Water Testing Laboratories Need to Up Their Game in 2022

Find out how what are the challenges facing water testing laboratories in performing vital Wastewater-Based Epidemiology (WBE) services.

Formaspace builds modern laboratory furniture at our factory headquarters in Austin, Texas. Shown above is a flexible, modular installation at a titration laboratory.

AUSTIN, TEXAS, UNITED STATES, September 22, 2022 / EINPresswire.com/ -- Wastewater-Based Epidemiology (WBE) Puts Water Testing Labs At The Forefront Of Infectious Disease Detection And Control

Water testing laboratories are at the front line of defense in public health. In this Formaspace laboratory research article, we look at the challenges facing water testing laboratories in performing vital Wastewater-Based Epidemiology (WBE) services.

- Testing For Polio Virus In Wastewater

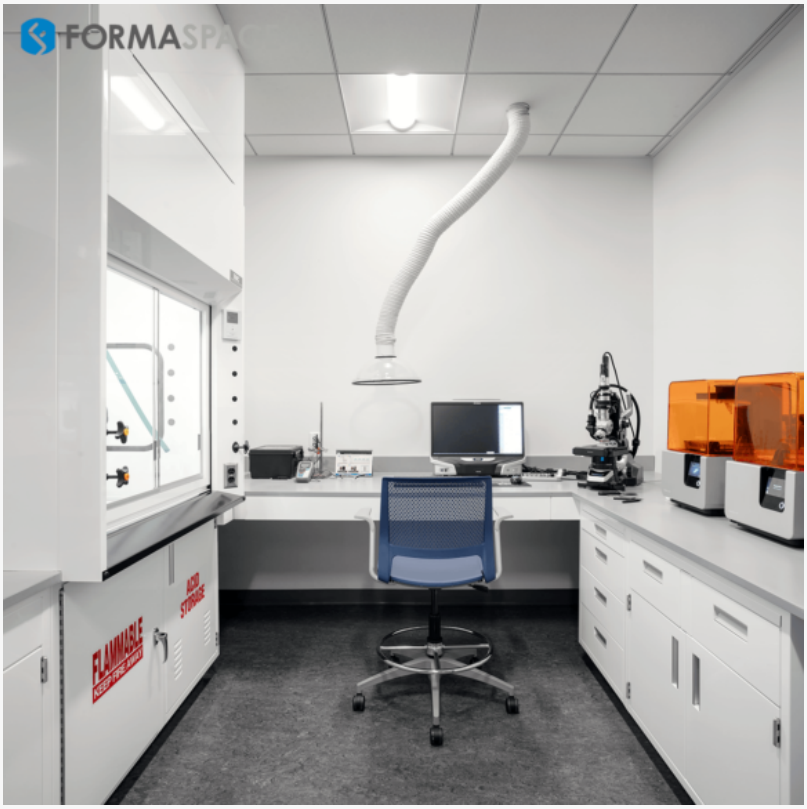
Polio is in the news again thanks to its recent discovery in New York and the UK. The problem may yet get worse – due to disastrous flooding in Pakistan, one of two countries (the other being Afghanistan) where polio is not yet under control.

Water testing laboratories have been screening wastewater for the paralytic poliomyelitis virus, which causes polio, using methods dating back to the 1940s.

In the virus detection method approved by the UN, sewage samples are collected at wastewater treatment plants and mixed with dextran and polyethylene glycol (PEG) polymers to separate them. Any enteric viruses (including polio) will collect 50-100x higher concentration levels at the

bottom and the boundary (interphase) layers. These samples are then eluted to further isolate the virus samples. Finally, these are applied to L20B mouse cell cultures to identify any presence of the polio virus.

Thanks to these wastewater-based epidemiology (WBE) protocols, public health officials were able to confirm the unexpected presence of poliovirus in Greater London, then in Rockland County, New York, just north of New York City. This is big news, as the US was declared free of Wild Poliovirus (WPV) in 1979.



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The virus found in New York was cVDPV2 (circulating Vaccine-derived Poliovirus type 2), a variant mutation derived from the live, attenuated (e.g. weakened) oral polio vaccine, known as Sabin OPV. Though Sabin OPV was the first polio vaccine, it's no longer widely used in Western countries, having been replaced with the Salk inactivated vaccine (IPV), an injectable version of a killed polio virus that cannot mutate and spread.

