

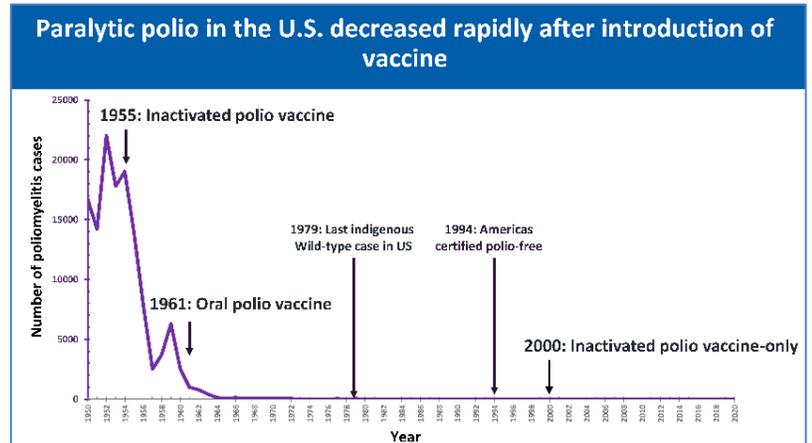


Mid-Michigan District Health Department, Wednesday, September 28, 2022
Central Michigan District Health Department, Wednesday, September 28, 2022
District Health Department 10, Friday, September 30, 2022

Polio

Polio and, more specifically, paralytic poliomyelitis, has likely existed since the ancient past. It was first clinically described as an illness in the late 1700s, and outbreaks were described starting in the 1800s. In the United States, polio infections peaked in 1952, with over 21,000 cases of paralysis from polio occurring. Cases of polio dropped rapidly in the US after introduction of effective vaccines in 1955.

Poliovirus is a type of enterovirus with three serotypes, type 1, type 2, and type 3. Immunity to one serotype does not provide protection to other serotypes. The virus enters the body through the



mouth and multiplies in the mouth, throat, and gastrointestinal tract. The virus can be shed in stools for several weeks after infection and it is highly infectious. Most of those infected (70-75%) have no symptoms of having contagious polio. About 24% of those infected have a mild illness, usually low fever, and sore throat, with complete recovery in less than a week. Nonparalytic aseptic meningitis occurs in 1% to 5% of people infected, which may cause a neck stiffness, feeling mildly ill for a few days, increased or abnormal sensations (e.g., pain in the limbs, back, or neck), headache, and vomiting, followed by complete recovery.

Less than 1% of all polio infection result in paralytic poliomyelitis and it can take up to 30 days after infection for this complication to occur. Poliomyelitis causes a flaccid type of paralysis, where the muscles are floppy and have decreased muscle tone. Some may have no other signs of polio illness, only the pain and paralysis of poliomyelitis. The paralysis is usually asymmetrical, with one side of the body worse than others. The paralysis is often permanent, though some recovery can occur. The death rate of paralytic polio is 2% to 5% for children and 15% to 30% for adolescents and adults. The death rate is higher if the face, neck, and/or respiratory muscles are involved.

