Aging Water Systems Nationwide Pose Threats to Health

MCLEAN, Va. (Nov. 15, 2017) - Traditional water treatment efforts have focused on water leaving the treatment plant, but a large number of recent waterborne disease outbreaks in the U.S. can be traced to plumbing systems in buildings. Legionnaires disease outbreaks in New York City and toxic levels of lead in Flint, Michigan have raised questions about how to manage risks in aging water systems.

Multiple studies assessing the risk of opportunistic pathogens in water systems and the institutional infrastructure failures that led to the Flint water crisis will be discussed at the 2017 Society for Risk Analysis (SRA) Annual Meeting.

Legionellosis is the most common waterborne disease outbreak in the U.S. and its incidence is increasing. The *Legionella* microbes grow well in warm, stagnant water, particularly in large distribution systems, such as those found in hospitals or hotels. Researchers from the Ohio State University will discuss the need to create a quantitative microbial risk assessment (QMRA) model to better understand how certain conditions affect *Legionella*’s ability to cause disease.

The researchers will evaluate infection rates for the microbe in normal conditions, in different genetic scenarios and under environmental stressors (such as chlorine treatment). Building this model will allow scientists to further understand how environmental conditions affect *Legionella*, which could help control exposure and consequently, prevent outbreaks.

*Legionella* is just one of many opportunistic premise plumbing pathogens (OPPPs) lurking in water sources. Others include *non-tuberculous Mycobacteria*, *pseudomonas aeruginosa*, *Naegleria spp.*, and *Acanthamoeba spp.* OPPPs don’t often cause illness in healthy individuals, but are still a key cause of waterborne illness in the U.S. In their study, *Reverse QMRA for Opportunistic Pathogens in Premise Plumbing*, researchers from Drexel University discuss the benefits and feasibility of developing a risk-based strategy to determine water quality targets for buildings.

"Drinking water quality can decline in between water treatment plants and the point at which we use water in our homes," states Kerry Ann Hamilton, a postdoctoral fellow at Drexel University. "This research will provide criteria for determining reasonable limits for some microorganisms most frequently linked with disease and household plumbing."

Changes in usage, due to innovative plumbing and low-flow water fixtures, has led to increased water age in buildings. Having older water can result in bad taste and smell, disinfectant byproducts and greater microbial levels in water. Researchers from Purdue University conducted a study, *Water
Chemistry and Microbiology Changes as Plumbing Ages, to understand the link between fixture water use and drinking water quality in a newly plumbed residential green building. After 72 hours, bacteria and organic carbon levels increased inside the plumbing system compared with the chlorinated municipal tap water entering the building.

Metal plumbing components caused zinc, copper and lead levels to rise above levels measured at the water treatment plant. Also, use of different fixtures cause drinking water quality to vary within the same building.

When the city of Flint, Michigan began using the Flint River as a drinking water source without properly implementing federally mandated corrosion control in April 2014, a prolonged period of drinking water quality problems was triggered. These problems included red water and elevated levels of disinfection byproducts, coliform, bacteria, lead and Legionella. In 2016, 91 cases of Legionellosis and 12 deaths were attributed to an unprecedented outbreak of Legionnaires’ Disease during the time Flint River water was used.

A new study from Virginia Tech, Links Between Physical and Chemical Water Quality, Reported Incidence of Legionnaires’ Disease, and Waterborne Legionella pneumophila in Flint, Michigan, presents several lines of evidence linking the Flint River water to the outbreak. Water quality reports and experiments revealed that Flint River water was conducive to Legionella growth. The water also leached elevated iron nutrients from water pipes and chemicals from while temperatures rose to ideal levels for Legionella growth.

The water crisis brought national attention to the risks associated with aging infrastructure and inadequate drinking water treatment. Data collected from tap samples in Flint challenge risk assumptions in the Safe Drinking Water Act under the Lead and Copper Rule (LCR), particularly with regard to prioritized sampling locations and effective corrosion control treatment. Researchers from Michigan State will discuss proposed changes for the LCR.

These studies will be presented during two sessions at the 2017 SRA Annual Meeting at the Crystal Gateway Marriott in Arlington, Virginia.

- Monday, Dec. 11, 2017, 3:30-5 p.m.: Opportunistic Pathogens in Premise Plumbing
- Tuesday, Dec. 12, 2017, 1:30-3 p.m.: An Interdisciplinary Analysis of Multiple Risks and Lessons Learned from Flint, Michigan

*Jade Mitchell, Ph.D., from Michigan State University, Andrew Whelton, Ph.D., from Purdue University, Alexis Layman Mraz from Ohio State University, Kerry Ann Hamilton, Ph.D., from Drexel University and Tim Bartrand, Ph.D., from the Environmental Science, Policy and Research Institute will be available for media interviews at the 2017 SRA Annual Meeting. Please contact Melanie Preve at melanie@bigvoicecomm.com for all interview requests.

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