

# POLIO GLOBAL ERADICATION INITIATIVE

## Polio eradication – final hurdles and new vaccine options Meeting of SSTMP and SSTTM, November 11, 2022



# Poliomyelitis—What is it?



- **Viral disease; no specific treatment exists**
- **1 in 200 are paralyzed; some die**
- **Transmitted by fecal-oral or oral-oral route**
- **Peaked worldwide in early-1950s**
- **Vaccines developed in 1950s; two types:**
  - **Salk—dead virus—injectable**
  - **Sabin—weakened virus—oral**

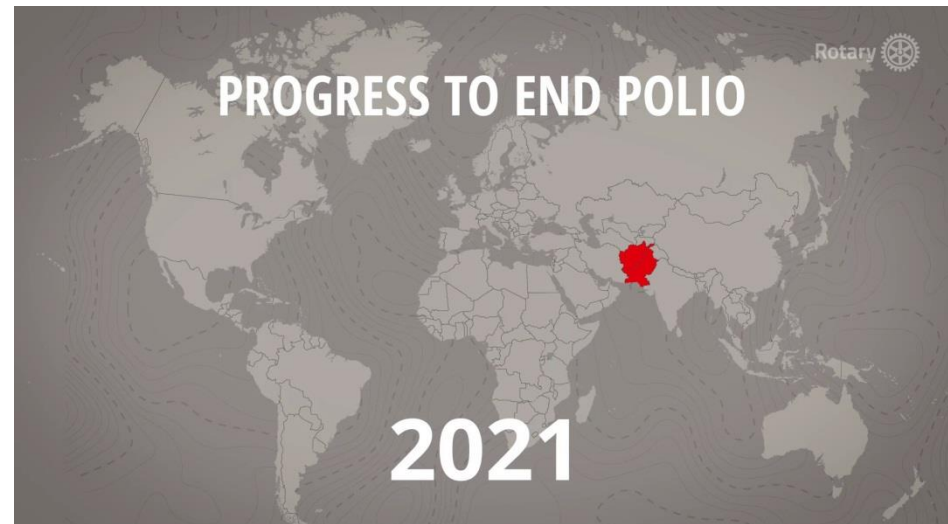


**Poliovirus eradication is the largest public health effort ever attempted**

**Initiated in 1988 with the goal of eradication in 2000**

**Current goal is eradication by the end of 2023.**

# Polio—Where is it endemic?



# Types of Polioviruses

## Wild (WPV)

- Type 1 (still circulating in Pakistan and Afghanistan, with risks of exportations worldwide)
- Type 2 (certified as eradicated)
- Type 3 (certified as eradicated)

## Vaccine derived polioviruses (VDPV) (from OPV)

- VDPVs are mutated Sabin (OPV vaccine) polioviruses
- Most become circulating VDPVs (cVDPVs)
- Epidemiology, neurovirulence and control measures for VDPVs is similar to wild polioviruses
- VDPV may emerge in immunodeficient persons (iVDPVs)

# Global WPV1 isolates

Previous 12 Months: 29 paralytic cases caused by WPV1



<sup>1</sup>includes viruses detected from AFP and environmental surveillance

<sup>2</sup>Onset of paralysis/collection date :

