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Preventing an outbreak of SARS-CoV-2 on campus using wastewater surveillance

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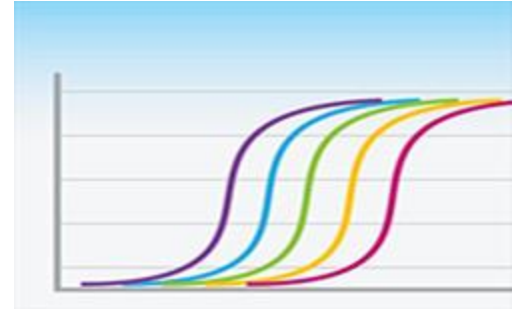
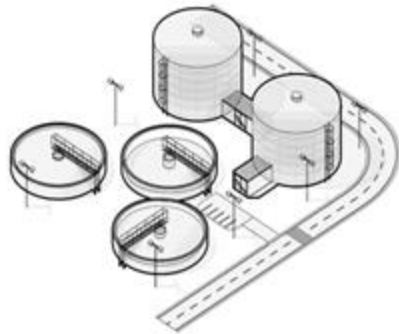
Preventing an outbreak of SARS-CoV-2 on campus using wastewater surveillance

Presenters: Abdul Al Riahi, Amr Labak



University of Windsor

Wastewater-based epidemiology



Purpose



Grab sample (credit: Windsor Star)

- ❑ Monitor campus residence halls using wastewater to try to prevent outbreaks through early detection of COVID-19 cases
- ❑ Learn about how to properly implement wastewater monitoring on a small scale (ex. Residence halls, congregate living settings)
- ❑ Determine how to best collect samples for comprehensive monitoring
 - ✓ Composite samples
 - ✓ Passive samples
 - ✓ Grab samples

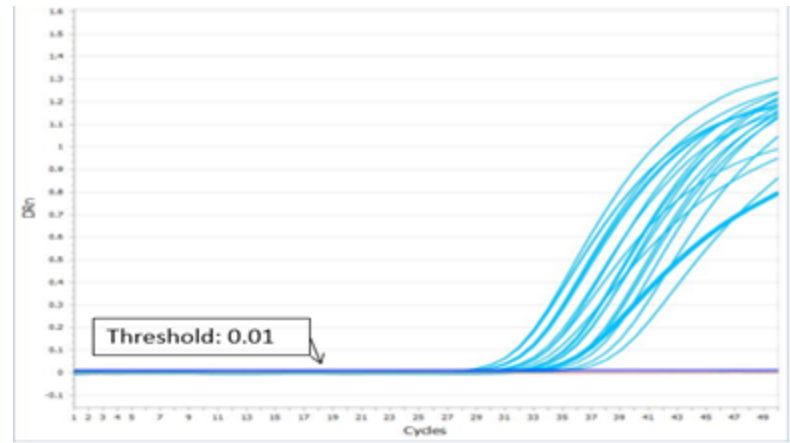
Passive Samplers

- ❑ Use of modified Moore swabs connected by fishing line down the sewers
- ❑ Liquid collected by samplers is processed through a 0.22 μ m cartridge filter
- ❑ Greater sensitivity for viral detection, compared to grab samples
- ❑ High volume sewage passing through the swab

