DEPARTMENT OF HEALTH

Study Summary: Building Water Quality Following Shutdowns

Purpose and Background

The Minnesota Department of Health (MDH) is nearing completion of a research study conducted in partnership with the University of Minnesota (UMN). The study focus is potential exposure to opportunistic pathogens in buildings that are reopened after being closed due to the COVID-19 pandemic. Opportunistic pathogens in this case are microorganisms that occur naturally in water and are adapted to survival, growth, and persistence in drinking water distribution systems and building plumbing. These pathogens can cause disease, especially in those with weakened immune systems, when people breathe in water droplets that contain the pathogens.

Water quality problems can arise as water sits in building plumbing systems. One potential problem is warming of cold water and cooling of hot water to temperatures that provide ideal growth conditions for bacteria, including waterborne opportunistic pathogens such as *Legionella* and *Mycobacterium*. If protective maintenance measures are not taken, people who are exposed to showers and other water sprays contaminated with pathogens may become sick.

Study findings will be used with other information to evaluate public health risk and develop strategies to reduce those risks.

Methods

UMN researchers collected, monitored, and analyzed water samples from nine buildings where water had been stagnant for a long period of time. Five buildings were served by municipal water systems that provide treated surface water and use chloramine disinfection. One building was served by a municipal water system that provides treated groundwater disinfected with free chlorine. Three buildings were served by separate groundwater wells from a non-disinfecting noncommunity public water supply.

Researchers collected samples from where the water entered the buildings, after flushing the building inlet taps for 5-10 minutes until water quality and temperature stabilized. They then sampled water from showers inside the buildings, after removing the showerheads. They sampled both hot and cold water. They collected shower samples before, during, and after flushing the shower plumbing lines. They then collected shower samples two more times within seven days after the initial sampling to observe changes in water quality.

They tested the samples for bacteria using two methods: one that detects genetic material (like DNA) of bacteria and one that cultures (grows) bacteria.

Findings

- Bacteria levels were higher before flushing than during or after flushing. In the buildings served by chloramine-disinfected systems, both total bacteria and opportunistic pathogen levels were almost always reduced to below detection after six minutes of flushing. Special circumstances, such as longer pipes or high storage capacity, could increase required flushing time, so building owners should be aware of these factors.
- Opportunistic pathogens were not detected in the building in the free chlorine-disinfected system.

- One building in the non-disinfecting system required 30 minutes of flushing to reduce opportunistic pathogen levels. Opportunistic pathogens were not detected in the other two buildings. Total bacteria levels were higher in the flushed non-disinfected system than in most of the flushed disinfected system samples, as expected.
- *Legionella pneumophila*, a pathogenic species of high public health significance, was not detected by either testing method (genetic or culture) in any system in the study, indicating low risk from this pathogen. Risk from *Mycobacterium avium* complex was estimated to be low due to its presence at low concentrations when detected.
- These results may not represent all buildings. More research is needed in more buildings and in other seasons to better estimate risk.
- Water quality returned to post-stagnation levels within a week after flushing, indicating the need for a routine flushing program.

Future Plans

Researchers plan to determine which species of *Legionella* are present and perform an overall bacterial community analysis. They are also working to assess bacteria that might affect chloramine decay. Testing should also be repeated in more buildings and other seasons, but there is currently no funding for this work.

Recommendations

The study reinforces the messages in existing guidance for Ensuring Water Quality in Building Premise Plumbing (https://www.health.state.mn.us/communities/environment/water/docs/com/buildowner.pdf). MDH will continue to evaluate any new information as it becomes available and update guidance as needed.

MDH has shared this guidance with public water suppliers through emails and newsletters. MDH will share any updates to the guidance based on future research. MDH encourages water suppliers to communicate with building owners about building water quality.

For More Information

A recent publication titled Flushing of Stagnant Premise Water Systems after the COVID-19 Shutdown Can Reduce Infection Risk by Legionella and Mycobacterium spp. (https://pubs.acs.org/doi/10.1021/acs.est.0c06357) covers the results of this study for buildings served by the chloramine-disinfecting water systems. For more information about the study, contact MDH Drinking Water Protection at 651-201-4700 or health.drinkingwater@state.mn.us.

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01/2021
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