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ALDO MORO

CORSO DI IGIENE

Scuola
di
Medicina

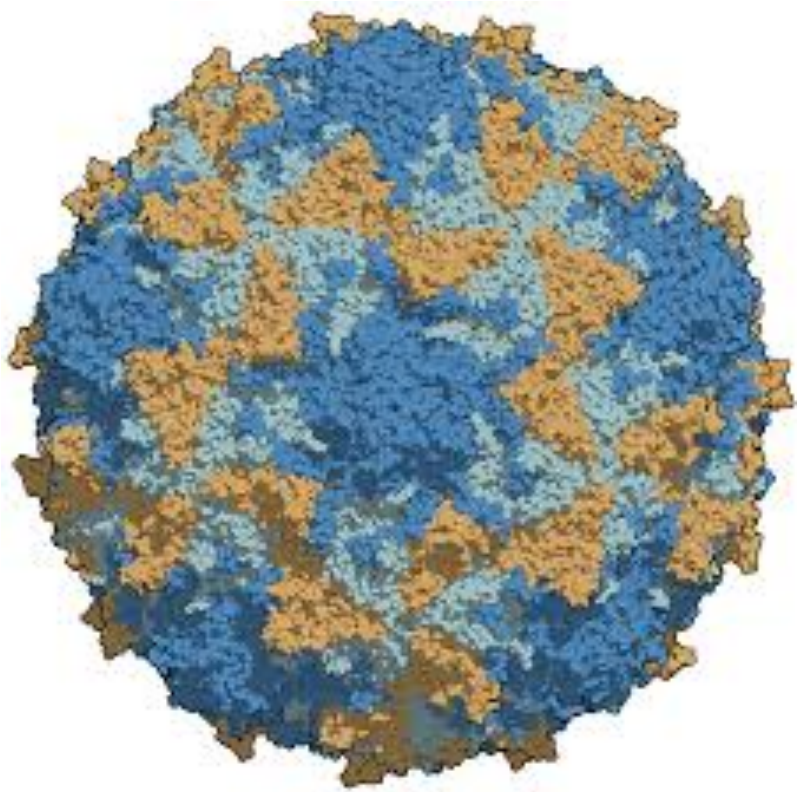
Poliomyelitis

Poliomyelitis

- First described by Michael Underwood in 1789
- First outbreak described in U.S. in 1843
- More than 21,000 paralytic cases reported in the U.S. in 1952
- Global eradication within next decade

Poliovirus

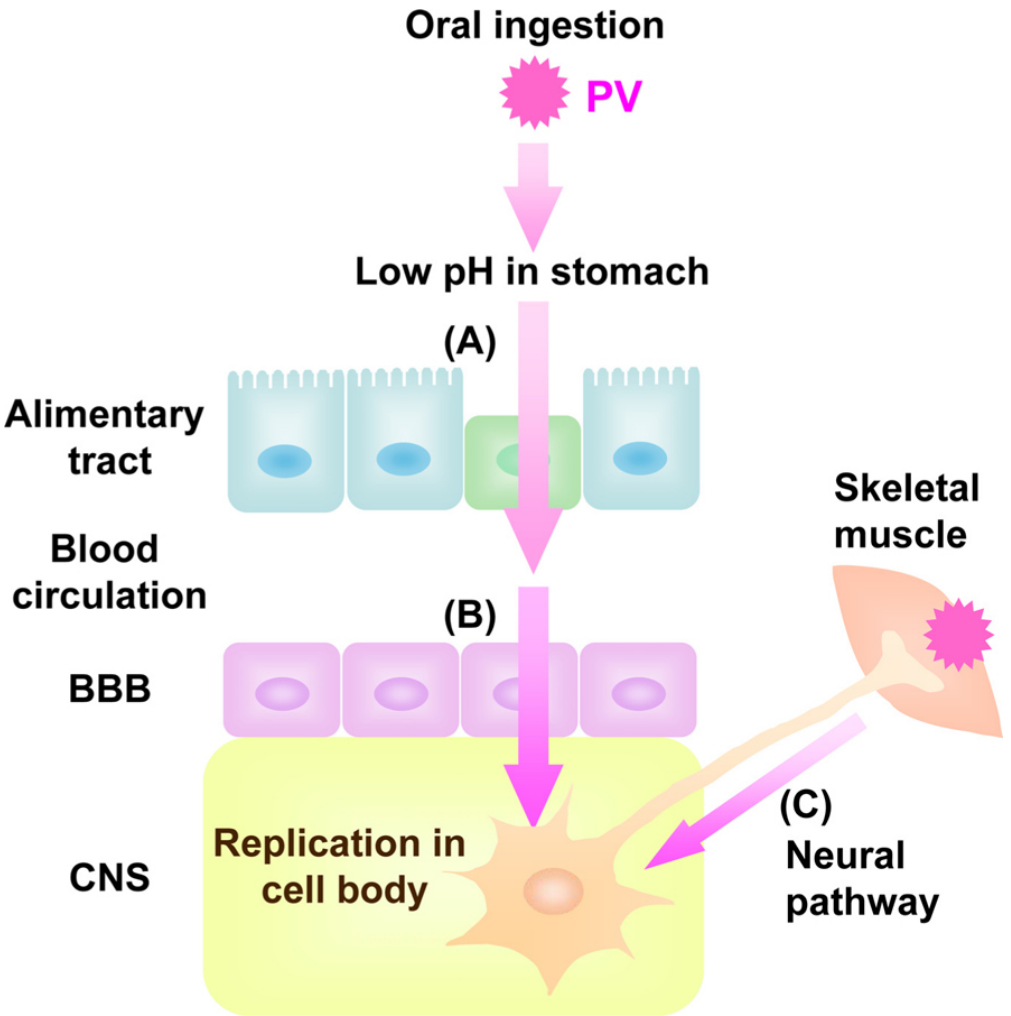
- Enterovirus (RNA)
- Three serotypes: 1, 2, 3
- Minimal heterotypic immunity between serotypes
- Rapidly inactivated by heat, formaldehyde, chlorine, ultraviolet light



