Monitoring Drinking Water Quality and Evaluating the Risks of Opportunistic Pathogens in Building Water Systems

Center for Environmental Health Engineering Dissertation Defense
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This dissertation focuses on studying risks associated with drinking water contaminants in building plumbing environments. The built environment impacts health and humans spend ~90% of their indoors. Building plumbing systems are complex and federal regulations generally focus on drinking water at the drinking water treatment plant and within the distribution system as opposed to within buildings. If drinking water is not properly managed in buildings, it can be a source or amplifier of microbial and chemical contaminants. Unlike regulations for chemical contaminants that are risk-based (e.g., USEPA Maximum Contaminant Levels [MCL]), for pathogens, regulations are either based on recommended treatment technologies or designated as zero (not detectable in water), which is not achievable in practice. Practice-based judgements are typically made at the building level to maintain water quality. This research focuses on two drinking water pathogens, *Legionella pneumophila* and *Mycobacterium avium* complex (MAC). Multiple aspects of water quality in two green buildings were monitored in tandem with water management interventions and analyzed for statistical relationships. Additionally, a quantitative microbial risk assessment (QMRA) framework was used to predict risk-based critical concentrations of *M. avium* for drinking water-related exposures. The overall goal of this work is to inform the development of water management plans and guidelines for buildings that will improve water quality in the built environment and promote better public health.

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