28 Sep. 2021 to 27 Sep. 2022 for previous 12 months

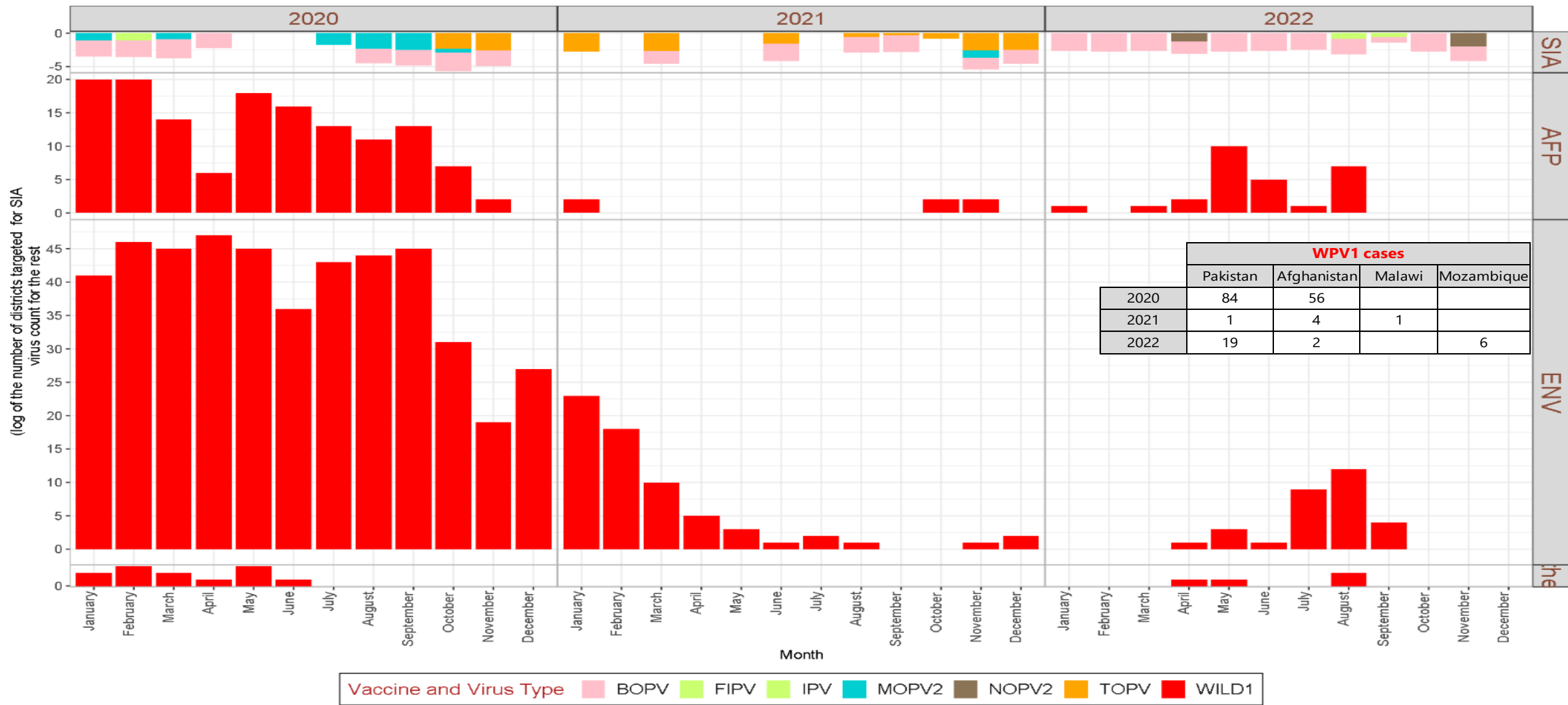
28 Mar. 2022 to 27 Sep. 2022 for previous 6 months

- WPV1 AFP
- ◻ WPV1 ES
- ◻ Endemic country (WPV1)

