

4-7-2005

# Eradicating Polio: 50 Years of Vaccines

United States National Library of Medicine

Follow this and additional works at: [http://digitalcommons.cwu.edu/government\\_posters](http://digitalcommons.cwu.edu/government_posters)

---

## Recommended Citation

United States National Library of Medicine, "Eradicating Polio: 50 Years of Vaccines" (2005). *U.S. Government Posters*. Book 157.  
[http://digitalcommons.cwu.edu/government\\_posters/157](http://digitalcommons.cwu.edu/government_posters/157)

This Book is brought to you for free and open access by the University Archives and Special Collections at ScholarWorks@CWU. It has been accepted for inclusion in U.S. Government Posters by an authorized administrator of ScholarWorks@CWU.



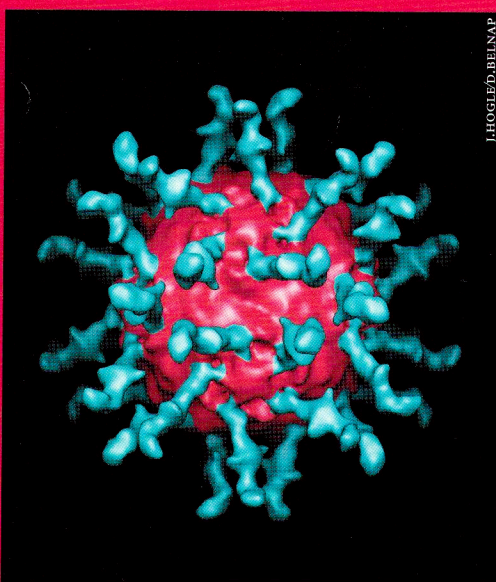
**"A MILESTONE FOR HUMAN KIND"**

- Sir Gustav Nossal, March 2005

# ERADICATING POLIO: 50 YEARS OF VACCINES

## POLIOVIRUS: BIOLOGY AND DISEASE

Polio is a contagious viral disease that can strike at any age, but mostly affects children under the age of five. The poliovirus enters the body via the mouth, multiplies in the throat and gut, enters the blood stream and, unless impeded by antibodies, invades the spinal cord and destroys motor neurons. Most patients have no symptoms, while around five per cent experience fever, sore throat, nausea and vomiting, and one in every 200 becomes irreversibly paralysed, usually in the legs. There is no cure, only protection through vaccination.



Poliovirus is a relatively small virus (27 nanometres in diameter) with genetic material consisting of ribonucleic acid, or RNA. Research continues into the molecular events underpinning infection, in the hope of developing new drugs against this and related viruses.

## IRON LUNGS

In the 1950s, huge breathing machines known as 'iron lungs' became a common sight in hospitals. They assisted breathing during the acute phase of polio in which around 10 per cent of patients experience temporary paralysis in their chest muscles, and are at risk of death through asphyxiation.



## OUTBREAKS

Polio is an ancient scourge that spreads from person to person via infected saliva and stools. With the introduction of polio vaccines in the 1950s, most countries have eradicated wild-type polio, yet it continues to be endemic in parts of South Asia and Africa, fuelled by conditions of poor hygiene. Newborns everywhere need vaccinating as polio outbreaks can still occur - either when an infected person arrives from another country or in the rare instance when the live oral polio vaccine virus mutates back to a virulent form.



THE WILD POLIOVIRUS USUALLY PARALYSES CHILDREN UNDER FIVE YEARS OF AGE

## VACCINES: WHAT & HOW

The two main types of polio vaccine used today are based on those developed by Salk (IPV) and Sabin (OPV). IPV elicits protective antibodies in the blood that block the spread of the virus to the central nervous system, and therefore provides excellent individual protection against paralytic polio. However, it triggers only low levels of immunity in the gut, whereas OPV confers strong gut immunity which limits wild virus multiplication and reduces its spread from person to person. This explains why mass vaccination campaigns with OPV can rapidly stop person-to-person transmission of wild poliovirus. For a few months, OPV virus is shed into the stools of recently immunized children, and in areas where hygiene and sanitation are inadequate this can result in immunization of close contacts. OPV is cheaper to produce than IPV and easier to administer as drops by mouth, and can be given by volunteers without the need for healthcare workers, needles, or syringes. OPV remains the vaccine of choice in areas where wild poliovirus is endemic.

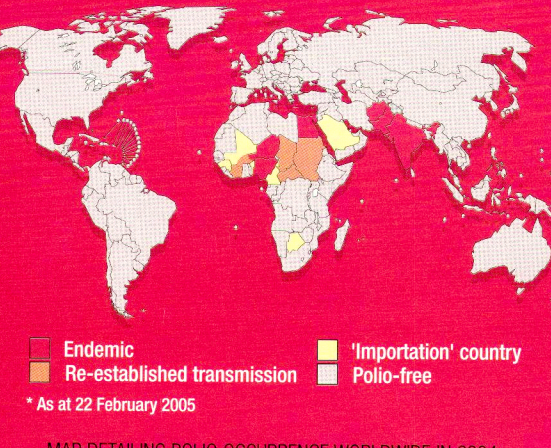
Standard OPV consists of all three poliovirus types (trivalent OPV) while a new monovalent type 1 OPV provides a boost in immunity against type 1 poliovirus.

