Polio Prevention- What Healthcare Providers Need to Know

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Immunize SD Conference

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OBJECTIVES

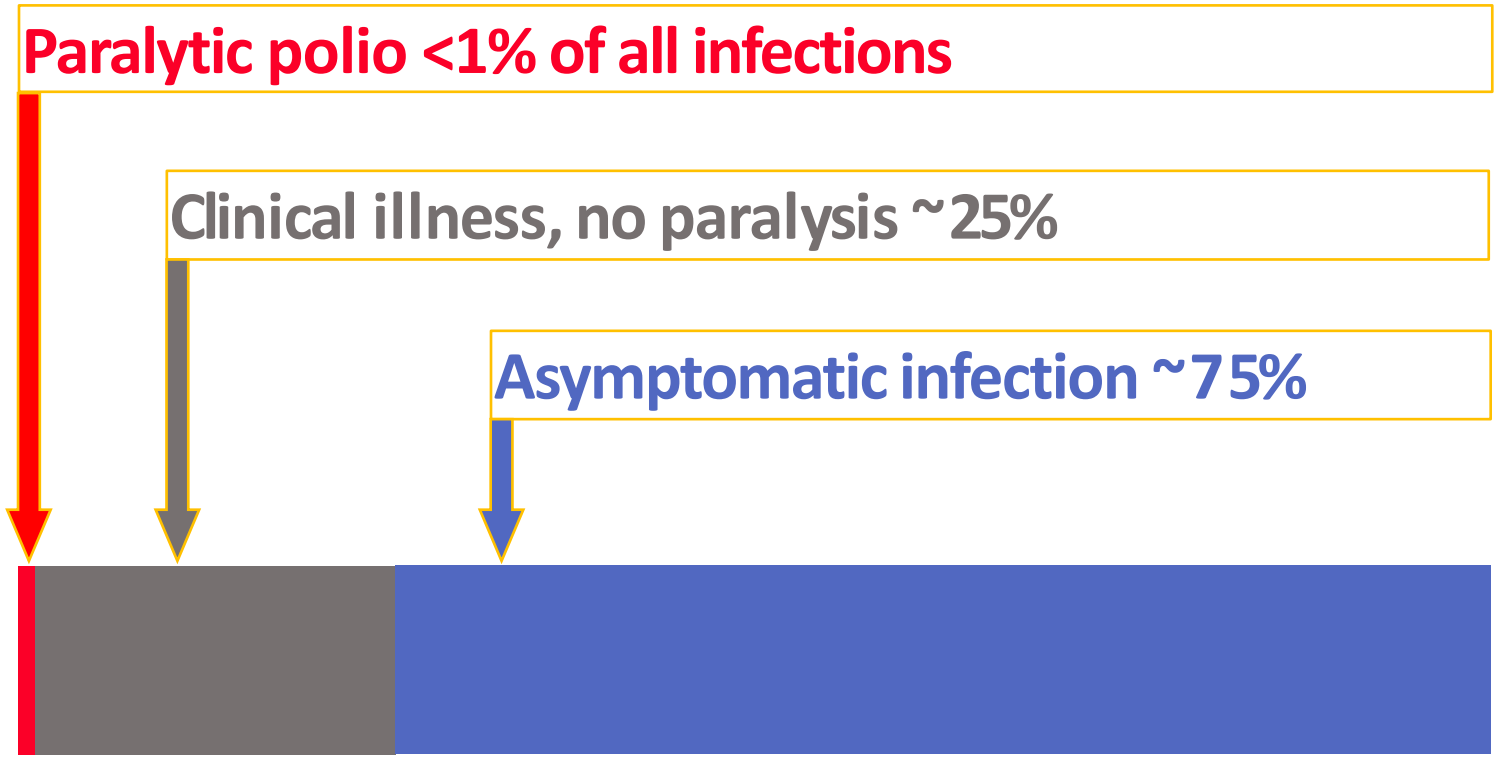
- Describe polio and types of polio vaccines
- Discuss CDC ACIP polio vaccine recommendations
- Discuss management considerations and Post-Polio Syndrome

"The BIG WHY? Etiology"

