

Oral Polio Vaccine and VDPV

Why in news?

The U.S., the U.K., and Israel, among others, recently reported polio cases in unvaccinated people after having been polio-free for more than a decade.

What is polio?


- *Poliomyelitis* (commonly called polio) is a highly infectious *viral disease* that can leave patients disabled, and in some cases, even prove fatal.
- The virus enters the nervous system and can cause total paralysis in just a few hours.
- **Types of Polio virus** - Wild poliovirus (WPV) has three known strains - types 1, 2, and 3 - each with a slight difference in structure.
- Immunity to one type does not guarantee immunity to others.
 - **Type 1 WPV** - remains in circulation and endemic to Pakistan and Afghanistan.
 - **Type 2 WPV** - declared eradicated in September 2015.
 - **Type 3 WPV** - declared eradicated in October 2019.
- **Spread** - The polio virus is most commonly spread through the *faecal-oral route* and through *contaminated water or food*.
- The virus multiplies in the host's intestine.
- **Treatment** - There is *no known cure* for polio. It can only be prevented by way of vaccination.
- **Vaccine** - There are two types of vaccines - oral poliovirus vaccine (OPV) and inactivated poliovirus vaccine (IPV).
- Click here to know more about [Polio virus resurgence](#).

India was declared polio free in 2014 by WHO.

What is OPV and IPV?

- **Oral Polio Vaccine** (OPV) is a live attenuated vaccine for Polio.
- It contains weakened polioviruses (all three types - 1, 2, and 3) to induce an immune response in a human body without causing disease.
- **Inactivated Polio Vaccine** (IPV) contains inactivated polioviruses (all three types).
- IPV is administered by injection.
- It induces a strong systemic immune response, thus protecting against paralytic poliomyelitis, without any risk of causing VAPP or VDPV.

What are the pros and cons of OPV?



Pros and Cons of OPV

<p>The OPV is less expensive.</p> <p>It is easy to administer as it is an oral vaccine.</p> <p>The mucosal immune response is also triggered in addition to the significant immune response in the blood (the systemic immune response).</p> <p>It triggers a robust immune response in the gut lining</p> <p>Easier to manufacture as the 'seed virus' required for the vaccine development</p>	<p>Its uptake by the immune system is not as desired and requires multiple doses over time.</p> <p>OPV in rare cases can lead to vaccine-associated paralytic poliomyelitis (VAPP) due to its ability to reverse the virus's neurovirulence.</p> <p>When the virus's ability to jump from one person to another is restored, the result can be vaccine-derived paralytic poliomyelitis (VDPV).</p> <p>The cases reported in the U.S., the U.K. and Israel last year were all VDPVs.</p>
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What is the inactivated polio vaccine?

- **Global switch** - Poliovirus Type-2 cause 90% of VAPP and VDPV cases.
- Type 2 virus was eradicated worldwide in 1999 and it was decided that OPV type-2 be discontinued.
- Since April 2016, the OPV has had attenuated versions of types 1 and 3 of the virus.
- This is accompanied by the introduction of the IPV in countries that still depended on the OPV in their national immunisation programmes.
- **VDPV after switch** - But the number of VDPV cases on contrary to expectation *increased* after April 2016.
- The previously existing type-2 VDPV began to circulate.
- In 2020, the VDPV Type-2 cases were at 1,081 from 26 countries, many of which were previously polio-free.
- **Reasons**
 - Limited supply/availability of the IPV
 - Cost and logistics of the IPV
 - Sudden increase in the demand for IPV after the switch.
 - The population immunity against type-2 virus dropped in OPV.

What are the alternatives in development?

- Experts are trying to develop better polio vaccines to tackle the disadvantages of both the OPV and the IPV.
- **Novel OPV (nOPV)** - It has been recently in use in African countries.

- It is manufactured using attenuated polioviruses in which certain mutations have been introduced using genetic engineering.
- nOPV makes it 5 times harder for the virus to regain its neurovirulence.
- All clinical trials shows that novel OPV is safer and effective than monovalent oral polio vaccine type 2 (mOPV2).
- Even after administering the nOPV, a few VDPV cases have been reported.
- **Sabin IPV** - Researchers are trying to use attenuated viruses instead of wild viruses to make the IPV-manufacturing safer.
- Sabin IPV is currently undergoing clinical trials in Japan and China.
- **Adjuvant** - Experts are also testing specific adjuvants (substances that enhances the body's immune response to an antigen) to be added to the IPV to induce a mucosal immune response.

References

1. [The Hindu - OPV in the world's quest for eradication](#)
2. [The Hindu - Unethical to continue using polio-causing OPV](#)

