How Nanotrap® Particle Technology is Improving the Public Health Response to SARS-CoV-2

Lauryn Massic, Association of Public Health Laboratories infectious diseases fellow, shares how breakthrough technologies from Ceres Nanosciences and Apostle enables SARS-CoV-2 wastewater surveillance results that are efficient and accurate.

In this interview, Lauryn Massic, from the Nevada State Public Health Laboratory, shares how the use of Ceres Nanosciences' Nanotrap particle technology increases her throughput and gets results fast.

Lauryn Massic, *Association of Public Health Laboratories infectious disease fellow* at the Nevada State Public Health Laboratory.

Tell us about your current research at Nevada and your ultimate goals.

LM: *We have made it our goal at the Nevada State Public Health Laboratory to be proactive in the fight against the spread of SARS-CoV-2. That is why we are establishing a wastewater surveillance system in northern Nevada that will act as an early detection system for SARS-CoV-2. We are using the information from our surveillance for variant detection and to predict outbreaks. We are obtaining wastewater samples every day from wastewater reclamation facilities in counties in northern Nevada. We are somewhat unique as a state lab that is also located on a university campus. Because of this, we are also testing wastewater from dormitories and high trafficked buildings on campus once every day. By sharing this data with the public, we hope to increase public awareness. I find sharing this information to be critical in combating the virus.*

Please share with us more about your workflow and your metrics for success.

LM: *Our goal in setting up our workflow was to have a turnaround time of less than one day for detection and quantification of the virus in wastewater samples. We wanted to be able to test wastewater from each community facility at least three times per week and to test the campus dorms every day of the week.*

The workflow we follow in the lab starts with the use of Ceres Nanosciences' Nanotrap Microbiome A Particles on the Apostle MagTouch 2000 for virus concentration from the wastewater. This is followed by RNA extraction using ThermoFisher and Apostle Bio reagents on the MagTouch 1000. We are analyzing the RNA using the Promega SARS-CoV -2 Wastewater RT-qPCR kit and are sequencing extracted RNA using Illumina short read sequencing on a MiniSeq.

Please describe how the solution in your lab is aiding you in doing more today.

LM: *With this solution, I can now confidently quantify SARS-CoV-2 copies per liter, detect sample positivity, as well as identify variants of SARS-CoV-2 from the wastewater sample. The data collected from our lab's wastewater surveillance system is important, but so is making that critical information accessible to the public. The Nevada State Public Health Laboratory is working hard in spearheading the creation of a platform on our website to share SARS-CoV-2 surveillance data and we are participating in the CDC and FDA wastewater surveillance programs NWSS and LFFM.*

How has the Apostle automation accelerated your testing capabilities?

LM: *With Apostle automation, my team and I have been able to develop a method to detect and quantify SARS-CoV-2 in wastewater samples, while also having the ability to sequence viral RNA from the wastewater samples. We can accomplish the detection and quantification portion all in the span of a day, and the hands-free time of the automated process gives us the ability to complete other wastewater-related tasks.*

Can you share how you are concentrating your samples today, and the value the Nanotrap particles bring your team in the lab?

LM: *Currently, my team and I are using the Apostle MagTouch 2000 along with Ceres Nanosciences' Nanotrap technology. We've found Ceres' Nanotrap particles to be invaluable to our process, as they have outperformed alternative beads that we have tried by eliminating any inhibitors that may be present. While we use an automated method with our Apostle MagTouch 2000, I personally like the flexibility Ceres offers with automated and manual methods available. The Nanotrap particle automated method is simple and gives me more hands-free time in the lab. Currently, I am only spending an hour a day doing hands-on work in the laboratory, despite the large number of samples I am processing, which has been a huge benefit of the Nanotrap particles. They are easy to use and have improved our workflow greatly.*

Why did you choose Apostle?

LM: *When we chose Apostle, we were struggling to get what we needed from the larger companies we were used to ordering from. Supply chain issues made it hard for us to get what we required to continue testing, which is what led to us searching for alternative vendors. We were lucky enough to have one of my colleagues bring Apostle to our attention. Apostle was able to quickly supply us with instruments, plates and reagents for a fraction of the price of the competitors. Apostle has been a great partner for us. Their technical support team programmed our MagTouch 2000 at no cost, and their team was supportive and accommodating every step of the way.*

Why did you choose Ceres Nanosciences Nanotrap technology?

LM: *We discovered Ceres Nanosciences through UC San Diego's wastewater surveillance publications from the Rob Knight Lab which used the Nanotrap technology. We were interested in the particles' ability to give us higher throughput and faster results, without sacrificing accuracy. The Nanotrap particles have made detection so easy. Similar to Apostle, Ceres has been accommodating and offered us solutions to roadblocks in the lab when needed. They're hands-on and have been prompt in their correspondence to us.*

SARS-CoV-2 wastewater surveillance is now a core focus in many labs. How are you addressing it today in your lab, and what are your future goals with overall wastewater monitoring?

LM: *Wastewater testing for SARS-CoV-2 is a key component of our state health laboratory, especially in our molecular department, in addressing the public health challenges that SARS-CoV-2 has presented us. We are grateful for the grants we received that have allowed us to take part in wastewater surveillance, which, because of the pandemic, looks to be the system that the world is moving towards.*

I am an Association of Public Health Laboratories infectious disease fellow and plan to continue our wastewater surveillance efforts for the rest of my fellowship year. The lab is already thinking about implementing a long-term plan to address a variety of public health issues. Our future goals for our wastewater surveillance system are to expand our current workflow to be capable of identifying pathogens besides SARS-CoV-2. We are looking to address bacteria outbreaks, such as Neisseria gonorrhea *and* Chlamydia trachomatis*, along with other STIs. We are also interested in exploring using this system to identify pathogens associated with food borne illnesses. There are a lot of available directions we can go in with this system.*