

THE POLIO EPIDEMIC: Dreaded disease has new life

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On Thursday, the world's count of known polio cases jumped 20 percent overnight.

Earlier, the World Health Organization's tally of the paralyzing disease had reached 386 in 10 countries. But as national ministries of health made their weekly reports, it spiked to 462, with new cases in Afghanistan, India, Indonesia, Nigeria and Yemen.

Fewer than 500 cases of disease in countries with hundreds of millions of residents does not sound like cause for alarm — but the WHO estimates that for every known case, there are 150 to 200 people who show no symptoms but still transmit the virus. The world's total tally of polio could be more than 90,000 cases and rising.

If things had gone as planned, 2005 would be the year in which international health authorities declared there were no new polio cases worldwide. Instead, the campaign to eradicate the disease faces at least another year of intense effort — and influential scientists are beginning to ask openly whether it can ever succeed.

The questions are being raised reluctantly and sympathetically. No one has yet recommended abandoning an effort that has taken 17 years, cost almost \$4 billion and deployed an estimated 20 million volunteers.

But prominent infectious disease specialists — including the chief of the 1970s campaign to end smallpox, the only disease eradicated by man so far — say the polio effort has encountered political, cultural and scientific complexities that could not have been foreseen and may be insuperable.

"There is truly a formidable challenge here," said Dr. D. A. Henderson, who led the global smallpox campaign and is now a senior scientist at the University of Pittsburgh's Center for Biosecurity.

"I am very pessimistic at the moment," said Dr. Samuel Katz, one of the developers of the measles–mumps–rubella vaccine and a professor emeritus at Duke University Medical Center. "There is such a thing as volunteer and worker fatigue, and donor fatigue."

The heads of the campaign, however, remain — guardedly — upbeat.

"We are feeling optimistic — really," said Dr. David Heymann of the World Health Organization, named chief of the global polio effort in 2003 by incoming WHO president Dr. J.W. Lee. "There is a real feeling of momentum, though everyone expresses concern that the momentum cannot be sustained."

The Global Polio Eradication Initiative, a coalition of the WHO, Centers for Disease Control and Prevention, United Nations Children's Fund, Rotary International and private donors such as the Bill and Melinda Gates Foundation, dates to 1988.

It was inspired by the smallpox campaign, which reduced cases of the world's worst infectious killer to zero within 10 years, and modeled on the Pan–American Health

Organization's 1980s campaign to eliminate polio in the Americas, which succeeded in less than six years.

In 1988, polio — a viral disease that usually attacks children and destroys the nerves that control movement — circulated freely in 125 countries and paralyzed about 350,000 children each year. The coalition initially thought disease transmission could be stopped within 12 years, by 2000, but the target date has been pushed back twice, to 2002 and then to 2005.

By the end of 2003, there were only 784 cases left in the world, in six countries: Nigeria and Niger, Egypt, Afghanistan, Pakistan and India.

Part of power struggle

Planners expected India and Pakistan would be the most difficult. They did not expect that three Muslim provinces in northern Nigeria, locked in a political struggle with the largely Christian federal government, would suspend polio vaccination as a bargaining chip.

Two of the provinces capitulated within months, but the third, Kano, held out for almost a year while its religious leaders claimed the vaccine had been deliberately contaminated in a plot to sterilize Muslim children. Kano's leadership boycotted a 2004 summit meeting at WHO headquarters, and turned away reports by two commissions that found the vaccine — made in Indonesia, a majority-Muslim nation — to be free of contamination.

Cases within Nigeria began to climb: There were 793 in 2004, more than 2003's world total. And the disease began to cross borders. By the end of 2003, Burkina Faso, Cameroon, Chad, the Central African Republic, Cote d'Ivoire, Benin, Ghana and Togo had been reinfected; by the end of 2004, Sudan, Ethiopia, Mali, Guinea, Botswana and Saudi Arabia.

This year, polio reached not only Indonesia, but also Yemen, which now has 220 known cases, most in the Red Sea port of Al Hudaydah.

"That clearly is very intense transmission," said Mark Pallansch, chief of the CDC's enterovirus lab, who performs genetic fingerprinting of polio strains to track the virus' movement. "If you assume there are 200 infections for every paralysis case, then this is to the point of saying one-half of all the children in the area have been exposed to the virus in a short period of time."

Polio's rapid resurgence has revealed inherent problems in the eradication campaign.

