Mpox wastewater surveillance in California

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The California Department of Public Health quickly expanded their wastewater surveillance system to include testing of mpox virus. This led to timely and accurate surveillance of the virus that informed the allocation of state and local resources for a public health response that was earlier than it would have been using standard case identification methods.

The "What"

In May of 2022, a mpox case was reported in California. It was identified less than a week after the first case in the United States had been reported. The burden of disease within California was unclear. At a time when insight into where mpox was circulating and how many people were impacted was critical for public health response and for resource allocation, traditional case-based surveillance was still being scaled up.

The majority of California's 61 local health jurisdictions (LHJs) did not have local testing capacity, limiting the number of patients that could be tested for mpox. Additionally, the association between mpox and sexual transmission created stigma impacting both provision of tests by providers and test seeking behavior by patients. Most counties in the state did not yet have a case, and whether significant resources should be dedicated to the response by state and local public health and the healthcare system was unclear.

The California Department of Public Health (CDPH) Surveillance of Wastewaters (Cal-SuWers) Team and the California Wastewater Surveillance Network, established through funding by the Centers for Disease Control and Prevention (CDC) Epidemiology and Laboratory Capacity for the Prevention and Control of Emerging Infectious Diseases (ELC) cooperative agreement, quickly partnered with academic researchers at the Sewer Coronavirus Alert Network (SCAN, a collaboration between researchers at Stanford and Emory University), to use wastewater surveillance as an adjunctive surveillance mechanism to monitor and assess the emerging threat. Testing wastewater for mpox virus would allow LHJs to rapidly identify the presence of mpox cases within entire communities (sewersheds) without needing to screen individual patients. Rapid implementation of surveillance for such an emerging pathogen was possible by leveraging the existing strong collaboration between CDPH and SCAN and wastewater surveillance infrastructure already built for public health surveillance.

To begin wastewater testing for mpox, the SCAN lab rapidly developed and validated the mpox virus assay and aligned their lab protocols to meet laboratory safety requirements needed for handling mpox. In collaboration with CDPH, supported by epidemiologists funded by ELC, wastewater testing for mpox virus began at nine wastewater treatment facilities across five counties (Sacramento, San Francisco, San Mateo, Santa Clara, and Yolo) within weeks of the first mpox case in California was identified.

> Detecting mpox within sewersheds allowed CDPH and LHJs to respond to the outbreak **earlier than would have been possible** with a surveillance system reliant solely on case identification.

The "So What"

Wastewater surveillance provided important early information to public health about the scope of mpox within California and was used for public health planning and response. All nine sewersheds participating in early mpox testing detected mpox virus in wastewater, and at five sites, mpox virus was detected before or within a day of the first case being identified in the corresponding sewershed. In response to detecting mpox virus where cases had not yet been identified, the CDPH mpox response team contacted the respective LHJs to alert them and provide resources. This involved providing information to notify clinicians, consulting with public health labs, and allocating resources for LHJs (vaccines, therapeutics, testing materials, etc.).

In response to detecting mpox in wastewater, LHJs increased outreach and communication to their healthcare system and within their communities to encourage testing, vaccination, and treatment. After multiple sewershed sites had consistent mpox detections in wastewater, suggesting that mpox transmission was widespread within those communities and the state, CDPH mpox response efforts were escalated, and additional resources and support were directed towards the response. The epidemiologists necessary for interpreting this novel data stream (mpox wastewater data) and translating it into actionable public health situational awareness for both state and local public health were funded through ELC.

The "Now What"

Rapidly integrating wastewater surveillance for mpox virus into the California state mpox response, and subsequently detecting mpox within sewersheds allowed CDPH and LHJs to respond to the outbreak earlier than would have been possible with a surveillance system reliant solely on case identification. The strong relationships observed between mpox virus DNA in wastewater and incidence of reported cases in the same regions supports that wastewater surveillance is a viable method to monitor trends in mpox virus activity. This mpox wastewater use case is a good example of how wastewater surveillance can rapidly adapt to identify emerging pathogens, bolster infectious disease surveillance, and protect public health.

Adding additional pathogen targets to the wastewater surveillance system or increasing the number of sites with routine monitoring have the potential to strengthen several surveillance systems throughout the state. Epidemiologists are necessary to understand this complex and novel environmental surveillance system and to carefully assess and adapt use of this system for each new pathogen in order to make the data usable for public health. Partnerships with academic researchers and private laboratories are also important to advance methods and extend outreach. CDC ELC funding made these activities possible, without which California would not have a wastewater surveillance program or network.

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