Poliovirus

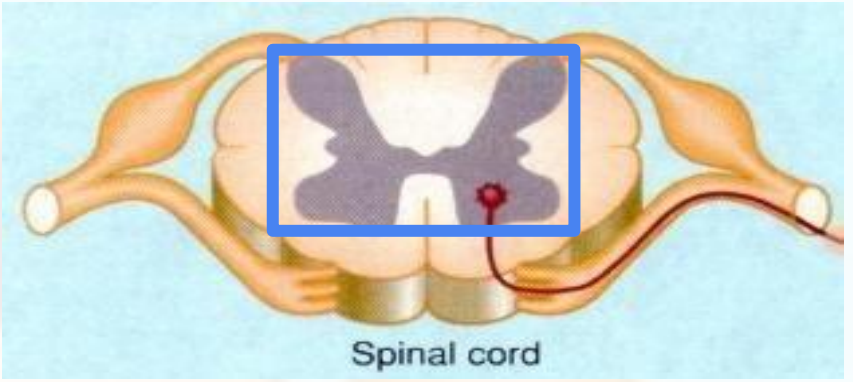
- Polio is caused by poliovirus- RNA virus, *Enterovirus genus, family Picornaviridae*
- Three serotypes: 1, 2, and 3
- Immunity to one serotype does not produce significant immunity to the other serotypes
- Highly infectious
- Person-to-person spread of poliovirus occurs via the fecal-oral or oral- oral routes
  - Fecal-oral is the most important transmission pathway in settings with suboptimal hygiene and sanitation
- Patients are most infectious during days immediately before and after onset of symptoms, but virus is excreted and may remain present in stool for up to 6weeks, sometimes longer
  - Can be shed in individuals with minor symptoms or no illness

Paralytic polio (CDC)



1 paralytic case indicates an outbreak

Pathogenesis



- Incubation period:
  - 3 to 6 days for nonparalytic polio
  - 7 to 21 days for onset of paralysis in paralytic polio
  - Virus mainly replicates in the gastrointestinal system and oropharynx
  - Invades local lymphoid tissue and may enter the bloodstream, and then infect cells of the central nervous system- *virus is carried by retrograde axonal transport to the spinal cord*
    - Gray matter of the spinal cord is affected, specifically the anterior horn cells of the motor neurons

Paralytic poliomyelitis- clinical symptoms

- Most patients have preceding illness 1-3 weeks before the development of flaccid weakness
- Frequently gastrointestinal illness (GI) with symptoms of fever, sore throat, abdominal pain, muscle aches, malaise
- Weakness onset is often accompanied by recurring fever and neck or back pain, and pain in the affected limb(s)
- Most patients have preceding illness 1-3 weeks before the development of flaccid weakness
- Onset of weakness is rapid- Within hours to a few days
- Loss of muscle tone (floppy) and reflexes
- Weakness is usually in lower extremities, asymmetric, proximal>distal
- Bulbar poliomyelitis presents with cranial nerve findings and can lead to respiratory impairment; might present with a weak or hoarse cry in infants
- Sensory and bowel/bladder function, cognition usually spared

Diagnostic studies

Neuroimaging

- **MRI with and without contrast of the entire spine and brain- hyperintense lesions**
- Use the highest tesla scanner available (ideally 3T)
- Axial and sagittal images are most helpful in identifying lesions

Laboratory Testing

- **Collection of CSF, serum, stool, and NP/OP swab** and other pathogen-specific tests should be done as soon as possible for best chance of pathogen yield; in-house enterovirus (EV) testing is an important first step but will not pick up stool EV, the gold standard for polio
- For poliovirus, collect two whole stool and two oropharyngeal (OP) swabs
- Taken at least 24 hours apart during the first 14 days after onset of limb weakness
- All specimens should be routed through state/local health departments for initial EV testing and then to CDC for confirmation of poliovirus

Care of the patient- Initial acute management of polio

- No FDA-approved treatment- no antivirals or medications/biologics for poliomyelitis
- Monitor respiratory status as rapid progression of weakness
- Neurology and infectious disease consultation
- Rehabilitation therapy such as PT/OT/speech/swallowing should initiated as soon as possible

Infection control measures

- Isolate the patient in a room with a private bathroom, if possible, while undergoing diagnostic evaluation
- HCP should use **standard and contact precautions** during interactions with suspected case-patients
- If patient develops **respiratory distress, consider droplet** precautions
- Only HCP and lab personnel with evidence of complete polio vaccination should work with patients with polio

- **CDC recommends a single lifetime booster for:**
  - ✓*Laboratory and HCP who handle specimens that might contain polioviruses*
  - ✓*HCP who are treating patients who could have polio*

