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# Poliomyelitis in the UK and globally

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# Paralytic poliomyelitis



Photo courtesy of Immunization Action Coalition  
(<http://www.immunize.org/catg.d/pict001.htm>)

Common endemic infection worldwide prior to use of vaccine

Three types of poliovirus cause infection (1, 2, 3)

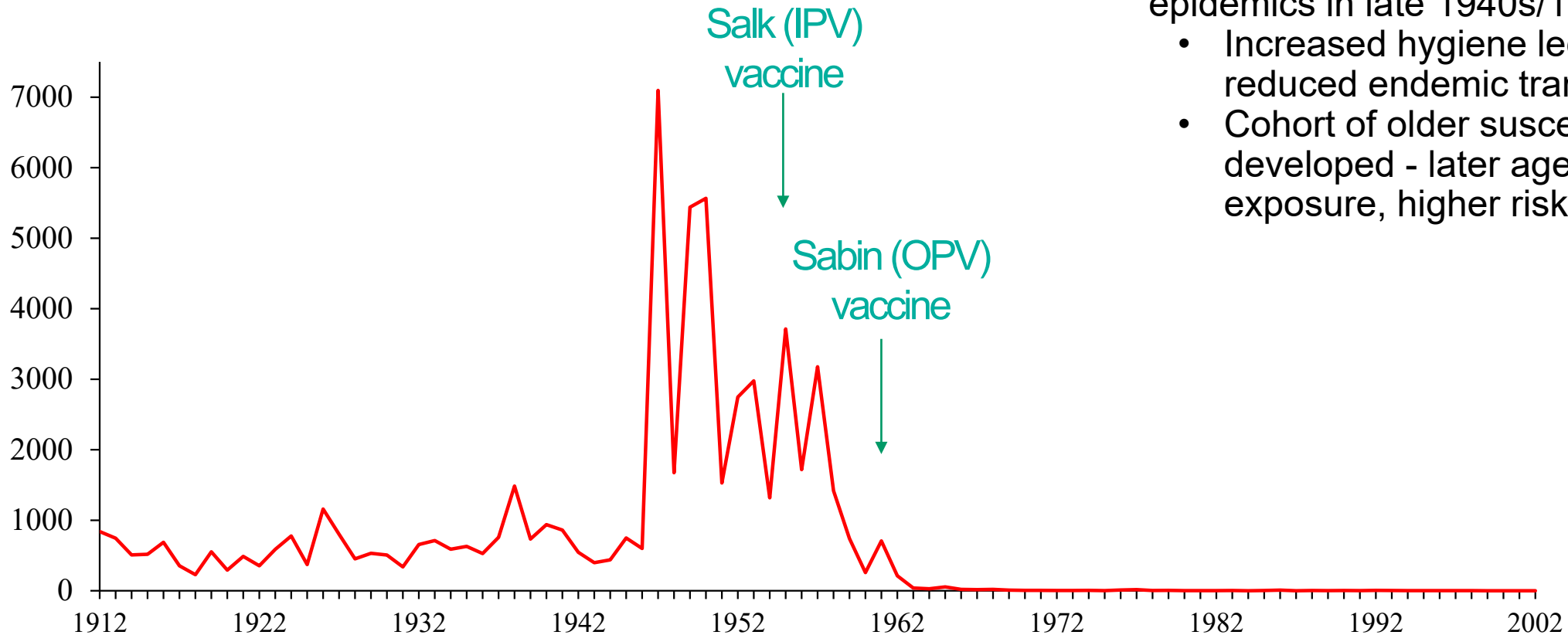
Less than 1% of all polio infections result in paralysis

Paralysis of limbs and respiratory muscles may occur

The degree of recovery varies but residual paralysis is common



# Acute paralytic poliomyelitis - England and Wales 1912-2002\*



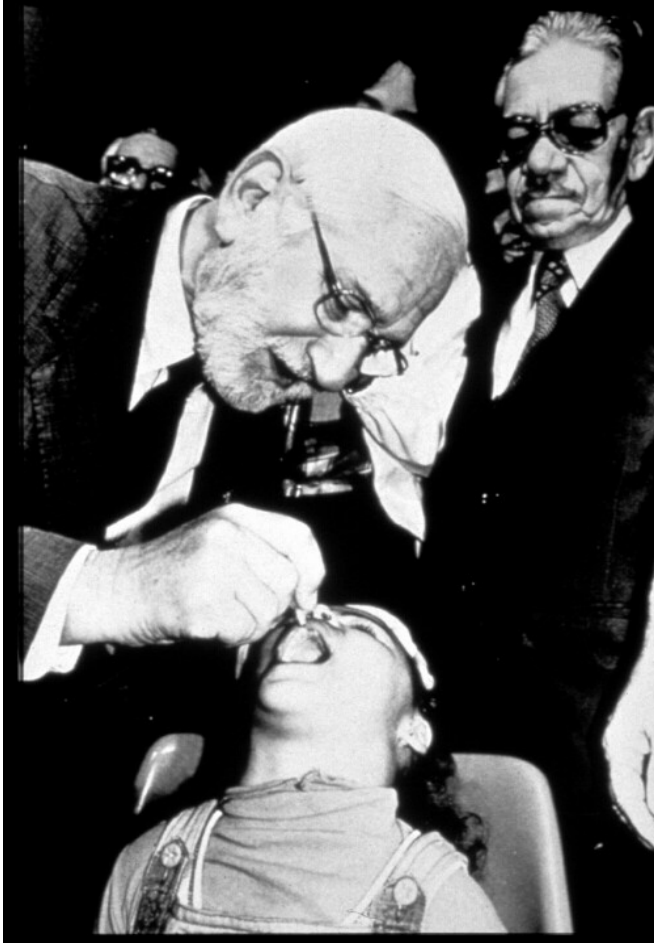
Many developed countries had large epidemics in late 1940s/1950s

