

What You Need To Know About In-House Wastewater Based Epidemiology

Introduction

Since early 2020, we have learned a lot about COVID-19 and the SARS-CoV-2 virus that causes it. But presymptomatic and asymptomatic transmission, plus gaps in testing and contact tracing, have made it hard to pinpoint the virus and take appropriate protective actions against outbreaks. Today, streamlined sampling and testing (eligible for CARES Act funding) are making in-house wastewater testing one of the least invasive and most reliable early warning systems available.

Some of the earliest adopters of wastewater testing for SARS-CoV-2 presence were universities that already had the right equipment and personnel in their science labs. But now that more comprehensive [testing solutions](#) and cost-effective [sampling options](#) are readily available, wastewater utilities are learning that obtaining valuable readings is more practical and affordable than originally anticipated (Figure 1). Being able to provide more granular data for public-health decisions in their community is enabling wastewater utilities to have greater impact in protecting their most vulnerable customers.

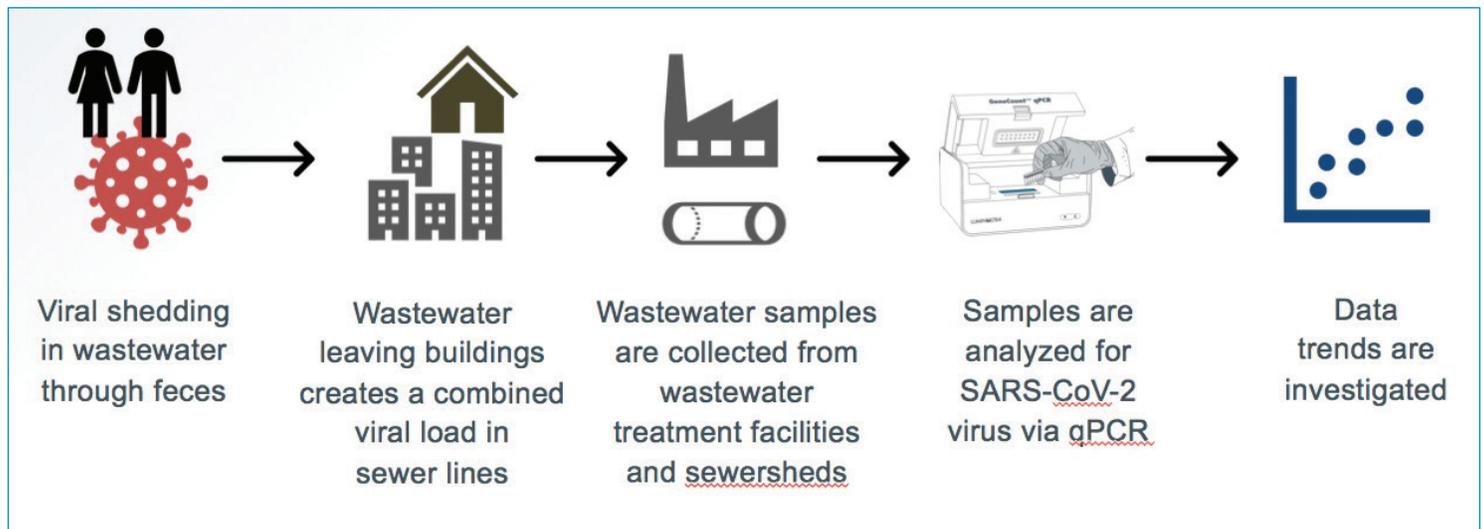


Figure 1. Wastewater utilities can play an important role in quantifying the relative incidence of SARS-CoV-2 virus in their local communities, even before human testing reveals positive COVID-19 cases. Non-invasive sampling at key locations throughout a sewershed can identify high-risk locations in time for public-health officials and residents to take more aggressive protective measures. (Graphic courtesy of LuminUltra)

Debunking Myths About Wastewater Based Epidemiology

- **“It’s Too Hard.”** For as amazing as quantitative polymerase-chain-reaction (qPCR) technology is, the technical knowledge and physical skills required to obtain results from a purpose-specific testing solution in just a few of hours are no more demanding than those required for wastewater nutrient or organics testing. Turnkey solutions, including instrumentation, labware, reagents, and simplified RNA separation, can deliver results in about two hours. Testing personnel wear the same PPE gloves and masks used when testing for E. coli, norovirus, etc.
- **“It’s Too Expensive.”** Compared to manual grab samples being shipped to external, third-party labs, automatic sample collection (Figure 2) and robust in-house qPCR instrumentation offer both faster results and a much lower out-of-pocket cost per test. Better yet, those same capabilities add capacity for additional process-control, water-quality, and health-issue testing (e.g., problematic bacteria in a wastewater treatment train, E. coli-induced beach closings, on-site testing for Legionella threats in potable water systems, and more). Equipment costs are comparable to other common wastewater lab instrumentation (i.e., spectrophotometers).
- **“It’s Too Late To Do Anything With The Information Anyway.”** It is true that wastewater testing reveals SARS-CoV-2 presence only after people have been infected. But even simply announcing a spike in SARS-CoV-2 presence via local media or social media can encourage more citizens to exercise precautionary behavioral changes. As this success story at the University of Denver demonstrates, sharing same-day information collaboratively with administrators, health authorities, and other decision-makers enables them to make more informed and effective decisions sooner (Figure 3).
- **“With The Introduction Of Vaccines, Is Epidemiology Testing Even Necessary?”** Despite ongoing vaccination efforts, epidemiologists warn of the need to remain vigilant for a year or longer due to overwhelming demand and delays in vaccine distribution, anti-vaccine resistance, seasonal resurgence, and the potential for new viral mutations. As infection rates drop and personal testing decreases over the long term, ongoing wastewater monitoring can serve as the proverbial ‘canary in the coal mine’ to detect any resurgence in viral presence.



