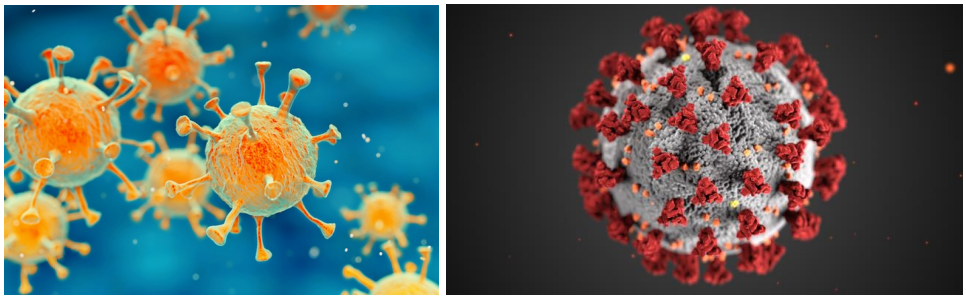
LCCMR Emerging Issues Proposal: State-wide reconnaissance of SARS-CoV-2 in drinking water supplies



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Emerging Issue: The State of Minnesota, the United States of America, and the entire world are currently in the middle of the worst disease pandemic since the "Spanish flu" of 1918. This pandemic is caused by a novel coronavirus, officially designated as SARS-CoV-2 and also known as COVID-19. While several pathways of SARS-CoV-2 transmission are well known (via aerosols, direct contact, etc.), relatively little is known about the fate of this virus in our water infrastructure. Recent scientific publications have reported substantial quantities of SARS-CoV-2 in untreated municipal sewage, but nothing is known about the fate of this virus once it reaches the environment. We hypothesize that drinking water utilities that treat surface water (e.g., Minneapolis Water Works, St. Paul Regional Water Services) offer a robust treatment process, with filtration and chlorine disinfection, that should protect public health against all viruses, including SARS-CoV-2. In contrast, recent research has demonstrated that numerous viruses (e.g., norovirus, avian influenza) can survive in and be transported by groundwater and contaminate drinking water wells. We hypothesize, therefore, that SARS-CoV-2 will also contaminate our groundwater (via septic systems, leaking sewers, and other pathways) and potentially eventually contaminate some drinking water supplies. Our concern about the safety of drinking water is particularly focused on public water supplies that use groundwater but do not practice disinfection and on private homes that are supplied water from private wells. There is an obvious and urgent need to perform this work as quickly as possible to limit the spread of SARS-CoV-2 during this pandemic and to protect the health of Minnesotans.

Proposed Work: We will collect water samples from both public water utilities (supplied by both surface water and by groundwater) and from private homeowners (i.e., private wells). These will be "high volume" water samples (> 200 gallons) using a membrane-filtration technique that we have used in previous projects. These samples will be preserved and stored until we are able to extract and purify RNA (i.e., we are concerned about the current availability of laboratory supplies), which will then be quantified by quantitative reverse transcriptase polymerase chain reaction (RT-qPCR) (i.e., the same assay used to identify patients infected by SARS-CoV-2).

Deliverables: We will provide data on the quantities of SARS-CoV-2 in drinking water to LCCMR and to Minnesota Department of Health (MDH) staff as soon as we generate reliable data. These data will be organized by drinking water type (surface water vs. groundwater source, disinfected vs. not disinfected, public water supply vs. private well). We will also publish our results in the peer-reviewed technical literature (likely via open access format).

Budget: The majority of this field and laboratory work will be performed by Drs. LaPara and Hozalski, along with Dr. Taegyu Kim (a post-doctoral research associate already working in our department). While Drs. LaPara and Hozalski normally manage laboratory work rather than perform it themselves, it is necessary for them to perform the laboratory work for this project because, due to the pandemic, the University of Minnesota has imposed a hiring freeze and has also imposed new, strict safety requirements that prevent us from involving undergraduate students. Drs. LaPara, Hozalski, and Kim will devote 40% of their time to this project until June 30, 2020; we anticipate devoting the remaining 60% of our time to a companion project also related to the SARS-CoV-2 pandemic (Flushing to Address Legionella Concerns Resulting from Extended Building Shutdowns). We will also try to involve additional personnel (either graduate students, technicians, or post-doctoral research associates) as their time and availability permit.

We have requested $17,121 for laboratory materials and supplies and safety equipment. These funds will be used to purchase expendable laboratory supplies, such as membrane filters, RNA extraction kits, and other reagents necessary for performing RT-qPCR. We will also be purchasing safety equipment that is somewhat unusual for research projects, such as high-quality digital thermometers (to monitor our personal body temperatures, twice per day), N95 masks, and similar items. We have requested $7,700 in travel funds, which will be used to travel throughout the State of Minnesota to collect water samples. This amount is admittedly high, but reflects the increased costs of operation due to safety concerns/social distancing (i.e., we will each drive separately to collect water samples; we will not share hotel rooms, etc.). We have also requested $2,000 in equipment repair costs; although our laboratories at the University of Minnesota have all of the necessary equipment to complete this project, we will be using it heavily and inevitably something breaks and needs repair. By requesting this repair money at this time, we can avoid requesting approval of a re-budget by LCCMR staff, which will allow to complete the work more quickly.

Item	Requested Amount
Faculty Salary and Fringe (LaPara)	$10,827
Faculty Salary and Fringe (Hozalski)	$11,940
Post-doc Salary and Fringe (Kim)	$3,044
Grad Student/Post-Doc/Technician Salary and Fringe (TBD)	$6,665
Lab Materials and Supplies	$17,121
Equipment Repair	$2,000
Travel (in-state only)	$7,700
(Indirect Costs, not requested)	($32,021)
Total Request	**$59,297**