INFECTIONOUS DISEASES

Just one poliovirus left to go?
Vaccinators may have wiped out the second of three strains of the virus

By Leslie Roberts

he long-running global polio eradication effort, years behind schedule and buffeted by setbacks, got a shot of good news this week. Its leaders declared the effort has likely eradicated the second of the three varieties of the virus.

The feat, if confirmed, would mark just the third time that a distinct human pathogen has been wiped out through immunization, after smallpox and one other polio strain, the scientists write. “This is a very big deal ... that puts us a lot closer to eradication” of all three polioviruses, says Chris Maher, the World Health Organization’s manager for polio eradication and emergency response in the eastern Mediterranean region, who is not on the new paper.

“Two of the three viruses are down, and only one to go,” he adds. The news “bodes well” for the Global Polio Eradication Initiative (GPEI), agrees Walter Orenstein, an infectious disease expert at Emory University School of Medicine in Atlanta.

The announcement on 13 November in the Morbidity and Mortality Weekly Report (MMWR) comes with caveats. The paper is titled “Possible Eradication of Wild Poliovirus Type 3—Worldwide, 2012.” “Given all the bumps in the road, we are trying to be ... cautious,” says Stephen Cochi, a co-author and one of the lead scientists on polio eradication at the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta. But “we believe the evidence is quite good,” says first author Olen Kew, a CDC virologist who has tracked the global comings and goings of the virus since 1985.

Poliovirus comes in three varieties, or serotypes, each genetically distinct and with its own personality. Wild-type 2, for instance, is the most transmissible, whereas wild-type 3 tends to stay put. Wild-type 3 is the “most insidious of the viruses,” Maher says, because it causes paralysis in only about one in every 1000 people it infects, compared with one in 200 for wild-type 1, and so can circulate undetected. The trivalent oral polio vaccine (OPV) that is a workhorse of the campaign is essentially a vaccine-derived form, created when the attenuated virus used in OPV reverts to its virulent, transmissible form. For reasons that are not entirely clear, in most of the countries that have already eradicated polio, wild-type 3 “checked out” next, a number of years later, followed closely by wild-type 1, Kew says. In Vietnam, for instance, type 3 vanished in 1993, and type 1 in 1994. India, the most recent country to eradicate polio, last saw type 3 virus in 2010; type 1 held on just one more year. The eradicationists fervently hope the pattern will hold globally, and in the past few years, GPEI has gone on a war footing, with more targeted vaccines and a surge of public health workers into infected countries.

The last two sightings of wild-type 3 occurred in Nigeria in 2012, where an 11-month-old was paralyzed in the northern state of Yobe on 10 November. The last positive environmental sample was collected from sewage mental samples of sewage water for traces of the virus. This “would pick up the virus even without cases,” Kew says, as happened recently in Israel with wild-type 1 (Science, 8 November 2013, p. 679).

Genetic evidence also points to extinction, Kew says. Wild-type 3 did not suddenly vanish. “It is not a binary event, now you have it, now you don’t,” Kew says. But over the years, the genetic diversity of this serotype declined, from 17 distinct genotypes in 1988 to just two in 2012.

The disappearance of type 3 from Nigeria adds to the encouraging news from that country. It has not seen a trace of wild poliovirus in 3 months and has had only six cases this year. “I am encouraged we will see a polio-free Africa by the end of the year,” Cochi says. “The one lingering uncertainty is Borno, the northeastern state where [the terrorist group] Boko Haram is most active.”

A virus fades out
Polio cases caused by wild-type 3 dropped from 67 in 2011 to 21 in 2012, then vanished.

The MMWR announcement may also put even more pressure on Pakistan, which has a runaway epidemic. The country now accounts for 85% of all polio cases in the world and constantly reinfests neighboring Afghanistan. With its ballooning case count—more than 235 this year—Pakistan is fast becoming a global “pariah,” Cochi says. If GPEI’s intensified strategy works in Nigeria, with its troubles and insecurity, there is no reason it can’t work in Pakistan, he says—if the government finally gets serious about polio eradication.

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