Figure 2. Automatic sampling is a cost-saving, labor-saving way to enable thorough data collection with minimal disruption to wastewater utility work schedules and budgets. This instructional video describes how proper sampler design and implementation can pay dividends in epidemiological and environmental testing applications.

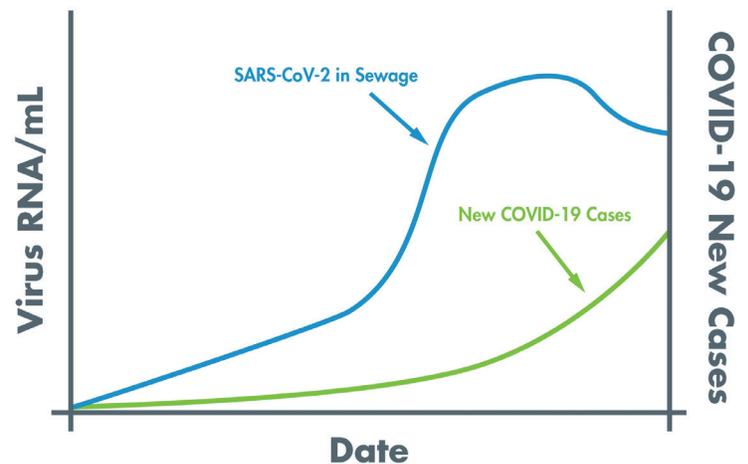


Figure 3. Wastewater epidemiology testing with in-house qPCR technology shows a strong correlation in the rising presence of the virus that causes COVID-19 up to seven days in advance of manifesting it in confirmed new cases. Using that information to take immediate action can help entire communities—and in the case of localized sampling, sub-communities—reduce opportunities for transmission and minimize disruption of normal activities. (Graphic courtesy of LuminUltra)

Calculate The Benefits To Be Achieved

The underlying technology in the world's first onsite, rapid qPCR wastewater-testing solution accelerates the potential to identify viral presence as an advance warning system for increased risk in local communities, making it easier to achieve:

- **Faster Results.** In-house testing maintains control over sampling locations, test frequency, and test costs, with results available in as little as two hours vs. up to seven days for mail-in, third-party-lab testing.
- **Highly Accurate Testing.** Existing in-house-lab personnel using self-contained qPCR instrument and assay kits can generate reliable, accurate results from even trace amounts of virus in wastewater.
- **Lower Costs Per Test*.** Quicker results also come at a fraction of the cost for mail-in, third-party-lab testing—around \$40 per in-house test vs. \$200 to more than \$600 per third-party test—making widespread testing more affordable. *After instrument purchase.
- **A Comprehensive Solution.** Complementing rapid qPCR technology with automatic sampling, a purpose-specific SARS-CoV-2 assay, and task-specific training makes timely testing capabilities easily accessible to any wastewater lab technician (Figure 4).



Figure 4. Comprehensive kits that include everything needed to start—a qPCR instrument, pipettes and necessary labware, heating block, and SARS-CoV-2 assay with reagents—make it easy for current wastewater lab technicians to deliver new insights on a community's exposure to COVID-19 from the first day of testing.

Turn Open Concerns Into Actionable Information

The opportunities afforded by in-house testing are reliable and desirable for public wastewater utilities tasked with informing local public-health officials and high-risk customers, as well as for independent wastewater testing/consulting firms needing to address private-client concerns:

- **Document Rapidly Changing Trends.** While SARS-CoV-2 presence in wastewater does not quantify the exact number of human COVID-19 cases or identify specific individuals, trends in the overall viral load have been [documented](#) as reliable advance indicators of increasing or decreasing risk.
- **Support Public-Health Decisions.** In-house wastewater testing provides important insights decision-makers need to adapt public-health guidelines to new spikes in SARS-CoV-2 presence or evaluate impacts of previously issued guidelines. As the primary analysts of system-wide or zone-specific SARS-CoV-2 presence in the collection system, wastewater utilities can play a collaborative role in improved response to local threats.
- **Deliver Value-Added Service For Customers.** Large wastewater customers—such as schools, universities, senior-care facilities, penitentiaries, and even large commercial entities—can benefit from insight into their specific, shared-space communities. Portable automatic samplers that collect targeted samples from strategic locations can help such organizations maintain a higher degree of normalcy through informed management decisions, take quick action to tamp down infection flare-ups, and better protect the interests of employees and residents.

Take The Next Steps Toward Improved COVID-19 Insight

For wastewater operations looking to evaluate SARS-CoV-2 wastewater monitoring, working closely with an experienced provider of [wastewater epidemiology surveillance solutions](#) can provide expanded insight into various testing options and the practical and financial benefits of each. That can include mail-in testing for ad-hoc spot checks; ongoing, timely, and affordable in-house [sampling](#) and [testing](#) programs; and even guidance on securing [CARES Act funding](#) for those capabilities.



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