



TECHNOLOGY AND COVID

by Lisa Gibbs

Covid-19 and Human Wastewater

A relatively old technology is being used to help solve a novel problem: SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). The relatively old technology is wastewater epidemiology. The novel problem is a highly transmissible virus that emerged in late 2019 and has caused a pandemic of acute respiratory disease, which we now label as Covid-19 (coronavirus disease 2019).

One glance at the World Health Organization's Coronavirus Disease (Covid-19) Dashboard (<https://covid19.who.int/>) is ample evidence of the pervasiveness of this virus across the planet. Researchers around the world have been working diligently to learn where the virus is found, how the virus is transmitted, what measures can be taken to reduce the speed of spread, what medicines are effective treatments, and they are developing vaccines in record speed.

One method of detecting where the virus may be lurking is the collection and testing of wastewater samples. Israel has been using a monthly routine of "environmental surveillance" since 1989 to detect poliovirus, and the nation ramped up efforts after an outbreak in 2013. A growing body of research on Wastewater-based epidemiology (WBE) supports the concept that evidence of drug use and infectious diseases can be present in human wastewater.

One research study based on WBE focused on tracking cocaine consumption in medium-sized cities along the River Po in Italy. The 2005 study concluded cocaine was present in the collected wastewater, and the research technique has “the unique potential ability to monitor local drug abuse trends in real time, while preserving the anonymity of individuals.” More recently, researchers at Massachusetts Institute of Technology (MIT) refined the use of wastewater for early detection of disease. Around 400 water facilities in 42 states are now participating in clinical tests as an attempt to detect Covid-19 before an outbreak occurs. By mapping data collected from sewage, communities are provided with information to develop public health initiatives. Further research suggests WBE is a “tool that has potential to act as a complementary approach for current infectious disease surveillance systems and an early warning system for disease outbreaks.” In an article published in the April 2020 issue of *Environment International*, researchers determined untreated wastewater contains human biomarkers that when analyzed can provide a picture of the population’s health in real time.

The Centers for Disease Control and Prevention (CDC) acknowledge the potential impact of this type of surveillance. According to the CDC, “the virus has been detected in wastewater several days prior to reported cases within the community.” The CDC, in collaboration with several federal agencies, developed a National Wastewater Surveillance System website, one equipped with guidelines for developing a strategy to collect and test wastewater samples. The strategy consists of three steps: Identify public health data needs by detecting the presence of the virus within wastewater and then monitoring the trends in that area; assess sampling and testing capacity; and develop a sampling plan.

Private colleges and universities can utilize this technique and incorporate wastewater sampling as part of a comprehensive Covid-19 campus plan. Collaboration with local public health agencies is essential for staying informed of community spread. Early detection is also key, and wastewater sampling can be assigned to specific buildings on campus. Dormitories are a particular area of concentration, and sampling can be as precise as specific floors of the building.

Case Study

St. Lawrence University in Canton, New York, included wastewater testing as part of its goal to ensure safety for students, staff, and faculty when they returned to campus in late August. Ten residence halls were outfitted with sampling machines. Testing during the first two weeks of classes provided a baseline from which to make later decisions should evidence of the virus increase. If increases are detected, residents are required to stay in their rooms until individual testing is completed. Campus Health Services works with St. Lawrence County Public Health to assess and then contact those who test positive.

Nearly three months into the semester, on November 10, 2020, the campus was notified that the “system has detected positive traces of the virus in wastewater samples from Sykes, Lee, Priest, and Reiff Halls on campus. While it is important to remember that detecting positive traces in wastewater testing does not mean that we have active positive cases, we must also consider the recent significant increase in local cases.” St. Lawrence County officials had

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declared a state of emergency due to increases in the county one day prior. Students living in the affected residence halls were placed in precautionary quarantine, leaving for meal pick-up only. In-person classes were suspended, all in-person activities were cancelled, and students were discouraged from leaving campus.

On November 13, the precautionary quarantine was lifted and no new active cases were recorded. In-person classes and activities resumed and, wastewater testing indicated no increases in the virus. Soon thereafter, wastewater sampling detected the virus in additional

residence halls on campus, and those residents were placed on precautionary quarantine. An “unauthorized large gathering” took place over the weekend, and by November 19, the campus had 9 active cases. Moreover risk status was increased from “Green: Low Risk” to “Yellow: Moderate Risk”. Yellow is described as “incidence of the virus remains low, but indicators show increased or potential for increase in transmission.” In-person classes were suspended for the remainder of the semester, and in-person activities were cancelled. Athletic and recreation facilities closed, and students were discouraged

from leaving campus. The active cases were placed in quarantine and contact tracing was implemented. It is hoped these actions and continued wastewater surveillance will prevent the need to increase campus risk status.

As the pandemic continues, researchers are closing in on effective methods of identification, containment, and cure. Wastewater-based epidemiology (WBE) is one promising tool for early detection of the virus. Protocols put in place and followed by St. Lawrence University seem to have slowed the spread of the virus on campus. Other private colleges and universities using WBE as part of a comprehensive Covid-19 plan may have similar success.



ABOUT THE AUTHOR: PUPN staff writer Lisa Gibbs earned her Ed.D. in Higher Education Administration in 2018. She is an advocate for arts, particularly dance, in education, and for increasing the financial well-being of artists through financial education.

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