



Development of Polio Vaccines

For Prelims: [Polio](#), [Vaccine Derived Poliovirus](#), [WHO](#), [Universal Immunization Programme](#)

For Mains: Poliovirus, Polio Immunization and Eradication Programmes in India and the world, WHO Programmes on Polio.

[Source: TH](#)

Why in News?

The wild poliovirus is beginning to reappear in big cities in **Afghanistan** and **Pakistan**, due to **vaccine hesitancy, misinformation, conflict, poverty, and limited access** to these isolated regions.

- As a result, the [World Health Organization](#)'s **Global Polio Eradication Initiative** is set to **miss its deadline of eradicating polio by the end of 2024.**

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What is polio

■ Poliomyelitis (polio) is a highly infectious viral disease, mainly affecting children

■ According to WHO, the virus is transmitted from person-to-person, mainly through the faecal-oral route



STRAINS

■ There are three types of polio virus strains — P1, P2 and P3

■ P2 was eradicated globally in 1999

■ India attained a polio free status in 2014 after successfully eliminating the wild P1 and P3 strains

VACCINATION SCHEDULE

OPV: At 6 weeks, 10 weeks and 14 weeks

IPV: At 6 weeks and 14 weeks

OPV booster: Between 16 and 24 months

What is the History of Development of Polio Vaccines?

- The development of the 2 polio vaccines - the **Inactivated Polio Vaccine (IPV)** by **Jonas Salk** and the **Oral Polio Vaccine (OPV)** by **Albert Sabin** was a result of several key breakthroughs:
 - **Culturing the Poliovirus in Non-Nerve Cells:**
 - In 1948, microbiologists discovered a method to grow the poliovirus in human muscle and skin cells, rather than just in nerve cells as was previously believed.
 - This allowed for the **mass production of the poliovirus**, which was crucial for vaccine research and development.
 - **Development of the Inactivated Polio Vaccine (IPV):**
 - **Jonas Salk** developed the **first successful polio vaccine** by **growing the poliovirus, inactivating** it and injecting it into test subjects.
 - The IPV generated systemic immunity, as it was **introduced into the muscle**.
 - **Development of the Oral Polio Vaccine (OPV):**
 - Albert Sabin developed the OPV, which contained **live, weakened poliovirus strains that were administered orally**.

- The OPV induced a **powerful protective mucosal immune response** in the gut, where the virus begins its infection.

Note

- The immune system has 2 main parts: the **systemic** (including the blood, brain, and other organ systems) and the **mucosal** (including the inner linings of the digestive and respiratory systems, urogenital tract, and eyes).
 - Mucosal components are lined with **mucous membranes** for additional protection due to frequent contact with the external environment.

What are Advantages and Disadvantages of IPV and OPV?

Inactivated Polio Vaccine (IPV)	Oral Polio Vaccine (OPV)
<p>Advantages:</p> <ul style="list-style-type: none"> ▪ IPV is made from killed or inactivated poliovirus, which means it cannot cause the disease. ▪ IPV is safe for use in immunocompromised individuals, as it does not contain live virus. ▪ IPV provides long-lasting immunity and does not require multiple doses to maintain protection. <p>Disadvantages:</p> <ul style="list-style-type: none"> ▪ IPV is more expensive to produce and administer compared to OPV. ▪ IPV requires multiple doses (usually a series of 2-4 shots) to achieve full immunity. ▪ IPV does not provide the same level of mucosal immunity as OPV, which can limit its ability to interrupt the transmission of the virus. 	<p>Advantages:</p> <ul style="list-style-type: none"> ▪ OPV is less expensive to produce and administer compared to IPV. ▪ OPV only requires a single or a few doses to provide effective immunity. ▪ OPV can provide better mucosal immunity, which helps to interrupt the transmission of the virus. <p>Disadvantages:</p> <ul style="list-style-type: none"> ▪ OPV contains live, weakened poliovirus, which in rare cases can mutate and cause vaccine-derived poliovirus (VDPV) outbreaks. ▪ OPV is not recommended for use in immunocompromised individuals, as the live virus can pose a risk. ▪ OPV-derived immunity may not be as long-lasting as IPV-derived immunity.

Note:

The world has utilised both vaccines in the fight against polio.

- Some countries, such as **Norway, Sweden, Finland, and Iceland**, relied exclusively on the **IPV**.
- **Most countries**, however, used a **combination of the two vaccines**.
 - These countries preferred the **OPV for its superior protection** and ease of administration, and then **switched to the IPV** when the number of natural polio cases drops to zero.

What are the Key Facts about Polio?

- **Polio (poliomyelitis)** is a highly infectious **viral disease** that enters the body through the **mouth, multiplying in the intestine** before invading the **nervous system**.

- **It mainly affects children under 5 years of age.**

- The incubation period for poliovirus is usually 7–10 days, but it can range from 4–35 days.

- Initial symptoms of poliovirus infection include **fever, fatigue, headache, vomiting, stiffness** in the neck, and **pain** in the limbs.
 - Up to **90%** of those infected with poliovirus experience **no or mild symptoms**, often going unrecognised.
- One in 200 infections leads to permanent **paralysis** of the legs, which can occur within a few hours of infection.
 - **5-10% of those paralyzed by polio virus die** when their breathing muscles become immobilised.
- The virus is **shed by infected people, usually children, through faeces**, and can spread quickly in areas with poor hygiene and sanitation systems.
- Cases due to wild poliovirus have **decreased by over 99% since 1988**, from an estimated **350 000 cases** in more than 125 endemic countries, to just 2 endemic countries **Afghanistan** and **Pakistan** (as of October 2023).
- **India** received **polio-free certification** by the WHO in **2014**, after three years of zero cases.

What are the Measures Taken to Eradicate Polio?

- **Global:**

- **Global Polio Eradication Initiative:** It was launched in **1988** by national governments and spearheaded by the WHO, Rotary International, the United States Centers for Disease Control and Prevention (CDC), and the United Nations Children's Fund (UNICEF).
 - [World Polio Day](#): It is observed every year on **24th October** in order to call on countries to stay vigilant in their fight against the disease

- **India:**

- [Pulse Polio Programme](#):
 - [Intensified Mission Indradhanush 2.0](#)
 - Universal Immunization Programme (UIP): It was launched in 1985 with the modification to 'Expanded Programme of Immunization (EPI). The objectives of the Programme include:
 - Rapidly increasing immunisation coverage, Improving the quality of services, Establishing a reliable cold chain system to the health facility level, Introducing a district-wise system for monitoring of performance, Achieving self-sufficiency in vaccine production.

Read more: [Guinea Worm Disease](#)

UPSC Civil Services Examination, Previous Year Question

Q. 'Mission Indradhanush' launched by the Government of India pertains to (2016)

- (a) immunisation of children and pregnant women
- (b) construction of smart cities across the country
- (c) India's own search for the Earth-like planets in outer space
- (d) New Educational Policy

Ans: (a)

Q. Which of the following are the objectives of 'National Nutrition Mission'? (2017)

1. To create awareness relating to malnutrition among pregnant women and lactating mothers.
2. To reduce the incidence of anaemia among young children, adolescent girls and women.
3. To promote the consumption of millets, coarse cereals and unpolished rice.
4. To promote the consumption of poultry eggs.

Select the correct answer using the code given below:

- (a) 1 and 2 only
(b) 1, 2 and 3 only
(c) 1, 2 and 4 only
(d) 3 and 4 only

Ans: (a)

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