Reporting

- Reporting of cases should not delay a patient's diagnosis and/or treatment and management plan
- Contact state/local health department on any suspected polio case
  - ***Paralytic polio*** has been classified as "Immediately notifiable, Extremely Urgent," which requires that local state health departments contact CDC within 4 hours
  - ***Non-paralytic polio*** has been classified as "Immediately notifiable, Urgent," which requires that local and state health departments contact CDC within 24 hours.
- Health departments will complete a patient summary form and request MRI report and images, and neurology consult notes from the hospital
- Information will be sent to CDC's expert neurology panel for review; this should be done while laboratory testing is underway; a classification of polio does not depend on laboratory results

Clinical Considerations, Post Polio Syndrome, and Vaccines

- Ensure household contacts are up to date on polio vaccination
- Hand hygiene: wash with soap and water before eating/assisting with feeding and after toileting/changing diaper/assisting with toileting
- Monitor household contacts for infection and shedding in stool, regardless of vaccination status

Post-polio Syndrome (PPS)

- Adults who had paralytic poliomyelitis during childhood may develop noninfectious post-polio syndrome 15 to 40 years later
- PPS is characterized by slow and irreversible exacerbation of weakness often in those muscle groups involved during the original infection
- Muscle and joint pain common manifestations
- In 25–40% of polio survivors
- Not contagious
- The cause of PPS is unknown. The new weakness of PPS related to the degeneration of individual nerve terminals in the motor units.

Post Polio Syndrome (PPS): Common Symptoms

- Slowly progressive muscle weakness
- Fatigue (both general and muscular)
- Decrease in muscle size (muscular atrophy)
- Loss of muscle function
- Pain from joint deterioration and increasing skeletal deformities such as curvature of the spine (scoliosis)
- Some individuals experience only minor symptoms, while others develop more visible muscle weakness and atrophy.
- PPS is rarely life-threatening but the symptoms can interfere significantly with the individual's capacity to function independently.

Diagnosis of Post Polio syndrome (PPS)…

Criteria for diagnosing PPS (NIH):

- **Prior paralytic poliomyelitis with evidence of motor neuron loss.**
- **A period of partial or complete functional recovery after acute paralytic poliomyelitis, followed by an interval (usually 15 years or more) of stable neuromuscular function.**
- **Slowly progressive and persistent new muscle weakness or decreased endurance, with or without generalized fatigue, muscle atrophy, or muscle and joint pain.**
- **Symptoms that persist for at least a year.**
- **Exclusion of other neuromuscular, medical, and skeletal abnormalities as causes of symptoms.**

Diagnostic tests include:

- **MRI and CT of the spinal cord**
- **Electrophysiological studies and other tests to investigate the course of decline in muscle strength and exclude other diseases that could be causing or contributing to the new progressive symptoms**
- **Muscle biopsy**
- **Spinal fluid analysis to exclude other, possibly treatable, conditions that mimic PPS**

Prognosis

- PPS is a very slowly progressing condition marked by long periods of stability
- Severity depends on the degree of the residual weakness and disability and individual has after the original polio attack
- People who had only minimal symptoms from the original attack and subsequently develop PPS will most likely experience only mild PPS symptoms
- People who were left with severe residual weakness, may develop a more severe case of PPS with a greater loss of muscle function, difficulty in swallowing, and more periods of fatigue

Management

No effective treatments to stop deterioration or reverse the deficits

Symptomatic management:

- non-fatiguing exercises (those that do not cause pain or fatigue lasting more than 10 minutes) may improve muscle strength and reduce tiredness. Exercise should be considered under the supervision of an experienced health professional.
- cardiopulmonary endurance training
- mobility aids and ventilation equipment
- counseling to help individuals and families adjust to the late effects of poliomyelitis

NIH Trials in the U.S. and Worldwide

Polio Vaccines

Two types of polio vaccines:

- ✓Inactivated polio vaccine (IPV)
- ✓Oral polio vaccine (OPV)

