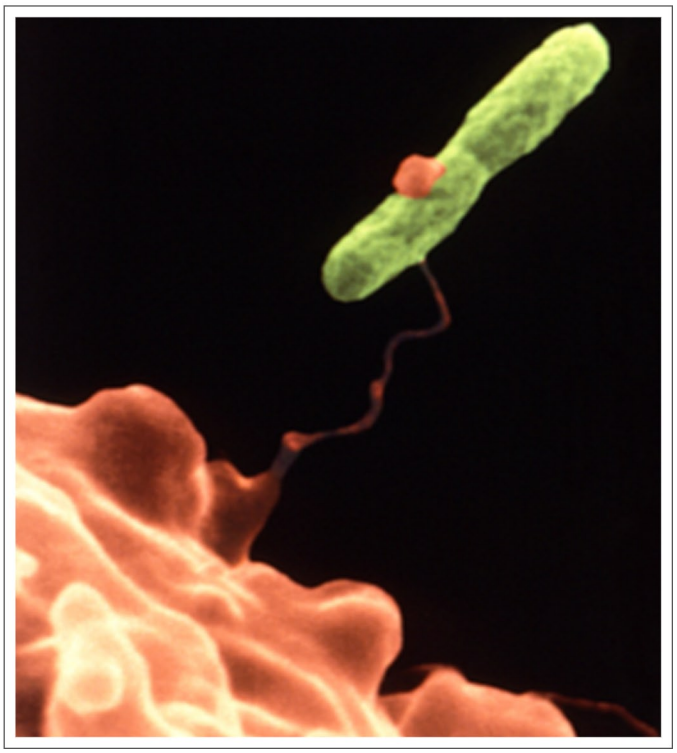

This electron micrograph depicts an amoeba, Hartmannella vermiformis (orange), as it entraps a Legionella Pneumophila bacterium (green) with an extended pseudopod. After it is ingested, the Legionella Pneumophila bacterium can survive as a symbiont within what then becomes its protozoan host. The amoeba then becomes what is referred to as a "Trojan Horse". By harboring the pathogenic bacteria, the amoeba can afford the protection and, in fact, in times of adverse environmental conditions, are able to meta-morph into a cystic-stage, enabling it and its symbiotic resident pathogens to withstand such environmental stresses. (This image is the courtesy of the Centers for Disease Control and Prevention and Dr. Barry S Fields.)