enteroviral antibodies varies with the immunoglobulin preparation. A phase 2 trial of pleconaril for severe neonatal enterovirus disease has been completed; however, as of this writing, the results have not been reported and the drug is not available on a compassionate-use basis. Glucocorticoids are contraindicated.

Good hand-washing practices and the use of gowns and gloves are important in limiting nosocomial transmission of enteroviruses during epidemics. Enteric precautions are indicated for 7 days after the onset of enterovirus infections. Enterovirus 71 vaccine candidates are under development.

PREVENTION AND ERADICATION OF POLIOVIRUS

(See also Chap. 148) After a peak of 57,879 cases of poliomyelitis in the United States in 1952, the introduction of IPV in 1955 and of OPV in 1961 ultimately eradicated disease due to wild-type poliovirus in the Western Hemisphere. Such disease has not been documented in the United States since 1979, when cases occurred among religious groups who had declined immunization. In the Western Hemisphere, paralysis due to wild-type poliovirus was last documented in 1991.

In 1988, the World Health Organization adopted a resolution to eradicate poliomyelitis by the year 2000. From 1988 to 2001, the number of cases worldwide decreased by >99%, with only 496 confirmed cases reported in 2001. Wild-type poliovirus type 2 has not been detected in the world since 1999. The Americas were certified free of indigenous wild-type poliovirus transmission in 1994, the Western Pacific Region in 2000, and the European Region in 2002. However, in 2002, there were 1922 cases of polio, with 1600 cases reported in India. In fact, after the nadir of 496 cases in 2001, 21 countries that had previously been free of polio reported cases imported from 6 polio-endemic countries in 2002–2005. By 2006, polio transmission had been reduced in most of these 21 countries. In 2012, 293 cases of polio were reported (the lowest number ever in a 1-year period); 85% were from Nigeria, Pakistan, and Afghanistan, the only countries where polio remains endemic (Table 228-2). As of November 2013, there had been 390 cases of polio in 2013 compared with 293 cases in 2012. The increase was associated with a marked rise in imported cases, including more than 180 cases in Somalia, more than 10 cases each in Kenya and Syria, and cases in Cameroon and Ethiopia. Also in 2013, wild-type poliovirus was detected in sewage in Israel, prompting a massive vaccination campaign with OPV. As of November 2013, India had not reported a case of polio since January 2011. Polio is a source of concern for unimmunized or partially immunized travelers. Importation of poliovirus accounted for ~50% of cases in 2013. Clearly, global eradication of polio is necessary to eliminate the risk of importation of wild-type virus. Outbreaks are thought to have been facilitated by suboptimal rates of vaccination, isolated pockets of unvaccinated children, poor sanitation and crowding, improper vaccine-storage conditions, and a reduced level of response to one of the serotypes in the vaccine.

TABLE 228-2 LABORATORY-CONFIRMED CASES OF POLIOMYELITIS IN 2012

Country	Type of Transmission	No. of Cases
Nigeria	Endemic	130[a]
Pakistan	Endemic	74[b]
Afghanistan	Endemic	46[c]
Chad	Imported	17[d]
Democratic Republic of the Congo	Vaccine-derived	17
Kenya	Vaccine-derived	3
Yemen	Vaccine-derived	2
China	Vaccine-derived	2
Niger	Imported	1
Somalia	Vaccine-derived	1
Total		**293**

[a]Of these cases, 8 were vaccine-derived. [b]Of these cases, 16 were vaccine-derived. [c]Of these cases, 9 were vaccine-derived. [d]Of these cases, 12 were vaccine-derived.

Source: World Health Organization.

While the global eradication campaign has markedly reduced the number of cases of endemic polio, doubts have been raised as to whether eradication is a realistic goal, given the large number of asymptomatic infections and the political instability in developing countries.

The occurrence of outbreaks of poliomyelitis due to circulating vaccine-derived poliovirus of all three types has been increasing, especially in areas with low vaccination rates. In Egypt, 32 cases of vaccine-derived polio occurred in 1983–1993; in the Dominican Republic and Haiti, 21 cases occurred in 2000–2001; in Indonesia, 46 cases were reported in 2005; in Nigeria, 385 cases occurred in 2005–2012; in the Democratic Republic of the Congo, 64 cases were reported in 2008–2012; in Pakistan, 16 cases occurred in 2012, and at least 30 cases occurred in 2013. These OPV-derived viruses reverted to a more neurovirulent phenotype after undetected circulation (probably for >2 years). The epidemic in Hispaniola was rapidly terminated after intensive vaccination with OPV. In 2005, a case of vaccine-derived polio occurred in an unvaccinated U.S. woman returning from a visit to Central and South America. In the same year, an unvaccinated immunocompromised infant in Minnesota was found to be shedding vaccine-derived poliovirus; further investigation identified 4 of 22 infants in the same community who were shedding the virus. All 5 infants were asymptomatic. These outbreaks emphasize the need for maintaining high levels of vaccine coverage and continued surveillance for circulating virus.

IPV is used in most industrialized countries and OPV in most developing countries, including those in which polio still is or recently was endemic. While IM injections of other vaccines (live or attenuated) can be given concurrently with OPV, unnecessary IM injections should be avoided during the first month after OPV vaccination because they increase the risk of vaccine-associated paralysis. Since 1988, an enhanced-potency inactivated poliovirus vaccine has been available in the United States.

After several doses of OPV alone, the seropositivity rate for individual poliovirus serotypes may still be suboptimal for children in developing countries; one or more supplemental doses of IPV can increase the rate of seropositivity for these serotypes. Against a given serotype, monovalent OPV containing only that serotype is more immunogenic than trivalent vaccine because of a lack of interference from other serotypes. With eradication of wild-type poliovirus type 2, bivalent OPV (types 1 and 3), which was shown to be superior to trivalent OPV, has been the vaccine of choice to eliminate polio and has markedly reduced rates of polio in Nigeria. As the frequency of wild-type polio declines and reports of polio associated with circulating vaccine-derived viruses increase, the World Health Organization is investigating whether IPV can be produced from OPV strains that require less biocontainment, ultimately replacing OPV.

OPV and IPV induce antibodies that persist for at least 5 years. Both vaccines induce IgG and IgA antibodies. Compared with recipients of IPV, recipients of OPV shed less virus and less frequently develop reinfection with wild-type virus after exposure to poliovirus. Although IPV is safe and efficacious, OPV offers the advantages of ease of administration, lower cost, and induction of intestinal immunity resulting in a reduction in the risk of community transmission of wild-type virus. Because of progress toward global eradication of polio and the continued occurrence of cases of vaccine-associated polio, an all-IPV regimen was recommended in 2000 for childhood poliovirus vaccination in the United States, with vaccine administration at 2, 4, and 6–18 months and 4–6 years of age. The risk of vaccine-associated polio should be discussed before OPV is administered. Recommendations for vaccination of adults are listed in Table 228-3.

There are concerns about discontinuing vaccination in the event that endemic spread of poliovirus is eliminated. Among the reasons for these concerns are that poliovirus is shed from some immunocompromised persons for >10 years, that vaccine-derived poliovirus can circulate and cause disease, and that wild-type poliovirus is present in research laboratories.

PARECHOVIRUSES

Human parechoviruses (HPeVs), like enteroviruses, are members of the family Picornaviridae. The 16 serotypes of HPeV commonly cause