AFP Surveillance in the 21st Century

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The virus and disease

Progress on polio eradication

Acute flaccid paralysis surveillance

Polio situation in the Region of the Americas
Poliovirus (the agent)

- **Poliovirus** is an RNA virus, member of the genus Enterovirus, *Picornaviridae* family.
- There are three poliovirus serotypes (1, 2 and 3) with minimal immunity between them (heterotypic).
- Poliovirus only infects people.
- Person-to-person transmission: fecal - oral and pharyngeal secretions.

Poliomyelitis (the disease)

- **Poliomyelitis** is an infectious disease caused by the poliovirus.
- The virus invades the nervous system and can cause permanent paralysis.
- Most people infected (72%) have no symptoms.
- One in 200 infections results in permanent paralysis and can cause death.

https://www.paho.org/es/temas/poliomielitis
https://www.cdc.gov/polio/what-is-polio/index.htm
https://www.cdc.gov/polio/what-is-polio/hcp.html
Poliomyelitis

Wild poliovirus WPV

Viruses originally present in nature. WPV2 and WPV3 have been eradicated. WPV1 is endemic in AFG and PAK. They are highly transmissible.

Vaccine-derived poliovirus or VDPV*.

In communities with low vaccination coverage, the virus mutates and recovers the neurovirulence => VDPV. There is a risk of transmission. Can be generated in immunodeficient individuals (PID).

Final classification of VDPV
- cVDPV circulating, evidence of H – H transmission.
- iVDPV associated with immunodeficiency.
- aVDPV ambiguous, the case is immunocompetent and the virus is not genetically related.
Poliomyelitis vaccines

**OPV**
- Licensed in 1963, created by Albert Sabin.
- **Live attenuated** virus vaccine that may contain one, two or three serotypes.
- It is administered orally.
- Provides **humoral immunity and long-term intestinal immunity; effective in stopping transmission**.
- In communities with low vaccination coverage, the virus can mutate and revert to neurovirulent (VDPV) and in rare cases, can cause vaccine-associated paralytic poliomyelitis (VAPP).

**IPV**
- Introduced in 1955, created by Jonas Salk.
- Inactivated vaccine containing the three PV serotypes (1, 2 and 3).
- Administered by intramuscular or intradermal injection (for fIPV).
- No risk of VAPP or VDPV.
- Generates **good humoral immunity** but induces very low levels of antibodies in the intestinal mucosa.
- Protects against paralytic disease but does not stop intestinal viral replication.
**Polio Eradication**

*Eradication:* permanent decrease to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts.

- **Last case of polio by WPV2 in 1999**
  - Declared eradicated in September 2015

- **Last case of polio by WPV3 in 2012**
  - Declared eradicated in October 2019
WPV1 & cVDPV1 polio cases, previous 12 months\textsuperscript{2}

Data in WHO HQ as of 23 May 2023

Excludes viruses detected from environmental surveillance;  \textsuperscript{2}Onset of paralysis: 24 May 2022 to 23 May 2023

<table>
<thead>
<tr>
<th>VIRUS</th>
<th>COUNTRIES</th>
<th>CASES</th>
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<tbody>
<tr>
<td>WPV1</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>cVDPV1</td>
<td>5</td>
<td>201</td>
</tr>
<tr>
<td>cVDPV2</td>
<td>19</td>
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</table>

Endemic country (WPV1)
Milestones in the eradication of Polio in the Americas

- **Polio cases, 1985**
- **Certified polio-free 1994**
- **Outbreak of cVDPV1, 2000 - 2001**

EPI Newsletter
Expanded Program on Immunization in the Americas

On August 23, 1991, Luis Ferrero Tencio was the last person to suffer from polio in the Americas when he was infected by the wild polio virus in his town Piucnos, Peru.
Polio surveillance is conducted through the acute flaccid paralysis syndrome (AFP).

