



Agilent Case Study: Ottawa Wastewater Success Story

Using Agilent Certified Pre-Owned Instruments to Research the Prediction of Covid-19

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CrossLab
From Insight to Outcome

What if predicting where and when a COVID-19 outbreak would occur were possible?

That's exactly what Denina Simmons is researching at Ontario Tech University in Canada.

Not just project the virus's trajectory but forecast where and when to expect a wave of positive cases.

The assistant professor of biology analyzed wastewater samples from across the Durham region in Ontario for traces of SARS-CoV-2 in an effort to determine if the virus that causes COVID-19 is detectable and could possibly predict COVID spikes in the population. Early results from her work showed a spike in the virus's presence in wastewater approximately 10 days before an identical spike in positive cases was reported in the region.

"If this can be proven, you can sort of think of it like an early warning signal," Denina said of the testing protocol, which uses an Agilent liquid chromatography quadrupole time-of-flight mass spectrometer (LC/Q-TOF MS) to measure the abundance of proteins that indicate SARS-CoV-2 presence in a research setting.

It's not exactly what Denina had in mind when her department purchased the instrument in late 2019. She had planned on using it to measure levels of environmental contaminants in fish proteins and metabolites — and she almost didn't get to. A new instrument just wasn't in the university's budget.

"The CPO program is the only reason that my team is able to do this work, as without it, we wouldn't have been able to purchase our Agilent (LC/Q-TOF MS). And I have no complaints. This instrument feels brand new to me, and the service and warranty are excellent. No regrets on our part."



Denina Simmons
Assistant Professor of
Biology, Ontario Tech
University, Canada

Agilent Certified Pre-Owned Instruments (CPO) Program

The program, which buys back older instruments from laboratories upgrading their equipment and refurbishes them to pass original specifications like new, has been beneficial in providing a wider array of options for customers. The advantages also include enhanced product stewardship and being an environmentally conscious supplier.

Meanwhile, customers get a break on price without sacrificing quality or support. "It was completely about affordability," Denina said of the university's decision to purchase a pre-owned system. The university also purchased a certified pre-owned gas chromatography-mass spectrometer (GC/MS) and has plans to use the program to buy a liquid chromatography triple quadrupole mass spectrometer (LC/QQQ MS) in the future.

But when the instrument arrived, Denina was tasked with more than studying fish proteins. A member of Ontario Tech University's board of directors shared reports of wastewater analysis for SARS-CoV-2 being done in Australia and suggested faculty researchers follow suit.

Denina was quick to accept the challenge—and she put her own twist on it.



Research done up until that point had focused on measuring the presence of SARS-CoV-2 ribonucleic acid (RNA) in wastewater.

"But I thought if you can measure RNA, you should be able to measure proteins because proteins are generally more abundant than RNA and more stable," Denina explained.

Her research began in September with the analysis of samples from wastewater treatment centers in five cities in Ontario: Ajax, Clarington, Pickering, Oshawa, and Whitby.

After the samples are precipitated and centrifuged, the remaining semi-solid pellet is broken down into peptides, or small chains of amino acids. **Denina then uses the LC/Q-TOF MS to measure the mass of those peptides and their sequences, which she can then map to known sequences of genes and proteins—including those of the SARS-CoV-2 virus.**

It's cool, she said, because most researchers are just looking for SARS-CoV-2 RNA or spike proteins, stick-like protrusions that bind the virus to human cells. This manner of testing increases the number of needles in the haystack, so to speak, while potentially giving public health officials time to prepare for COVID-19 outbreaks in specific areas. But the benefits of wastewater analysis don't stop there.

"We're seeing one or two proteins that are human, not viral, that we think may be connected to infections, but further research is still needed," Denina said. It's an approach with the potential to extend beyond COVID-19, she added, suggesting that wastewater could be scanned for other types of viruses.

"If this turns out to be successful, and if governments learn their lessons from this scenario, we might see a change in monitoring in the future," she said.

To learn more about the Agilent CPO Program visit us at www.agilent.com/en/products/certified-pre-owned-instruments

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