# Wild Poliovirus type 1

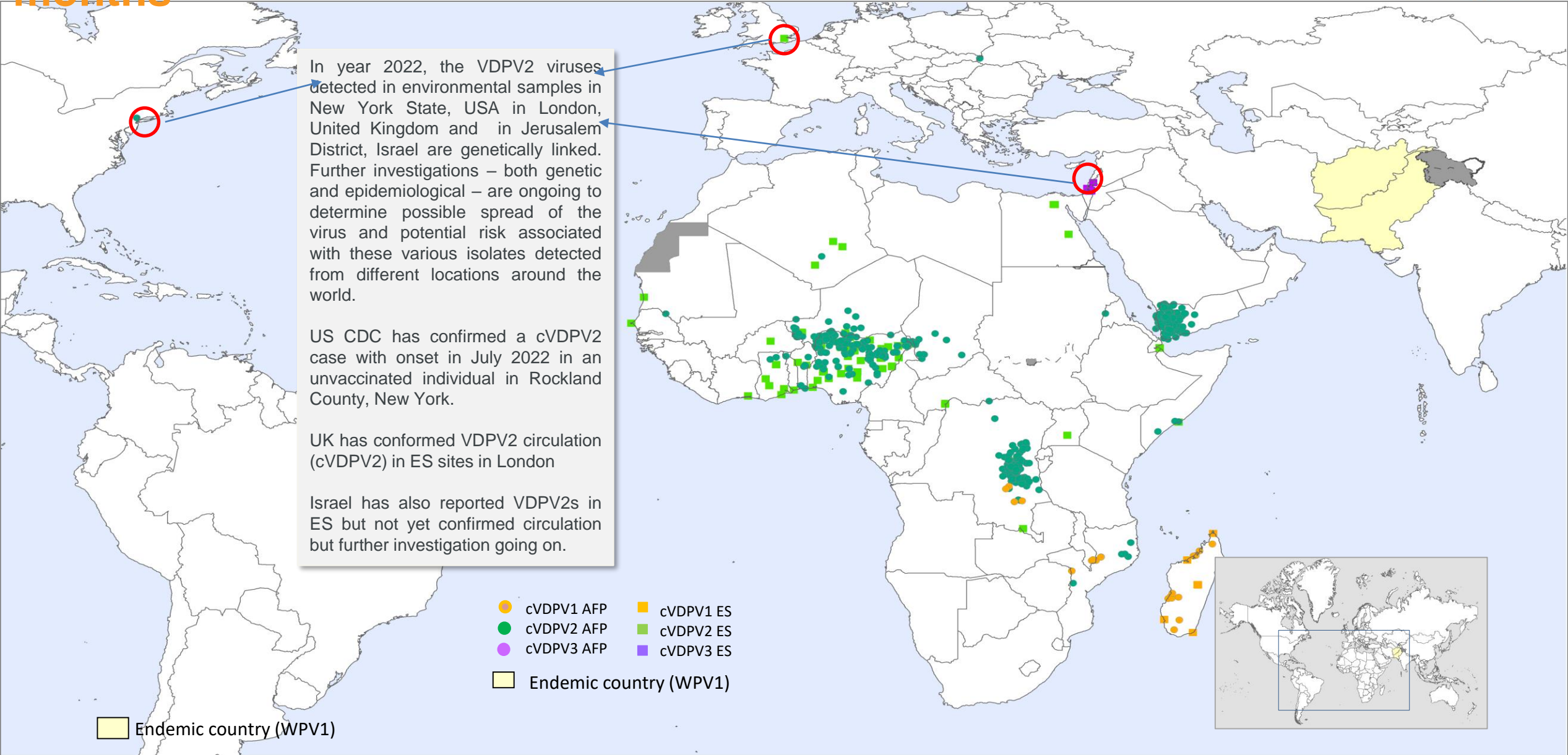
## Epi-Curve: AFP Cases, ENV, others(Human) and SIAs

Country: AFGHANISTAN, MALAWI, MOZAMBIQUE, PAKISTAN,  
 Province(s): BADAKHSHAN, BADGHIS, BAGHLAN, BALKH, BAMYAN, DAYKUNDI, FARAH, FARYAB, GHAZNI, GHOR, HILMAND, HIRAT, JAWZJAN, KABUL, KANDAHAR, KAPISA, KHOST, KUNAR, KUNDUZ, LAGHMAN, LOGAR, NANGARHAR, NIMROZ, NURISTAN, PAKTIKA, PAKTYA, PANJSHER, PARWAN, SAMANGAN, SAR-E-PUL, TAKHAR, URUZGAN, WARDAK, ZABUL, CENTR



# cVDPV outbreaks in the last 12 months

Previous 12 Months: 440 paralytic cases caused by VDPVs



In year 2022, the VDPV2 viruses detected in environmental samples in New York State, USA in London, United Kingdom and in Jerusalem District, Israel are genetically linked. Further investigations – both genetic and epidemiological – are ongoing to determine possible spread of the virus and potential risk associated with these various isolates detected from different locations around the world.

US CDC has confirmed a cVDPV2 case with onset in July 2022 in an unvaccinated individual in Rockland County, New York.