- Increased hygiene led to reduced endemic transmission
- Cohort of older susceptibles developed - later age at exposure, higher risk of paralysis

\* notifications to 1984, cases ascertained from any source after 1985



# Polio Vaccines



Salk (inactivated) injectable vaccine  
introduced in UK 1955

- Contains three “wild” viruses that have been inactivated (or killed)

Replaced by Sabin (live) oral vaccine in  
1961

- Contains three living viruses that have been “attenuated” so they do not cause disease

Excellent control of polio in UK



# Polio vaccines in the UK

## OPV

- OPV viruses grow in the human gut – high level of gut immunity
- Commonly shed vaccine virus for a few weeks
- Virus can spread to inadvertently immunise unvaccinated contacts
- Good protection against risk of spread from imported wild virus
- Very small risk of vaccine associated paralytic polio (1 case per million)

## IPV

- IPV gives good protection against paralysis, cannot cause paralysis
- Poor gut protection, so virus circulation can still occur
- So OPV continued to be used until the risk of imported virus in the UK fell

In 2004, decision to switch all UK vaccines to IPV

- 8, 12 and 16 weeks (6-in-1 vaccine)
- 3 years 4 months pre-school booster (dTaP-IPV)
- 14 years old teenage booster (Td/IPV)



# Post eradication immunisation policy

Global eradication – mainly using trivalent OPV (tOPV) - has been successful

- Poliovirus type 2 declared eradicated in 2015
  - last case 1999
- Poliovirus type 3 declared eradicated in 2019
  - last case 2012
- Poliovirus type 1 is the only remaining “wild” virus

From April 2016, routine tOPV should have been replaced with bivalent OPV (types 1,3) or monovalent OPV (type 1)

- Due to supply issues, OPV continued to be used as part of outbreak control into 2021 (e.g. in Afghanistan and Pakistan)



# Nearing eradication – the role of vaccine viruses

Where immunization rates are low, OPV vaccine-like viruses can spread across a community

- during spread, the vaccine virus starts to mutate so it develops potential to cause paralysis - vaccine-derived poliovirus (VDPV)

Where the mutated virus continues to circulate for months - circulating vaccine derived poliovirus (cVDPV)

- Increasing risk that an unvaccinated individual could be exposed and develop paralysis
- cVDPVs have now caused small outbreaks of paralytic polio in several countries

