

Assessing the presence SARS-CoV-2 in wastewater and potential health risks to wastewater workers

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Introduction

The primary route of transmission of SARS-CoV-2 is through person-to-person droplets released during talking, coughing, sneezing, and touching contaminated surfaces. However, gastrointestinal symptoms and fecal shedding of the virus in COVID-19 patients have been reported suggesting a fecal-oral transmission route. This raises the question of whether municipal wastewater plays a role in introducing SARS-CoV-2 in wastewater and associated environments. Recent studies have reported the presence of SARS-CoV-2 RNA at various points along the sewer network including at wastewater treatment plants (WWTP). However, health risks to wastewater workers and users of treated effluents have not been established. This is largely because infectivity and persistence of the virus in wastewater is not yet known. Furthermore, removal of SARS-CoV-2 at WWTPs remains uncertain particularly in developing countries given the challenges to treat wastewater to acceptable standards.

Objectives

This project seeks to assess the occurrence of SARS-CoV-2 in wastewater and removal by treatment processes, evaluate virus infectivity, estimate potential health risks to workers, and assess SARS-CoV-2 strains circulating in communities.

Materials and methods

Environmental samples will be collected weekly for ten weeks at three WWTPs in Gauteng and analysed for SARS-CoV-2 RNA presence and treatment removal effectiveness using RT-qPCR. Positive samples will be subjected to metagenomic analysis to assess SARS-CoV-2 strains circulating in communities. Viral infectivity will be tested on Vero E6 cell line for both environmental positive and spiked samples. Worker health risks will be estimated using quantitative microbial risk assessment.

Results and discussion

Preliminary results indicate the presence of SARS-CoV-2 RNA at all plants with detection of the RNA in treated effluents at two plants. Although no definite conclusions can be drawn yet, other studies have reported similar results in untreated wastewater but not in treated effluents. Important to note is that RNA detection does not imply infectivity. Infectivity is yet to be determined as part of this project. SARS-CoV-2 RNA was easier to detect from the solid portion compared to the aqueous portion the primary and activated sludge samples clarified through centrifugation. Going forward, it is recommended to test for the viral signal both in the solid and aqueous portions of the wastewater samples to avoid under or over estimation of risks.