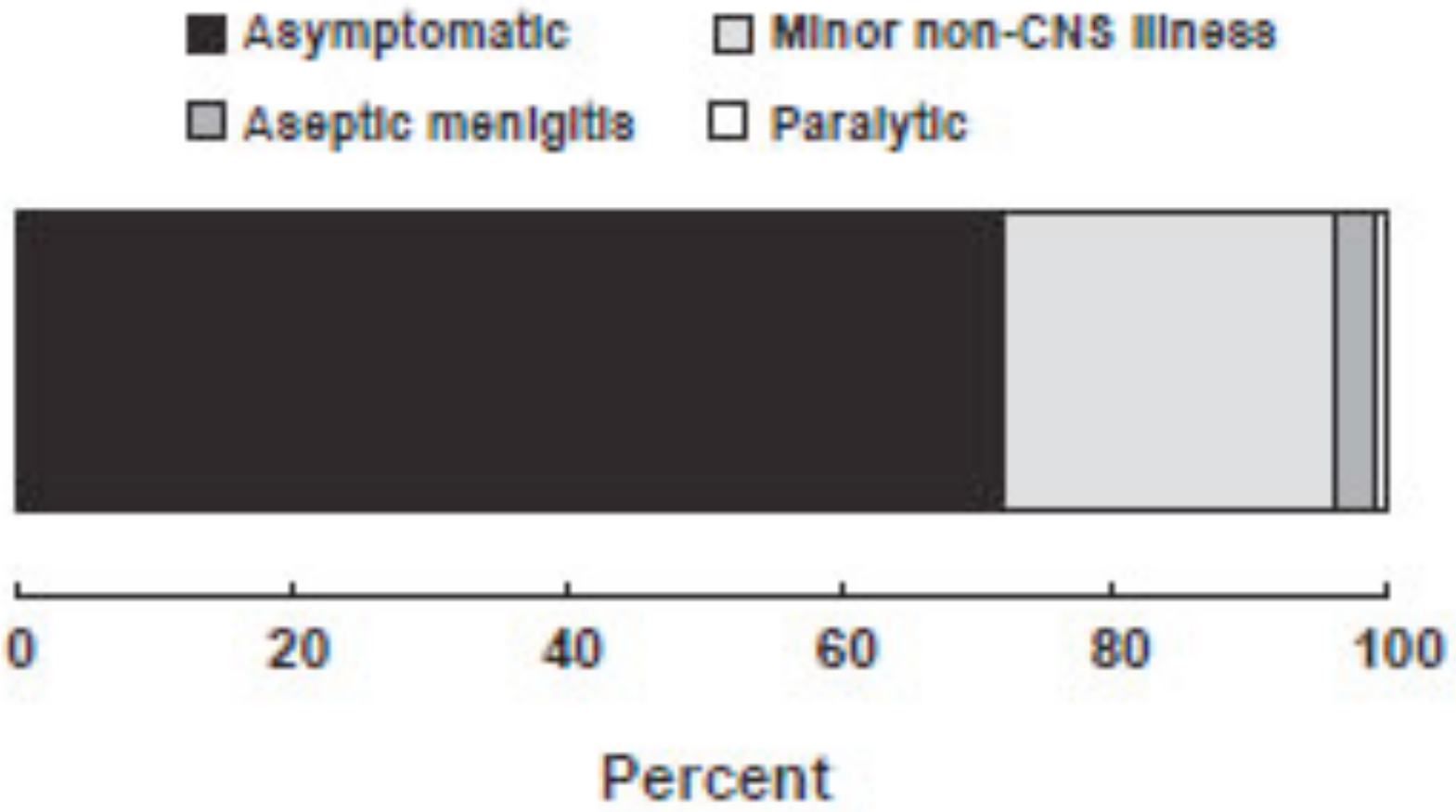
Poliomyelitis Pathogenesis

- Entry into mouth
- Replication in pharynx, GI tract
- Hematologic spread to lymphatics and central nervous system
- Viral spread along nerve fibers
- Destruction of motor neurons

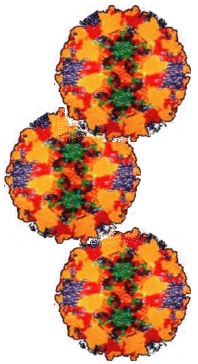
Poliomyelitis Pathogenesis



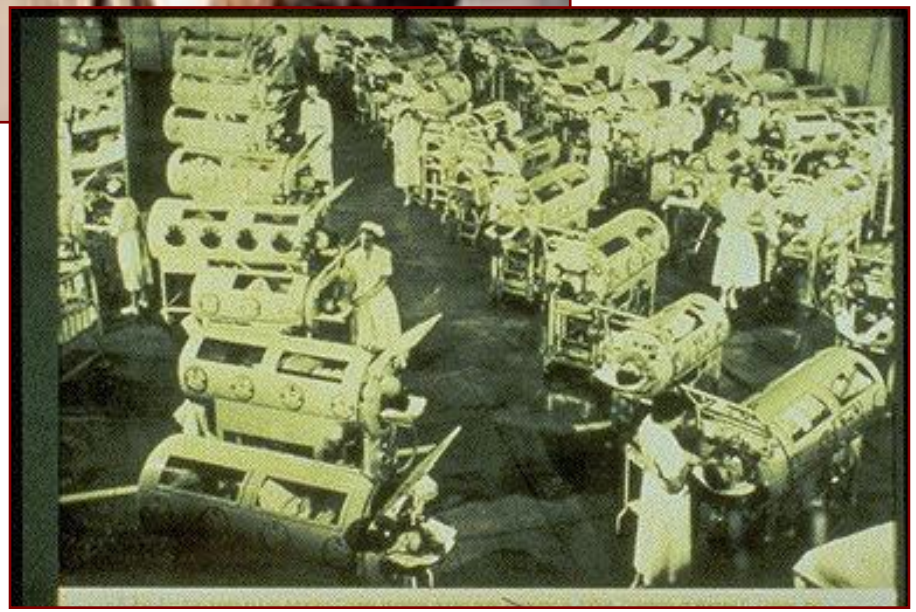
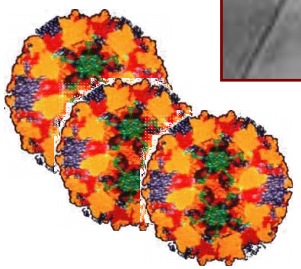
Outcomes of poliovirus infection