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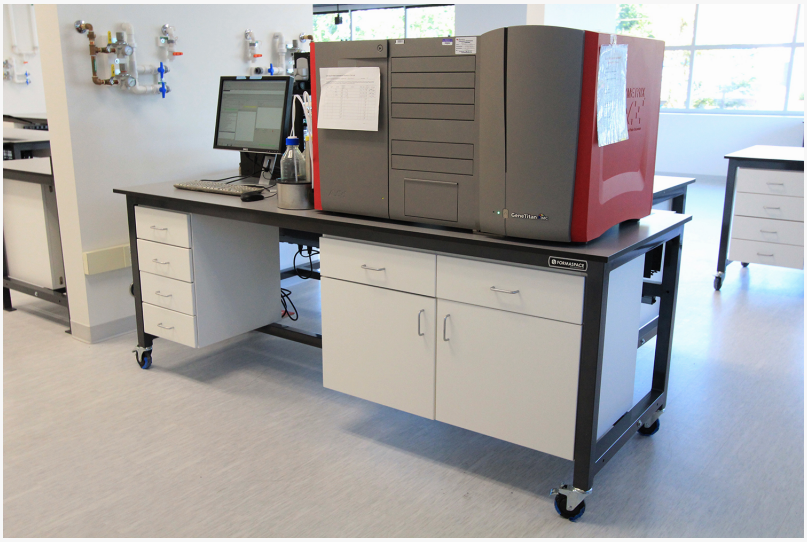
However, Sabin OPV (including the most current version, Sabin OPV serotype 2 or mOPV2) remained the preferred option for polio eradication campaigns in developing countries for decades due to three factors: its low cost and ease of administration (no injection needles are required), its ability to pass protection from a vaccinated individual onto other family and community members, and its capability of halting active polio outbreaks by preventing the virus from entering the intestinal lining of vaccinated individuals.

The downside of Sabin OPV is there is always a small chance that the virus can mutate to create neurovirulent variants (such as cVDPV2) that cause neurological disease. While the number of these cases remains low (in the hundreds), travelers can bring these variants to areas where polio has been eradicated, places where vigilance (and vaccine rates) are now low.

Indeed, the New York cVDPV2 outbreak is thought to have come about from an individual (or family) arriving from somewhere in the Middle East, possibly via Israel. NYSDOH's public health laboratory, Wadsworth Center, confirmed the presence of cVDPV2 in sewage samples via a polymerase chain reaction (PCR) assay, and now it's up to public health officials to trace and contain the outbreak in Rockland County, where vaccination rates among the Orthodox Jewish community are considered too low to create effective herd immunity.



Formaspace specializes in custom furniture solutions, such as the heavy-duty mobile cart shown above, built to support the lab equipment used to sequence the human genome.

To stop the spread of cVDPV2 at the source, the Bill & Melinda Gates Foundation funded the development of a next-generation version of the Sabin OPV serotype 2 (mOPV2) oral polio vaccine, called novel oral polio vaccine type 2 (nOPV2). Over the last two years, the WHO has administered over 110 million doses of nOPV2 around the world as part of an emergency use authorization with good results. The new nOPV2 vaccine uses genetic engineering techniques to modify the Sabin sero type 2 RNA gene sequence so that it's more stable and less likely to create variants that cause neurological disease.

Testing For Covid Virus In Wastewater

The sudden emergence of the novel coronavirus Covid 19 in early 2020 once again thrust water testing laboratories into the forefront of public health – this time challenged to:

- Identify the presence of the SARS-CoV-2 RNA (the virus that causes Covid) in sewage effluent
- Correlate the concentration of virus found in the waste stream with active Covid infections
- Help determine if the virus can be spread enterically, e.g., by ingesting contaminated sewage
- Identify concentrations of specific Covid variants, such as Delta or Omicron.

Water testing laboratories were able to draw on their long-standing expertise in testing sewage samples for the presence of the poliovirus.

However, in practice, testing for the Covid virus required creating new lab techniques.

For example, collecting Covid virus samples proved more difficult due to the small size of Covid RNA fragments, so several methods were devised, including using electrostatic charges on filters

to attract the virus, taking samples from concentrated sewage sludge, or using new collection devices containing magnetic beads or cotton swabs to trap the virus over several days.

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