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Frequently Asked Questions (FAQs): Wastewater Surveillance for Influenza A Viruses

These FAQs address the evolving situation around wastewater surveillance for influenza A specifically. For general information about wastewater surveillance and the role it plays in infectious disease surveillance in California, please see the [CDPH Wastewater Surveillance Toolkit](#), which includes FAQs and additional resources.

What is Wastewater Surveillance?

Wastewater surveillance, also known as Wastewater-Based Epidemiology (WBE), is a public health tool that can test for fragments (e.g., RNA, DNA) of infectious pathogens (e.g., viruses, bacteria, etc.) in untreated wastewater samples. Samples for wastewater surveillance are generally collected as the wastewater enters a wastewater treatment plant (WWTP) before it begins the treatment process in which microbes, contaminants, and debris are removed from the wastewater. Testing these samples can provide additional understanding about the presence of viruses and other infectious diseases within a community to supplement other sources of public health surveillance.

As an example, people infected with SARS-CoV-2, the virus that causes Coronavirus disease 2019 (COVID-19), can shed the virus in feces for several days. Those viral fragments get flushed down the toilet and mix with sewage from the entire community. By taking a single small sample of wastewater at the WWTP and looking for how much viral material is in it, wastewater surveillance can quickly provide information about how much SARS-CoV-2 is impacting the entire community. This type of surveillance tool can provide useful information even as people change their testing habits over time and can sometimes provide early warning of increased disease activity.

How are sewersheds determined as part of the California Wastewater Surveillance Network?

Sewersheds represent the service areas of wastewater treatment plants and indicate where wastewater is being collected and monitored (e.g., where pipes drain from). Sewershed boundary maps are typically created and provided by the utilities and are mapped based on sewer connection lines. For purposes of wastewater surveillance to inform public health, samples are most commonly collected at the headworks (main input) of the treatment plant, pre-treatment, and represent the entire catchment area for a given wastewater treatment plant, and thus can catch any contributions that are connected to that sanitary sewer system.

All sites participating in wastewater surveillance are invited to submit their data to CDPH and be part of the Cal-SuWers Network).



How can communities request H5N1 wastewater testing or create their own sewershed for testing?

If communities are interested in participating in wastewater surveillance, there may be a limited opportunity to join through a contract with the CDC NWSS program. The CDPH laboratory does not currently have capacity for testing at additional sites. If there are sites that are interested, we ask that you please send the CDPH wastewater surveillance program the contact information for these sites, at wws@cdph.ca.gov. We will then compile a list of priority sites throughout our state that we will submit for CDC NWSS to review and approve based on priority sites throughout the county.

Is California conducting wastewater surveillance for influenza?

Yes. Wastewater surveillance for select infectious pathogens (including influenza A and influenza B) is currently being conducted in California through a network of several programs and partners, including the California Department of Public Health (CDPH) state testing lab (the Drinking Water and Radiation Laboratory (DWRL)), and partners in the California Surveillance of Wastewaters (CalSuWers) Network, which include WastewaterSCAN (an academic program led by researchers from Stanford University and Emory University), and sites enrolled in a Centers for Disease Control and Prevention (CDC) National Wastewater Surveillance System contract (using Verily Life Sciences laboratory as contractor).

For more information about CalSuWers, please see [California Wastewater Surveillance Network FAQs](#).

For more information about WastewaterSCAN, please see [WastewaterSCAN's FAQs](#) and [About Us webpage](#).

How long has influenza been monitored via wastewater surveillance in California?

Wastewater surveillance for influenza in California began in January 2022 through the WastewaterSCAN program to supplement other public health surveillance systems for human influenza. Following the successful use of wastewater for the surveillance of SARS-CoV-2 during the COVID-19 pandemic, wastewater surveillance was expanded to include other infectious pathogens (including influenza, mpox, and norovirus) of public health importance in California. The WastewaterSCAN program currently tests wastewater for influenza A (including subtyping of H1, H3, and H5) and influenza B at 140+ sites across the U.S., including 28 sites in California. Together with wastewater testing performed by CDPH DWRL and CDC NWSS, influenza monitoring now occurs at over 100 sites in California.