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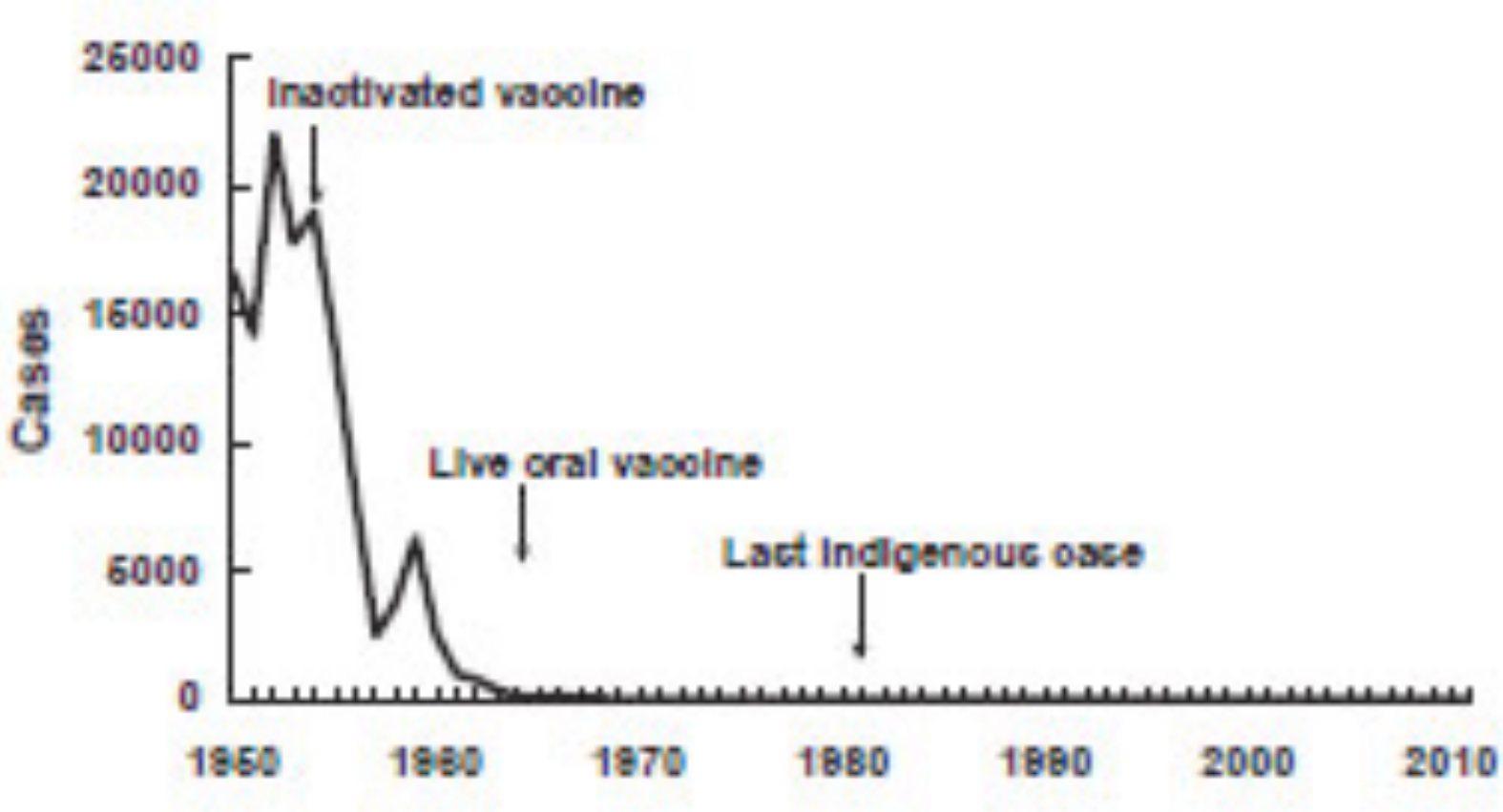
Laboratory Testing

- Viral Isolation (Cell culture or PCR)
  - Stool
  - Pharynx
  - Cerebrospinal fluid (CSF)
  - Blood
- Serology

