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Effects of in-sewer processes on the fate of coronavirus in wastewater

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PROBLEMS TO ADDRESS

Wastewater based epidemiology (WBE) has the potential of becoming a powerful approach to monitor pathogen prevalence and serving timely intervention during outbreaks. By retrospectively linking the concentration of human pathogens in the sewage stream to excretion at the community level, urban wastewater can provide quantitative information on public health status within the sampled urban catchments. However, the in-sewer transport process of pathogens in sewage is not well understood and failing to compensate for effects from influencing factors to in-sewer degradation renders WBE data vulnerable to false estimation of upstream shedding.

RESEARCH OBJECTIVE

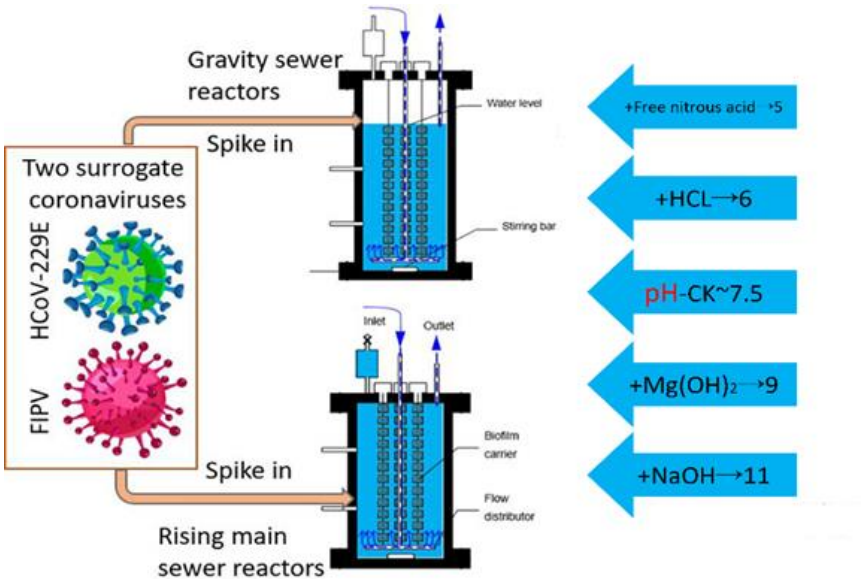
To determine the fates of target pathogens (surrogate viruses of coronavirus) in sewers under different environmental conditions (changing pH, chemical dosing, biofilm).

WATER INDUSTRY BENEFITS

Overall, these research outcomes could contribute to a better understanding of pathogen survival in sewer systems and help the WBE method develop further as a surveillance tool of infectious diseases

FINDINGS TO DATE

The in-sewer decay could cause much under-estimation for WBE back-calculation in subtropical cities or during summer. Rainfall-induced freshwater dilution in sewers makes the WBE estimation sensitive to pathogen decay of bacteria but not of viruses. Saline water intrusion in sewer systems may enhance the decay of some enteric pathogens and thus under-estimation of upstream pathogen shedding.


Gravity sewer reactors
Spike in
Two surrogate coronaviruses
HCoV-229E
FIPV
Spike in
Rising main sewer reactors
Water level
Stirring bar
Inlet
Outlet
Biofilm carrier
Flow distributor
+Free nitrous acid ›5
+HCL→6
pH-CK~7.5
+Mg(OH)2→9
+NaOH→11