IPV

OPV

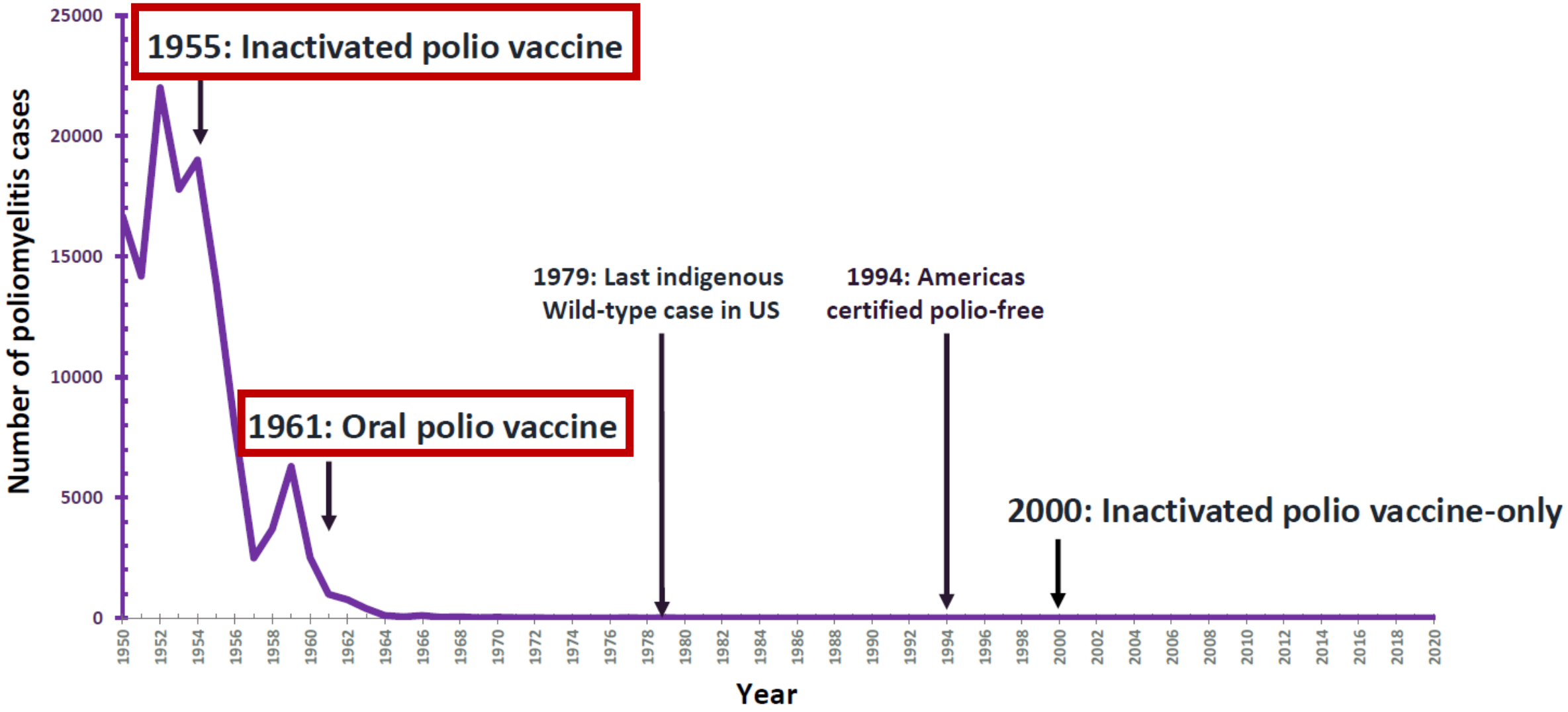
Inactivated Polio Vaccine (IPV)

- Contains types 1, 2, and 3 polioviruses that have been chemically killed
- Viruses cannot replicate, infect, or cause disease
- IPV induces effective humoral (blood)
  - Immunity but limited intestinal mucosal
  - (Gut) immunity;
  - Prevents paralysis
  - Limited effectiveness in decreasing transmission
- Vaccine of choice for non-outbreak
  - Countries
- Only vaccine currently used in the United States since 2000