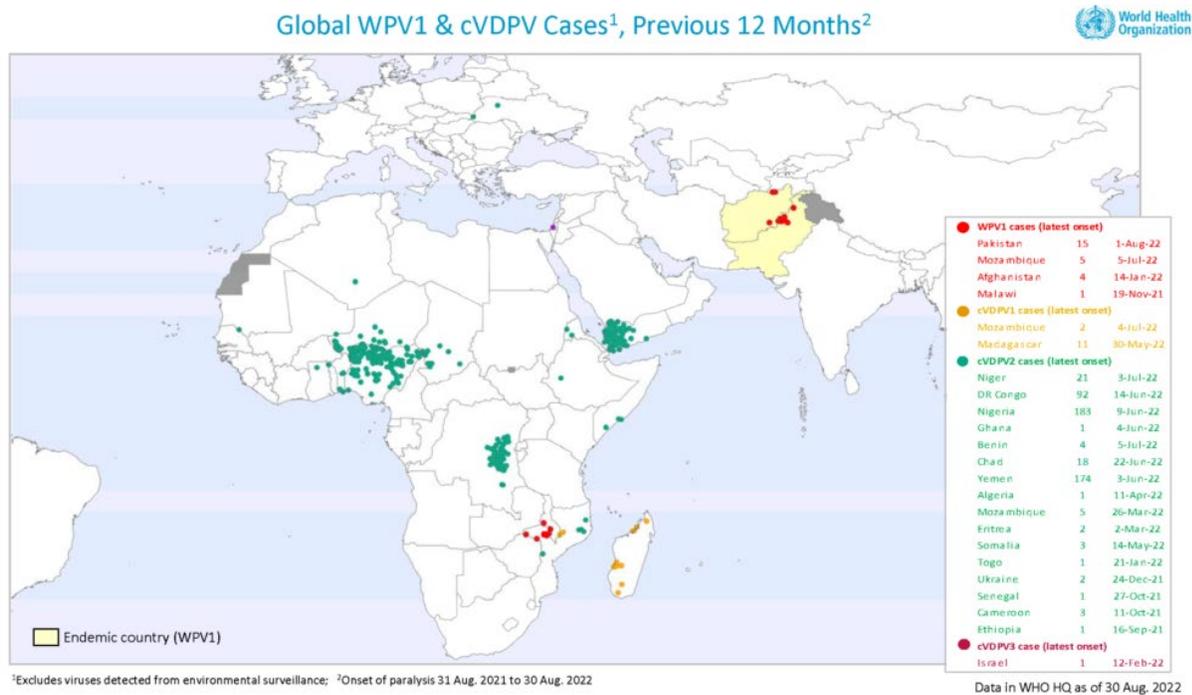
Some People May Experience

-  Pain in the arms or legs
-  Pain in the neck or back
-  Difficulty moving the eyes or drooping eyelids
-  Facial droop
-  Difficulty swallowing or slurred speech

Immunization against polio has been a huge global achievement. (Note: Michigan played a pivotal part in the development of the polio vaccine. Dr. Thomas Francis Jr., director of the Poliomyelitis Vaccine Evaluation Center at the University of Michigan School of Public Health, conducted the two-year national field trials of the poliomyelitis vaccine on 1.8 million children. The press conference announcing their results was held at U of M, Ann Arbor <https://www.uofmhealth.org/news/archive/202005/looking-back-another-virus-battle-u-m%E2%80%99s-role-polio-history>.) There are two types of polio vaccine: inactivated polio vaccine (IPV) and live attenuated (weakened) oral polio vaccine (OPV). The characteristic of each vaccine is summarized in the table below.

