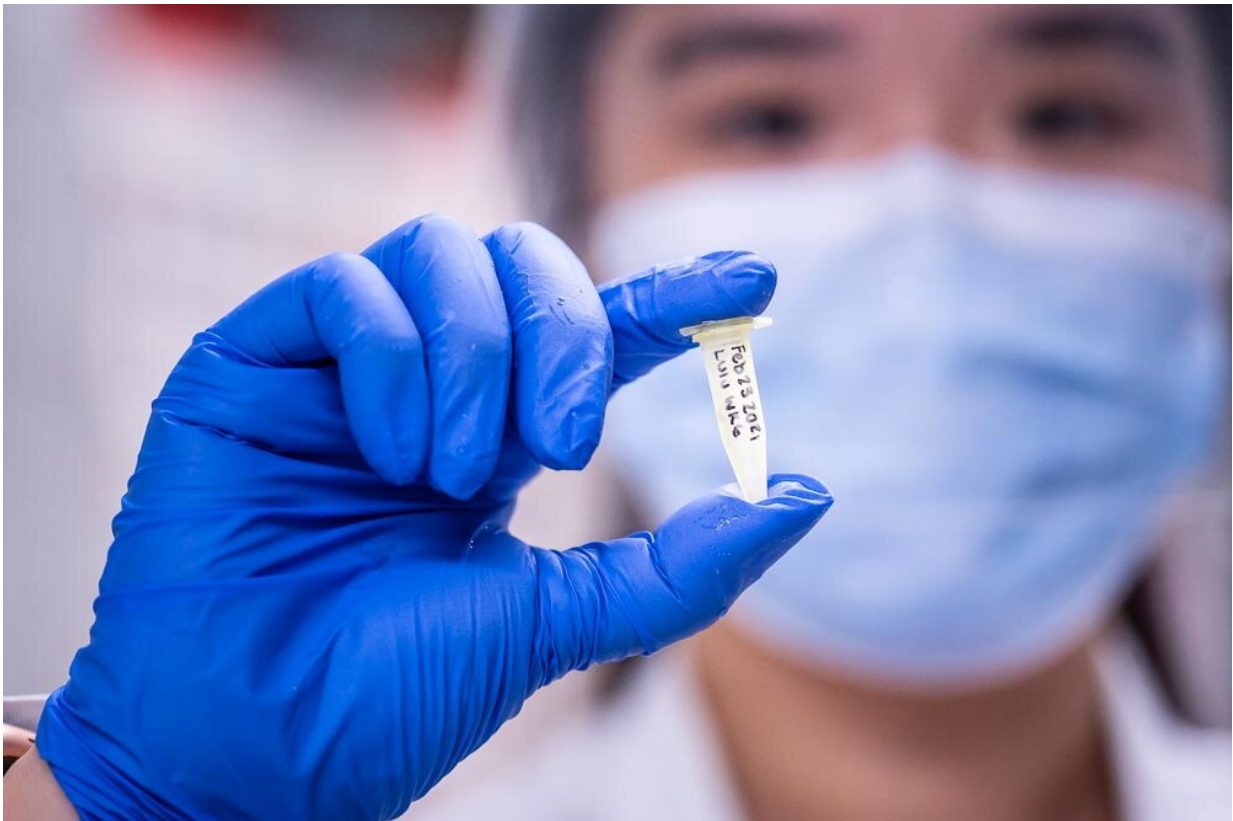


Wastewater genomic testing can effectively track COVID-19 variants of concern

July 13 2021, by Lou Corpuz-Bosshart



Study author Xuan Lin, a PhD student in civil engineering is holding a frozen wastewater RNA sample that is used for sequencing. Credit: Paul Joseph

Wastewater testing can accurately and rapidly identify levels of COVID-19 infections in the community, including the rise of variants of

concern, suggests new research led by UBC professor Dr. Ryan Ziels.

Ziels and his colleagues analyzed sewage samples from five municipal wastewater plants in the Metro Vancouver region during a period of increased COVID-19 case counts, from February to April 2021.

The results, described online in preprint at medrxiv, showed that viral concentrations in wastewater collected from the Vancouver region closely tracked the numbers of clinical cases in the region.

The researchers, which included Ph.D. civil engineering student Xuan Lin, also found that the frequency of mutations associated with variants of concern in wastewater strongly correlated with trends in clinically diagnosed cases in the community.

In this Q&A, Dr. Ziels, an environmental engineering researcher who studies microbial ecology, discusses the research findings—and how genomics testing of wastewater can inform disease surveillance and management strategies.

How did you become involved in this research?

I have been researching genomics sequencing of wastewater for several years and when the pandemic broke, I decided to apply this knowledge to understanding the SARS-CoV-2 virus in collaboration with other researchers. Our team includes environmental microbiologists, engineers, and epidemiologists (at UBC and BC CDC), and we were fortunate to collaborate with Metro Vancouver for our work.

Like many other diseases, the SARS-CoV-2 virus is shed in feces during infection, and viral genome fragments can be detected in municipal wastewater.

The big question was how we can detect these fragments rapidly and accurately in order to provide additional inputs into the public health toolkit?

What methods did you use to measure and monitor variants of concern in Metro Vancouver wastewater?

I'd previously developed a fast and accurate sequencing technique using handheld DNA sequencers, and with some modifications my team and I applied this platform to measure coronavirus genome fragments in wastewater samples from the Vancouver region.

What we're doing is similar to the work being by CanCOGeN, the Canadian COVID Genomics Network—a consortium of Canadian federal, provincial and regional public health authorities, which is sequencing up to 150,000 viral genomes across Canada. But here, instead of sequencing patient samples, we are sequencing wastewater samples that collect input from entire populations within a region.

What were your key findings?

In terms of quantifying the amount of coronavirus genome fragments, we found a bit of an early signal compared to changes in hospitalizations or case numbers. This suggested that wastewater testing can provide some form of early warning.

With genome sequencing of wastewater, we can detect increases in mutations associated with variants of concern, and we provide this information to our health authorities as an additional aid in their public health strategies.

We are able to adapt our method to look for emerging variants and really

get a snapshot of the entire region in one sample. Genome sequencing also allowed us to determine which sewer-sheds in Metro Vancouver the variants were becoming more dominant in.

Rapid sequencing of viral information allows us to provide very fast turnaround—we provide reports to update our medical health officers in as little as three to four days from sample collection.

What are the implications for future pandemic testing and management?

There is growing research that wastewater sampling can be useful in understanding the extent of COVID-19 infections in communities. Our goal is to supplement, not replace, other testing epidemiology methods. Wastewater testing can be useful when clinical testing is difficult or lacking at a municipal scale.

We are also cooperating with the Canadian Water Network to establish a national working group that is sharing knowledge on [wastewater](#) monitoring. Such a national network can lead to reliable data as we advance towards re-opening of our economy.

More information: Xuan Lin et al, Assessing multiplex tiling PCR sequencing approaches for detecting genomic variants of SARS-CoV-2 in municipal wastewater, *medrxiv* (2021). [DOI: 10.1101/2021.05.26.21257861](https://doi.org/10.1101/2021.05.26.21257861)

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