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### Legionella in Cooling Towers

#### WHAT IS LEGIONELLA?

A bacterium discovered in 1977, after investigation into the 1976 American Legion Convention Bellevue Stratford Hotel in Philadelphia outbreak, where 34 attendees died and over two hundred were stricken with pneumonia. Exposure to *Legionella pneumophila* may cause one of two medical conditions; Legionnaire's disease and the less serious Pontiac Fever. The CDC estimates that 8,000 to 18,000 people contract Legionnaires' disease in the United States each year. Some of the population can be infected with the Legionella bacterium and have mild symptoms or no illness at all. About 5% to 30% of people who have Legionnaires' disease die.

Contraction of the disease occurs when people deeply inhale contaminated aerosols (mists containing 5-micon diameter droplets) from devices such as cooling towers, showers, and faucets, and aspiration of contaminated water. Person-to-person transmission does not occur.

Legionella is a waterborne bacterium that requires a host, or a biological particulate in order to survive through protection from the environment and a needed source of nutrients. Growth within biofilms is a primary means of proliferation. Cooling towers, through their direct contact with ambient air and provision of a warm water environment with adequate oxygen supply are a target for Legionella growth and multiplication. They are thermo-tolerant and thrive in water temperatures of 68 to 113°F. Survival rates of Legionella fall to zero at water temperatures of > 131°F.

#### SAMPLING AND ANALYSIS FOR THE PRESENCE OF LEGIONELLA

The most efficient means of obtaining Legionella cultures is by taking water samples from the cooling tower, i.e., at the point of spray distribution, and its basin. Any results indicate the planktonic population, i.e., in the bulk water. It is recommended to take 1-Liter samples in laboratory-provided bottles that are sterilized and modified with a preservative. The samples are placed on ice and forwarded to an approved laboratory within 24 hours. To complete an investigation, it is also recommended to take swab samples in areas of biofilms, water aspirating equipment points (i.e., nozzles), cooling tower fill packings, drift eliminators, etc., where the sessile and intracellular populations exist.

The most popular culture method of analysis takes 10 days for incubation. Quicker analysis such as polymerase chain reaction (PCR) or direct fluorescent antibody (DFA) can provide quicker turn-around information, but do not distinguish between dead and viable organisms.

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## ACTION LEVELS

Risk to human health has been characterized by the proportionate number of viable organisms as measured in colony forming units, or CFUs in a milliliter (mL) sample of water. Below is a summary table.

<u>Risk</u>	<u>Concentration (CFUs/mL)</u>
Very Low	< 10
Low	10 to 99 (typical level)
Moderate	100 to 999 (hypochlorination rec'd)
High	> 1,000 (uncommon)

## LEGIONELLA CONTROL IN COOLING TOWERS

In addition to mechanical cleaning of the sump and providing any filtration, below are some industry guidelines for “chemical” control of Legionella in cooling towers.

<u>Cooling Tower Institute (CTI)</u>	<u>American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)</u>
Continuous halogen treatment at 0.5 to 1.0 ppm of free halogen concentration (Cl <sub>2</sub> , Br <sub>2</sub> ). Use bromine (Br <sub>2</sub> ) for higher pH ranges.	Employ a water treatment program that controls scale, corrosion, and biological fouling. Non-oxidizing biocides are recommended as a supplement to oxidizing biocides (not quaternary amines).
For fouled systems, hypochlorinate for at least 6 hours.	Establish a program of 4-5 ppm of free chlorine residual and maintain for 6 hours.

There are other techniques for controlling Legionella in cooling towers and cooling water systems. Ozone is cost-effective for larger cooling towers (> 500 tons) where the initial capital outlay is recovered in typically 2 years through lowered chemical costs for make-up and blowdown treatment. Side-stream filtration combined with UV may be more effective in smaller towers that do not have large make-up demands. Catalyx technologies offers a compact, side-stream filtration package that utilizes a centrifugal sand filter with a 0.5 to 2.0 µm rating and a high-dose, medium-pressure UV chamber.

Feel free to contact Catalyx directly for more information regarding air and water purification evaluations and equipment supply and service.

Catalyx's Titan Aire™ Air Purification systems are manufactured to ISO 9001 standards and meet the European CE guidelines for electrical components. To the best of our knowledge, the information contained herein is accurate, however, we do not assume any liability whatsoever for the accuracy or completeness of the information contained herein. Titan Aire™ is a trademark of Catalyx technologies, LLC.