UK has confirmed VDPV2 circulation (cVDPV2) in ES sites in London

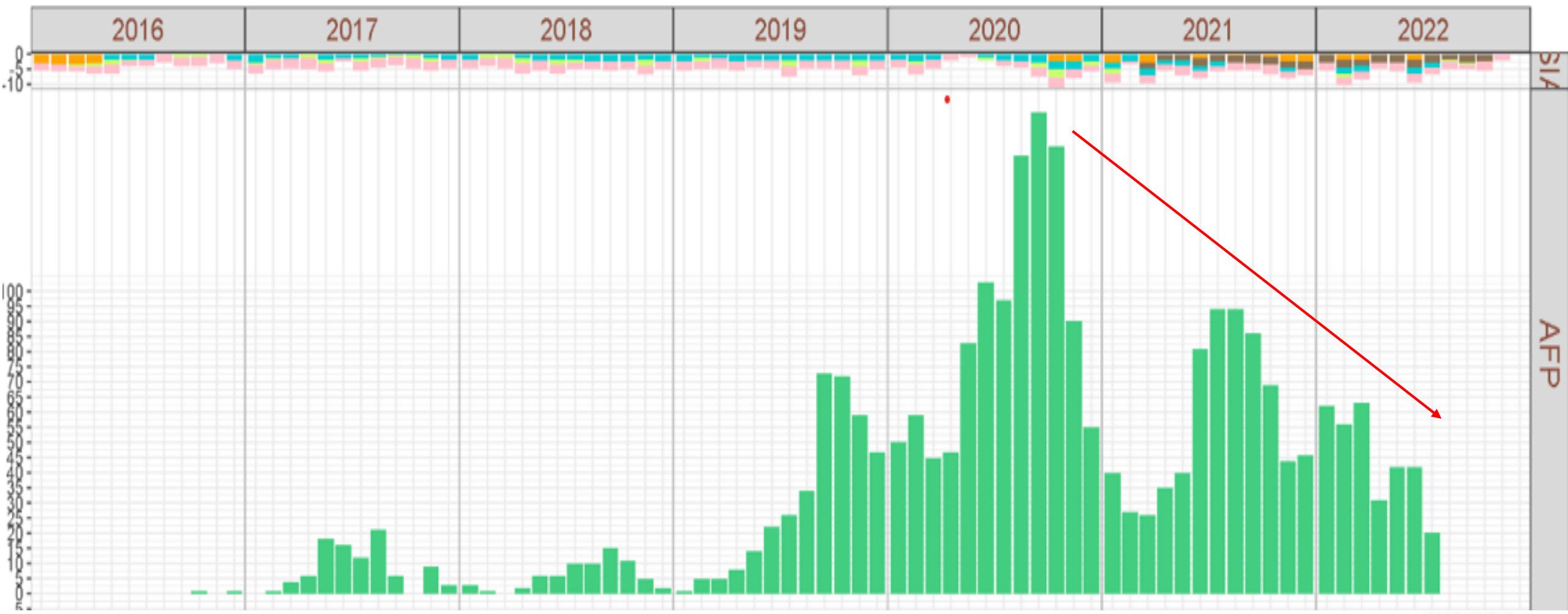
Israel has also reported VDPV2s in ES but not yet confirmed circulation but further investigation going on.

- cVDPV1 AFP
- cVDPV2 AFP
- cVDPV3 AFP
- cVDPV1 ES
- cVDPV2 ES
- cVDPV3 ES
- Endemic country (WPV1)

<sup>1</sup>Excludes viruses detected from environmental surveillance; <sup>2</sup>Onset of paralysis 21 Sep. 2021 to 20 Sep. 2022



# Global, post switch cVDPV2 trend between 2016-2022



# Polio eradication strategy in practice



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## **Routine immunization**

Ensuring high coverage with polio vaccines in all countries according to immunization calendars

## **Vaccination Campaigns**

Vaccinating all children < 5 years of age regardless of vaccination status (also rereferred to as Supplemental Immunization Activities [SIAs]) as response to outbreaks

## **Sensitive surveillance (including genetic characterization of all detected polioviruses)**

- Acute Flaccid Paralysis (AFP) surveillance
- Environmental sampling (sewage monitoring)
- Poliovirus surveillance among immunodeficient persons



# Polio Vaccines

**Inactivated Polio Vaccine (Salk)**  
Killed virus administered by injection  
1955

**Problem: manufactured with live virus; low impact on mucosal immunity**



**Oral Polio Vaccine (Sabin)**  
Live weakened virus  
1961

**Problem: VDPVs**



## Need for new tools to complete poliovirus eradication

- Genetically more stable OPV (in use under Emergency Use Listing)
- Non-infectiously manufactured IPV (Virus-Like-Particle [VLP] Polio vaccine in development)

# nOPV2: An Innovative Tool to Stop cVDPV2 Outbreaks

## Modification of Sabin mOPV2

nOPV2 is a next-generation version of the existing highly effective cVDPV2 outbreak response vaccine, Sabin mOPV2.