Wastewater influenza A data from all sites participating in CDPH's Cal-SuWers program, including WastewaterSCAN, are available through the [CDC NWSS program influenza A dashboard](#). WWSCAN program data are also available through the [WastewaterScan dashboard](#). CDPH also maintains an internal dashboard including influenza A data that is available to all participating sites; please email wws@cdph.ca.gov for access if needed.

What does influenza monitoring in Wastewater in California tell us about this current flu season?

While seasonal influenza viruses are detected year-round in the United States, they are detected in greater numbers and concentration during the influenza season, which generally occurs during fall and winter. The exact timing and duration of influenza seasons varies, but activity often begins to increase in October and peaks between December and February.

The most recent influenza respiratory season (winter 2023/2024) demonstrated a typical seasonal pattern, peaking in early January 2024. Influenza activity has decreased since then, though there remains continued influenza activity, which can be a normal and expected pattern.

As of mid-March/April 2024, there have been increases in influenza A concentrations in wastewater at some sites across the country, including a few sites in California. Thus far, in California, most of these increases have been relatively small and/or short-lived.

Of note, wastewater can be tested for influenza A, which includes all subtypes (H1, H3, and H5). To date, most wastewater data reflect results for general influenza A. Starting in spring 2024, wastewater samples also began being tested for specific subtypes of influenza A, including H5. Tests for overall influenza A are distinct from H5 subtype testing, and results are reported separately. Detection of influenza A does not mean that H5 is present; in some instances, H5 may be one of the subtypes present in the wastewater.

Two recent studies indicated that at least some sewersheds with increases in influenza A concentrations in the spring of 2024 had detectable concentrations of H5 in the wastewater. One published study detected H5 in 5 of 6 monitored sites (Wolfe et al., 2024; <https://doi.org/10.1021/acs.estlett.4c00331>). The other study detected H5 in 19 of 23 monitored sites (Tisza et al., 2024; preprint: <https://doi.org/10.1101/2024.05.10.24307179>). Neither of these studies were able to differentiate between animal or human sources of H5 in the wastewater.

What do human influenza surveillance data show in California?

Human laboratory surveillance data do not indicate a significant or unexpected increase in human influenza activity (as of September 2024). Similar to wastewater surveillance data, human laboratory surveillance data show that the most recent influenza respiratory season (winter 2023/2024) demonstrated a typical seasonal pattern and peaked in early January 2024. Influenza activity has decreased since then; continued influenza activity can be a normal and expected pattern. There have not been any human influenza A (H5N1) infections in California to date (as of September 12, 2024).

For more information concerning human influenza surveillance in California, please see [CDPH Influenza Surveillance Program Historic Influenza and Other Respiratory Disease Surveillance Reports](#).

What is the reason for the increases in influenza A concentrations in wastewater at several national sites and in some California sites since March 2024?

This is an area of active investigation, and the reasons likely vary at different sites due to different localized reasons.

Localized patterns of fluctuating human seasonal influenza activity (influenza H3 and H1 viruses) may be contributing to increased wastewater concentrations of influenza A. However, H5N1 influenza A viruses may also contribute to increased wastewater concentrations of influenza A. H5 testing in wastewater cannot differentiate whether the source is animal or human at this time. Potential animal sources include:

- Animal products from infected animals (e.g., dairy cattle), entering the wastewater stream via dairy processing plants or other industrial, commercial, retail handlers (or less likely, residential consumers)
- Waste from infected wild birds or other animals, especially if sewage systems are 'combined' (see below)

Most wastewater sewage systems in California are considered 'closed,' meaning they do not allow significant intrusion of rainfall into the wastewater stream. However, some systems are considered 'combined,' meaning they can allow rainfall (and other surface contaminants including animal waste) to mix in with normal wastewater streams.

It is important to note that high levels of influenza A virus in wastewater do not necessarily mean that there are H5N1 influenza A viruses present. However, it is possible that H5N1 influenza viruses can be a cause, and the CDC advises that jurisdictions with high levels of influenza A virus continue to review wastewater data in combination with other human influenza surveillance system data (e.g., influenza-like illness, or ILI, or the National Respiratory and Enteric Virus Surveillance System, or NREVSS) and collaborate with partners to better understand factors contributing to increases such as animal sources located in individual sewer systems (e.g., livestock, wild birds, or waste from a milk processing).

Is influenza A (H5N1) virus currently being monitored via wastewater surveillance in California?