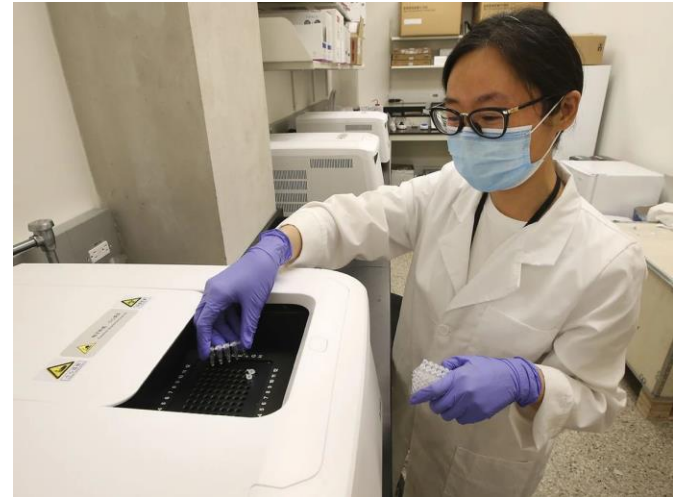


RNA extraction & RT-qPCR

- ❑ Detection of the presence of genetic material (RNA)
- ❑ Mastermix required uses only 1 step for cDNA synthesis and qPCR
- ❑ Detection of nucleocapsid gene (N1)
- ❑ Detection of PMMoV in wastewater as a fecal indicator
- ❑ RNA is extracted with Qiagen AllPrep Powerviral DNA/RNA kit

