



RISK RESILIENT

Legionnaires' Disease

With so many businesses sitting vacant, unoccupied, or at reduced occupancy since the declaration of the COVID-19 pandemic, it's more important than ever to manage risk. And when operations are ready to reopen and ramp back up, there are increased and unique risks to consider.

While equipment and facilities may be top of mind, when restarting your operations, the health and safety of your people (employees and customers) should be the first priority.

A specific health risk to look out for is a pneumonia-type illness called Legionnaires' disease.

The bacterium responsible for Legionnaires' disease belongs to the genus *Legionella*, and there are approximately 35 *Legionella* species known to produce the disease¹.

When water is allowed to stagnate in lukewarm temperatures – for example in HVAC systems, cooling towers, piping systems, or water heaters – it can grow *Legionella* bacteria, the bacterium responsible for Legionnaires' disease. Humans can then become infected if they inhale or aspirate aerosolised water contaminated with *Legionella* bacteria.

Legionella species are commonly found in any aquatic environment and thrive in warm, stagnant water. They can survive for several months in a wet environment and multiply in the presence of algae and organic matter². The water droplets that carry *Legionella* into the lungs are not visible to the naked eye¹.

Two distinct illnesses have been associated with the *Legionella* species¹:

- Legionnaires' Disease - severe pneumonia
- Pontiac Fever - a mild, non-pneumonia influenza-like illness



According to the U.S. Centre for Disease Control, about 1 in 10 cases is fatal.

Know the Risks

While the transmission of Legionnaires' disease is not completely understood¹, here's an overview of what is known about how the bacteria spreads:

- *Legionella* is believed to spread through ventilation systems in buildings. When the circulated air picks up droplets of contaminated water, the bacteria can be transported throughout a building. If the droplets are small enough, they can be inhaled, thus providing a way for the bacteria to enter the lungs¹.
- The presence of *Legionella* in water and soil is not automatically associated with an outbreak of the disease. It appears that the *Legionella* microbe must reach the lungs to produce the disease. Inhalation of small particles of contaminated water (aerosols) or soil seems to be the key. Aspiration – choking during drinking, ingesting, or swallowing – is another way that the *Legionella* microbes can enter the lungs. This action allows fluids and particles to enter the lungs instead of going into the stomach¹.
- Evidence of person-to-person transmission of bacteria causing Legionnaires' disease has not been found. The disease is not contagious, thereby differing from SARS, COVID-19, and influenza – diseases that require the public to wear masks³.

1 Government of Canada, C. (2021, February 16). (none). Retrieved February 17, 2021, from <https://www.ccohs.ca/oshanswers/diseases/legion.html>

2 Just the Facts: *Legionella* and Water Supply Systems. (n.d.). Retrieved March 03, 2021, from <https://www.safeplumbing.org/advocacy/health-safety/legionella>

3 Is it contagious? (n.d.). Retrieved February 17, 2021, from <https://legionella.org/about-the-disease/what-is-legionnaires-disease/is-it-contagious/>

- Observations indicate that single cases of Legionnaires' disease are more common than out-breaks. Outbreaks typically occur in large institutional buildings, such as hotels, spas, hospitals, or on cruise ships. In addition, manufacturing or industrial operations are also at risk as they often utilize cooling towers and processing systems that use water.

Examples of Legionnaires disease cases across Canada¹

Outbreak in an inner-city district in Calgary, Alberta.

Cause: A definitive source was not identified, however Geomapping of case movements within the affected urban sector revealed a 1 km common area of potential exposure, which coincided with multiple active construction sites that used water spray to minimize transient dust.

Impact: 8 cases identified. 4 were critically ill requiring intensive care admission – no deaths.²

Outbreak at Walmart, Surrey, BC

Cause: Store's cooling towers.

Impact: 7 cases identified.³

Outbreak in Quebec City, QC.

Cause: contamination of water in industrial cooling towers.

Impact: 180 people affected, 3 deaths.⁵

Outbreak at the Seven Oaks Home for the Aged long-term care facility in **Toronto, ON.**

Cause: cooling tower located on the home's roof.

Impact: 135 infected: 70 residents, 21 visitors, 39 staff and 5 members of the community. 23 residents deaths.⁴

Outbreak in the greater Moncton area.

Cause: unknown.

