

Detection of poliovirus in London highlights the value of sewage surveillance

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The recent discovery of poliovirus in London wastewater has garnered wide public interest and media attention. It serves as a reminder that until the virus is eradicated from the world, all countries are at risk of a resurgence if high vaccine coverage falters. The simultaneous detection of genetically linked poliovirus in New York and Israel indicates the likelihood that the virus has spread through international travel and emerged in geographically distant locations. This observation is unexpected as it involves high-income countries with exclusive use of the inactivated polio vaccine (IPV) and high national vaccine coverage¹.

No cases of polio have been identified to-date in the UK; circulating poliovirus has been detected in London solely through environmental surveillance (ES). In this issue of the *Lancet*, Klapsa and colleagues present these data². Their surveillance reports have enabled a rapid public health response, which includes the introduction of an IPV booster dose for children aged 1-9 years in London, and expansion of environmental, clinical and laboratory surveillance across the UK^{3,4,5}.

The authors report the detection of 118 poliovirus isolates related to the serotype 2 Sabin vaccine strain in London wastewater between February and July 2022. Extension of ES has enabled them to localise virus transmission to several north and east London boroughs. Sequential sampling and whole genome sequencing of isolates demonstrates that all polioviruses identified are genetically linked and share a single common origin, and has led the authors to trace the genetic evolution of the viruses over time. They infer from the high genetic diversity, geographic spread, and increasing concentration and frequency of polioviruses detected, that virus transmission is occurring in the community. Of concern, they argue that all polioviruses detected are likely to be neurovirulent, and thus have the potential to cause paralytic disease in under-vaccinated individuals. In addition, the authors describe a novel method for direct detection of poliovirus from sewage using nanopore sequencing, which is faster than the gold-standard method and demonstrated good sensitivity after modification in this setting.

The data presented by Klapsa and colleagues provide an example of highly effective ES. Their approach facilitated early detection of poliovirus, localisation of transmission and characterisation of genetic evolution of the virus over time. This enabled a timely and focused response, including the targeted IPV booster dose programme. Ongoing ES will be critical in evaluating the effectiveness of these interventions in interrupting virus transmission, and informing the need for further interventions, which might include consideration of the use of the novel oral polio vaccine type 2 (nOPV2)³.

These results are pertinent to other countries which exclusively use the IPV; they demonstrate that vaccine-derived poliovirus (VDPV) can emerge in such settings and underline the importance of implementing ES more widely than is currently the case. The genomic data will underpin tracking of the emergence of genetically linked VDPV in Israel and New York, and may guide future control measures. The methods described are also relevant to countries where ES is used to monitor existing VDPV outbreaks in the context of oral polio vaccine use

and low vaccination coverage. Whilst requiring further validation, the technique described for direct molecular detection may offer a means of more rapid identification of polioviruses in wastewater.

There are limitations to this work. Although large-scale ES has enabled localisation of poliovirus transmission to several areas of London, it does not identify transmission in small communities or on an individual basis. Thus, it is unclear whether virus transmission is being sustained by unvaccinated or under-vaccinated individuals, or whether transmission is also occurring between vaccinated individuals. The age cohort involved in these transmission events is also unknown. Whilst the extent of circulation implied by these results suggest that transmission between vaccinated individuals may be occurring, stool surveys would be required to confirm this.

These important results highlight the critical role of ES in identifying and understanding poliovirus transmission, and guiding appropriate and timely responses. Ongoing surveillance will be essential to determine if the intervention in London works or whether further escalation is needed. Important as these findings to the local public health response, they also starkly highlight wider deficiencies in surveillance, emphasising that today we are in the dark about what is happening across most of the planet.

Conflicts of Interest

AJP is the chair of the Department of Health and Social Care's Joint Committee on Vaccines and Immunisation (JCVI) and was a member of WHO's SAGE until Jan 1, 2022. AJP does not participate in the JCVI COVID-19 committee. Oxford University has entered a partnership with AstraZeneca on COVID-19 vaccines. AJP has advised Shionogi on COVID-19. MH declares no competing interests.

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