Medical Xpress

Nationwide initiative will monitor wastewater for COVID-19, monkeypox, other diseases

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Stanford undergraduate Julia Simon collects wastewater from the Codiga Resource Recovery Center on the Stanford campus for analysis. Credit: Harry Gregory

Researchers at Stanford University and Emory University have launched

a nationwide initiative to monitor monkeypox, COVID-19, and other infectious diseases in communities by measuring viral genetic material in wastewater. The effort will also provide health officials and the public with free, high-quality data, which is critical to informing public health decision making. The initiative is already producing data, including the first detections of monkeypox DNA in wastewater in the United States.

This new, Stanford-led effort, called WastewaterSCAN, significantly expands access to the analytical approach and public reporting developed by the scientists and 11 Northern California communities through the Sewer Coronavirus Alert Network (SCAN) that launched in November 2020. Beginning with the SARS-CoV-2 virus that causes COVID-19, SCAN has provided frequent information that is comparable over time and from place to place about the community levels of COVID-19, its variants, monkeypox, influenza A, and RSV to help shape public health responses to those infections.

The scientists leading WastewaterSCAN (Twitter: @WastewaterSCAN) were the first to report detections of genetic markers of the monkeypox virus in wastewater in the United States, which thus far are the only reported detections from wastewater monitoring. They began testing for monkeypox viral DNA at the 11 locations in Northern California on June 19, had the first two positive detections in plants serving parts of San Francisco the next day, and have found monkeypox viral DNA in wastewater from 10 sites.

As of today, 38 treatment plants in eight states are receiving monkeypox results from WastewaterSCAN and SCAN in addition to results for the SARS-CoV-2 virus that causes COVID-19 and its BA.4 and BA.5 variants, influenza A and RSV. In all, the team has detected monkeypox DNA in wastewater in 22 locations.

"Because it's population-based and unbiased by access to clinical testing,

wastewater helps us understand infectious disease trends in a community. We've seen how valuable this can be as individual testing practices for SARS-CoV-2 have changed," said Alexandria Boehm, professor of civil and environmental engineering at Stanford. "Genetic material of the pathogens we monitor has been documented in excretions from infected people that end up in the wastewater treatment system."

The scientists at Stanford and Emory are working with Verily Life Sciences, which collaborates to optimize methods for high throughput, test samples, and produce data in its lab, and with local wastewater and public health officials to produce actionable data about COVID-19 and other pathogens. Communities in California, Colorado, Florida, Georgia, Idaho, Kentucky, Michigan, and Texas are participating thus far. The analytical approach does not measure infectious viruses in wastewater, but instead detects short pieces of the viral genomes.

"We need to rethink our paradigm for tracking infectious disease and anticipating new threats," said Marlene Wolfe, assistant professor of environmental health at Emory University and co-principal investigator for WastewaterSCAN. "We take the same sample of wastewater solids that we're already collecting—it's less than half a gram that represents up to millions of people in a community—and do a slightly different test for the next variant or the next pathogen."

Bradley White, lead scientist on Verily's public health efforts, including wastewater testing, said that providing rapid turnaround of sample results is critical to helping public health officials understand the community spread of these viruses, enabling more effective mitigation and treatment. "Together with Stanford and Emory scientists, we have created shareable, open-access protocols that enable knowledge transfer between academic, industrial, and government labs—and helps unlock a life-saving, new approach for viral disease surveillance," he said.

WastewaterSCAN is also partnering with the National League of Cities to support a cohort of 50 of its member cities as they implement wastewater monitoring and work to improve public health based on its results.

"As we saw during the COVID-19 pandemic, community leaders play a critically important role in proactively managing health crises—and this public health emergency is no different," said NLC CEO and Executive Director Clarence Anthony. "This partnership's work to expand access to wastewater monitoring tools will help cities, towns, and villages across the country lead their response efforts to the monkeypox outbreak equipped with data and a network of support."

Wastewater plants in participating communities sample three times a week and are provided with materials to ship the containers to Verily's lab for analysis including detection of viral genetic material with PCR-based technology. The results are made available on a public website within 48 hours of the samples' arrival.

The materials and shipping are free to the communities, and stipends are available to defray some labor costs for sampling. WastewaterSCAN's national expansion was made possible thanks to support from the Sergey Brin Family Foundation and Bloomberg Philanthropies. WastewaterSCAN aims to demonstrate the value of a national sentinel system using wastewater to inform public health measures and to support the establishment of publicly funded, durable public health infrastructure to prepare for future pandemics.

Provided by Stanford University

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