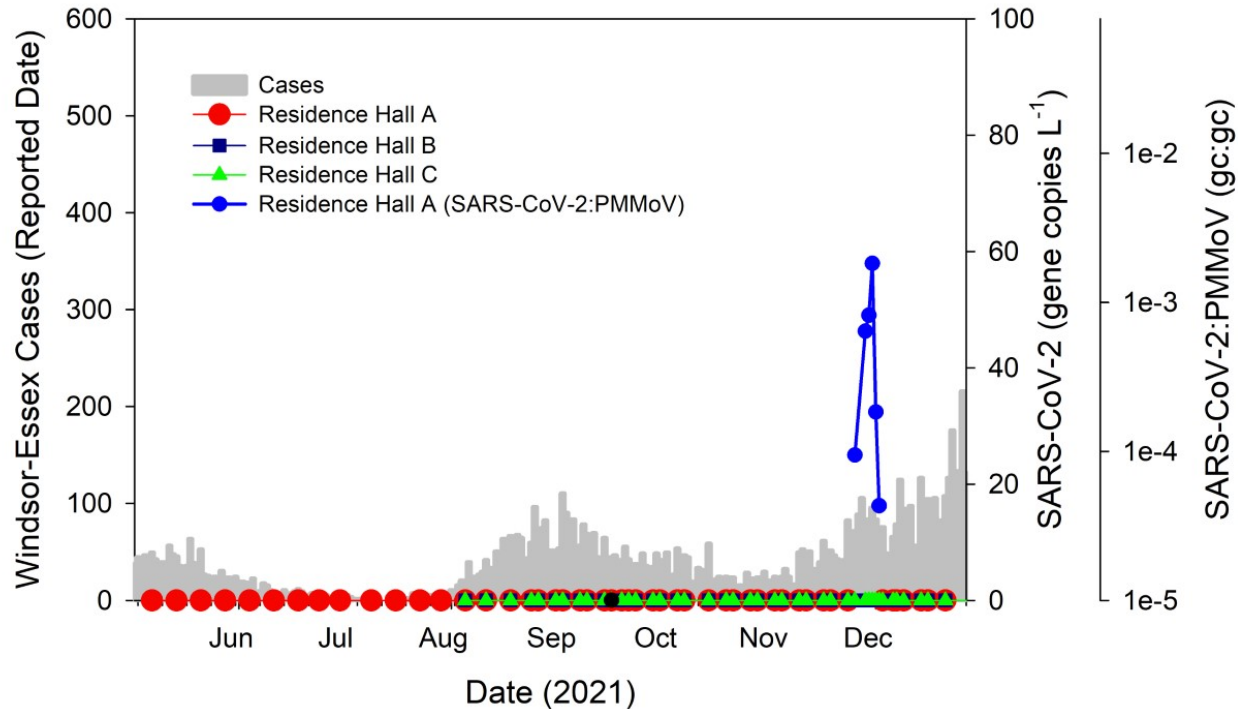


Amplification curve



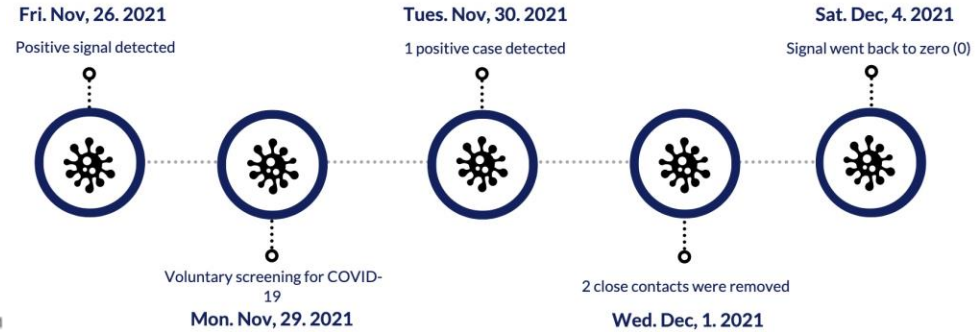
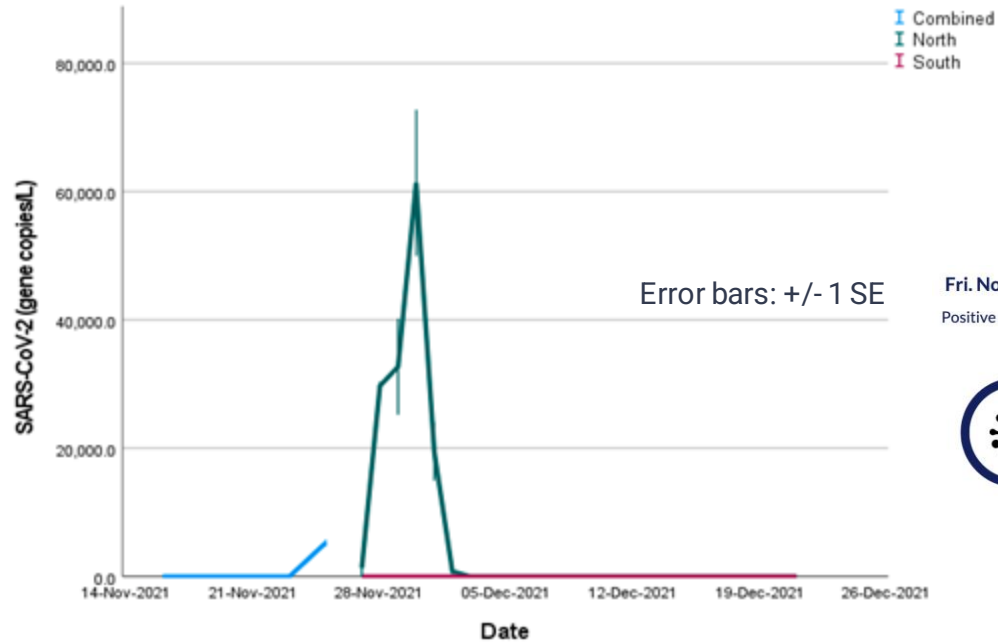
RT-qPCR machine (credit: Windsor Star)

Case study



Concentration of the SARS-CoV-2 N1 gene target in wastewater captured by passive samplers in the residence hall sewers

Case study



SARS-CoV-2 N1 signal after separating the residence hall into 2 sections

Outcomes

- ❑ Increased public health messaging
 - ✓ Symptom monitoring
 - ✓ Masking
 - ✓ Social distancing
 - ✓ Hand washing
- ❑ Encouraged testing
- ❑ Quarantining positive cases
- ❑ A number of students tested positive and were removed to a quarantine facility
- ❑ Wastewater signals went back to zero after the infected people were isolated

