

## LCCMR Emerging Issues Proposal: Flushing to Address Legionella Concerns Resulting from Extended Building Shutdowns



Raymond M. Hozalski (Project Manager) and Timothy M. LaPara (Co-Principal Investigator)  
Department of Civil, Environmental, and Geo- Engineering, University of Minnesota

The unprecedented extended shutdown of many buildings around Minnesota due to the coronavirus (COVID-19) pandemic has resulted in stagnant water conditions within building plumbing systems. Such building closures cover a wide spectrum of activities and industries including health clubs, college campuses, and many 'non-essential' businesses around the State. The University of Minnesota, for example, closed campus recreation centers and most dormitories beginning in mid-March. Many of these closures are likely to persist into and possibly through the summer. Water stagnation in premise plumbing can have a variety of effects including: a) dissipation of the protective chlorine residual, b) increase in temperature in cold water lines, and c) decrease in temperature in hot water lines. Taken together, all of these factors lead to conditions that favor bacterial growth, especially of opportunistic pathogens like *Legionella*. The purpose of this study is to quantify *Legionella* in stagnant water in closed buildings and determine how to flush the plumbing to improve water quality and safety once we return to 'normal' activities following the shutdown resulting from the coronavirus (COVID-19) pandemic.

**Emerging Human Health Issue:** Bacteria of the genus *Legionella*, especially the species *L. pneumophila*, cause a potentially fatal illness termed Legionnaires disease and another less serious, flu-like illness called Pontiac fever. Exposure of Minnesotans to these disease-causing bacteria via showering and other water uses is likely to occur as building are re-opened following the COVID-19 shutdown.

### Emergency Funds Justification:

- This is an unprecedented time in our state's history. This already devastating COVID-19 situation also can have collateral detrimental consequences as we emerge from the shutdown.
- Our team has connections with water utilities around the state as well as the Minnesota Department of Health (MDH), which will help facilitate the proposed work and dissemination of the results.

### What we propose to do:

- We will collect water samples from University of Minnesota dormitories and recreation centers during the stagnation period to quantify *Legionella* concentrations. While *Legionella* is certainly not exclusively a university or metro area problem, University of Minnesota buildings will be sampled as they are considered representative facilities that are readily accessible to our team. We believe it will be possible to extend our results to other buildings around the State.
- We will collect water samples over time during flushing to evaluate the effects of flushing approach (i.e., duration and water temperature) on water quality improvement.

- *Legionella* will be quantified using both culture-based (i.e., Legiolert for *L. pneumophila* only) and culture-independent (i.e., quantitative PCR) methods for all *Legionella* and *L. pneumophila*.
- Water quality indicators including temperature, pH and chlorine (free and total) concentration will also be determined.

**Deliverables:**

- Document the extent of the problem by providing data on *Legionella* occurrence levels in stagnant water in buildings experiencing extended closure or inactivity.
- Determine if flushing with the standard chlorinated cold water supply is sufficient to improve water quality or whether hot (50°C or 122°F) or very hot (70°C or 158°F) water is required.
- Provide guidance information on flushing conditions and times needed to restore safe water for showering and other purposes where exposure to aerosols (water droplets in the air) is likely.
- Work with MDH personnel to develop a flushing guidance document and to disseminate all project information.

**Timeline:**

We plan to complete all flushing trials and sampling activities in May and June of 2020. We plan to complete water sample analyses, data analysis, and report writing by the end of August 2020.

**Budget:**

A budget summary is provided below including personnel, supplies, and travel. The majority of this field and laboratory work will be performed by Drs. LaPara and Hozalski, along with Dr. Taegy Kim, a post-doctoral research associate already working in our department. While Drs. LaPara and Hozalski normally manage research rather than perform it themselves, it is necessary for them to perform the sampling and laboratory work for this project because, due to the pandemic, the University of Minnesota has imposed a hiring freeze and has also imposed new safety requirements that prevent us from involving undergraduate students. Drs. LaPara, Hozalski, and Kim will devote 60% of their time to this project until June 30, 2020 and varying amounts for the remainder of the summer (Hozalski and LaPara at 25% and Kim at 100%). We anticipate devoting the remaining 40% of our time until June 30<sup>th</sup> to a companion project also related to the COVID-19 (i.e., SARS-CoV-2) pandemic (State-wide reconnaissance of SARS-CoV-2 in drinking water supplies). We will also try to involve additional personnel (either graduate students or post-doctoral researchers) as their time and availability permit.

Item	Amount
UMN Personnel	
Post-docs, Graduate Students, Technicians	\$29,799
Faculty investigators	\$51,904
Supplies and Expenses	
Laboratory Supplies <sup>1</sup>	\$20,000
Laboratory Services <sup>2</sup>	\$5,000
Equipment repair contingency	\$2,000
Travel	
In-state travel for sampling and meetings	\$1,000
<b>Total</b>	<b>\$109,703</b>

<sup>1</sup> Includes ultrafilter membranes, Legiolert test kits, DNA extraction kits, chemicals, and reagents.

<sup>2</sup> Use of University of Minnesota Genomics Center facilities.