# Sewage surveillance

## Its role in the detection and prevention of polio

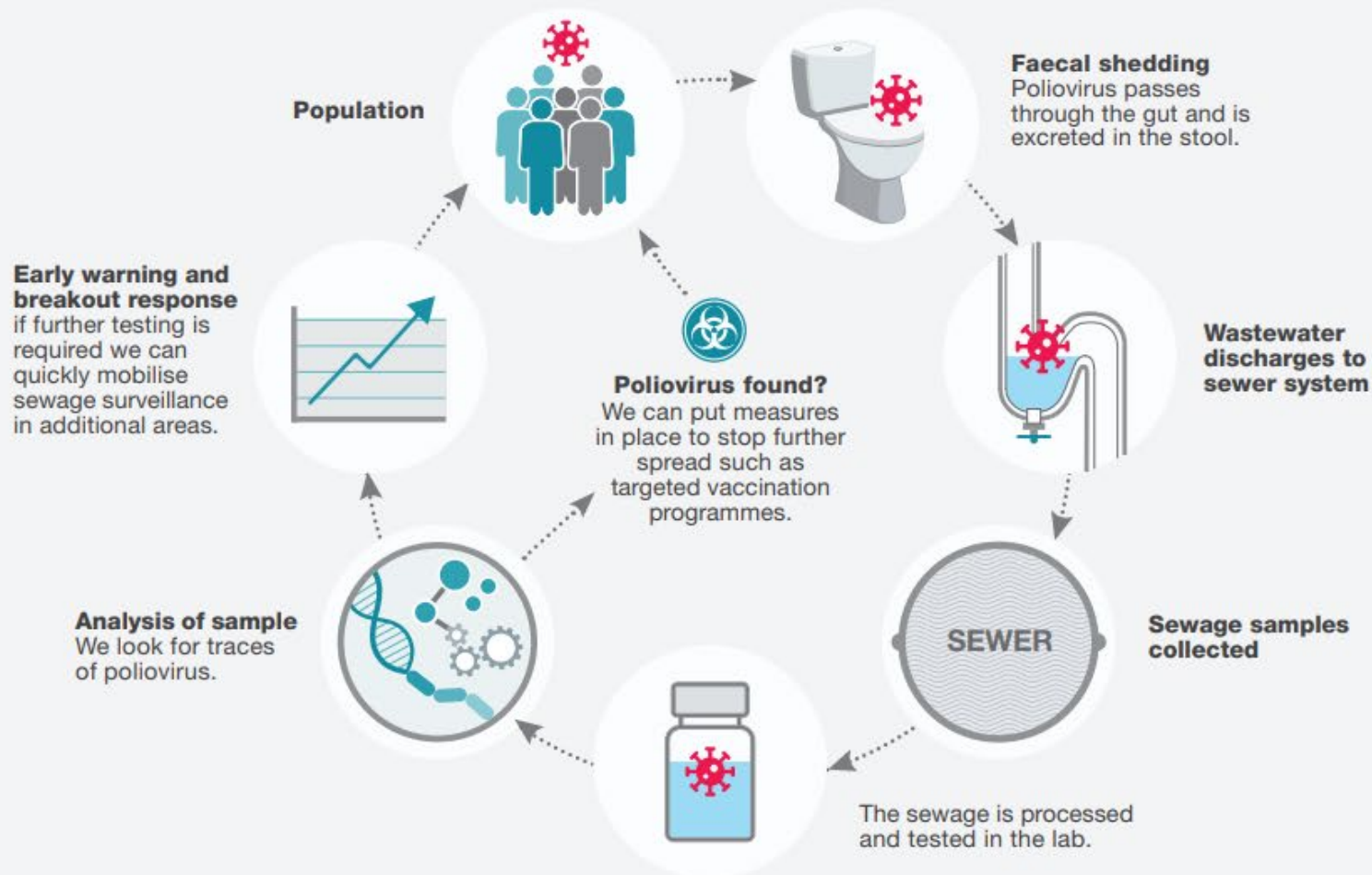
**Sewage surveillance acts as an early warning system for a range of viruses and pathogens that pose a risk to public health.**

By analysing sewage samples we can access valuable data on diseases that often present asymptotically, such as polio.

This data informs public health decision-making, supporting the aims of the Global Polio Eradication Initiative.

### How it works

- We collect sewage samples and analyse them in the lab.
- If poliovirus is found, we can put measures in place to prevent further spread.
- Monitoring takes place at population level, and we cannot trace infections back to individuals.





# Routine environmental surveillance for polio in UK

- Environmental surveillance for polio – a key component of our commitment to WHO global polio eradication programme
- Since 2016, fortnightly raw sewage samples collected from London and Glasgow and sent to the National Institute for Biological Standards and Control (MHRA) for testing
- NIBSC is a WHO Global Specialised Laboratory for polio:
  - perform investigations that are essential to establish the temporal and geographical transmission pathways of poliovirus circulation
- An average of 1-3 polioviruses are detected from UK sewage samples each year:
  - single detections, unrelated to each other
  - further virus characterisation has suggested that they were viruses from recent vaccinees entering the UK
  - subsequent sample was always negative

# Detection of poliovirus in sewage

- vaccine-**like** poliovirus type 2 (PV2) was first identified in a sewage sample collected from London Beckton Sewage Treatment Works in February 2022
- Genetically related poliovirus was picked up again in April and has persisted since
  - Hypothesis is that an individual recently vaccinated with oral polio vaccine (OPV) entered the UK in early 2022
- The virus has continued to spread in north-east and central London (presumably due to sub-optimal vaccine coverage)
  - the virus has continued to evolve and, since June, has been defined as vaccine-derived poliovirus type 2 (VDPV2)
- By August VDPV2 has continued to be detected for more than 2 months
  - UK now considered to have circulating virus (cVDPV2)
  - Additional sampling upstream has localised circulation to north central and east London

# International context

- the UK virus has only been detected in sewage samples
  - we do not know which population it is circulating
  - **no associated cases of paralysis have been reported**
- Case of paralytic polio was confirmed in unvaccinated adult member of Charedi population in NY state
  - Sewage samples in that area tested positive
- VDPV2 has also been detected in sewage in Israel
- viral typing confirms a link between viruses detected in London, New York state and in Israel