**Sewer Monitoring and the Co-Immunity Project**

UNIVERSITY OF LOUISVILLE
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Co-Immunity PROJECT

The COVID-19 pandemic remains an ongoing and evolving situation. Below are frequently asked questions about sewer monitoring, which has been used as a public health tool since 1854 and has received new attention during the 2020-2021 SARS-CoV-2 pandemic.

**What is the Co-Immunity Project?**
Co-Immunity is a research project led by the Christina Lee Brown Envirome Institute at the University of Louisville School of Medicine and several partners. The goal of the Co-Immunity Project is to monitor and understand the spread of COVID-19 in Louisville Metro-Jefferson County. Additional goals include identifying risk factors that predispose susceptible individuals and vulnerable communities to the virus and uncovering acute and long-term health consequences of COVID-19. Learn more: https://louisville.edu/envirome/thecoimmunityproject

**Why is sewer monitoring a good public health tool?**
Due to the high cost and time needed to conduct individual testing, there is a need for time and cost-effective approaches to track the incidence and spread of COVID-19, and other diseases, in cities. Sewer Monitoring through a public health technique called wastewater-based epidemiology (WBE) is an example of such an effective, convenient, and economical strategy.

Sewer monitoring has been successful in accurately tracking polio and stomach and gastrointestinal virus outbreaks across the globe. Because people infected with SARS-CoV-2 shed the virus in their stool, even when they are asymptomatic, sewer monitoring offers four major benefits:

1. Analyzing wastewater for the virus can allow us to forecast a community's level of infection up to a week before clinical diagnostic tests, such as nose-swabs.
2. Wastewater testing may also help us understand how COVID-19 spreads, as repeated sampling over time has the potential to identify new outbreaks.
3. Early signals in wastewater can potentially prompt actions to reduce transmission.
4. As the COVID-19 pandemic ends, it is likely communities will see increased incidence of small, localized, outbreaks. In these instances, WBE could be used as a prescreening tool to better target clinical testing and vaccines in communities with limited resources.

At the University of Louisville, we want to use Louisville's underground sewer network to cultivate new methods to advance scientific understanding, promote health in our community, and be a leader in nation-wide wastewater testing efforts.

**What are the Limitations to Sewer Monitoring? (What *can't* it tell us?)**
Lab results show how much virus is entering the sewer system. Sewer water samples cannot show where or who is shedding the virus or the exact number of people who have contributed to

a single sample. Shedding levels can vary significantly between individuals because age, sex, income, and lifestyle factors impact how much stool a person normally produces. Shedding levels also vary with the severeness of COVID-19 infection and vary at different stages of infection.

**When do People "Shed" the Virus?**
People who have been infected may begin to shed virus in bowel movements before they experience symptoms and shedding can continue after they are no longer infectious. Published data suggests that shedding can continue for weeks after the infection begins. People who are asymptomatic also shed the virus. However, most of the data we have on this topic comes from studies of hospitalized individuals, mostly very sick individuals.

**What are you looking for in sewer water samples?**
Researchers are looking for fragments of RNA from the SARS-CoV-2 virus. If there is a lot of RNA fragments it means that there is more COVID-19 infection in that area. If there is a very small amount of RNA it means that fewer people are infected with the virus in that area.

**Where are samples collected?**
Through a partnership with Louisville's Metropolitan Sewer District (MSD) we are tracking the amount of virus RNA at 17 locations throughout Jefferson County. These sites include 13 manhole sites, 2 pump stations, and 2 wastewater treatment plants. Having multiple locations instead of just one makes our testing more accurate and reliable. At least 8,000 people contribute waste into the pipes at each sewer monitoring site.

**How are the samples collected?**
Sewer water samples are collected twice a week using a portable pump that pulls a small amount of water out of sewer pipes every 15 minutes over a 24-hour period. The sample is called a "composite" sample because it shows a picture of everything that has gone down nearby toilets over the past day and night. Each sample contains 4-5oz of sewage, just over a half-cup of water.

**Who is excluded from wastewater tests?**
Testing results will only represent the people in a community with flush toilets that go into Louisville's sewer system. People that do not use flush toilets or people who have septic systems are not represented in the sewer water samples.

**How are the results from wastewater tests used?**
Researchers will use test results, along with many other pieces of clinical information, to inform public health decisions. UofL researchers meet with the Louisville Metro Public Health Department weekly to share sewer monitoring results from the Co-Immunity Project.

