What are the uses of wastewater surveillance? | Explained

What are the viruses under watch now? How many cities will be covered? What is the process?

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Representative image | Photo Credit: The Hindu

The story so far: The Indian Council of Medical Research (ICMR) will initiate wastewater surveillance for 10 viruses across 50 cities over the next six months. Currently, five cities are being monitored. The move is aimed at identifying any increase in virus growth trend at the earliest, said ICMR head Rajiv Bahl.

What is the plan?

"The next six months will see the scaling up of surveillance across India which will enable us to pick up any rise in virus load in the community. Currently, the COVID-19 virus and polio virus are under surveillance," explained Dr. Bahl. He added that wastewater surveillance will now be used to monitor more commonly reported symptoms caused by several pathogens, such as fever, diarrhoea,

acute encephalitis syndrome (inflammation of the brain), and respiratory distress. The ICMR is involved in establishing environmental surveillance for viruses, including the Avian Influenza Virus (AIV) by monitoring surface water and wastewater, particularly in areas with outbreaks, to establish an early warning system.

India also has a robust surveillance system for Influenza-Like Illness (ILI) and Severe Acute Respiratory Illness (SARI) through ICMR and the Integrated Disease Surveillance Programme (IDSP). Wastewater and Environmental Surveillance (WES) use samples from sewage, or other environmental waters impacted by human wastewater.

Why is wastewater surveillance vital?

The ICMR has noted that like all countries across the globe, India too is experiencing a significant increase in the emergence and re-emergence of pathogens, including viral, bacterial, and zoonotic diseases. Factors contributing to this pathogen load include population growth, rapid urbanisation, environmental changes, and increased human-animal interaction.

Recently, following the COVID-19 pandemic, Wastewater-Based Epidemiology (WBE) has emerged as an effective tool for the early detection of disease outbreaks. According to experts, WBE can be used as a predictive instrument, capable of providing near-real-time, community-level pathogen surveillance and anticipating and mitigating future pandemics even before the first clinical symptoms are detected. "This approach enables cost-effective, non-invasive, and population-wide monitoring of infectious diseases' emergence, evolution, and decline. By identifying pathogens in human waste (e.g., viruses and bacteria), WBE delivers real-time insights into infection trends, encompassing data from asymptomatic and pre-symptomatic populations, enabling timely interventions from public health authorities," according to an article titled 'Integrated environmental surveillance: the role of wastewater, air, and surface microbiomes in global health security'.

It added that among the key advantages are its capacity to encompass large populations, pinpoint transmission hotspots, and facilitate resource allocation for containment efforts.

How is it done?

According to the Centers for Disease Control and Prevention, U.S., people with certain infections (such as COVID-19), can shed pieces of the virus or bacteria when they use the bathroom, shower, wash hands, or launder clothing, even if they don't have symptoms. These pieces of virus or bacteria travel from the toilet, sink, shower, or other drain through the sewage system.

So, before wastewater is treated, wastewater operators take samples to send to the laboratory. Laboratories test the wastewater sample to detect and report on the different types of infections that are circulating in a community. This information is available in as little as five to seven days after waste enters the sewer. Public health officials use wastewater data to better understand disease trends in communities and make decisions, such as providing guidance on how to prevent infections or increasing testing or vaccination options.

Where else can the information be used?

Wastewater surveillance is a useful method to collect information and tackle diseases as well as land-based sources of pollution. In addition, it also provides useful data to maintain ecosystem services and protect freshwater and marine ecosystems. "This trend is encouraging for the future of health systems and sound environmental management but there is a need for expanding this positive trend further and enhancing the good practices and significant efforts to monitor and assess water quality," according to the United Nations Environment Programme. The World Health Organization is also working on capacity development for wastewater and environmental surveillance.

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