Legionnaires’ Disease: Preventive Strategies for Healthcare Settings

In 2010, eight individuals – three outpatients, three pharmacy customers, a delivery person and a man waiting to pick up his wife – walking past a decorative water wall in a Wisconsin hospital lobby were exposed to Legionella pneumophila bacteria. Shortly afterward, they exhibited symptoms of Legionnaires’ disease, including fever, chills, headaches and coughing.

All of the victims had pre-existing medical conditions or other factors that increased the risk of contracting the disease. Fortunately, all eight recovered – after three were hospitalized and placed on ventilators – and no additional cases were reported after the water wall was shut down.¹

The incident demonstrates that infection from Legionella bacteria and other waterborne pathogens remains a serious potential threat for hospitals, aging care organizations and other healthcare settings. This issue of AlertBulletin® provides information and resources designed to help leaders protect the safety of patients/residents, staff members and visitors by establishing an effective preventive program focusing on water testing and plumbing system inspection and maintenance.

LEGIONELLA BASICS

Each year, between 8,000 and 18,000 individuals in the United States are hospitalized with Legionnaires’ disease, a serious form of pneumonia with a fatality rate of over 10 percent, according to the Centers for Disease Control and Prevention (CDC). Infection is caused by inhaling or aspirating droplets of water containing the bacteria, with symptoms typically appearing two to 14 days after exposure. The disease cannot be passed from person to person.

The Legionella bacterium feeds on everything from algae and insects to sediment and even rust. It is resistant to conventional chlorination practices and highly heat tolerant, thriving in water temperatures of 20–45°C (68–113°F). Institutional water heaters frequently contain cool zones near the base, where cold water enters and scale and sediment accumulate. The temperature and residue of these zones provide ideal conditions for bacterial growth. Other common sites of contamination include sinks, faucets, showers, cooling towers and hot tubs.

While no one is completely safe from the disease, it poses the greatest danger to the following individuals: those over 45 years of age, smokers, heavy drinkers, and those suffering from chronic respiratory or kidney disease, or a compromised immune system.

Patients/residents with cystic fibrosis, chemotherapy-related neutropenia and diabetes are also more vulnerable to both infection and serious complications.

Legionella symptoms are typical of pneumonia, so the disease can be difficult to identify in its early stages. Effective, pathogen-directed therapy requires accurate diagnosis involving the testing of sputum, blood and/or urine for evidence of bacteria in the system.

INFECTION CONTROL STRATEGIES

Unlike other varieties of pneumonia in healthcare settings, Legionnaires’ disease is highly preventable. The following suggestions can help minimize the likelihood of contamination and bacterial exposure within the facility:

- Ban decorative water walls and fountains, as the mist created by falling water is hazardous if bacteria are present.
- Raise water-heater temperatures. Hot water should be stored at a minimum of 60°C (140°F) and delivered at a minimum of 50°C (122°F) to all outlets.
- Install a water system designed to recirculate water and minimize “dead legs” within pipelines. Employ fail-safe scald-protection equipment, if necessary.
- Operate domestic hot-water recirculation pumps continuously, excluding them from energy conservation measures.
- Drain the hot-water tank periodically to remove scale and sediment, and clean it with chlorine solution, if possible. Thoroughly rinse the tank to remove excess chlorine before reuse.
- Identify points in the water system where water stagnates, such as storage tanks, drinking fountains or unused pipe sections. Flush these lines frequently to reduce bacterial growth, remove rubber or silicone gaskets (which provide nutrients for the microbes), and consider installing heat tracing to maintain a constant temperature of at least 50°C (122°F).
- Document all infection control measures. Logbooks should list dates of inspections and cleaning, water-quality test results, and plumbing checks and maintenance.
- Perform regular risk assessments. Such evaluation involves analyzing the facility’s water supply process (possibly by way of a flow diagram), identifying water system hazards and vulnerabilities, and evaluating the population’s susceptibility to infection and illness.²


Water sampling guidelines

Water hygiene is an essential part of any Legionella control program, with testing and treatment schedules and procedures reflecting the degree of risk indicated by the assessment. The following guidelines can enhance the water testing process:

- **Require staff to observe personal safety precautions when testing water**, including turning off the cooling tower fan during the sampling process to protect against aerosols, and wearing a HEPA cartridge-equipped respirator.

- **Use sterile, screw-capped plastic bottles for sampling.** Obtain an extra, unfilled bottle as a “field blank” for quality control testing, and consider adding sodium thiosulfate to bottles as a preservative and neutralizing agent for halogen (i.e., chlorine).

- **Collect samples from potable water sources**, such as water fountains, faucets and showerheads. Swab samples from faucet aerators and showerheads, as well as inside faucets and showerhead piping, and wherever biofilm is visible.

- **Gather samples from the bottom or side of non-potable water sources**, such as cooling towers, chillers, condensate pans, sprinklers and reservoirs. In addition, take a sample from the “pack column” section of cooling towers and the sand filter of whirlpool spas.

- **Number each sample, identifying the source of the water on the sample data sheet.** Send a copy of the data sheet with the samples to the analytical laboratory, also noting any biocide used in water treatment.

- **Cap the bottles tightly to prevent leakage,** and ship the specimens in insulated boxes or freezer packs to protect against temperature fluctuations. Never use ice or dry ice.

- **Send the sample to a reputable laboratory.** Facilities should be certified by the American Industrial Hygiene Association Laboratory Accreditation Program for Environmental Laboratories, and in compliance with the ISO/IEC international standard for testing and calibration laboratories.

In collaboration with the CDC, the American Society of Heating, Refrigerating and Air-Conditioning Engineers has proposed a new standard, “Prevention of Legionellosis Associated with Building Water Systems,” which is available for public review at [https://osr.ashrae.org/Public%20Review%20Draft%20Standards%20Lib/Std-188P-20Final%206%2010%202011.pdf](https://osr.ashrae.org/Public%20Review%20Draft%20Standards%20Lib/Std-188P-20Final%206%2010%202011.pdf). If issued, the guideline would change Legionella prevention from a voluntary effort to a proactive requirement. Compliance would involve identifying environmental risks, forming a hazards analysis and critical control points team, and establishing critical control limits.

Legionella continues to pose a serious, but controllable, danger to vulnerable patients, residents and others, requiring an ongoing commitment to water safety. Additional information on Legionella compliance and regulatory limits is available at the sites noted in the Resources section below.

**RESOURCES**