Some stem from the disease's own inescapable characteristics. Because polio produces symptomless infections — and because other infections mimic its fast-moving floppy paralysis — doing lab analysis on every case is essential for defining how far the disease has spread. Smallpox was much easier to find: It caused a unique, easily identifiable rash.

Vaccination problems

Smallpox was easier to prevent, too: A single dose of vaccine produced lifelong immunity. Protection against polio takes at least three doses of vaccine. In tropical areas, for reasons that are not clear despite years of study, full immunity requires eight doses or more.

Children in some of the reinfected countries had not been vaccinated enough: In Yemen, Pallansch said, surveys show an average vaccination rate of 65 percent of toddlers, "but it is safe to say there were significant areas where coverage was below 50 percent." And those that had been inoculated had received only one or two doses of vaccine.

In other countries, children had not been vaccinated at all: They were born after national governments, seeing the disease eliminated within their borders, halted the expensive, complicated vaccination campaigns and redirected money and effort to other health problems.

That strategy was implicitly backed by the coalition, which in 2003 withdrew vaccination funding from almost 100 countries that had vanquished polio to concentrate its limited money on the six most seriously affected nations.

Massive emergency campaigns inoculating more than 100 million children have been staged in the reinfected countries, but polio has nevertheless become locally re-established in six. Those campaigns have come at a cost: "There is a \$50 million shortfall for the second half of this year, and an additional \$200 million needed for next year," said Dr. Hamid Jafari, chief of the CDC's global immunization program. "That might increase if we have additional importations into other polio-free countries."

Flawed surveillance

In canceling vaccination funding for polio-free countries, the coalition bargained that governments would keep close watch to catch importations before the disease could regain a foothold in places where it had been wiped out.

But findings in the CDC's polio lab throw doubt on the strength of the countries' disease-surveillance programs.

Pallansch and longtime research partner Olen Kew have developed a "molecular clock" — based on the rate the polio virus changes over time — that lets them infer how long a virus has been circulating in an area even without a sample to prove its presence. Recently they dated three sets of viruses from Sudan and Chad, and found them most closely related to viruses last seen up to five years ago.

Two were of a type that is known to stay in one area, but the countries' surveillance programs had never picked them up.

The implications have left the coalition apprehensive. The eradication plan's last phase requires that surveillance for polio be excellent, because the weakened live virus in the oral polio vaccine — which typically spreads from recipients to others close to them and circulates for months or years — can unpredictably mutate into a form that causes paralysis instead of protecting against it.

With vaccinations ended, the only protection against a devastating outbreak of vaccine-caused polio would be keeping close watch to recognize the mutated virus as soon as it erupted. Some believe that may not be achievable.

"Once you stop transmission and are not finding cases, it is very difficult to keep governments interested and spending money," Henderson said.

As a result, Katz said, polio vaccination may never stop — at least not in industrialized countries that can afford to keep vaccinating. Most of the West, including the United

States, already uses an injectable polio vaccine that carries no risk of mutation because it contains a killed virus, but is not practical for the developing world because it costs several dollars per dose instead of the oral version's several cents.

Projections revised

Absent good surveillance, the only way to protect against an outbreak of mutated vaccine virus is to keep vaccinating which makes moot one of the chief rationales for the eradication campaign, that millions of dollars would become available for other health problems once polio ends.

Given the mounting obstacles, observers say it is reasonable to expect the eradication program to take even longer — "I would like to say it is going to make it," Katz said, "but maybe 2010 is a better goal than 2006" — or to be transformed, perhaps into a permanent immunization program that administers vaccines for multiple diseases at once.

The latter choice carries the moral freight of consigning the developing world to being at permanent risk of polio, as well as invalidating almost 20 years of work.

"So many people have been so devoted to eradicating polio, and have worked so damn hard on it, that it is very hard to say, 'Maybe we ought to alter our goals to something more appropriate to the resources available and to the prospects of the future,'" Henderson said.

Publicly, the coalition partners remain committed. At Rotary International, which launched its PolioPlus effort three years before the WHO targeted the disease and has raised almost \$600 million, "we are in it until the end," said PolioPlus manager Carol Pandak.

The CDC and the WHO continue to express confidence that cases in India and Pakistan can end this year. Regarding Africa, they are much less sure.

"Whether Africa will see success or not this year, we won't even forecast until August or September, when the season of high transmission has begun again," Heymann said. "When that occurs, we'll take another look and see where we stand."