Future Applications

- ❑ Continue to provide a community-wide swab
- ❑ Prevention of small scale outbreaks
- ❑ Used in congregate living settings with high risk individuals (retirement homes)
- ❑ It can potentially be used in the detection of different viruses/bacteria
- ❑ Future uses in agriculture and detection of pathogens in livestock populations



Faculty sponsor: Dr. Mike McKay
(credit: Windsor Star)

Challenges

- ❑ Public trust (only works if the public takes action after results are provided)
- ❑ Uptake by public health
- ❑ Unpredictable wastewater flow and timing of fecal deposition into wastewater stream
- ❑ Relevancy of signal and speed of response
- ❑ Time and effort vs frequency to deliver action

Acknowledgements

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University of Windsor Return to Campus Team

Ontario Wastewater Surveillance Initiative – Ministry of Environment, Conservation and Parks



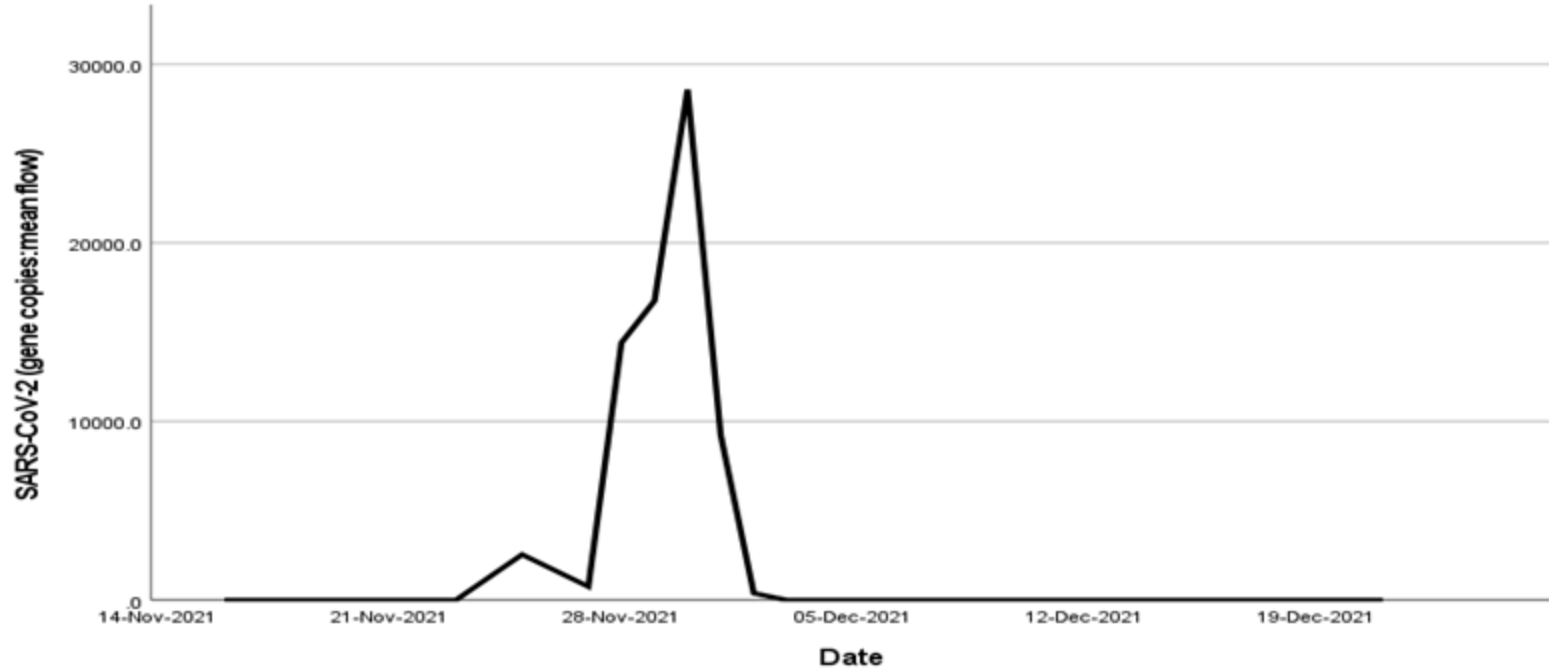
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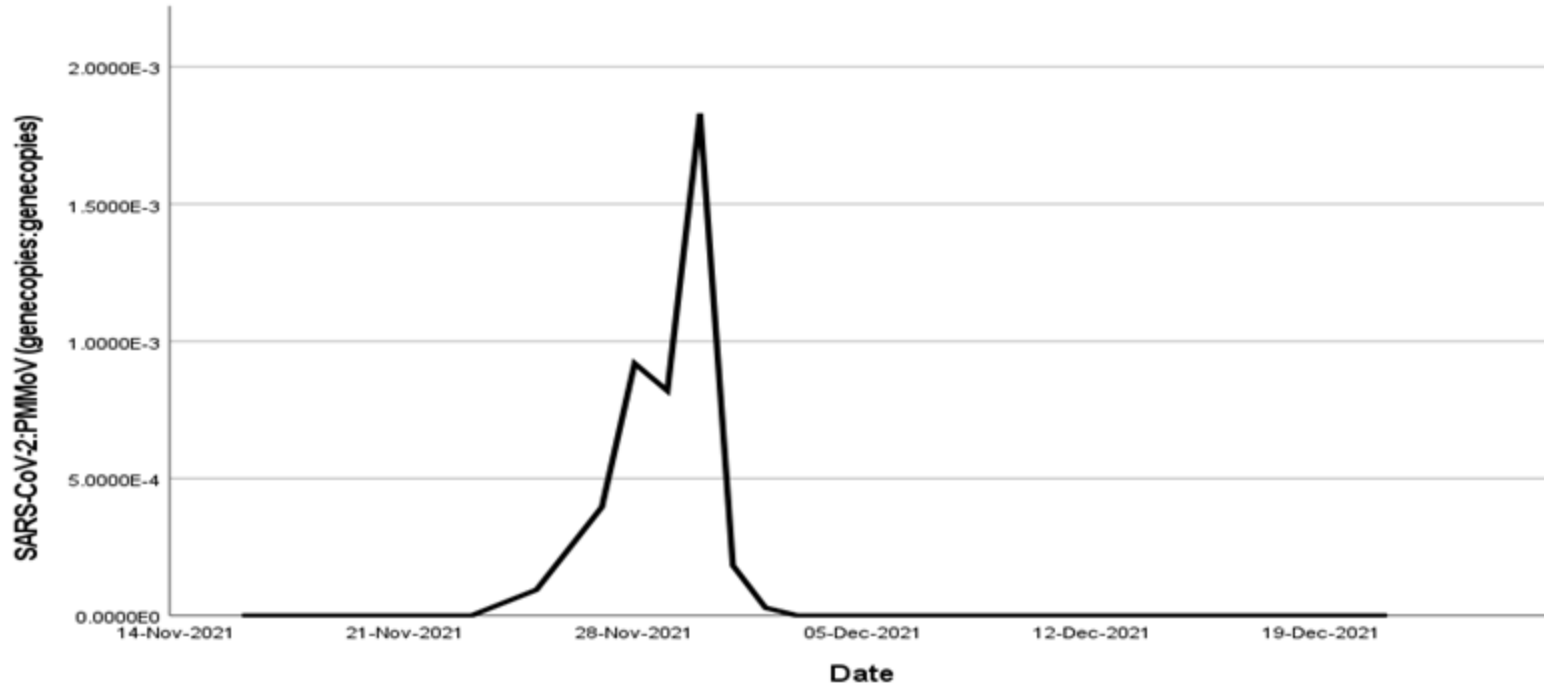
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Case study



SARS-CoV-2 signal normalized by mean flow during passive sampler deployment

Case study



PMMoV normalized SARS-CoV-2 signal