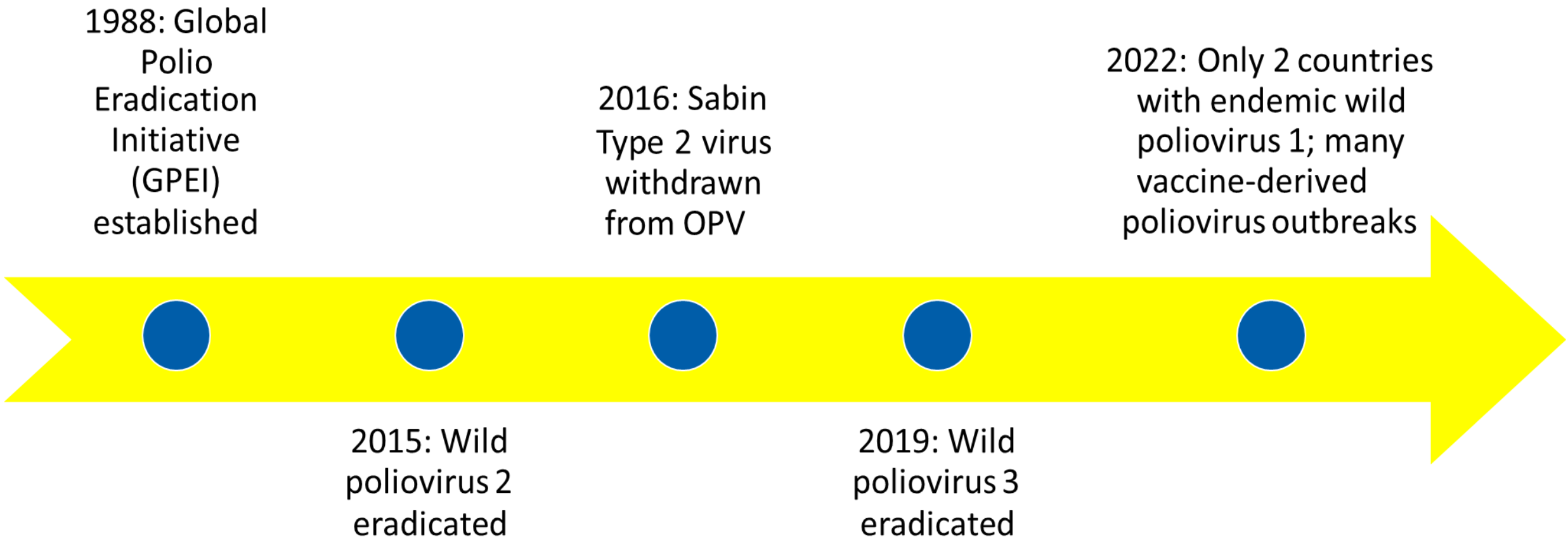
Oral Polio Vaccine (OPV)

- Live attenuated vaccine (contains live, weakened polioviruses)
- Replicates in gut, is shed in stool
- Prevents paralysis and transmission of polio
- Given orally (two drops)
- Vaccine of choice for developing countries or countries experiencing polio outbreaks
- If allowed to circulate in under-immunized populations for long enough, can revert to a form that causes paralysis

- Paralytic polio in the U.S. decreased rapidly after introduction of vaccine



Global Polio Eradication Progress



VDPV

- **VDPV: vaccine-derived poliovirus strain related to the weakened live poliovirus contained in oral polio vaccine (OPV)**
- **If allowed to circulate in under-immunized populations for long enough, the weakened virus can revert to a form that causes illness and paralysis.**
- **Outbreaks most commonly caused by type 2**
- **As the risk of importations of wild poliovirus and vaccine-derived poliovirus from other countries continues, it is critical to maintain high vaccination coverage worldwide, including in the United States**

ACIP Polio Immunization Recommendations

Routine Childhood Schedule

IPV Dose	Routinely Recommended Age
1	2 months
2	4 months
3	6–18 months
4	4–6 years

Vaccine name	Vaccine components	Age indication	Dose in polio series	Injection route
Ipol (SP)	IPV	6 weeks and older, any dose in the series	Any	IM or SC
Pentacel (SP)	DTaP-IPV/Hib	6–4 yrs	1, 2, 3, 4	IM
Kinrix (GSK),	DTaP-IPV	4–6 yrs	4	IM
Quadracel (SP)	DTaP-IPV	4–6 yrs	4, 5	IM
Vaxelis (Merck)	Dtap-IPV-Hib-HepB	6 wks–4 years	1, 2, 3	IM
Pediarix (GSK)	DTaP-HepB-IPV	6 wks–6 yrs	1, 2, 3	IM

IM = Intramuscular; SC = Subcutaneous; All vaccines in the table are non-live

ACIP Polio Immunization Recommendations

At least 1 dose needed after age 4

- A 4th dose is not necessary if the 3rd dose was administered:
  - At age 4 years or older AND
  - At least 6 months after the previous dose

