

Polio vaccines. Grading tables

Table I: Efficacy/effectiveness of oral poliovirus vaccine (OPV) against clinical poliomyelitis

Settings: Global

Question: What is the evidence that oral poliovirus vaccine (OPV) protects against clinical poliomyelitis?

Conclusion: High scientific evidence that OPV protects against clinical poliomyelitis

Quality assessment						Summary of Findings
No of studies	Design	Limitations	Inconsistency	Indirectness	Imprecision	Quality
5	Observational studies	No serious	No serious	No serious	No serious	High ¹

¹ With observational studies, the level of scientific evidence will not normally exceed “low” according to the Grade system. However, as argued below, based on the consistent results of clinical trials and the overwhelming reduction in the incidence of polio following world-wide vaccination efforts, the level of scientific evidence for the protective effectiveness of OPV was upgraded from “low” to “high”.

The success of the OPV in curtailing polio epidemics and reducing or even eliminating the disease in endemic countries provides overwhelming evidence of the effectiveness of polio vaccines, in particular OPV. Thus, following extensive immunization and other control measures three of the six WHO regions are already certified as free of indigenous wild poliovirus transmission (*see Certifications of poliomyelitis eradication 1994, 2001, and 2002*), wild poliovirus serotype 2 is eradicated, and the endemic circulation of wild polioviruses types 1 and 3 is now restricted to small geographic areas within 4 countries.

As examples of the vast literature in the field, 5 country-based reports are included that illustrate the dramatic overall impact of OPV on the incidence of poliomyelitis, but also illustrate that OPV-induced immunity may vary considerably between countries. The biological reasons for these geographic differences remain unclear.

Dong DX et al (1984) reported that prior to the vaccination program in 1960-64, the average annual incidence of poliomyelitis was 3.18 cases/100,000 population. The incidence dropped to 0.80/100,000 population in 1976-80 and to 0.47/100,000 population in 1981. The incidence of poliomyelitis was reduced markedly in those areas where an expanded immunization program was well administered. The data from a large investigation of poliovirus neutralizing antibody in health populations in Shanghai, Hunan, Henan, and other cities and provinces showed clear elevation of antibody levels as well as good immunologic effectiveness for OPV.

Sutter RW et al (1991) conducted a case-control study of an outbreak in Oman where the incidence of paralytic disease in children aged < 2 years had reached 87/100,000, despite a coverage with 3 doses of OPV among 12-month-olds that recently had risen from 67% to 87%. It was reported that 3 doses of OPV reduced the risk of paralysis by 91%. Cases and controls had similar type 1 neutralizing antibody profiles that suggested widespread type 1 poliovirus transmission.

Heymann DL et al (1987) provided proof of the considerable herd immunity effects of OPV in a study in Yaoundé, Cameroon, where the incidence of paralytic polio decreased by 85%, although only 35% of children 12-13 months of age had received 3 doses of the vaccine.

Kim-Farley J et al (1984) conducted a case control study during an outbreak in Taiwan involving 1031 cases of type 1 paralytic poliomyelitis. Vaccine efficacy was estimated at 82% after one dose, 96% after two doses and 98% after three or more doses.

Deming MS et al (1992) conducted a case-control study in The Gambia. In a matched analysis of 195 cases and 839 controls, the efficacy of three or more doses of trivalent oral polio vaccine was 72% (95% confidence interval 57-82). The efficacy of three or more doses in 1- to 2-year-old children, in whom the determination of vaccination status was considered to be more accurate than in older children, was 81% (95% confidence interval 66-90).

Selected literature

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