CDPH is working with WastewaterSCAN as well as directly with Verily Life Sciences laboratory on testing for H5 (an indicator of influenza A (H5N1)).

WastewaterSCAN began prospective testing with their H5 specific influenza assay at all WastewaterSCAN sites across the country, including in 28 sites across California, in mid-May 2024. CDPH has also contracted with Verily Life Sciences to conduct H5 testing at 7 sites in California in late May 2024.

The first positive H5 wastewater detection for any site will be communicated by the CDPH wastewater surveillance team directly to the involved local health department and wastewater utility. CDPH will be available for support and is developing recommendations for local health departments if there are positive H5 detections in wastewater. CDC has also developed a checklist document for health jurisdiction to follow up increases in influenza A wastewater concentrations or H5 detections. All wastewater influenza A and H5 data from sites participating in the WWSCAN program are available through the WastewaterScan [dashboard](#); please see the WastewaterSCAN dashboard directly for a list of participating sites as this will change over time. Currently CDPH H5 data from contracted sites are only available via a summary report that is routinely sent out to all participating stakeholders. H5 specific data will be included on an internal dashboard in the future. Please email

Wastewatersurveillance@cdph.ca.gov to receive summary reports or for access to the internal dashboard if needed.

The CDC also has a dashboard reporting [influenza A](#), and separately, [H5 data](#) from wastewater.

If wastewater testing detects influenza A H5 at one or more sites in California, does that mean there are human influenza (H5N1) infections in California?

This is an area of active investigation, and the reasons for a positive H5 detection may vary at different sites due to different reasons.

While it is possible that a wastewater influenza A H5 detection is due to human influenza A (H5N1) infections, there are other potential, more likely causes for positive detections in wastewater. These include detections of H5N1 viral fragments contained in animal products and wastes that enter the sewage system. Wastewater collected and tested at a treatment plant comes from a variety of sources, including sewage from industries such as dairy processing plants, commercial and retail businesses, as well as from residential housing. In addition, some sewer systems are combined systems, receiving runoff diverted from rainfall and city streets as well, so animal waste from streets could be washed into the wastewater stream.

The convergence of sewage from multiple sources at wastewater treatment plants means that material tested for wastewater surveillance may include animal sources. If influenza A H5 is detected via wastewater surveillance in California, additional investigation may be warranted.

How will wastewater surveillance help CDPH monitor or better understand potential human influenza A (H5N1) infections in California?

To date, there have been no reported human cases or human detections of influenza A (H5N1) in California. The main goal of wastewater surveillance for influenza is to detect and monitor for human influenza A as well as influenza B trends and activity in California communities. Data collected from wastewater surveillance can help detect early signals of disease transmission in certain areas and help inform public health actions.

Where is wastewater currently being tested for H5N1 influenza A viruses?

Wastewater monitoring is carried out by several groups in California, including the California Department of Public Health (CDPH) state testing laboratory. CDPH also oversees the California Surveillance of Wastewaters Network (Cal-SuWers Network) which includes data from contributing partners, such as the Centers for Disease Control and Prevention (CDC) National Wastewater Surveillance System (NWSS) contract, academic led monitoring initiatives by WastewaterSCAN, Healthy Central Valley Together, and other partners.

The Cal-SuWers Network monitors wastewater in approximately 78 sites in 36 counties, covering about 60% of California's population. Coverage of various pathogens varies depending on the data source and what target(s) each lab is monitoring. H5 monitoring is currently being conducted by the WastewaterSCAN and CDC NWSS programs at 54 sites in California, including three sites in the Central Valley (Turlock, Merced, and Lodi).

There are over 900 wastewater treatment plants in California and, in general, a county is serviced by multiple wastewater treatment plants. A city may also be serviced by multiple wastewater treatment plants (and thus, have multiple sewersheds). Wastewater sewersheds (the service area of a wastewater treatment plant) do not follow municipal boundaries. As the sewershed represents the network of pipes that drain into a single wastewater treatment plant, the boundaries of the sewershed are determined by a number of factors that can vary by location (e.g., existence of historical infrastructure, changes in altitude since wastewater drains downward). Additionally, about 10% of Californians live in residences that have septic systems – these residences would not be represented by current wastewater surveillance methods.

