Metropolitan Water Reclamation District of Greater Chicago

FACT SHEET

# Sewage surveillance: Detecting COVID-19 virus

The Metropolitan Water Reclamation District of Greater Chicago (MWRD) remains committed to gaining a better understanding of the spread of the COVID-19 virus (SARS-CoV-2), while protecting the public health of the region. The MWRD has participated in numerous studies to help researchers analyze sewage samples and to gain a retrospective understanding of how COVID-19 spread in communities might be detected in sewers. On average, the MWRD transforms more than 1.2 billion gallons of wastewater into clean water each day at seven water reclamation plants (WRPs) to ensure the public health and the environment are protected across an 882-square-mile service area covering the majority of Cook County. The MWRD also protects area waterways and manages stormwater to mitigate flooding.

The MWRD's Monitoring and Research Department has been collecting samples from seven WRPs to support numerous studies on sewage surveillance monitoring for COVID-19 and tracking its spread in the Chicago area since March 2020. The risk of transmission of the virus through wastewater is low, but traces of viral RNA present in the wastewater offer insight into its prevalence. An effective way to conduct COVID-19 monitoring is through targeted community-level monitoring of wastewater samples. Although it is retrospective and cannot prevent COVID-19 or its spread, targeted monitoring can effectively survey communities for potential spread and hot spots and give public health agencies an edge in evaluating the presence of the virus and implementing additional strategies. The MWRD does not own local sewers that would allow it to conduct a detailed surveillance at the local community level, but the agency can collect wastewater samples flowing into its treatment plants via local sewers and the MWRD's intercepting sewers to provide a big picture overview. However, the sample collection from intercepting sewers is not simple. Local level sampling by each community and sample analysis may create considerable workload that is beyond current capacity and resources. The MWRD maintains the best quality control in sample collection to ensure reliable data production and assists with data interpretation and timely use of data to warn public health departments of possible outbreaks. The MWRD has provided plant operating data, pertinent information and mapping data about the sewerage system within the service area, and assisted researchers to assess different sampling frequency and methods for concentration and quantification of virus genetic material in samples.

**1.** Traces of the COVID-19 virus can be monitored in the flow of wastewater from a person carrying the virus.

**2.** Following a toilet and pipes, wastewater is conveyed through local sewers and the MWRD's intercepting sewers.

**3.** At the MWRD's seven water reclamation plants, 24-hour composite samples are taken and shared with research partners.

## MONITORING THE WATER ENVIRONMENT

The MWRD's Monitoring and Research Department employs 291 staff members, including many talented and essential lab technicians who sample and test the region's water and wastewater and ensure water quality meets the highest standards. At any given time, the MWRD encounters unpredictable and unique situations. COVID-19 is no exception. Monitoring and Research staff analyze groundwater, organic compounds and both wastewater entering the WRPs (influent) and clean water discharged from the WRPs (effluent) and share its water quality analysis at mwrd.org/reports.The MWRD also collects monthly river water samples at 29 locations throughout Cook County. They then return these samples to the lab, where they analyze the water for dozens of chemical and biological constituents. The MWRD also operates continuous monitors, which collect hourly dissolved oxygen levels, specific conductance measurements, and temperature readings at 21 locations throughout the waterways in the MWRD service area.

# SEWAGE SURVEILLANCE STUDIES

## RESEARCH PROJECTS

**Research partners:** Stanford University and University of Michigan.

**Funder:** National Science Foundation (NSF).

Between March 2020 and March 2021, the MWRD collected and froze samples each week and shipped them to researchers at Stanford University along with metadata associated with the samples and sewershed information about the MWRD's WRPs. Researchers developed methodologies for detecting genetic markers of the COVID-19 virus in sewage resulting from feces shedding from symptomatic and asymptomatic patients at a community scale and using the data generated to develop models to predict the prevalence of COVID-19 in the community. The MWRD's samples were taken from six MWRD WRPs and included both influent (raw sewage) and primary sludge solids. The study included 49 wastewater treatment utilities across the United States. The research team may still publish results from these samples, but the MWRD's participation has concluded.

## LOCAL PROJECTS

**Research partners:** Argonne National Laboratory (Argonne), Northwestern University (NU), and the University of Illinois at Chicago (UIC).