- Children who have received 4 doses (or more) before 4 years of age need an additional dose
  - There should be at least 6 months between last and next-to-last dose

Catch-Up Schedule

- If accelerated protection is needed (e.g., travel to polio-endemic area), minimum age (6 weeks or older) and minimum intervals may be followed for the 4 doses:

0 – 4 weeks – 4 weeks – 6 months

- If the accelerated IPV schedule cannot be completed before leaving, the remaining doses should be given in the visited country, or upon returning home, at the intervals recommended
- In addition, children completing the accelerated schedule should still receive a dose of IPV at 4 years old or older, as long as it has been at least 6 months after the last dose.

Vaccine Effectiveness

- IPV highly effective in producing immunity to poliovirus
  - 90% of recipients are immune after 2 doses
  - 99% of recipients are immune after 3 doses
- Duration of immunity not known with certainty

OPV receipt- considerations

- **A person is considered to be fully vaccinated if they received:**
  - ✓ **Four doses of any combination of IPV and trivalent oral polio vaccine (tOPV)**

or

  - ✓ ***series of at least three doses of IPV or tOPV***

and

  - ✓ **The last dose in either series should be given after 4 years of age and at least 6 months after the previous dose**

- **If Outside the United States, received OPV:**
  - ✓ **Use the date of administration to make a presumptive determination of what type of OPV was received -Trivalent OPV was used throughout the world prior to April 1, 2016**
  - ✓ **Persons 18 years of age and younger with doses of OPV that do not count towards the U.S. vaccination requirements should receive IPV according to the ACIP immunization catch up schedule**

ACIP Polio Immunization Recommendations: Adults

- **Unvaccinated adults who are at increased risk of exposure to poliovirus should be given three doses of IPV at recommended intervals:**

  - ✓Two doses separated by 1 to 2 months
  - ✓A third dose 6 to 12 months after the second dose

- **If accelerated protection is needed (e.g., travel to polio-endemic area), use the minimum intervals:**

  0 – 4 weeks – 4 weeks

ACIP Polio Immunization Recommendations: Adults

Adults at increased risk of exposure

- ***Travelers who are going to countries where polio is epidemic or endemic***
- ***Laboratory and healthcare workers who handle specimens that might contain polioviruses.***
- ***Healthcare workers or other caregivers who have close contact with a person who could be infected with poliovirus.***
- ***Unvaccinated or incompletely vaccinated adults whose children will be receiving oral poliovirus vaccine (for example, international adoptees or refugees).***
- ***Unvaccinated or incompletely vaccinated adults living or working in a community where poliovirus is circulating.***

ACIP Polio Immunization Recommendations for Previously Vaccinated Adults

Previously completed series

- Adults who are completely vaccinated *but are at increased risk for exposure to poliovirus*, including **international travelers, laboratory workers, and healthcare workers, may receive a single lifetime booster dose of IPV**

Incomplete series

- Administer remaining doses in series based on immunization history

No need to restart a valid, documented series
Valid = minimum intervals met

Contraindications and Precautions

Contraindications

- Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component; streptomycin, polymyxin B or neomycin