The Fresno-Clovis Regional Wastewater Treatment Facility is a part of the Cal-SuWers Network. Sanger is currently outside of the service area for the Fresno-Clovis Regional Wastewater Treatment Facility. The Fresno wastewater sewershed only covers the city of Fresno.

How are the H5N1 wastewater testing locations determined?

The partner programs contributing to the Cal-SuWers Network independently decided the sites that they monitor.

Sites monitored by CDPH were chosen:

- To complement existing coverage by partner programs
- To meet programmatic priorities (consideration of different use cases for wastewater such as using it as an early-warning system for emerging pathogen concerns or routine surveillance for common diseases)
- Based on availability of utilities to participate given their resource constraints; since participation by utilities is voluntary, buy-in by local utilities and public health and resources are essential for sites to participate.
- In consultation with local health departments.
- With a focus on representativeness and equity (balancing major metropolitan areas with low-density rural sites, and efforts to provide coverage in low-socioeconomic status and high-risk populations).

Selection of sites that monitor wastewater for H5 was based on the pre-existing network that has been built and maintained over time. There are currently 6 sites being monitored in the San Joaquin Central Valley through various wastewater surveillance programs. The number of participating sites across the state, including in the Central Valley has fluctuated. CDPH actively works to sustain state coverage of wastewater surveillance participants, however utility participation is voluntary and competing priorities can reduce a utilities capacity to participate.

Currently, we are looking to recruit additional sites for further H5 investigation. CDPH is continuously working to create a long-term sustainable wastewater infrastructure for public health, which includes continuing surveillance at existing sites while balancing available resources and coverage of sites that are both important for local communities as well as for state or local public health department awareness and action. As public health needs evolve we try to support emerging public health responses with our existing surveillance and pivot as feasible.

How accurate is it for the sewershed it covers?

The accuracy of the system may vary from disease to disease, and even from site to site, depending on site-specific factors (e.g., industrial drainage into the wastewater system that degrades viral particles). The sensitivity and specificity of wastewater for H5 is unknown at this time.

For example, how far reaching and accurate is the Fresno sewershed?

Sewershed boundaries are considered approximations. Boundaries are generally accurate at the city level but to determine the exact accuracy of the sewershed boundary (down to specific buildings) further consultation with the utility directly would be needed. Sanger, CA, is outside the service area for the Fresno-Clovis Regional Wastewater Treatment Facility and its wastewater is not captured by wastewater monitoring at the “Fresno” wastewater sewershed site, which only covers the city of Fresno.

Could it be possible it is leaving a key area like Sanger misdiagnosed or overlooked?

Currently, there is no wastewater monitoring taking place in Sanger, CA and the local utility is not participating in sampling. Wastewater is one aspect of surveillance that complements other traditional public health surveillance, such as monitoring of exposed persons, testing, and offering treatment, for various pathogens already in place. Wastewater surveillance is a sentinel surveillance system, meaning that not all wastewater treatment facilities and cities need to participate in order for public health to have useful surveillance data. Data from participating sites can be used as proxy for nearby and neighboring cities and counties.

California has hundreds of active wastewater treatment plants, and due to resource constraints at the utility, laboratory, and public health levels, it is not currently feasible or necessary to collect and test wastewater samples from all utilities in the state. The goal of the current wastewater surveillance program in California is to serve as a sentinel surveillance system with enough wastewater treatment plants participating from throughout the state to be representative of most populations and regions of the state to provide CDPH and local health jurisdictions with useful disease trends. Even though not all wastewater treatment facilities have the resources or ability to participate, the data from those that do can represent a significant portion of the population and we can use wastewater surveillance to infer the prevalence of diseases in nearby communities. We can use the data from these representative samples to draw conclusions about larger populations.

By monitoring wastewater from strategically selected locations, public health can gain valuable insights into the health of larger regions. For example, we have heard from health officers from counties where wastewater surveillance isn’t available but who still find wastewater surveillance data useful since they may have residents that move between surrounding counties where there is wastewater surveillance data. Often, wastewater surveillance is capturing large metropolitan or high-density cities where many people may commute to work or go to school.

CDPH is continuing to work to create a long-term sustainable wastewater infrastructure for public health, which includes continuing surveillance at existing sites while balancing available resources and coverage of sites that are both important for local communities as well as for state or local public health department awareness and action.

Map:

California Wastewater Monitoring (As of 10/2024)