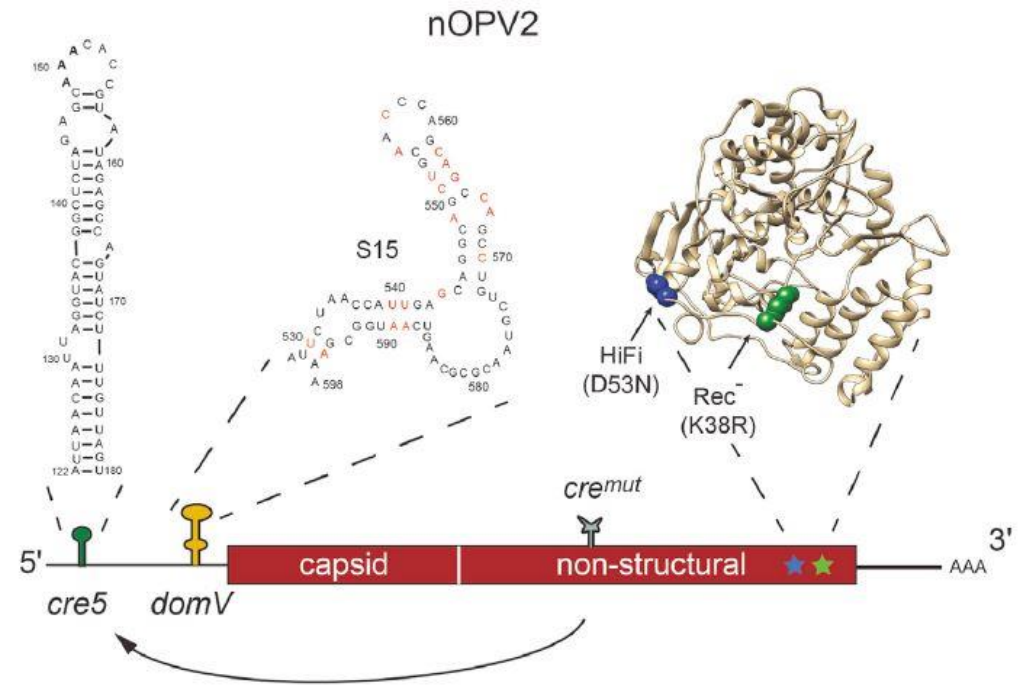
## Addresses cVDPV2

nOPV2 has been developed to better address the risk of cVDPV2 and vaccine associated paralytic poliomyelitis (VAPP) through enhanced genetic stability.

## Rolled out under an Emergency Use Listing

nOPV2 use is done under an EUL--a regulatory pathway that involves careful and rigorous analysis of available data to enable early, targeted use of unlicensed products for a Public Health Emergency of International Concern (PHEIC) such as polio.

While being used under EUL, the vaccine is subject to additional requirements, including enhanced safety and surveillance protocols.



**Relevant publication on the nOPV2 Modifications and Source of this photo:** Ming Te Yeh, Erika Bujaki, Patrick T. Dolan, Matthew Smith, Rahnuma Wahid, John Konz, Amy J. Weiner, Ananda S. Bandyopadhyay, Pierre Van Damme, Ilse De Coster, Hilde Revets Andrew Macadam, and Raul Andino. *Engineering the Live-Attenuated Polio Vaccine to Prevent Reversion to Virulence. Cell Host and Microbe. 2020.*

