

POLIOVIRUS VACCINES FOR AUSTRALIAN CHILDREN: INFORMATION FOR GPS AND IMMUNISATION PROVIDERS

Epidemiology of Poliomyelitis

Mass vaccination against polio was introduced in Australia in 1956 with the Salk inactivated polio vaccine. This was followed by a dramatic fall in the incidence of polio. The Sabin oral polio vaccine (OPV) was introduced in 1966 for three reasons. First, it induces good intestinal immunity and is spread to non immunised contacts, which confers secondary community protection. Second, it is easily administered orally, and third it is less expensive. OPV was also extremely successful, with no reported cases of wild-type polio in Australia since 1977.¹ The Western Pacific Region was declared polio free in 2000.

Worldwide there were 1255 polio cases reported in 2004. Polio remains endemic in five countries in 2005 (Nigeria, India, Pakistan, Niger and Afghanistan), and another nine countries, including Indonesia, have had recent cases due to importation. In Indonesia this year, local transmission of polio virus has been re-established and has resulted in the country's largest polio epidemic ever, with more than 200 recognised cases.² A massive international effort is underway to achieve global polio eradication, primarily through national polio "days" where all children in a certain region are given OPV.³ The risk, although small, of contracting polio from an imported case or by travel justifies continuing polio vaccination.

Vaccines available, efficacy and administration

Two types of equally effective polio vaccines are currently available in Australia.⁴ The oral poliovirus vaccine contains live, weakened (attenuated) strains of poliovirus types 1, 2 and 3. The inactivated poliovirus vaccine (IPV) contains killed strains of poliovirus types 1, 2 and 3. IPV provides very good serum antibody responses (efficacy >90%), although less intestinal immunity occurs than with OPV.⁵

Recently, combination vaccines that include IPV have been licensed in Australia.⁴ These include Infanrix Hexa™, Infanrix Penta™, Infanrix-IPV™, Pediacel™, Poliacer™ and Quadracel™. These vaccines are as equally effective in generating an immune response to polio virus as IPV alone and result in fewer injections at each visit than if IPV had been given separately. From November 2005 IPV-containing vaccines will be provided free under the National Immunisation Program, replacing the use of OPV. The funded combination vaccines that will be available will vary between states/territories and more information can be obtained by contacting your state or territory health department. Further detailed information on the switch from OPV to IPV in Australia for both immunisation providers and the general public is available at <http://www.immunise.health.gov.au/ipv/index.htm>.⁶

Children who have already commenced their immunisation schedule with OPV can complete it using IPV-containing vaccines. After the introduction of IPV-containing vaccines in November 2005, OPV may no longer be available from the manufacturer in Australia.

Recommendations for Australian children

The recommended schedule is a primary course of three doses of IPV at 2, 4 and 6 months old and a booster dose at 4 years old. As IPV will not be funded until November 2005, OPV should be used in the interim.

OPV is contraindicated in immunocompromised individuals or household contacts of immunocompromised persons. Household contacts include household-like situations such as long day-care. IPV can be used in these individuals.⁴

A booster dose of polio vaccine is no longer recommended for adolescents/adults because a three dose primary schedule with a booster at 4 years of age provides lifelong protection. However, a booster dose is recommended for:

- Travellers to areas or countries where polio is endemic or epidemic
- Health care workers exposed to possible polio cases or vaccinees. A single booster dose is desirable every 10 years.⁴

Vaccine associated paralytic poliomyelitis (VAPP)

The major advantage of IPV over OPV is that it does not cause vaccine associated paralytic poliomyelitis (VAPP). This is a rare but serious side effect of OPV. It occurs when a mutation of one of the attenuated OPV strains regains the capacity of the poliovirus to cause paralysis. After receiving OPV, the vaccine virus normally replicates in the gastrointestinal tract of healthy children, and may be present in the stool for up to six weeks. In some individuals excretion may persist for a longer period and immunodeficient patients may excrete the virus for years. Each time the three serotypes replicate in the gastrointestinal tract,

random mutations can occur, leading to a loss of attenuation and a concomitant increase in neurovirulence. If a mutated vaccine virus causes poliomyelitis in a vaccine recipient or close contact it is defined as VAPP.⁵

The overall risk of VAPP is approximately 1 in 2.4 million doses administered, but is six times higher after the first dose (1:750,000 doses) than subsequent doses.¹ Immunocompromised persons have a 3000 fold higher risk of VAPP than the immunocompetent. Neither immunocompromised patients nor their household contacts should receive OPV. The risk of VAPP is also much higher in populations with low vaccine coverage. The last reported case of VAPP in Australia was in an unvaccinated mother of a recently vaccinated infant whose onset of illness was in December 1994.⁷

In Australia, naturally occurring paralytic polio no longer occurs, so even a small risk of VAPP is considered unacceptable. As there is no risk of VAPP with IPV because the virus is inactivated, it has been recommended to replace OPV, as has also been done recently in the United States, the United Kingdom and New Zealand.⁸ A number of European countries have always used IPV.

Adverse events

IPV-containing vaccines are safe. Injection site reactions (erythema 33%, pain 13% and induration 1%) can occur. Other symptoms in young children can include fever, crying, and decreased appetite (5-10%).⁴

Advice to parents

Providers should inform parents/caregivers that IPV-containing vaccines are preferred to OPV in the immunisation schedule recommended by NHMRC, because of the proven but extremely rare risk of VAPP with OPV. However, until November 2005, OPV is the vaccine funded through the National Immunisation Program and parents should not delay immunisation until IPV is funded. From November 2005, IPV will be funded through the National Immunisation Program and will most likely be given in combination with other vaccines, reducing the number of injections the child would otherwise have needed if IPV had been given separately. Parents can obtain further information about the program and vaccine formulations from their state or territory health department or the Department of Health and Ageing website.⁶

If OPV is given to children then parents/carers need to be informed of the following:

- Unvaccinated or incompletely vaccinated household contacts of children given OPV should be offered OPV vaccination at the same time.
- Contacts of an OPV vaccinated infant need to ensure strict hand washing after changing baby's nappies and safe disposal of nappies to minimise exposure to the vaccine virus in faeces.

References

1. Burgess MA, McIntyre PB. Vaccine-associated paralytic poliomyelitis. *Commun Dis Intell* 1999; 23: 80-81.
2. Global case count. Global polio eradication initiative. 2005. www.polioeradication.org
3. Progress towards global eradication of poliomyelitis, 2002. *MMWR* 2003; 52: 366-369
4. NHMRC. The Australian immunisation handbook. 8th edition. Canberra: Australian Government Department of Health and Ageing; 2003: p 234-242. www.immunise.health.gov.au/handbook.htm
5. Plotkin S, Orenstein W. Vaccines. 4th ed. Philadelphia: Saunders; 2004. p 625-649 and 651-705.
6. Inactivated polio vaccine (IPV) to replace oral polio vaccine (OPV). Australian Government Department of Health and Ageing. 2005. www.immunise.health.gov.au/ipv/index.htm
7. Sullivan A-A, Boyle RS, Whitby RM. Vaccine-associated paralytic poliomyelitis. *Med J Aust* 1995; 163:423-424.
8. Prevention of poliomyelitis: Recommendations for use of only inactivated poliovirus vaccine for routine immunisation. American Academy of Pediatrics. Committee on Infectious Diseases. *Pediatrics* 1999; 104: 1404-1406.