**Paralysis:** weakness, loss or decrease of movement.

**Flaccid:** loss of muscle tone.

**Acute:** rapid progression of paralysis.

All cases in **children under 15** years of age presenting AFP for any reason except severe trauma, or any person of **any age** in whom poliomyelitis is suspected, should be investigated.

The syndromic definition allows the **surveillance** system to be **sensitive** as it captures polio cases, but also other diseases present in similar ways.

All cases should be thoroughly **investigated** including stool sample collection for laboratory diagnosis.

Source:
Differential diagnoses of poliomyelitis

There are many infectious and non-infectious diseases that can cause paralysis, and therefore be confused with poliomyelitis.
Investigation of a suspected case of poliomyelitis

Probable case of acute flaccid paralysis

- Trauma or tumor?
  - Yes
  - Adequate sample?
    - Yes
    - Wild virus isolated?
      - Yes
      - Died or lost to follow-up?
        - Yes
        - Compatible
        - Investigation completed
      - No
      - Sequelae?
        - Yes
        - Discarded
        - Investigation completed
        - Confirmed
      - No
      - Discarded
    - No
  - No
  - Confirmed
  - Investigation completed
- No
  - Discarded
Decision tree for case investigation

**PROBABLE CASE**

1. Continue investigation to determine final classification
   - Fill out investigation form and line-listing as data become available.
   - Collect 1 stool specimen from the patient; collect specimens from 5 contacts (only if the epidemiologist so indicates).
   - Arrange for follow-up to determine clinical outcome.

2. To begin community control measures:
   - Visit home/neighborhood
   - Start immunization activities
     1. Decide:
        - Who to vaccinate (target age group)
        - Where to vaccinate
        - Where to vaccinate (including door-to-door)
     2. Notify national surveillance coordinator and discuss control strategy
     3. Notify community leaders and surveillance coordinators in other areas
     4. Review polio vaccination coverage data on children under 5 years old in affected and surrounding areas
     5. Search for additional cases in a wide geographic area. Inquire about any cases that may have occurred in the last six months:
        - Visit schools, churches, etc.
        - Visit medical care facilities
        - Meet with community leaders
        - Conduct door-to-door searches
     6. Increase surveillance for the following 6–12 months:
        - Complete line-listing of all cases
        - Submit a case investigation form to the surveillance coordinator

3. Confirmed or polio-compatible case
   - Was another cause confirmed?
     - Yes: Report to the surveillance coordinator
     - No: Discarded case (no additional investigation required)

   - Yes: Continue investigation to determine final classification
   - No: Discarded case (no additional investigation required)
Obtaining samples for laboratory diagnosis

- Obtain a stool sample within 14 days of the onset of paralysis.
- Use a clean, empty container to collect 8 g of stool (two-inch size).
- Label all samples (case or contact name, case number, date of sample obtained).
- Refrigerate samples immediately after collection (4-8 °C).
- Rectal swab is a non-suitable sample.
Laboratory diagnosis of poliovirus

1. Virus Isolation in Cell Cultures
   Timely reporting of results = 14 days

2. Intratypic differentiation of poliovirus
   Timely reporting of results = 7 days

3. Genetic sequencing of VP1 region
   Timely reporting of results = 7 days
Any person under 15 years of age presenting AFP, for any reason except severe trauma, or any person of any age in whom poliomyelitis is suspected.

Probable case

Confirmed case

Acute flaccid paralytic disease associated with isolation of wild poliovirus (or derived poliovirus VDPV), with or without residual paralysis.

Compatible case

Acute paralytic disease with residual polio-like paralysis after 60 days, or failure to follow up or death, in which a stool sample was not obtained within 15 days of paralysis.