**How does wastewater data inform our community?**
Sewer monitoring provides two key pieces of information:

1. Where the virus is, and
2. Where it is spreading.

Finding the virus in wastewater has either come just before or at the same time as new confirmed

clinical cases. For example, if the virus is found in wastewater in areas with no confirmed cases, this could mean that new clinical cases will soon appear.In areas where no virus is found in the wastewater, this could mean that few people, if any, are infected in that portion of our community.

**Are you able to identify specific people from sewer water samples?**
No, sewer monitoring is completely anonymous for two reasons:

1. We picked sampling locations that combine sewage from at least 8,000 residents, effectively preventing the identification of particular people.
2. Our lab methods only extract virus RNA. No human DNA is ever analyzed.

**What are the Ethical Implications of Sewer Monitoring?**
Issues of privacy or stigmatization pose potential concerns for research, data collection, and analysis of wastewater. However, through the assurance of anonymous results, the protection of identifiable information, and diversity of selected sampling sites, the Co-Immunity Project has incorporated ethical approaches to their work which safeguard the safety and well-being of individual privacy in effective ways. By developing strategies for transparency around scientific findings and research outcomes, as well as crafting community agreements that incorporate the input of our community members, ethical research methods have become a major component of the Co-Immunity wastewater study. As further knowledge and insights regarding the ethics of wastewater testing continue to emerge and evolve, we are committed to adjusting our own principles and adopting new guidelines into our studies with the intent of promoting equity and inclusivity in the realms of medicine and public health.

**Is this information the only source of information about COVID-19 infection used by public health authorities?**
No, wastewater monitoring is strictly used as additional information to be compared with clinical case reporting from a variety ofsources. See other sources of information that the CDC uses by visiting www.cdc.gov/coronavirus/2019-ncov/cases- updates/wastewater-surveillance.html#what-is

**Can I Get COVID-19 from Drinking Water, Sewer Water, or Streams?**
It is unlikely - waterborne transmission of SARS-CoV-2 has never been demonstrated in humans.

You will not contract COVID-19 from drinking water. Louisville has some of the best water in the United States. The Louisville Water Company's treatment methods ensure that you cannot get COVID-19 from drinking tap water.

It is unlikely that you can contract COVID-19 from sewer water. The virus gets damaged in greywater from sinks, washing machines, showers, etc. because of detergents, soaps, and other disinfectants which inactivate the SARS-CoV-2 virus. Researchers predict that SARS-CoV-2 will also be inactivated through the conventionaltreatment of wastewater.

It is unlikely that you can contract COVID-19 from streams. There is no evidence of COVID-19 transmission through surface water in rivers, creeks, and lakes. Researchers have found SARS-CoV-2 RNA in surface water (streams, creeks, and lakes) only twice. In these two studies only

fragments of RNA were found, not the whole virus. This is because coronaviruses are unstable (they do not survive well) in the environment because they are vulnerable to damage by UV light and oxidants such as chlorine and bleach.

However, it is important to know that Louisville's storm water and wastewater are often routed through the same network of pipes, this is called a combined sewer system. Therefore, during heavy rain, sewage and storm water can mix inside the sewers and overflow into streams like Beargrass Creek. This is why other pathogens (such as E-coli) are commonly found in rivers, lakes, and streams. Using sensible precautions, such as hand washing after water recreation, you can continue to enjoy Louisville's abundant and treasured waterways.

**How is wastewater sample and data collection funded?**

The research is funded through the Christina Lee Brown Envirome Institute's the Co-Immunity Project. Additional sources of funding include the Jewish Fund for Excellence, the Foundation for a Healthy Kentucky, and the Centers for Disease Control (CDC).

**How can I learn more about wastewater-based epidemiology?**

Reach out to learn more, we will answer any question you may have or present at community meetings.

- Email us at envirome@louisville.edu for a complete schedule or more information.
- Visit our website: www.louisville.edu/envirome/thecoimmunityproject/wastewater
- Connect with us on Facebook: www.facebook.com/CLBEnviromeInstitute

**Can I visit a sampling site in person?**

Yes, interested participants or community members can schedule a site visit by emailing us at envirome@louisville.edu.

**References & Suggested Reading**

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