# NOVEL OPV2 DEVELOPMENT FIRST-IN-HUMAN STUDY: POLIOPOLIS – A CITY BY THE UNIVERSITY OF ANTWERP



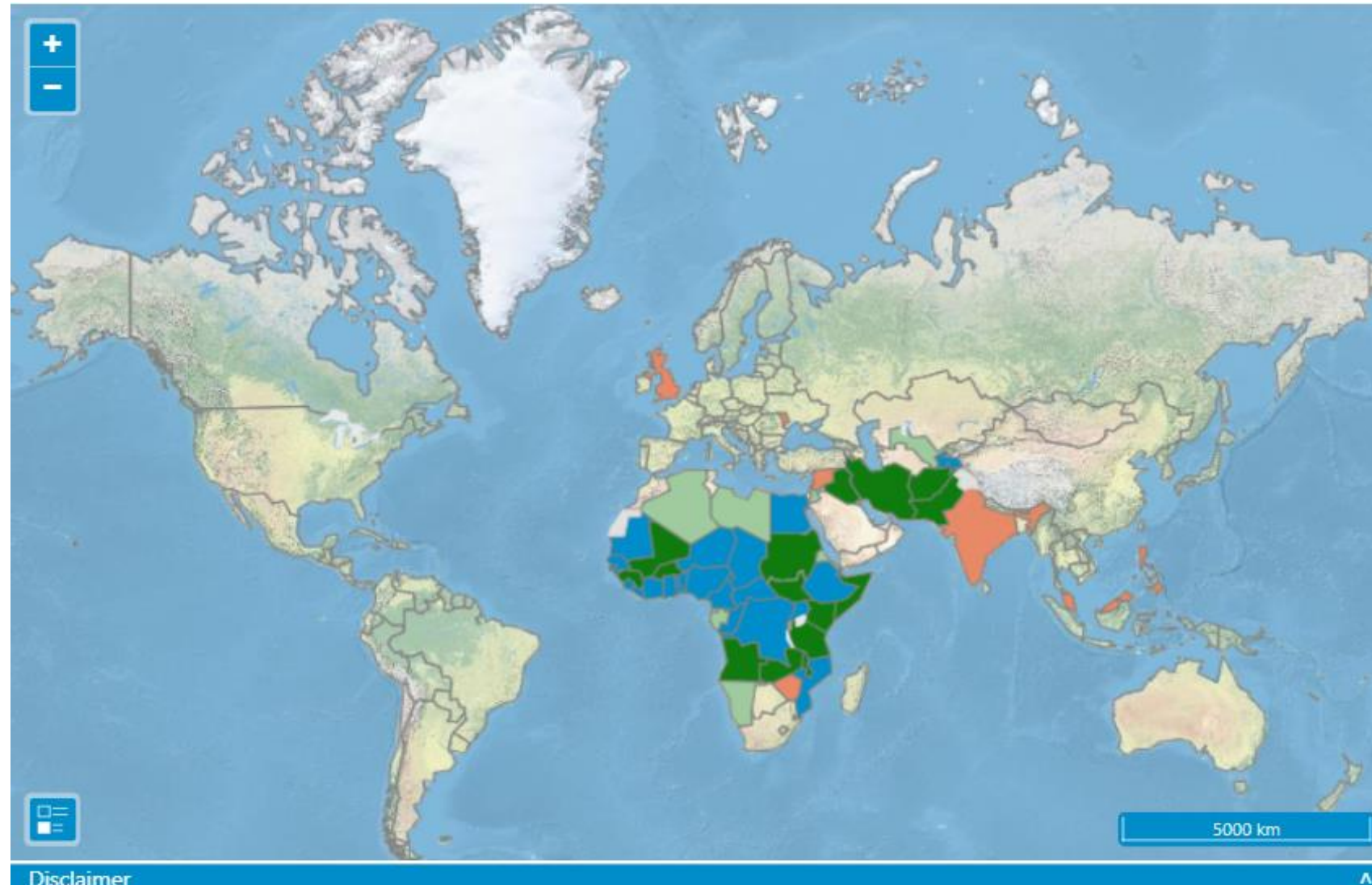
Pierre Van Damme, Ilse De Coster, Ananda S Bandyopadhyay, Leen Suykens, Patrick Rudelsheim, Pieter Neels, M Steven Oberste, William C Weldon, Ralf Clemens, and Hilde Revets. **Poliopolis**: pushing boundaries of scientific innovations for disease eradication. *Future Microbiology*. 2019.

