Legionella: Don’t Assume

By Matthew R. Freije, Member ASHRAE

Investigators suspected a cooling tower in a densely populated area of Edinburgh, Scotland, was the source of Legionella that sickened more than 100 people between the end of May and mid-July of this year, three of whom died. Later in July, 21 people contracted Legionnaires’ disease from a hot tub on display in a store in Stoke-on-Trent, England. Two of them died days later. Ten people who stayed at or visited a downtown Chicago hotel between mid-July and mid-August contracted Legionnaires’ disease, three of whom have since died. And, as of early September, the case count in an outbreak in Quebec—which has been blamed on cooling towers—was up to 176, with 11 deaths.

The outbreaks were reported by the media but most cases of Legionnaires’ disease occur one at a time, without news coverage. In fact, only about 10% of hospital-acquired cases are detected at all, according to the Centers for Disease Control and Prevention, in Atlanta (CDC). The percentage of cases detected is even lower among those acquired outside of hospital stays.

What nearly all cases have in common—whether part of an outbreak or sporadic—are incorrect assumptions. Most facility operators have heard about Legionnaires’ disease associated with building water systems but many falsely assume that Legionella control measures are unnecessary since they have not been mandated by law, or do not apply to their particular building because of its age, design, young and healthy occupants, location, or water supply. Others implement measures, but ineffective ones, based again on false assumptions.

Legionnaires’ disease can be prevented only by taking effective steps to control Legionella bacteria in water systems. Avoid false assumptions about Legionella control, including these four pertaining to plumbing systems:

1. Don’t assume new piping systems are resistant to Legionella. Many old plumbing systems are actually less prone to Legionella than new systems, probably because most old systems are simpler and have relatively less total surface area (e.g., in piping and valves) on which biofilm can develop. Of four buildings on a hospital campus that have been tested for Legionella monthly for about three years, the newest building has presented the biggest challenge. High Legionella positivity and concentrations were found at a cancer hospital despite having been in operation only three years. Another hospital, only three years old, required chemical disinfection because of Legionella.

2. Don’t assume that Legionella growth is water specific. Monthly test results have shown the cold water systems to be more prone to Legionella than the hot water in some buildings, particularly at ice machines and drinking fountains. A building’s domestic cold water may not always be cold. Incoming water temperatures may exceed 75°F (24°C) during the summer in many parts of the United States. Even if the water enters the building below 68°F (20°C), its temperature may increase significantly as it flows in pipes along sun baked walls, in ceilings, or...
in pipe chases, or because of hot water infiltration at janitor sinks, bed pan washers, shower valves, or other cross connections. Cold water is not generally recirculated, so stagnation can be another factor, especially in buildings that are vacant on weekends.

4. Don’t assume that a disinfection system will control Legionella from the moment you turn it on. Thankfully, current disinfection technology combined with proper operation and maintenance can sufficiently control Legionella in nearly all plumbing systems. However, these technologies will not control Legionella immediately. Sometimes it takes a few months. Moreover, vigilant maintenance is a must—in the entire plumbing system as well as the disinfection equipment itself—to ensure that the equipment is operating, that it is producing the required dosage, and that the disinfectant is flowing throughout the system.

Simple as that sounds, it often does not happen. In July and August alone, disinfection systems at one hospital were found to be off during most of the vendor’s weekly inspections. Some weeks the unit was off because of a failed part—electric cell, analyzer sample chamber, temperature switch, fitting, tubing, solenoid valve, low-flow alarm, GIF outlet. At other times it was off because the facility personnel or a contractor turned it off and forgot to turn it back on. Sometimes it was off for no apparent reason.

The flushing procedures assigned to hospital environmental services (housekeeping) crews has also been crucial. To control Legionella, the disinfectant must flow throughout the system.

Another reason not to assume performance is that Legionella is sometimes found at a few outlets even when disinfection equipment is well maintained and the piping adequately flushed, particularly in large plumbing networks. In hospitals, the best solution is usually to install filters (validated for ≤0.2 micron) on those faucets and showers.

Those are only four. The list of assumptions could go on. Perhaps the best summary is simply, “Don’t assume,” which is the essence of the verification step required by the HACCP water plans proposed in ASHRAE 188P (see “What’s Proposed in Legionella Standard,” ASHRAE Journal, May 2012).

The HACCP approach does not tolerate assumptions. Implementation of a Legionella HACCP water plan’s control measures must be verified. And, the overall effectiveness of a plan in accomplishing its objective—to prevent Legionnaires’ disease by controlling Legionella—must be validated.

Had Legionella control been validated rather than assumed, the recent Legionnaires’ cases and deaths reported in the media, as well as hundreds of others that went undetected, could very likely have been prevented.

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