

## Efforts continue to eradicate polio in Pakistan

March 18, 2020

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Article type: [MMWR in Review](#)

Topics: [Infectious Diseases](#), [Vaccine/Immunization](#)

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- Hsu CH, et al. *MMWR Morb Mortal Wkly Rep.* 2019;68(45):1029-1033, <http://bit.ly/2Uoyxvl>.

Poliovirus is in the *Picornaviridae* family, *Enterovirus* genus, and replicates in the pharynx and lower intestinal tract. Poliovirus requires an acid stable pH to survive passage through the stomach into the intestine.

Poliovirus is spread through fecal-oral and respiratory tract routes. Humans are the only natural reservoir. Poliovirus is highly contagious requiring only small quantities of virus to cause infection and prefers summer-autumn months in temperate climates, while infecting year-round in tropical climates.

Shedding of the virus in the alimentary tract occurs for four to eight weeks after infection and for one to three weeks from the pharynx, making people with disease infectious for a prolonged period of time. The incubation period of the virus averages three to six days in nonparalytic infection and seven to 21 days in paralytic disease. Polio spreads quickly from the gastrointestinal tract to lymph nodes and tissues, including liver, spleen, bone marrow and muscle.

In less than 1% of cases, polio can seed the central nervous system through anterior horn cells, causing acute flaccid paralysis (AFP). The highest risk group for infection and AFP is people 15 years of age or younger.

### **Clinical manifestations**

Approximately 70% of people infected with polio will be asymptomatic. About 25% will have nonspecific influenza-like symptoms, including sore throat, fever, malaise, nausea, headache, abdominal pain or nonparalytic viral meningitis.

When AFP develops, it causes asymmetric paralysis of the proximal muscles, including arms and legs, and patients will have areflexia. Mortality rate from AFP ranges from 2%-10% generally due to paralysis of the diaphragm. Up to 25%-40% of adults who had AFP during childhood also may develop post-polio syndrome (PPS), which manifests as irreversible exacerbation of weakness in muscle groups involved during the initial infection.

### **Vaccination in the U.S.**

The first U.S. outbreak of paralytic poliomyelitis occurred in Vermont in 1894 and peaked in 1952 with 57,879 cases reported that year. Implementation of the inactivated poliovirus vaccine (IPV) program in 1955 led to a rapid decline in cases, and by 1979, poliovirus was eradicated in the U.S.

In 1988, the World Health Assembly developed a global poliomyelitis eradication goal to be accomplished by 2000.

Vaccine Schedules	Inactivated Poliovirus Vaccine	Oral live-attenuated Poliovirus Vaccine
US recommendations	4 doses <ul style="list-style-type: none"> <li>• 2 months</li> <li>• 4 months</li> <li>• 6-18 months</li> <li>• 4-6 years</li> </ul>	None
WHO recommendations	1 dose* <ul style="list-style-type: none"> <li>• At least 14 weeks of age</li> </ul>	3 doses <ul style="list-style-type: none"> <li>• Begin at 6 weeks<sup>^</sup></li> <li>• At least 4 weeks between doses</li> </ul>

\* May be co-administered with OPV dose

<sup>^</sup> Age at first dose of OPV varies based on local epidemiology of vaccine-associated paralytic poliomyelitis

In 2000, the U.S.

discontinued use of oral attenuated polio vaccine (OPV) as about five to six cases of vaccine-associated paralytic poliomyelitis (VAPP) occurred per year. Following this change, VAPP cases no longer occurred.

Currently, four doses of IPV are recommended. They are given at 2, 4 and 6-18 months and 4-6 years of age. The minimum interval between doses three and four is six months. The Centers for Disease Control and Prevention (CDC) estimates the efficacy of IPV to be 99% following three doses, and it provides lifelong immunity.

### Vaccine-derived disease

OPV is used more commonly worldwide. Initially, trivalent OPV, which contained all three serotypes, was used. In May 2016, it was replaced with bivalent OPV, which contains serotypes 1 and 3, since no cases of wild serotype 2 had been reported since 1999.

The World Health Organization recommends that countries using OPV add one dose of IPV to their immunization schedules. This is to prepare for when OPV is discontinued after global certification that all wild polioviruses have been eradicated. Currently, wild poliovirus serotype 1 (WPV1) accounts for all naturally occurring disease.

### Diagnostic testing, treatment

The standard diagnostic test of choice is viral culture from stool or throat specimens. Fecal and respiratory tract swab specimens are most likely to grow poliovirus in culture, while urine and cerebrospinal fluid (CSF) have low sensitivity for isolation in cell culture.

Nucleic acid amplification testing of the CSF may detect enterovirus infection but does not differentiate poliovirus from other enteroviruses.

Real-time reverse transcriptase-polymerase chain reaction is available, but two or more swabs should be obtained from a patient's stool or throat since virus may be secreted intermittently, causing false-negative results.

Treatment is supportive.

### Progress in Pakistan

As of 2016, Pakistan and Afghanistan are the only countries with continued, uninterrupted viral transmission of WPV1.

When compared to the previous four years, cases in Pakistan increased 15-fold in 2018-'19. In 2017, eight cases of WPV1 were reported in Pakistan, but from January 2018 to September 2019, 84 cases were reported. Infected patients ranged in age from 2 months to 12 years old.

All cases in 2019 came from districts Balochistan (nine cases), Punjab (five cases), Khyber Pakhtunkhwa (61 cases) and Sindh (nine cases). Cases have been associated with poor vaccine coverage, with rates as low as 35% in Balochistan province. Vaccine refusals partially due to spread of false information within a community, community campaign fatigue and poor vaccine implementation are potential reasons for exacerbation of cases. In addition, three-dose coverage of OPV is highly variable among provinces in Pakistan. The status of polio eradication in Pakistan has serious implications for the success of the Global Polio Eradication Initiative.

During this time period, surveillance for both AFP cases and contaminated environmental sites has increased. Systemic sewage testing was performed at 60 sites, and 45% tested positive for WPV1 in 2019 compared with 15% in 2018 and 16% in 2017. Prior nonreservoir sites, especially in districts with detected human cases, tested positive for WPV1.

Due to this increase in cases, supplemental immunization activities have been implemented, particularly in high-risk districts. As of August 2019, 19,274 community health care providers have been deployed to 15 districts, including along official border crossings with Afghanistan and major domestic transportation routes. The Pakistan polio eradication program has performed several management, communication, community involvement and epidemiologic reviews to identify gaps to improve vaccine compliance and interrupt WPV1 transmission.

Although no cases in travelers have been reported in the U.S. since 1993, clinicians should remain vigilant and obtain travel histories in patients who present with AFP symptoms.

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### **Question**

What is the incubation period for acute flaccid paralysis caused by poliomyelitis?

- A. One to three days
- B. Two to three months
- C. Seven to 21 days
- D. 10 to 20 years

Answer: C

### **Resources**

- [Information on poliovirus from the CDC](#)
- [2018 AAP Red Book chapter on poliovirus infections](#)

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