# Novel Oral Poliovirus Vaccine roll-out

Over 500 million doses of nOPV2 administered to stop outbreaks

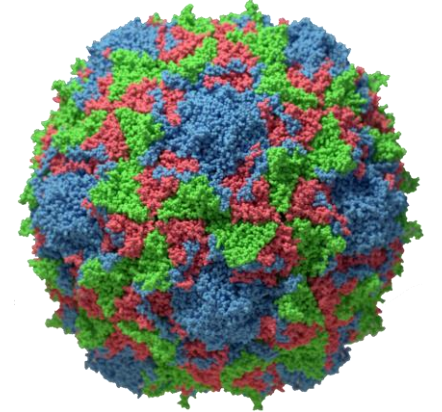
**23 countries conducted vaccination campaigns with nOPV under EUL**

- Discussions ongoing (7)
- Verification in progress (10)
- Verified, but have not conducted campaigns (15)
- Verified and nOPV2 campaigns conducted (23)



# Polio Virus Like Particle (VLP) Vaccine - Development

- Produce poliovirus empty particles (VLPs) by recombinant expression in yeast, mammalian, insect (plant or prokaryotic) systems following introduction of stabilising mutations into the capsid.
- Focus on expression system: Yeast (*Pichia*); baculovirus as 'back-up'.
- Status: Pre-clinical development completed with promising immunogenicity results; in process to find viable commercial partners to produce GMP material for in-human trials.





# Shift in thinking when eradication goal was adopted and now...

## THINKING IN 1988

Need to eradicate three wild polioviruses (WPV 1,2,3)

Acute flaccid paralysis (AFP) surveillance was adequate to find virus

Everything needed for eradication was already known

And much more: role of persons with immunodeficiencies, role of older children, containment issues etc...

## THINKING IN 2022

Need to eradicate six polioviruses (WPV 1,2,3 and Sabin vaccine viruses 1,2,3)

AFP surveillance is not enough; environmental surveillance offers much in detecting virus

Continuing need for an extensive research on new vaccines, mucosal immunity, role of immunodeficient persons in long-term transmission, etc...

# New times, new strategy

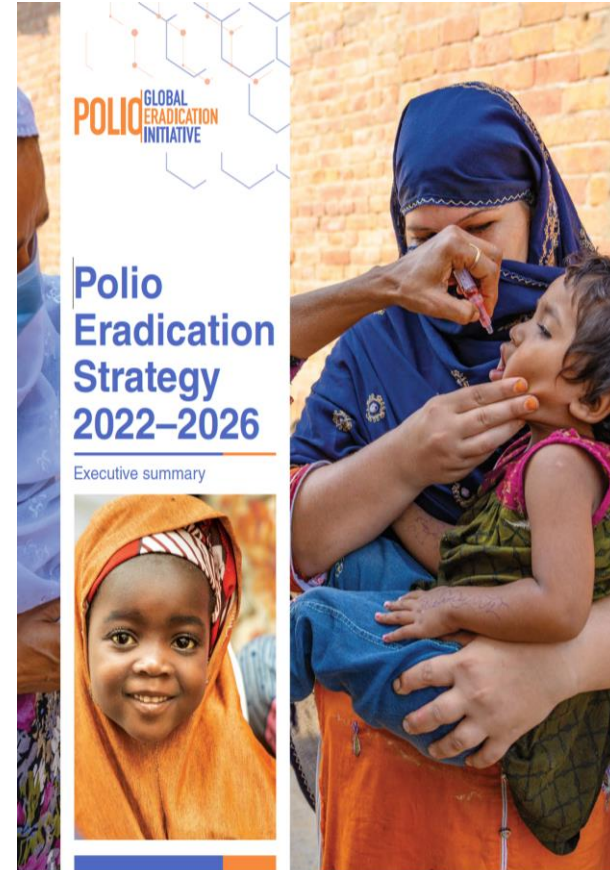
## COVID-19 pandemic changed everything

- Demanded agility and adaptability of the polio program to a new global environment
- Showed how valuable the polio eradication network is to pandemic preparedness and response
- Sent a reminder that the window to eradicate can be closed by the next disruption

## Polio Eradication Strategy 2022/2026

- Goal 1: permanently interrupt all wild poliovirus transmission
- Goal 2: stop vaccine-derived polio transmission and prevent outbreaks in non-endemic countries

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World Health Organization Rotary CDC unicef BILL & MELINDA GATES Foundation Gavi

EVERY  
LAST  
CHILD



## Global political commitments

- World Health Assembly
- Rotary Convention, Houston, Texas
- G20 Health/Development Ministers
- G7 Leaders
- Commonwealth Heads of Government

## Resource mobilization

- Pipeline of asks to existing, lapsed and new donors
- Discussions on new mechanism with European Investment Bank
- Momentum building opportunities in the year
- Creative approaches to private sector fundraising



Thank you

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