NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

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OUTBREAK RESPONSE UNIT, & CENTRE FOR VACCINES AND IMMUNOLOGY

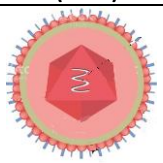
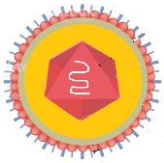
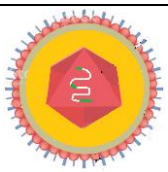
Polio eradication and Vaccine-derived polio virus (VDPV)

Frequently Asked Questions

1. What is VDPV and how is it related to polio?

The oral polio vaccine (OPV) contains a live attenuated (weakened) polio vaccine-virus which activates an immune response in the body. The vaccine is very safe and interrupts person-to-person spread of polio. When a child is vaccinated with OPV, the weakened vaccine-virus grows in the intestines for a short time. When the body responds by developing antibodies to the vaccine-virus, a person becomes immune also to wild polio virus (WPV). Very rarely, when a child is vaccinated with OPV, and they have a weakened immune system because of a congenital (hereditary) deficiency, the vaccine may grow in the intestine for longer than usual. This gives the virus a chance to become genetically altered. Very rarely, this genetic alteration may allow the OPV to cause paralysis. When this alteration occurs, and persons develop an 'acute flaccid paralysis', this virus is known as a Vaccine-Derived Poliovirus (VDPV). There are three types of VDPV: **Immunodeficiency-related vaccine-derived poliovirus (iVDPV)** occurs when the VDPV is found in a person with a hereditary or other reason for being immunocompromised. **Circulating vaccine-derived poliovirus (cVDPV**) occurs when there is evidence of circulation of VDPV in the community. This is defined as the finding of VDPV in persons from > one household. Circulation of VDPVs occurs when populations are inadequately immunized. **Ambiguous vaccine-derived poliovirus (aVDPV)** is the name given to cases that cannot reliably be defined as cVDPV or iVDPV. Fortunately, vaccination against polio using both the live attenuated vaccine (Sabin strain) or intramuscular vaccine (iPV) causes immunity (protection) against wild type polio and VDPV.

Polio virus, polio vaccine, and vaccine-derived polio-virus

Clinical condition	Virus strain	Relationship to wild polio virus (WPV)	Frequency of occurrence Comments
Paralysis	Wild polio virus (WPV)		WPV type 2 is eradicated. Type 3 was last seen in 2012. WPV 1 is found in Pakistan, Afganistan. WPV1 was last seen in Nigeria in 2016.
Asymptomatic infection leading to immunity to polio	Polio vaccine (Sabin)		Derived from WPV, known as the 'Sabin' strain. Comes as PV1, PV2, PV3. Is avirulent – ie does not cause symptoms
Paralysis	Vaccine-derived polio virus (VDPV)		Incredibly rare. Arises from mutations in Sabin polio virus. Usually in persons with hereditary disorders of the immune system

2. Why is VDPV significant?

Unlike the oral polio vaccine (OPV), vaccine-derived polio virus can cause paralysis. This means that persons in whom VDPV is found, have potential to spread this virus to others in their community. If persons in the community are not vaccinated for polio, they may develop paralysis. Therefore VDPV in the community poses just as great a risk to the community as wild polio virus. All efforts must be made to prevent the spread of VDPV when it is detected.

3. Where has VDVP occurred in the world?

Since 2016, wild poliovirus cases were reported in only three countries in the world - Pakistan, Afghanistan and Nigeria. There have not been any outbreaks of wild polio virus outside the three polio-endemic countries since August 2014. VDPV is incredibly rare – more rare even than polio. While there have been isolated detections of iVDPV in a number of countries across the world, cVDPV has been reported from very few countries – currently only Democratic Republic of Congo and Syria. The social disruption in these countries has lead to under-vaccination of their populations. This has allowed VDPV to circulate.

4. What are the signs and symptoms of VDPV?

VDPV presents as acute flaccid paralysis (AFP) which includes loss of muscle reflexes, severe muscle pain and spasm, and floppy limbs that are often worse on one side of the body. Non-paralytic symptoms include fever, sore throat, headache, vomiting and fatigue.

5. How are persons with VDPV identified?

As part of the work to eradicate polio, all persons who present with symptoms of 'acute flaccid paralysis' (AFP) are investigated by taking of stool specimens. At the NICD lab, stool specimens are cultured for enterovirus – which includes poliovirus. If a poliovirus is isolated, the RNA of the virus is sequenced. By definition, a VDPV has >10 nucleotide differences from the Sabin vaccine-virus.

6. How should health authorities act if a VDPV is detected?

The detection of a VDPV is a potentially serious event. Health authorities should immediately notify appropriate clinicians, facility managers, district and provincial authorities, and the WHO. The provincial outbreak response team should be fully informed about the significance of the event, and should be convened to co-ordinate the investigations. An incident manager should be appointed to co-ordinate contact tracing, community investigations, laboratory testing, communications, and reporting.

7. What investigations are required if a VDPV is detected?

Following diagnosis of a VDPV, it is important to determine if the VDPV virus is circulating in the community, or if it is an isolated case. If the case is found to be circulating in the community, there are serious implications for public health, as unvaccinated persons may be at risk for developing paralysis. It is also important to determine if the person who was diagnosed with VDPV has a hereditary immunodeficiency. Field visits should be conducted to check on household contacts to determine if they have been infected with the VDPV. Stool samples from at least five direct contacts (i.e. siblings, household contacts, playmates) as well as from at least 20 persons of the same age group living in the community should be sent to NICD. Epidemiological investigation of the case is conducted to search for additional unrecognized and unreported cases in hospitals in the area. Vaccination coverage rates in the local community and health district should be calculated to assess the magnitude of risk to the population.

8. Where can I find out more information?

Medical/clinical related queries: NICD Hotline +27 82 883 9920 (for use by healthcare professionals only).
Laboratory related queries: Centre for Vaccines and Immunology Laboratory: +27 11 386 6536.
Results inquiries: NICD Specimen Receiving Laboratory: +27 11 386 6404. Or Centre for Vaccines and Immunology Laboratory: +27 11 386 6536.
Guidelines and other documents: NICD website at www.nicd.ac.za under the 'Diseases A-Z' tab. The WHO website www.who.int