## SIGNS OF SUCCESS

The drive to eradicate polio promises to parallel the successful campaign against smallpox. Before the Salk vaccine was introduced in 1955 there were more than 21,000 polio cases annually in the USA alone. When the Global Polio Eradication Initiative (GPEI) began in 1988, poliovirus was still endemic in more than 125 countries on five continents, causing more than 350,000 cases worldwide. This has plummeted by more than 99 per cent, to 1,263 cases in 2004.

Just six countries remain polio-endemic (wild poliovirus circulating): Afghanistan, Egypt, India, Pakistan, Nigeria and Niger, with Nigeria accounting for the highest number - 789 cases - in 2004. Intensified vaccination campaigns are also continuing in five other countries with 're-established polio transmission' owing to imported poliovirus from Nigeria circulating for longer than six months - Burkina Faso, Central African Republic, Chad, Côte d'Ivoire and Sudan.

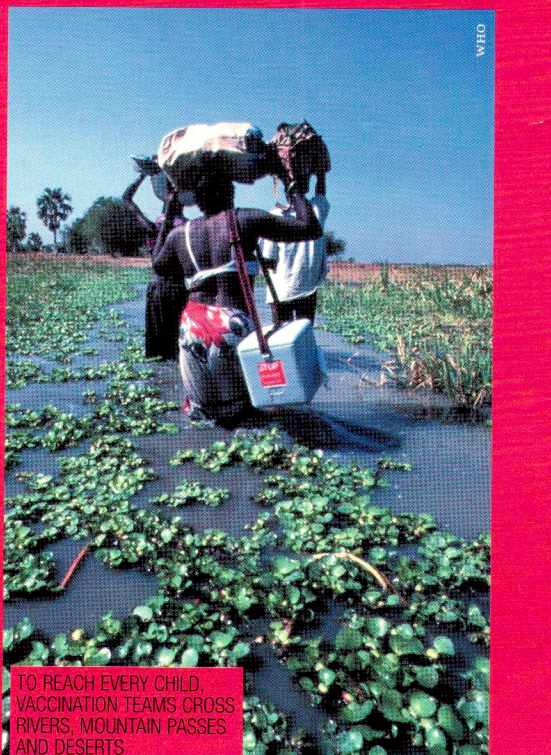
Polio Eradication 2004 1,262 cases\*



MAP DETAILING POLIO OCCURRENCE WORLDWIDE IN 2004

## THE END GAME

GPEI hopes to achieve its goal of interrupting wild poliovirus transmission by the end of 2005 or soon after. Millions of volunteers and vast publicity campaigns are aiming to reach as many children as possible on National Immunization Days. In 2008, GPEI hopes to certify the world polio free, and to ensure that polio never returns. As part of the 'end-game' strategy, many countries have replaced OPV with IPV so as to avoid polio outbreaks caused by circulating OPV strains, and others will follow suit. The main priority will then be to ensure safe containment of laboratory stocks of poliovirus, and to stockpile vaccines in readiness for any future accidental exposure or bioterrorism.