Poliovirus Epidemiology

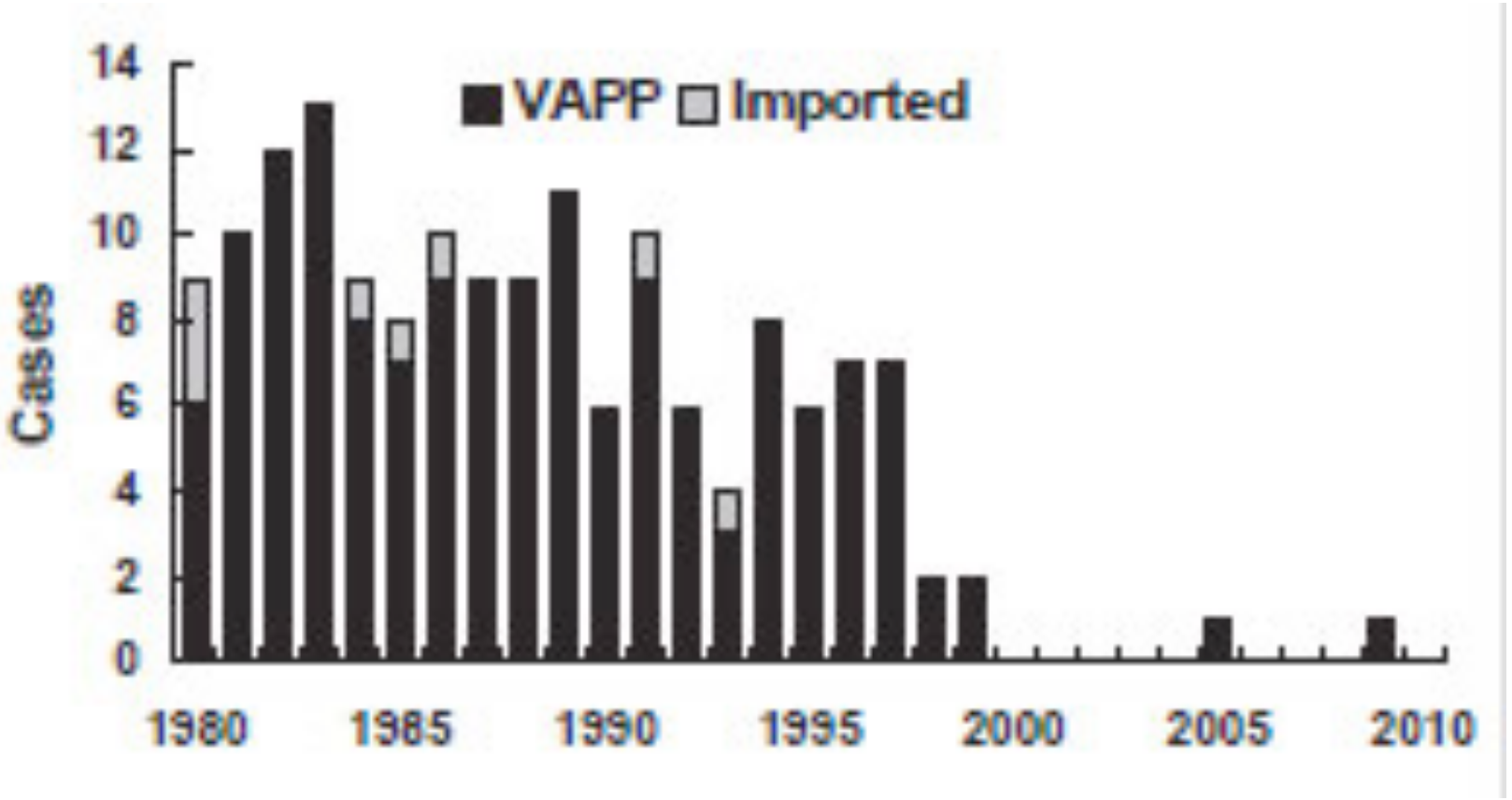
- **Reservoir**
  - Human
- **Transmission**
  - Fecal-oral
  - Oral-oral possible
- **Communicability**
  - most infectious 7-10 days before and after onset of symptoms
  - Virus present in stool 3 to 6 weeks

Poliomyelitis - United States, 1950-2011



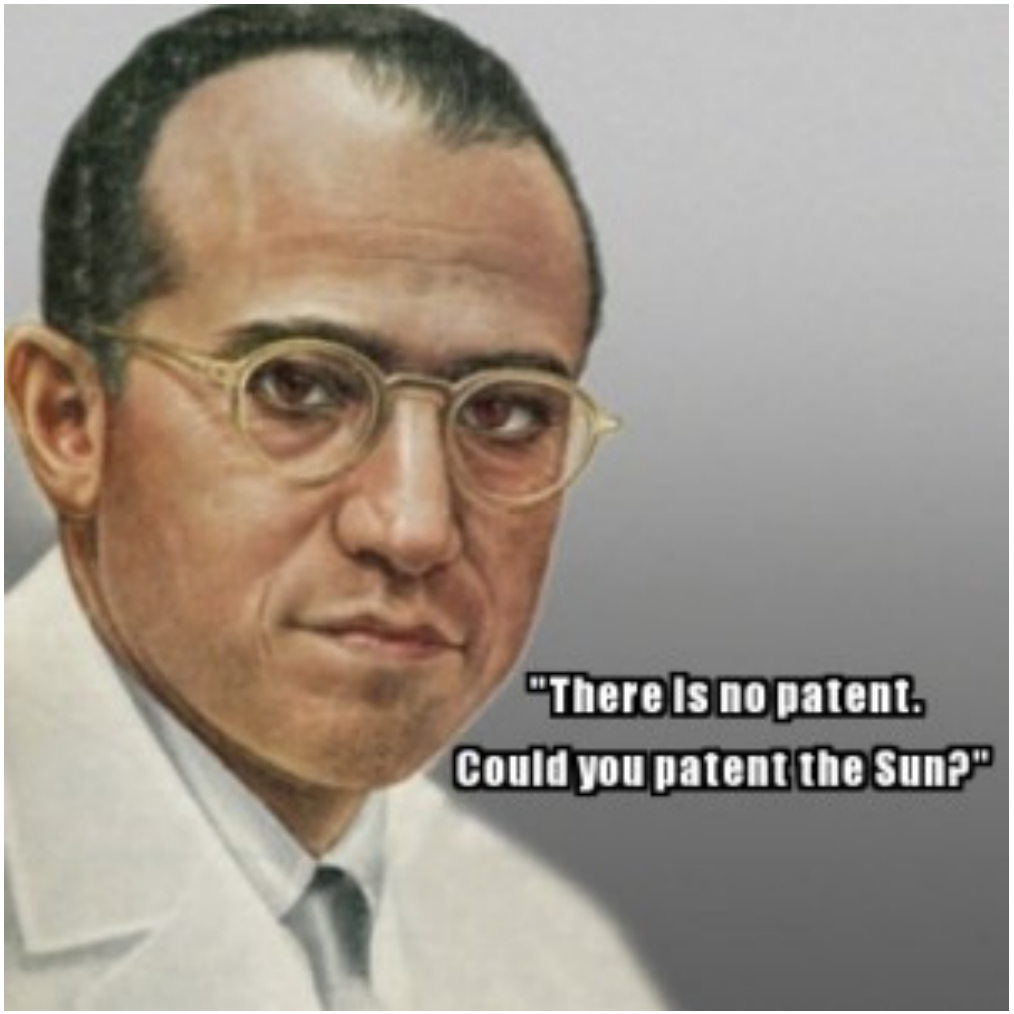
Source: National Notifiable Disease Surveillance System, CDC

Poliomyelitis - United States, 1980-2010



Source: National Notifiable Disease Surveillance System, CDC

Poliovirus Vaccine



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Poliovirus Vaccine

Poliovirus Vaccine

- **1955** - Inactivated vaccine
- **1961** - Types 1 and 2 monovalent OPV
- **1962** - Type 3 monovalent OPV
- **1963** - Trivalent OPV
- **1987** - Enhanced-potency IPV (IPV)

