State of Alaska Epidemiology Bulletin

Department of Health
Heidi Hedberg, Commissioner
Robert Lawrence, MD, MA, CMO

3601 C Street, Suite 540
Anchorage, Alaska 99503

Division of Public Health
Lindsey Kato, MPH, Director

https://health.alaska.gov/dph/Epi
24 Hour Emergency (800) 478-0084
Local (907) 269-8000

Editors:
Joe McLaughlin, MD, MPH
Louisa Castrodale, DVM, MPH

Bulletin No. 4
May 23, 2024

Wastewater Monitoring in Alaska

Background

Wastewater monitoring (WWM) involves testing sewage for viruses, bacteria, toxins, or other substances that can enter into wastewater via toilets, sinks, showers, laundry, drains, and sewers. WWM serves as an early warning system to monitor trends, to identify conditions of public health importance, and to detect outbreaks or the emergence of a new pathogen.[1] Pathogens identified in sewage samples from a wastewater treatment plant could come from anywhere in the sewershed (the geographic area drained by a network of sewers and funneled to a treatment plant). The practice of WWM has been around since the 1940s when it was used to track the spread of polio.[2]

The Centers for Disease Control and Prevention (CDC) formed the National Wastewater Surveillance System (NWSS) in 2020 as part of the COVID-19 pandemic response effort. Many U.S. states subsequently began testing wastewater for SARS-CoV-2, the virus that causes COVID-19. Some WWM programs in the U.S. now test for other respiratory pathogens (e.g., influenza and respiratory syncytial virus [RSV]), gastrointestinal pathogens (e.g., hepatitis A virus, norovirus, rotavirus), and additional infectious agents (e.g., mpox and *Candida auris*). Some WWM programs are also exploring methodologies that enable testing for antimicrobial-resistant pathogens, illicit substances, and environmental toxins. WWM provides improved equity and efficiency in disease surveillance compared to traditional case-based methods, as it captures community-level infection data regardless of individuals' access to healthcare or their healthcare-seeking behaviors.

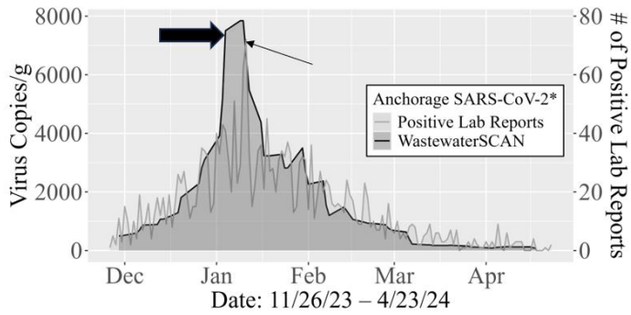
WWM limitations include the exclusion of communities without sewer systems (e.g., those on septic-based systems or decentralized water systems);[3] challenges in detecting low concentrations of pathogens in sewage;[3] and costs and logistical constraints associated with sample collection, transport to a testing facility, and testing. Alaska's rural geography, isolated communities, and array of wastewater treatment systems present additional barriers. Finally, snowmelt and rainwater can enter into some sewersheds (e.g., through domestic sump pumps, gutter drainage from flat-roof buildings, and leaky underground sewer pipes), which might result in pathogen detections from sources outside of the sewer system.

WWM in Alaska

Many Alaska communities (e.g., Anchorage, Juneau, and Bethel) have WWM programs in place through private contracts, academic partnerships, and/or local community investments.[4] The Alaska Division of Public Health (DPH) is working with the Alaska Department of Environmental Conservation, the University of Alaska Anchorage, CDC's Arctic Investigations Program, and other partners to establish in-state testing capacity for WWM. Given the diverse wastewater treatment infrastructure present in communities across Alaska, DPH will support methodologies appropriate to rural communities that include sample collection techniques that work with lagoon systems and testing-in-place protocols using tabletop machines (e.g., Cepheid GeneXpert®).

The bulk of Alaska wastewater testing is occurring through one of two national programs, CDC NWSS and WastewaterSCAN (both are conducted at Verily Labs, a subsidiary of Alphabet, Inc.). NWSS is a federal collaborative effort involving Verily Inc. and government agencies to establish a nationwide network for monitoring infectious diseases in wastewater. WastewaterSCAN is a private company specializing in wastewater monitoring technology that offers a different scope of pathogen monitoring options than the NWSS program. WWM can detect increases in pathogen levels in near real-time, allowing for early detection of outbreaks, whereas clinical case surveillance relies on reporting and confirmation of individual cases, which may introduce delays in identifying emerging outbreaks or trends (Figure). This underscores the utility of WWM in providing advanced notice for changes in the prevalence of infectious diseases and other conditions being monitored.

Figure. Comparison of Wastewater Monitoring and Laboratory-Confirmed Reports for SARS-CoV-2 — Anchorage, November 26, 2023, through April 23, 2024*



**Data collected from Verily's WastewaterSCAN SARS-CoV-2 dashboard (https://data.wastewaterscan.org/) and laboratory-confirmed SARS-CoV-2 cases in Anchorage. WWM data were normalized (to pepper mild mottle virus levels) to represent concentrations of virus copies per gram in wastewater. The thick arrow signifies an early signal of heightened viral counts detected through wastewater sampling compared to traditional clinical case surveillance data, which peaked later (thin arrow).*

The Yukon Kuskokwim Health Corporation (YKHC) implemented WWM in October 2022 in Bethel. Wastewater samples collected at a terminal lift station are tested for SARS-CoV-2, RSV, and influenza onsite using the Cepheid's GeneXpert® system. Trends have correlated well with clinical testing results in Bethel and have informed the timing of influenza vaccination campaigns and RSV monoclonal antibody distribution. WWM data along with interpretation and community guidance are shared via a YKHC website.[5] In December 2023, with support from CDC, YKHC began a pilot project to expand its WWM to include tuberculosis and norovirus testing. This funding also supports collaboration with the University of Alaska Anchorage to test wastewater for the presence of other pathogens and antimicrobial resistance markers.

Looking ahead, Alaska DPH's WWM Program is working to build important public health infrastructure to be better prepared for future pandemics like COVID-19. This will include improved WWM testing technology, data processing tools, and partnerships with utilities and other key stakeholders. To coordinate the implementation and expansion of WWM in Alaska, DPH will be launching a workgroup in the near future composed of wastewater treatment center operators, laboratories, public health officials, and other key partners. People interested in participating in this workgroup may contact the Section of Epidemiology (907-269-8000) to learn more.

Acknowledgements

We extend gratitude to participating utility providers; their ongoing willingness to engage and collaborate on WWM is essential for the program's sustainability moving forward.

References

1. Centers for Disease Control and Prevention (CDC). About Wastewater Data. Last reviewed January 5, 2024.
2. Science in the News (blog). Something in the Sewage: What watching our wastewater can tell us about infectious diseases. Last reviewed March 9, 2023.
3. CDC. Wastewater Surveillance: A New Frontier for Public Health. Last reviewed April 15, 2024.
4. Alaska Division of Public Health. Wastewater Monitoring. Last reviewed April 30, 2024.
5. Yukon-Kuskokwim Health Corporation. Respiratory Illness Surveillance. Last reviewed May 10, 2024.

(Contributed by: Eliza Ramsey MPH, Clayton Weingartner MPH, William George MS, Alaska Section of Epidemiology.)