TO REACH EVERY CHILD VACCINATION TEAMS CROSS RIVERS, MOUNTAIN PASSES AND DESERTS

<p><b>4000 - 1500 BC</b> Egyptian mummies and stone carvings reveal polio-like disease to be present in ancient Egyptians.</p>	<p><b>1796</b> English physician Edward Jenner performs the first known vaccination against smallpox, using the contents of pustules from a milkmaid infected with the related cowpox disease.</p>	<p><b>1908</b> Austrian physicians Karl Landsteiner and Erwin Popper show that a virus is responsible for polio.</p>	<p><b>1931</b> Australian scientists Frank Macfarlane Burnet and Jean Macnamara identify three types of poliovirus, each triggering slightly different immune responses in monkeys.</p>	<p><b>U.S. scientists John Enders (see picture), Thomas Weller and Frederick Robbins</b> grow poliovirus in cell cultures paving the way for vaccine development. In 1954 they receive the Nobel Prize in Physiology or Medicine.</p>	<p><b>U.S. scientist Hilary Koprowski</b> at Lederle Laboratories, Pearl River, New York, gave live attenuated oral polio vaccine to the first child on 27 February, 1950, using virus isolated from animal tissue.</p>	<p><b>"Few have made one discovery that has benefited humanity so greatly"</b> (Francis Crick, June 1995)</p> <p>Salk's ingenuity was to apply two technologies recently developed by others to create the first effective polio vaccine. First, he succeeded in growing large quantities of poliovirus on cultures of kidney cells derived from monkeys. He then killed ('inactivated') the virus by chemical treatment with formaldehyde, a technique he learnt when helping to produce a vaccine against influenza. The result was an inactivated polio vaccine, or IPV.</p>	<p><b>U.S. scientist Albert Sabin</b>, at the University of Cincinnati College of Medicine in Ohio, creates an alternative 'live' polio vaccine (OPV) using all three types of wild poliovirus, attenuated through tissue culture.</p>	<p><b>1980</b> The World Health Assembly announces that smallpox has been eradicated.</p>	<p><b>1985</b> Rotary International launches PolioPlus, a programme to protect children worldwide from polio.</p>	<p><b>1994</b> The Americas are certified as free of wild polio virus after the last case of disease appeared in 1991.</p>	<p><b>Last wild polio cases in the Western Pacific, Europe, and the former Soviet Union.</b></p>			
<p><b>1905</b> Rotary International, the world's first and largest humanitarian service organization, is founded in Chicago, USA.</p>	<p><b>1921</b> Franklin D. Roosevelt contracts polio at the age of 39, and becomes a life-long supporter of initiatives to improve the lives of those affected.</p>	<p><b>1938</b> President Roosevelt founds the National Foundation for Infantile Paralysis or NFIP (known today as the March of Dimes), to raise funds to support the development and testing of a polio vaccine and care for patients.</p>	<p><b>1951</b> Koprowski reports on the first immunization of children with oral polio vaccine at an NFIP meeting in Hershey, Pennsylvania. The vaccine is tested and used extensively on our continents over the next decade.</p>	<p><b>1952</b> UNICEF develops a 'cold chain' to keep oral polio vaccines cold during transport and use, as they deteriorate at high temperatures.</p>	<p><b>U.S. scientist Jonas Salk</b>, head of the Virus Research Lab at the University of Pittsburgh, begins tests on an inactivated polio vaccine (IPV), first on his own family and then on polio survivors.</p>	<p><b>1954</b> Field trials of the Salk vaccine involving more than 1.8 million U.S. schoolchildren begin, funded by the March of Dimes.</p>	<p><b>1955</b> On 12 April, authorities declare the Salk polio vaccine safe and effective. Results are spectacular: in 1955, there are 28,985 cases of polio in the U.S.; in 1957, just 5,485 cases. By 1959, 90 other countries are using Salk's vaccine.</p>	<p>Following tests in the former Soviet Union and Eastern Europe, OPV is licensed for general use. Sabin (see picture above) and Salk (see picture below) were to remain bitter rivals, as Salk criticises OPV use for the risk of causing vaccine-associated polio, and Sabin claims superiority with a more effective vaccine.</p>	<p><b>1988</b> Launch of the Global Polio Eradication Initiative (GPEI) led by WHO, UNICEF, Rotary International and the U.S. Centers for Disease Control and Prevention, with the goal of eradicating polio by 2000.</p>	<p><b>1994</b> Last polio cases in China.</p>	<p><b>South African president Nelson Mandela</b> launches the 'Kick Polio out of Africa' campaign to improve immunization efforts.</p>	<p><b>2000</b> Global number of new polio cases falls to 2,979.</p>	<p><b>2003</b> Fewer than 800 polio cases are recorded worldwide in 15 countries.</p>	<p><b>2005</b> On 4 February, Afghanistan, India and Pakistan declare they are on target to end polio in 2005, as South Asia cases have fallen from 333 in 2003 to 193 in 2004 (as of 15 March). Hopes continue for global eradication by the end of 2005.</p>

1952 The largest ever polio epidemic in the USA with 57,879 reported cases.

PRINCIPAL SPONSOR: March of Dimes Saving babies, together

SUPPORTING SPONSOR: Rotary International

nature publishing group

WEBLINKS: Global Polio Eradication Initiative [www.polioeradication.org](http://www.polioeradication.org) | March of Dimes [www.marchofdimes.com](http://www.marchofdimes.com) | U.S. Centers for Disease Control and Prevention information on polio [www.cdc.gov/ncidod/diseases/submenu/sub\\_polio.htm](http://www.cdc.gov/ncidod/diseases/submenu/sub_polio.htm) | U.S. National Network for Immunization Information [www.immunizationinfo.org/vaccinesinfo/vaccine\\_detail.cfm?id=10](http://www.immunizationinfo.org/vaccinesinfo/vaccine_detail.cfm?id=10) | World Health Organization [www.who.org](http://www.who.org) | Rotary International [www.rotary.org](http://www.rotary.org) | UNICEF [www.unicef.org](http://www.unicef.org) | Bill and Melinda Gates Foundation [www.gatesfoundation.org](http://www.gatesfoundation.org)

HE 20.7308: E50

CENTRAL WASHINGTON UNIVERSITY LIBRARY  
09936196