Impact: 7 confirmed cases of severe pneumonia.⁶

References 1-6 are located on page 8.

Be Prepared

The following steps can be taken to help reduce the presence of Legionella in your business environment⁴:

Biofilm

Avoid water stagnation and low flow, as these conditions encourage the proliferation of the growth of biofilm. Biofilm protects Legionella from heat and disinfectant.

Lukewarm Water

Avoid water at temperatures between 20°C and 45°C, which favour the growth of Legionella bacteria.

Dead Legs

A dead leg is caused by no flow or rare flow of water to pipes. Such dead legs should be identified and eliminated. It's recommended to avoid the use of materials such as rubber washers and hoses that harbour Legionella or provide nutrients for microbial growth.

Cleanliness

Maintain the cleanliness of the plumbing system to avoid the accumulation of sediments, which can harbour Legionella and provide a nutritional source.

Aerosolization

Control the release of water spray.

4 HPAC Engineering. How to Improve Response to Legionnaires' Disease Outbreaks and Conserve Water. (2020, March 9). Retrieved February 17, 2021 from https://www.hpac.com/association-solutions/article/21125743/cooling-towers-legionella-sustainability-operations-maintenance-cities?utm_source=HR+HPAC+Engineering+Fastrack&utm_medium=email&utm_campaign=CPS200310016&oeid=882815407778J5M&rdx.ident%5Bpull%5D=omeda%7C882815407778J5M&oly_enc_id=882815407778J5M

Disinfecting

Disinfect regularly, for example with Chlorine, to control biofilm formation and the Legionella population.

Maintenance

Ensure that the plumbing system operates correctly and is well maintained.

Design and Installation of Cooling Towers

Ensure cooling tower emissions are not drawn into the building air intakes. The Canadian standard (CAN/CSA-Z317.2-15—Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities) requires that prevailing wind and building air intakes be considered when choosing the location of cooling towers.

Thermal Flushing/Dislodging of Biofilm

Mitigate the risks associated with thermal flushing (aerosolization and scalding), restarting the water system (dislodging of biofilms due to water pressure), and construction activity (dislodging of biofilms due to vibration).

Since inhalation is the main route of exposure, it's important that flushing be carried out with minimum creation of aerosols (i.e., the water flow should be increased gradually to a full flow to minimize the production of aerosols). If performed correctly, workers performing flushing should not be at an elevated risk for Legionnaire's disease.

Excessive Water Age

Prevent water from sitting too long in a system or in system piping, as this increases the likelihood the water disinfectant will dissipate over time, leading to pathogen growth.

Inadequate Corrosion Control

Manage corrosion as improper corrosion control can create the ideal environment for Legionella growth. Corrosion can occur in system pipes, depending on several water quality variables, including disinfectants used, water temperature and pH levels.

Cross Connections

Check to ensure that cross connections between potable and non-potable water are not introducing Legionella into the potable water supply system.

Registration of Cooling Towers⁵

Register your facility's cooling tower(s) with the appropriate registry.



A report, Electronic Registration Systems for Cooling Towers – Improving Public Health and Sustainability Outcomes, published by the Urban Sustainability Directors Network (USDN) argues that jurisdictions should create a registry of cooling towers.

"Cooling tower registries are a demonstrably effective and proactive tool for improving public health and fulfilling water efficiency goals." - Patrick Ryan

M.Sc., P.Eng., Chief Building Official from Vancouver, Canada.

In the Province of Québec, the RBQ regulates cooling towers and mandates that all cooling towers⁶:

- Be registered yearly
- Test water monthly
- Include design plans of piping in files

⁵ HPAC Engineering. How to Improve Response to Legionnaires' Disease Outbreaks and Conserve Water. (2020, March 9). Retrieved February 17, 2021 from https://www.hpac.com/association-solutions/article/21125743/cooling-towers-legionella-sustainability-operations-maintenance-cities?utm_source=HR+HPAC+Engineering+Fastrack&utm_medium=email&utm_campaign=CPS200310016&o_eid=882815407778J5M&rdx.ident%5Bpull%5D=omeda%7C882815407778J5M&oly_enc_id=882815407778J5M

⁶ Légis Québec. Law B.1.1, retrieved January 20, 2021 from: <http://legisquebec.gouv.qc.ca/en/showdoc/cr/B-1.1,%20r.%203>

- Include a signature from an engineering firm on all control processes
- Provide regulators with the following information, yearly:
 - Owner's address and phone number
 - Date of in-service yearly
 - Operator name and phone number
 - Procedure for start-up and shut down
 - Copy of last 2 years of testing in files

Other Canadian jurisdictions besides Quebec including Hamilton, Ontario, Vancouver, B.C., Quebec, require cooling towers to be registered.