**Funder:** Walder Foundation.

From October 2020 to December 2021, the MWRD provided raw sewage and final effluent samples from all seven MWRD WRPs, along with information about the MWRD's WRPs and collection system as part of the Chicago Prototype Coronavirus Assessment Network Node (PCANN). Samples from all WRPs varied by week depending on the laboratories' capacity and stage in the pandemic. Researchers have developed sampling and testing procedures and logistics among collaborators for the study titled: "Tracking SARS-CoV-2 in Chicago Area Waterways and nearshore Lake Michigan." The Argonne/UIC/NU team analyzes samples, evaluates data and communicates findings to the local public health departments, including the Cook County and Chicago departments of Public Health. Researchers have also received support from the Illinois Department of Public Health (IDPH) and are working with other partners to test new technologies that will allow for analytical results to be obtained in as little as one day for potential statewide application.

**Research partner:** Discovery Partners Institute (DPI)

**Funder:** Illinois Department of Public Health and Chicago Department of Public Health.

Beginning in January 2022, the MWRD provided raw sewage samples each week from all seven MWRD WRPs, along with information about the MWRD's WRPs and collection system. Researchers are building off the Walder Funded PCANN program to establish and expand a statewide wastewater program. The DPI Wastewater team includes researchers from UIC, Northwestern, Argonne, and University of Chicago. The DPI team analyzes samples for virus particles and variants, evaluates data and communicates findings to the state and local public health departments, including the Cook County and Chicago departments of Public Health. All data generated by DPI will be entered into the national database and will be accessible to local and state public health departments. State and local public health departments may share the SARS-CoV-2 wastewater data publicly on their websites or as part of reports.

## FEDERAL PROJECTS

**Project partner:** HHS Contractors - AquaVitas LLC (Phase 1) and Biobot (Phase 2).

**Funder:** U.S. Department of Health & Human Services (HHS). (Phase 1)

The HHS conducted a study in two phases. Phase 1 was from January to February 2021 and covered about 10 percent of the U.S. population (36 million people), including approximately 100 wastewater treatment plants. Phase 2 was from June to August 2021 and covered about 30 percent of the U.S. population from approximately 300 wastewater treatment plants. Samples were included in Phase 1 from the MWRD's Stickney, Calumet, O'Brien, Kirie and Egan WRPs and Phase 2 all seven WRPs. The study included sampling, analysis and uploading the analytical data. The HHS has created a national database that makes the data available to local public health departments.

**Project partner:** LuminUltra (Phase 1) and to be awarded (Phase 2).

**Funder:** US Centers for Disease Control and Prevention National Wastewater Surveillance System (CDC NWSS). (Phase 1)

The CDC NWSS is conducting a study in two phases involving samples from the MWRD's Kirie and Egan WRPs. Phase 1 is from January 2022 to March 2022 and focuses on testing 100 WRPs recommended by state public health agencies to assess SARS-CoV-2 in wastewater. Phase 2 will be from April until December 2022 and will test those same WRPs for SARS-CoV-2 variants. The study will include twice weekly sampling, analysis and uploading the analytical and operations data. This data will be uploaded to a national database that makes the data available to local public health departments and shared on the CDC NWSS website.

## ADDITIONAL STUDIES

The MWRD's scientists communicate regularly with the Illinois Water Environment Association (IWEA), the Illinois Association of Wastewater Agencies (IAWA), Water Research Foundation (WRF), the Water Environment Federation (WEF) and National Association of Clean Water Agencies (NACWA) to learn more about COVID-19, sewage surveillance, wastewater and biosolids analysis. The MWRD has also engaged with the CDC, the Council for State and Territorial Epidemiologists, and U.S. Environmental Protection Agency (EPA) on the improvement of national wastewater surveillance programs and stands ready to be called on for additional research.

The MWRD follows the guidelines of the CDC and IDPH and consults with local agencies like the Chicago Department of Public Health and Cook County Department of Public Health on how to best utilize sewage surveillance data. In September 2020, the MWRD signed a letter of support to the California Association of Sanitation Agencies for requesting funding support for sewage surveillance for COVID-19 from several non-profit organizations.

To view CDC NWSS data along with IDPH/CDPH DPI data, visit **https://covid.cdc.gov/covid-data-tracker/#wastewater-surveillance**