Inactivated Polio Vaccine (IPV)
Salk

- Contains **3 serotypes** of vaccine virus
- Grown on monkey kidney (Vero) cells
- Inactivated with formaldehyde
- Contains 2-phenoxyethanol, neomycin, streptomycin, polymyxin B

Oral Polio Vaccine (OPV)
Sabin

- Contains 3 serotypes of vaccine virus
- Grown on monkey kidney (Vero) cells
- Contains neomycin and streptomycin
- **Shed in stool for up to 6 weeks following vaccination**

Sabin vaccine

Vaccine efficacy

IPV

- Highly effective in producing immunity to poliovirus
- 90% or more immune after 2 doses
- **At least 99% immune after 3 doses**
- Duration of immunity not known with certainty

OPV

- Highly effective in producing immunity to poliovirus
- Approximately 50% immune after 1 dose
- **More than 95% immune after 3 doses**
- Immunity probably lifelong

Polio Vaccine Contraindications and Precautions

- Severe allergic reaction to a vaccine component or following a prior dose of vaccine
- Moderate or severe acute illness

Polio Vaccine Adverse Reactions

IPV

- Local reactions

OPV

Vaccine-Associated Paralytic Poliomyelitis

- Rate 1/1.600.000 doses
- More likely in persons 18 years of age and older
- Much more likely in persons with immunodeficiency
- No procedure available for identifying persons at risk of paralytic disease

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Polio vaccine Reccomendations, Italy

- In Italy, vaccination with OPV is **mandatory** for newborns since 1966
- In 1998 a sequential schedule (IPV-OPV) has been adopted
- Since 2005, **IPV is the only vaccine administered in Italy**

Polio Vaccination Recommendations, 1996-1999, USA

- Increased use of IPV (sequential IPV-OPV schedule) recommended in 1996
- Intended to *reduce* the risk of vaccine-associated paralytic polio (VAPP)
- Continued risk of VAPP for contacts of OPV recipients

Polio Vaccination Recommendations, 2000, USA

- Exclusive use of IPV recommended in 2000
- OPV no longer routinely available in the United States
- **Indigenous VAPP eliminated**

Polio Vaccination Schedule

Dose	Italy	USA
Primary 1	3 months	2 months
Primary 2	5-6 months	4 months
Primary 3	11-12 months	6-18 months
Booster 1	5-6 years	4-6 years
Booster 2	13-14 years	----

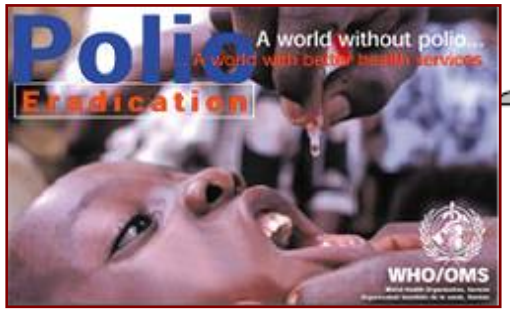
Polio Vaccination of Unvaccinated Adults

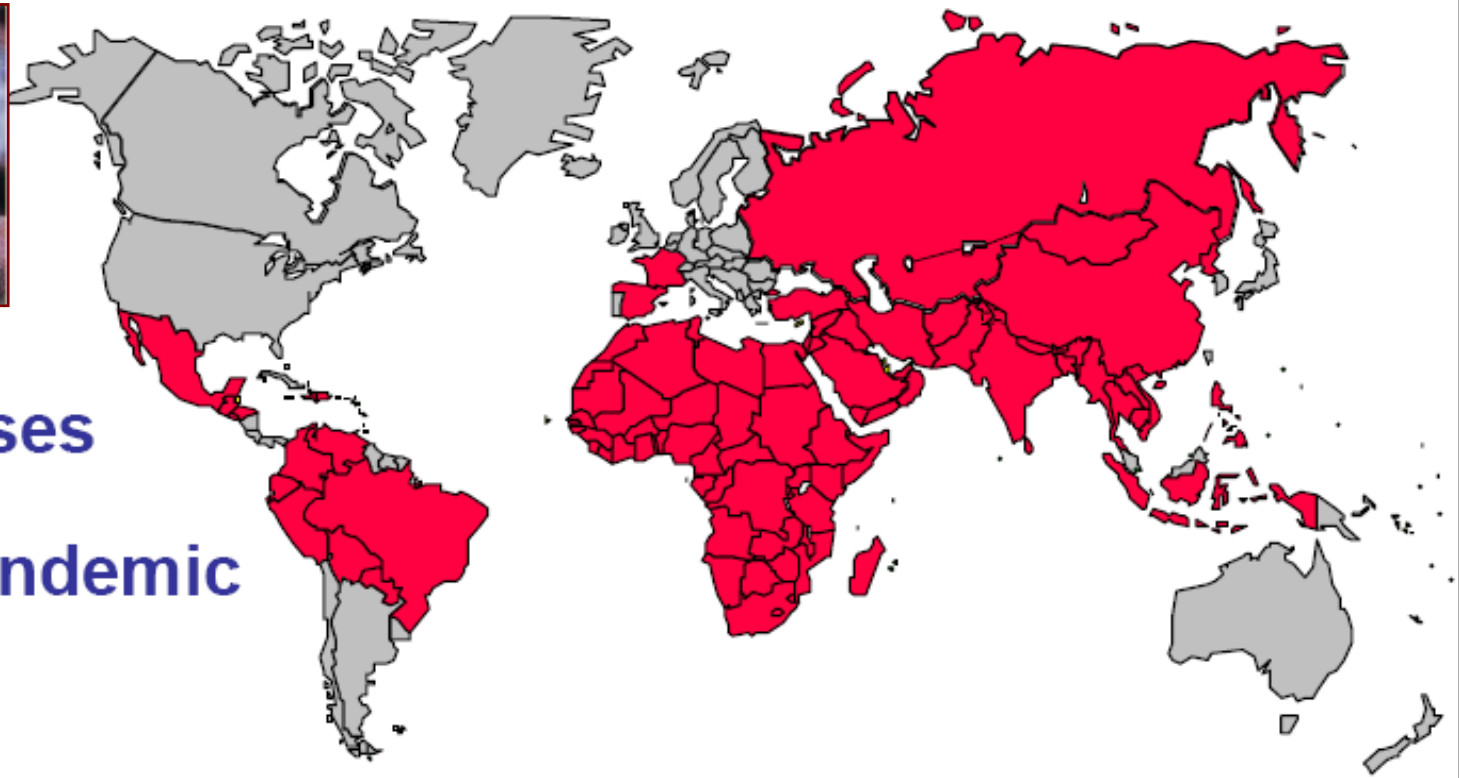
- **Use standard IPV schedule if possible** (0, 1-2 months, 6-12 months)
- May separate first and second doses by 4 weeks if accelerated schedule needed
- The minimum interval between the second and third doses is 6 months