Dismissed case

Any case of acute paralytic disease for which an adequate stool sample has been obtained within 14 days of the onset of paralysis and with a negative laboratory result for poliovirus.
## AFP Surveillance Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>System sensitivity</td>
<td>Detection of at least <strong>1 case of AFP/100,000 children under 15 years of age</strong>.</td>
</tr>
<tr>
<td>Adequate investigation of the case</td>
<td>≥80% of cases <strong>investigated</strong> (clinical, epidemiological) within 48 hours of notification.</td>
</tr>
<tr>
<td>Adequate stool sample</td>
<td>≥80% of cases had adequate stool samples collected for enterovirus detection (within <strong>14 days</strong> of onset of paralysis)</td>
</tr>
<tr>
<td>Case follow-up</td>
<td>≥80% of investigated AFP cases will be clinically evaluated within <strong>60 days</strong> of onset of paralysis.</td>
</tr>
</tbody>
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AFP Surveillance Indicators, Region of the Americas 2019 – 2022*

Tasa anual de casos de PFA

**Case of cVDPV2 Polio in NY, USA**

- In an unimmunized immunocompetent young adult with no history of travel during the exposure period.
- Provenance: Rockland County, NY State
- Onset of paralysis: June 20, 2022
- Notification to PAHO/WHO: 21 July 2022
- Classification as cVDPV2: 10 Sept 2022
- GPLN confirmed genetic linkage of virus to cVDPV2 detected in UK and Israel.

**Case of polio due to VDPV1 in Loreto, PER**

- Male, **14 months old**, with no history of vaccination or travel history.
- Origin: Manseriche district, department of Loreto.
- Stool sample collection: January 18, 2022
- VDPV1 confirmation: March 21, 2023
- Investigation and clinical evaluation of the case ruled out primary immunodeficiency.
Detection of cVDPV2 in wastewater, USA and Canada, 2022

Detection of PV2 in wastewater, NYS

- Notification to PAHO/WHO 06 Jan 2023, detection of VDPV2 in two samples collected in August 2022
- CDC confirmed genetic linkage to cVDPV2 case detected in Rockland, NYS
- No confirmed cases of polio or increase in AFP cases have been observed in the province of Quebec.
- Ambiguous, case is immunocompetent and the virus is not genetically related.

No confirmed cases of poliomyelitis or an increase in AFP cases have been observed in the province of Quebec in 2022.


Source: Canada IHR National Focal Point
# Polio Bulletin

## Acute Flaccid Paralysis Surveillance in the Americas

<table>
<thead>
<tr>
<th>Region</th>
<th>Expected</th>
<th>Reported</th>
<th>Confirmed</th>
<th>Total 2023</th>
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<td>280</td>
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<td>700</td>
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<tr>
<td>Total</td>
<td>1050</td>
<td>750</td>
<td>700</td>
<td>2800</td>
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## Poliovirus Surveillance in the Americas

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https://www.paho.org/es/boletin-semanal-polio
GTA Recommendations

1. Countries should make an effort to improve the performance of AFP surveillance indicators to avoid undiagnosed cases of paralysis caused by poliovirus.

2. Countries with a very high risk of outbreaks should consider collecting a second stool sample on a temporary basis while they strengthen their immunization program and surveillance system.

3. If a stool sample cannot be collected from the AFP case within 14 days of the onset of paralysis, or if the sample arrives at the laboratory in poor condition, it is recommended that a sample from three contacts be collected.
The commitment to keep the region polio-free
Resolution CSP30.R13, September 2022

Develop and implement a prioritized and targeted mitigation plan based on the recommendations of the GTA and the RCC.

- Increase vaccination coverage
- Improve surveillance
- Ensure adequate preparedness for outbreak response

Engage civil society, community leaders, NGOs, private sector, academia and other stakeholders to move forward and work in a joint and coordinated manner.
Acknowledgment

To all health professionals in the countries of the Region who have collaborated with polio program activities.

To the Ministries of Health for maintaining their commitment to the polio program and sharing information with PAHO/WHO.

To the CAN and the NCCs for their ongoing support and recommendations to keep the Region polio-free.
Global VDPV1, VDPV2 and VDPV3\(^1\) positive isolates, 2021-2023\(^2\)

\(^1\) includes pending, ambiguous and immunodeficient positive isolates; \(^2\) Onset of paralysis/collection: 01 Jan. 2021 to 23 May 2023

Data in WHO HQ as of 23 May 2023