Precautions

- Pregnancy
- Moderate or severe acute illness with or without fever

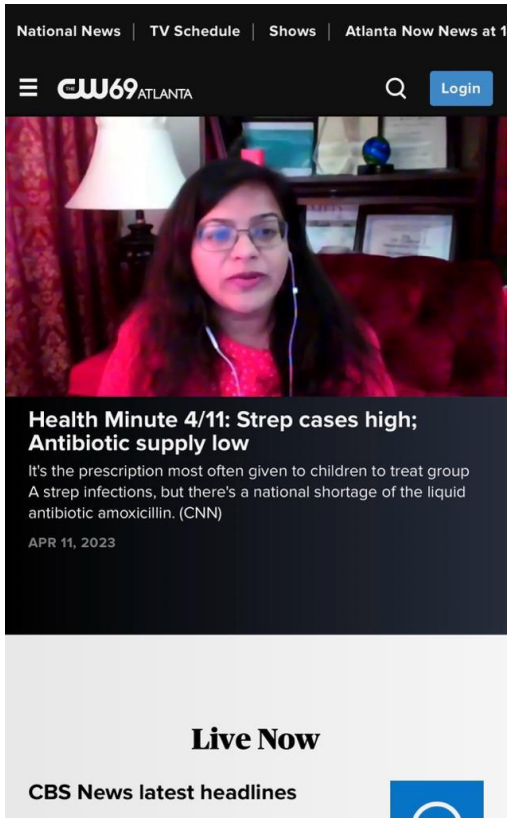
In Summary…

- Poliovirus is Highly contagious
- Paralytic Poliomyelitis is Preventable
- Two types of vaccines- OPV and IPV
- Vaccines are highly effective
- No treatment
- Management is supportive.
- Isolation of the Hospitalized Patient and Public Health Reporting are essential
- 25-40% of Adults who had paralytic poliomyelitis during childhood may develop noninfectious post-polio syndrome (PPS) 15 to 40 years later
- Maintaining High Vaccination coverage rates is paramount

Resources

Resources

- **CDC – Progress Toward Polio Eradication – Worldwide, January 2020 – April 2022:**
  https://www.cdc.gov/mmwr/volumes/71/wr/mm7119a2.htm
- **CDC – Polio – Vaccine Preventable Diseases Surveillance Manual:**
  https://www.cdc.gov/vaccines/pubs/surv-manual/chpt12-polio.html
- **CDC – Guidance for Assessment of Polio Vaccination Status and Vaccination of Children Who Have Received Poliovirus Vaccine Outside the United States:**
  https://www.cdc.gov/mmwr/volumes/66/wr/mm6601a6.htm
- **CDC – Poliomyelitis – For Healthcare Providers:**
  https://www.cdc.gov/polio/what-is-polio/hcp.html
- **CDC – Polio Vaccination – Information for Healthcare Professionals:**
  https://www.cdc.gov/vaccines/vpd/polio/hcp/index.html
- **NIH – Post-Polio Syndrome Fact Sheet:**
  https://www.ninds.nih.gov/post-polio-syndrome-fact-sheet



AAP national scholarship award for my research to be presented at the **Infectious Diseases Society of America** and my award winning QI IPC research as **visiting CDC Ambassador Faculty at Harvard**

Reminder: Our Next Full Coalition Meeting is Monday, February 3 at 9:00 a.m. via zoom. Join us to learn more about what is going on in Iowa regarding immunizations and the latest with Iowa Immunizes activities!

At the conclusion of the meeting, we'll be having a discussion on current topics with the HPV vaccine. There is currently proposed legislation in Iowa regarding this vaccine, so this will be a chance to get up to date on this immunization.

Dr. Kaushik Selected as National Faculty

Congrats to Dr. Ashlesha Kaushik who has been selected as one of 5 national faculty members with the CDC /American Academy of Pediatrics Chapter Immunization Representatives ECHO program 2023. Dr. Kaushik will be presenting on "Increasing Vaccine Confidence in the Community" on February 27, 2023.

Immunization Resources

Black Health Launches "Get Me Vaxxed" Campaign for Black History Month

The National Black Leadership Commission on Health (Black Health) launched Get Me Vaxxed, a new campaign for Black History Month that aims to raise COVID-19 vaccination rates among Black children aged 6 months to 5 years old.

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NFID #ShowUp and #FightFlu Toolkit

To raise awareness about the importance of annual influenza (flu) vaccination for US Black adults, the National Foundation for Infectious Diseases (NFID) developed the #ShowUp and #FightFlu Partner Toolkit: Helping You Show Up for Your Family and Your Community in collaboration with Black-led and Black-serving partner organizations. The campaign aims to empower Black adults with information about what they can do to help protect themselves and their families from flu, including getting an annual flu vaccine. The toolkit (available online at: www.nfid.org/infectious-diseases/flu-and-communities-of-color) includes key messages, graphics, and social media posts—all free and available to co-brand.

Immunizations in the News

NETEC

NETEC Webinar Series

Polio Resurgence: Guidance for Health Care Workers

EMORY MEDICINE | UNMC Nebraska Medicine | NYC HEALTH+ HOSPITALS | Bellevue

- **Invited expert presentation for NETEC EMORY National Town Hall on Polio Resurgence: guidance for Health Care Workers**
- **> 770 registrants**
- **highlighted on**
- YouTube channel,
- and the NETEC Resource Library.
- Additionally, direct links to social media posts promoting the replay: Facebook, Twitter, Instagram, and LinkedIn. also sent out via a NETEC e-blast

Thank You!