Polio Vaccination of Previously Vaccinated Adults

- Previously complete series
  - administer one dose of IPV
- Incomplete series
  - administer remaining doses in series
  - no need to restart series

Polio – the world in 1988





>350,000 cases

>125 polio-endemic countries

1988: World Health Assembly Voted to Eradicate Polio

Sabin AB.

Perspectives on rapid elimination and ultimate global eradication of paralytic poliomyelitis caused by polioviruses.
European Journal of Epidemiology. 7(2):95-120, 1991

The major challenge now is first to eliminate it rapidly from Asia and Africa where an estimated 250,000 cases and 25,000 deaths currently occur annually.

The great progress toward eradication of "wild" polioviruses from poor tropical and subtropical countries in Latin America was achieved by the independently organized annual, national days of antipolio vaccination - all based on the use of large armies of well-trained non-professional,community volunteers - first used in Cuba (1962), Brazil (1980), Nicaragua (1981), Dominican Republic (1983), Paraguay (1985), and Mexico (1986).

This novel approach, described in some detail in this communication, is recommended for the rapid elimination of wild polioviruses from Asia and Africa, and for ultimate global eradication with the help of a special cadre within the EPI of WHO."

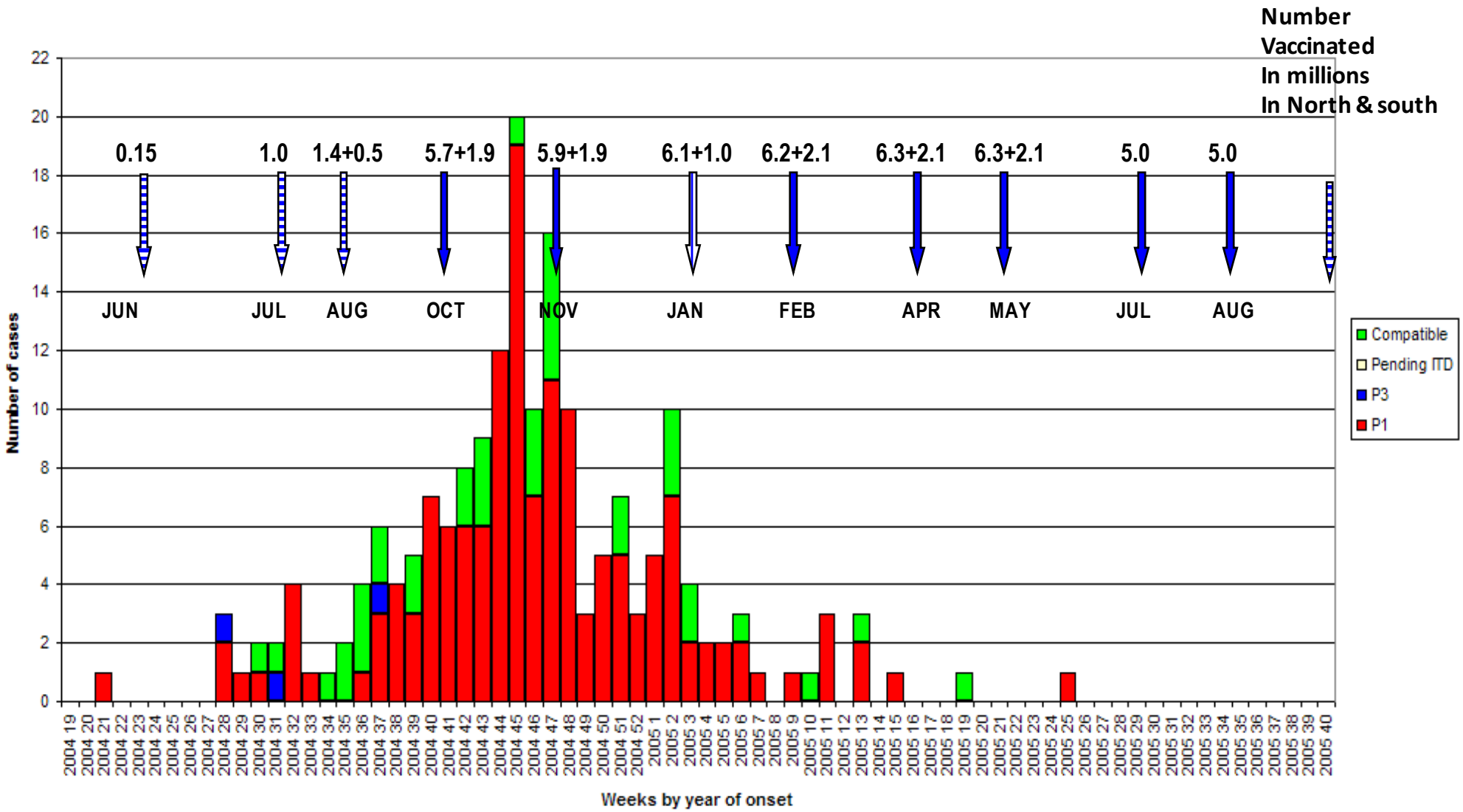
Polio eradication: key actions

- Routine vaccination
- National Immunization Days
- Acute Flaccid Paralysis (AFP) Surveillance
- Environmental Surveillance

Immunization Days (NIDs)

This supplementary immunization is intended to complement - not replace - routine immunization. The aim of mass campaigns is to interrupt circulation of poliovirus by immunizing every child under 5 years of age with two doses of OPV, regardless of previous immunization status.