Such registries prevent exposure to Legionella bacteria by encouraging proper maintenance of cooling towers.

Re-opening

Consider these steps when re-opening buildings that have been vacant/unoccupied, or have had reduced attendance:

STEP 1

Locate the main components of the building's plumbing system.

STEP 2

Prepare the hot production water system – water heater and water recirculation loop.

This step calls for supplying hot water at an adequate temperature for a period of at least 24 hours. The water temperature must be at 60 degrees Celsius at the water heater's outlet and reach a temperature of at least 55 degrees Celsius in a water recirculation loop.

STEP 3

Flush the system⁷:

In the case of partial building occupancy (fewer than 25% of users) or part of a building (wing, storey, etc.) for more than one month:

- Depending on the size of the building, carry out the preventive flushing after each week of partial occupancy in the parts of the building involved.

7 Reopening buildings – recommendations for restoring service to water distribution systems. (n.d.). Retrieved February 17, 2021, from <https://www.rbq.gouv.qc.ca/en/areas-of-intervention/plumbing/quality-and-safety-requirements/reopening-buildings-recommendations-for-restoring-service-to-water-distribution-systems.html>

- Depending on the size of the building, carry out a preventive 5-minute flushing of both hot and cold-water systems once a week, at the systems' farthest points in the building
- An automated flushing device can be used. This measure will reduce the risk of spreading the Legionella pneumophila bacteria and deteriorating the water quality, especially as it relates to water being consumed by occupants.
- Post the following notices at every point of consumption in parts of the building involved. By each water fountain and each kitchen faucet:
 - Let the water run for one to two minutes before consuming.
 - Before washing your hands (for a minimum of 20 seconds), let the water run to help purge the system.

In the case of partial occupancy (more than 25% of users) of a building or part of a building (wing, storey, etc.):

- No specific measure required, however, consider carrying out a preventive 5-minute flushing of both hot and cold water systems once a week, at the systems' farthest points in the building involved. An automated flushing device can be used. This measure will reduce the risk of deteriorating water quality, especially as it relates to water being consumed by occupants.

Visit sovereigninsurance.ca to learn more.

References from page 2 - Examples of Legionnaires disease cases across Canada

1 Center for Disease Control and Prevention. (2015, October 30). Active bacterial core surveillance for Legionellosis - United STATES, 2011–2013. (n.d.). Retrieved February 17, 2021, from <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6442a2.htm>

2 Knox, N., Weedmark, K., Conly, J., Ensminger, A., Hosein, F., Drews, S., & Legionella Outbreak Investigative Team. (2017, January). Unusual Legionnaires' outbreak in cool, dry Western CANADA: An investigation using GENOMIC EPIDEMIOLOGY. Retrieved March 03, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5197926/>

3 B.C. Walmart linked to outbreak OF legionnaires' Disease reopens. (n.d.). Retrieved March 03, 2021, from <https://www.canadiangrocer.com/top-stories/headlines/b-c-walmart-linked-to-outbreak-of-legionnaires-disease-reopens-82783>

4 CANLII. (2019, April 15). Glover v. Toronto (City), 2009 CanLII 16740 (ON SC). Retrieved March 03, 2021, from <https://www.canlii.org/en/on/onsc/doc/2009/2009canlii16740/2009canlii16740.html?searchUrlHash=AAAAAQAKbGVnaW9uZWxsYQAAAAAB&resultIndex=3>

5 Is Legionnaires' disease a problem in Canada? (n.d.). Retrieved March 03, 2021, from <https://www.moldbacteria.com/bacteria/is-legionnaires-disease-a-problem-in-canada.html>

6 Mackinnon, B. (2019, August 01). Legionnaires' disease OUTBREAK declared in greater MONCTON with 7 confirmed Cases | CBC News. Retrieved March 03, 2021, from <https://www.cbc.ca/news/canada/new-brunswick/legionnaire-disease-legionellosis-moncton-outbreak-water-bacteria-1.5233192>