Type of Vaccine	IPV	OPV
Virus in vaccine	Inactivated (dead) poliovirus (inactivated by dilute formalin). Contains serotypes 1, 2, and 3	Weakened poliovirus (weakened by repeatedly passing virus through cell cultures, causing virus became less contagious and less likely to cause illness). Currently only contains serotypes 1 and 3 (type 2 eradicated worldwide in 2015). This is called bivalent oral polio vaccine, or bOPV.
Where vaccine used	Most middle- and upper-income countries. Must be administered by a trained healthcare professional, costs \$1/dose. Only vaccine used in the US.	Many low-income countries. Easy to administer, can be administered by nonmedical volunteers. Costs less than \$0.15/dose. There are efforts to add IPV or switch to only IVP in all countries to try to eliminate polio worldwide.
How administered	Injection, either subcutaneous or intramuscular	Orally
How it works	Body produces antibodies in the blood in response to the inactivated virus.	Weakened virus reproduces in the intestines and the lymphoid tissue in the throat and intestines, causing antibody production in these areas, as well as the rest of the body.
Types of polio protected	Prevents paralysis, and to a lesser extent, polio infection. Protects against polio disease due to WPV and vaccine-derived polioviruses (VDPVs), but cannot stop spread of virus in a community.	Prevents paralysis and transmission of polio. Protects against polio disease due to WPV and vaccine-derived polioviruses (VDPVs). Helps stop transmission by limiting the virus's ability to replicate in the gut and spread to infect others.
Passage of virus to environment	None	Vaccine virus is shed from the throat and mouth for up to 14 days and excreted in stool for up to 6 weeks after vaccination.
Spread of vaccine virus to other	Does not occur	<ul style="list-style-type: none"> • May occur. Spread of the vaccine virus to others can help immunize others in the community. • If the vaccine virus spreads long enough in an under-immunized population, the vaccine virus can mutate, or revert, back to a form that can cause illness and paralytic polio. <ul style="list-style-type: none"> ➤ These are called vaccine-derived polioviruses (VDPVs). <ul style="list-style-type: none"> ▪ VDPVs are forms that have significant genetic change that develop after repeated replication of the vaccine strains contained in OPV in a community with poor vaccination coverage. The changes allow the VDPVs to re-acquire the ability to cause paralytic polio and be contagious like wild poliovirus.
Schedule	4 doses: 2 months, 4 months of age, 6-18 months, and 4-6 years (Recommendations of CDC)	5 doses: Birth, 6 wks., 10wks., and 14 wks. of age and one dose IPV at ≥14 weeks of age (Recommendation of WHO)
Immunity	90% or more are immune after 2 doses, at least 99% immune after 3 doses. Duration of immunity not known with certainty, although probably lifelong.	By 18 months of age, over 95% are immune to types 1 and 3 and 53% to 80% are immune to type 2. Duration of immunity not known with certainty, although probably lifelong

Polio remains endemic (naturally occurring) in only two countries: Afghanistan and Pakistan. Vaccine-derived poliovirus (VDPV) cases continue in many countries.



<https://polioeradication.org/polio-today/polio-now/>

In July 2022, a case of poliomyelitis caused by a vaccine-derived poliovirus (VDPV) was diagnosed in an unvaccinated 20-year-old man in Rockford County, New York. His virus was genetically linked to samples collected in sewage in Jerusalem and London. This patient had not traveled. Rockland County reviewed their sewage samples used for COVID monitoring and found poliovirus in samples from June that matched the patient's sample. New York had detected polio virus in their wastewater system as early as April, and New York City in August, making it likely it had been circulating for some time. Polio causes many asymptomatic and mild cases and has a long incubation period, so it is thought to be likely that other unrecognized cases occurred in the area. Rockland County has vaccination rates lower than most of the country, with only 60% of 2-year-olds fully vaccinated against polio, compared to the national average of 90%.

Similar events to this have happened in the US in the past. In 2005, vaccine-derived poliovirus (VDPV) poliovirus was identified in an immunocompromised infant girl in a predominantly unvaccinated Amish community in Minnesota. She did not develop paralysis but had many other illnesses and symptoms. Stool testing of her community found asymptomatic poliovirus infections with the same VDPV in three other children. None of those three children had been ill and none were immunocompromised. The source of the virus was never determined, but it appeared to have been circulating undetected in an unidentified location, probably another country, for at least 2 years based on number of genetic changes in the virus. Neither the infant nor her family members had any history of international travel.

These incidents highlight the importance of continued polio vaccination in all children in the US. Despite the apparent lack of polio in our country, there continues to be risk of infection and life-long paralysis from this virus, particularly in those that travel internationally to at-risk areas. There is also a real chance to eradicate another infectious disease and the Global Polio Eradication Initiative (GPEI) is working toward that goal. Rotary is a member of that initiative.

Most adults have been vaccinated for polio. Adults who are unvaccinated or have incomplete vaccination for poliovirus should receive catch up immunizations to complete their series. In general, booster doses are not needed but can be considered for adults at increased risk of polio exposure, including laboratory workers handling specimens that may contain polioviruses, healthcare personnel treating patients who could have polio or have close contact with a person who could be infected with poliovirus, and travelers to areas where poliomyelitis is endemic or epidemic.

Recommendations:

1. Encourage routine polio vaccination and catch-vaccination in the US and globally.
2. Support efforts to eliminate polio.

Sources

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