Epidemic curve of poliomyelitis in Sudan in relation to SIAs



Kano - NIGERIA

Calendar of Immunization Days in Nigeria for 2005

26 February - 1 March
9 - 12 April (includes vitamin A)
14-17 May (Sub-national campaign)
17-20 September
12-15 November (includes vitamin A)

National Immunization Days in Nigeria.

Did you know what is involved in a 4-day immunization campaign in Nigeria? Here are just some of the basic facts...

138,220 vaccinators in 13,822 sweep groups

27, 644 supervisors, with 13,822 vehicles (cars, motorcycles, mopeds, bicycles, boats, whatever it takes to reach every child)

45 million doses of polio vaccine, carried around the country in 83,000 Kick Polio Out of Nigeria vaccine carriers

498,000 ice-packs to keep all doses of polio vaccine cold despite the hot Nigeria temperatures

The commitment and support of everyone in Nigeria

Angola

Acute Flaccid Paralysis (AFP) Surveillance

- Nationwide AFP (**acute flaccid paralysis**) surveillance is the gold standard for detecting cases of poliomyelitis.
- The four steps of surveillance are:
  - finding and reporting children with acute flaccid paralysis (AFP)
  - transporting **stool samples for analysis**
  - isolating and **identifying poliovirus in the laboratory**
  - mapping the virus to determine the origin of the virus strain.

Successful proof of principle – 3 regions polio-free

Americas
Last case
Peru 1991

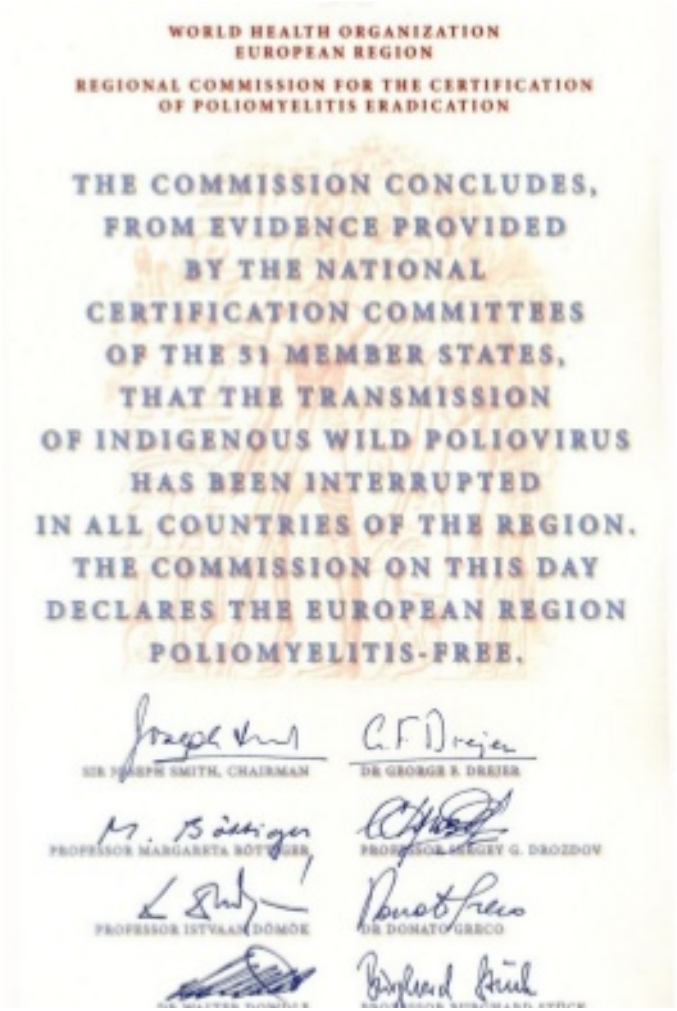
Western Pacific
Last case
Cambodia 1997

Europe
Last case
Turkey 1998

Successful Proof of Principle

One of the three poliovirus strains, Type II poliovirus, was eradicated by 1999.

