The polio virus fights back

Sabin's oral vaccine is actually causing new outbreaks of the disease.

By Wendy Orent

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We've been waiting a long time for the eradication of polio. Since the World Health Organization's 1988 decision to eliminate polio from nature, as it once did smallpox, billions of dollars have been funneled into this long war. The Bill & Melinda Gates Foundation alone has contributed more than $1 billion since 1999 to the effort, and it recently pledged an additional $119 million. The massive campaign has included armies of eradicators, mountains of research and the dedication of numerous governments and NGOs.

These efforts have spared perhaps 400,000 children a year worldwide from paralysis or death. But we're not done with polio yet. There's a bitter irony hidden at the heart of the eradication campaign: The primary tool eradicators have used to combat the virus — the oral polio vaccine created by Albert Sabin in the late 1950s — is itself causing outbreaks of the disease.

Last year was a good one for polio eradication. Nigeria, long a pool of infection, has vigorous new leadership dedicated to the campaign, and this has led to a sharp reduction in polio there. Transmission of the disease has nearly ceased in two other holdout areas: the states of Uttar Pradesh and Bihar in India.

No one denies, therefore, that the oral vaccine has considerable merits. It's cheap to make. It's easy to administer; you don't need a trained nurse with a clean syringe, just a volunteer with a dropper. And it gives excellent immunity. In theory, it produces a harmless infection in the child's intestines that can spread to other people in the community, further spreading resistance.

But there are problems with the method. T. Jacob John, veteran eradicator and polio expert from
Vellore, India, puts it this way: "This drama has two parts. In Part 1, the villain is WPV [wild poliovirus]. The hero is OPV [oral polio vaccine]. But after the break, Part 2 opens, where OPV has become the villain, and IPV [the inactivated vaccine Jonas Salk developed in the early 1950s], the forgotten one, becomes the real hero."

How can the oral vaccine, which has saved so many lives, also be a villain? Very rarely, it causes something called vaccine-acquired paralytic polio. The risk of getting this form of polio from the vaccine is minuscule — perhaps one case per million. But it is real. The threat of it caused the U.S. to switch to inactivated vaccine more than a decade ago.

And there is an even bigger risk with the oral vaccine: what happens to it after it leaves the human who was vaccinated. According to Columbia University virologist Vincent Racaniello, as soon as the vaccine is shed in stool, it's no longer simply a vaccine virus. It begins to evolve back to virulence, and this can be a big problem in countries where sanitation is poor.

The first serious outbreak of vaccine-derived polio was in Haiti and the Dominican Republic in 2000, six years after the WHO certified the Americas polio-free. The episode shocked the eradication community, but it was soon followed by another in Nigeria. Even as wild virus rates plunged there, an outbreak of vaccine-derived poliovirus caused about 350 paralytic cases.

And there is another problem with the oral vaccine. Not only does it have the capacity to pass polio through fecal matter, it sometimes does not work in tropical settings. Some children who have received 12 doses of the oral vaccine have still come down with paralytic polio, possibly because intestinal infections common in the developing world may change the intestines, leaving fewer receptors for the oral vaccine to latch on to.

More than a decade ago, the developed world returned to relying on Salk's inactive vaccine. But there are impediments to its use throughout the world.

First, it costs more, both to make and to administer. Second, it takes three sequential shots to achieve full immunity. And last, it doesn't protect against silent intestinal infections. Polio can live harmlessly in the intestines of even those who have been immunized, and no one knows it is there — until it runs up against someone who's never been immunized. In developed nations, where virtually everyone is vaccinated and where sanitation is good, this isn't a problem. But in the Third World, it's potentially deadly.

Perhaps the surest way of guaranteeing immunity — and of ultimately eradicating polio — is to first immunize with an injection of the inactive virus and then follow with the oral vaccine as a booster. This combination, known as the Gaza System, has been used in Israel and the Palestinian territories since 1988, and the region has seen no cases of polio since.

At this stage, few propose moving away from the oral vaccine until wild poliovirus has been eradicated. But it seems unwise not to take advantage of the forgotten hero, the inactive vaccine. The inactive vaccine can be given to infants in the same shot that immunizes against tetanus and diphtheria.
Today, access remains eradication's biggest problem. It's hard to get to all susceptible children, particularly in war-ravaged nations such as Pakistan and Afghanistan. And as John says, "Even where access is poor, every child has to be contacted repeatedly for the drops — 10 to 15 times." With a combination of inactive and oral vaccine, fewer contacts per child would be required.

The inactive vaccine, that once and future hero, is our safest bridge to a polio-free world — a world without any circulating virus, wild or vaccine-derived.

Wendy Orent is the author of "Plague: The Mysterious Past and Terrifying Future of the World's Most Dangerous Disease."

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