Europe polio free



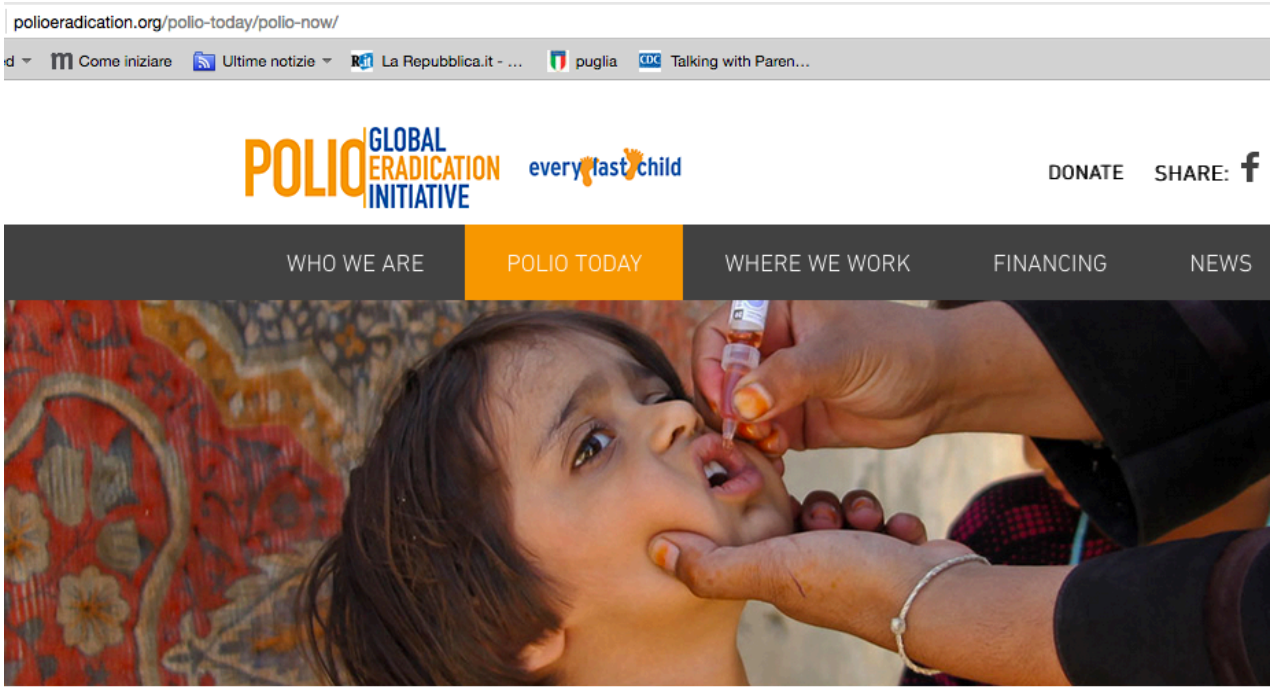
WORLD HEALTH ORGANIZATION
EUROPEAN REGION

REGIONAL COMMISSION FOR THE CERTIFICATION
OF POLIOMYELITIS ERADICATION

THE COMMISSION CONCLUDES,
FROM EVIDENCE PROVIDED
BY THE NATIONAL
CERTIFICATION COMMITTEES
OF THE 51 MEMBER STATES,
THAT THE TRANSMISSION
OF INDIGENOUS WILD POLIOVIRUS
HAS BEEN INTERRUPTED
IN ALL COUNTRIES OF THE REGION.
THE COMMISSION ON THIS DAY
DECLARES THE EUROPEAN REGION
POLIOMYELITIS-FREE.

SIR JOSEPH SMITH, CHAIRMAN
DR GEORGE F. DREJER
PROFESSOR MARGARETA BOTTIGER
PROFESSOR SERGEY G. DROZDOV
PROFESSOR ISTVAAN DÖMÖK
DR DONATO GRECO

Polio eradication



10 facts on polio eradication

10 FACTS ON POLIO ERADICATION

Next

1 2 3 4 5 6 7 8 9 10

Polio continues to paralyse children

While polio is a distant memory in most of the world, the disease still exists in some places and mainly affects children under 5. One in 200 infections leads to irreversible paralysis (usually in the legs). Among those paralysed, 5% to 10% die when their breathing muscles become immobilized.

10 facts on polio eradication

10 FACTS ON POLIO ERADICATION

Previous Next

1 2 3 4 5 6 7 8 9 10

We are 99% of the way to eradicating polio globally

In 1988, when the Global Polio Eradication Initiative was formed, polio paralysed more than 350 000 people a year. Since that time, polio case numbers have decreased by more than 99%.

10 facts on polio eradication

10 FACTS ON POLIO ERADICATION

Previous Next

1 2 3 4 5 6 7 8 9 10

There are just 3 countries which have never stopped transmission of polio

The 3 countries are Afghanistan, Nigeria and Pakistan. They face a range of challenges such as insecurity, weak health systems and poor sanitation. Polio can spread from these 'endemic' countries to infect children in other countries with less-than-adequate vaccination.

10 facts on polio eradication

1 2 3 4 5 6 7 8 9 10

Unlike most diseases, polio can be completely eradicated

There are 3 strains of wild poliovirus, none of which can survive for long periods outside of the human body. If the virus cannot find an unvaccinated person to infect, it will die out. Type 2 wild poliovirus was eradicated in 1999 and case numbers of type 3 wild poliovirus are down to the lowest-ever levels.

10 facts on polio eradication

1 2 3 4 **5** 6 7 8 9 10

Cheap and effective vaccines are available to prevent polio

There are 2 forms of vaccine available to ward off polio - oral polio vaccine (OPV) and inactivated polio vaccine (IPV). Because OPV is an oral vaccine, it can be administered by anyone, even volunteers. One dose of OPV can cost as little as 14 US cents.

10 facts on polio eradication

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1 2 3 4 5 6 7 8 9 10

The global effort to eradicate polio is the largest public-private partnership for public health

In fact, it is the largest-ever internationally-coordinated public health effort in history. It is spearheaded by national governments, WHO, Rotary International, the US Centers for Disease Control and Prevention (CDC) and UNICEF, and is supported by key partners including the Bill and Melinda Gates Foundation. Underpinning the effort is a global network of more than 20 million volunteers worldwide who have collectively immunized nearly 3 billion children over the past 20 years.

10 facts on polio eradication

1 2 3 4 5 6 7 8 9 10

Large-scale vaccination rounds help rapidly boost immunity

The Global Polio Eradication Initiative assists countries in carrying out surveillance for polio and large-scale vaccination rounds. When India was still polio-endemic, there were 640 000 vaccination booths, 2.3 million vaccinators, 200 million doses of vaccine, 6.3 million ice packs, 191 million homes visited and 172 million children immunized: all this in just one round of the national immunization days.

10 facts on polio eradication

1 2 3 4 5 6 7 8 9 10

Every child must be vaccinated to eradicate polio

This includes those living in the most remote and underserved places on the planet. To get each vaccine safely to children everywhere, all manner of transport is used – from donkeys to motorbikes to helicopters – to reach those living in remote areas, in conflict zones or difficult terrain.

10 facts on polio eradication

Polio-funded staff, strategies and resources are also used to advance other health initiatives

Strategies to find and map every child can be applied to other public health initiatives. While a vaccination team is in a remote village, they can, for little additional cost, provide other health interventions while they are there. For example, vitamin A has been given alongside polio campaigns. Since vitamin A gives a general boost to immunity, it allows children to fend off a range of infections, this has averted more than 1.5 million deaths.

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10 facts on polio eradication

1 2 3 4 5 6 7 8 9 10

We can eradicate polio

In 2011, this little girl, Rukhsar Khatoon, was the last child to be paralysed by polio in India. The WHO South East Asia Region was declared polio-free in 2014, marking a significant leap forward in global eradication, with 80% of the world's population now living in certified polio-free regions. The world can be freed of the threat of polio - with everyone's commitment, from parent to government worker and political leader to the international community.

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Polio Eradication

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