

HIV-positive worker went to Al-Fateh Hospital to deliver a baby, who was born infected with HIV. Poor infection-control practices in use at the hospital, noted in the 1999 WHO review, might have allowed the virus to spread to other patients.

Indeed, just months after the nurses and doctor were first jailed, in 1998, WHO compared the outbreak to documented nosocomial HIV outbreaks in Russian and Romanian hospitals. Now, 8 years and many scientific studies later, professionals who sought to pro-

vide needed health care to Libyan children may sadly become the scapegoats for another country that is loath to admit to a home-grown HIV problem — derived, in this case, from dismal hygiene practices that are only slowly being corrected. “The court is misusing science,” Richard Roberts said in explaining his decision to mobilize his fellow laureates in protest. “So scientists need to speak out.”

Dr. Rosenthal is a reporter for the *International Herald Tribune*.

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The Eradication of Polio — Progress and Challenges

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Six years after the original 2000 target date for the global eradication of polio, public health workers are encountering several stumbling blocks. Poliovirus circulation persists in countries where the virus is endemic; new outbreaks are occurring in previously polio-free areas, including, most recently, Kenya's first documented wild-type poliovirus infection in 22 years; and complex social challenges stand in the way of public health efforts in some countries.

Since 1988, when the World Health Assembly adopted the goal of eradication, the public health initiative has made extraordinary progress: the disease burden has been reduced by more than 99%, and the number of countries with endemic transmission has been reduced by more than 96%. Yet according to the reports from the global polio surveillance network,

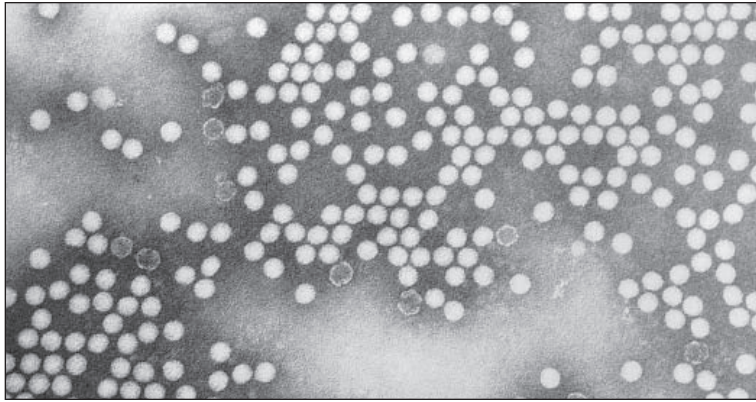
as of November 15, a total of 1646 cases had been confirmed this year,¹ and the annual incidence has remained steady for the past 4 years (ranging from 784 to 1972 cases per year). This apparent lack of progress in reducing the number of cases in the past few years has resulted in occasional impatience and frustration, even leading some to question the ultimate feasibility of global eradication.

The simple count of cases, however, does not fully reflect either the extent of recent accomplishments or the remaining barriers to eradication.² The past several years have been a roller-coaster ride in which progress against the virus has repeatedly been followed by setbacks in the form of outbreaks. Nevertheless, only four countries where the virus remains endemic — Nigeria, India, Pakistan, and Afghanistan — account for 93% of the world's cases of

poliomyelitis; unlike all other countries, they have never succeeded in interrupting the transmission of wild poliovirus.

A major accomplishment of the polio eradication program is the establishment of a global integrated virologic surveillance network. Because of the rapid mutation rate of poliovirus, molecular surveillance can provide greater insight into its circulation than would be possible with strictly epidemiologic tools. Thanks to continual changes in the genetic material of the virus and the routine molecular characterization of every wild poliovirus isolate in the world, patterns of genetic similarity can be used to help public health officials track individual virus lineages, understand the implied patterns of transmission, and monitor the progress of the eradication efforts.

Genetic sequencing has, for



Transmission Electron Micrograph of Poliovirus Type 1.

as infection with the human immunodeficiency virus and steroid contamination leading to infertility. Despite the optimism that marked the resumption of immunization activities,⁴ ongoing political, cultural, and religious objections hinder vaccination efforts, resulting in persistently low immunity in the population and, consequently, a high incidence of disease.

In several countries — particularly Afghanistan and Somalia, but also parts of Pakistan and Ethiopia — political instability or armed conflicts make vaccination logistically difficult and unpredictable at best. Polio can be eliminated from these regions, as it has been in Sudan and was previously in Somalia and Ethiopia, but negotiations for “days of tranquility” (the suspension of hostilities in order to allow for vaccination) will have to remain an integral part of polio eradication activities for the foreseeable future.

In the countries where the virus is still endemic, poliomyelitis largely affects underserved populations. In India, for example, the epicenter of the current cir-

culatation of the virus is in western Uttar Pradesh, where nearly 70% of cases occur among members of the minority Muslim population.

Because of persistent viral transmission, polio eradication activities have been intensified in India, and most children in the northern part of the country are now receiving more than 12 doses of vaccine before their second birthday (many more than the number of doses that are recommended for routine vaccinations, but necessary to attain immunity in high-risk areas and to eradicate the virus in some populations). These increased activities have led to fatigue among both the local vaccination teams and the community members who participate. Moreover, a median of 10 reported vaccine doses have been received by persons who have contracted poliomyelitis; this has raised questions about the efficacy of the vaccine. The quality and potency of the vaccine have been tested and shown to be adequate, but various biologic and ecologic factors such as other enteric infections and poor nutrition may be contributing to its reduced

effectiveness in inducing immunity in these particular reservoir populations. A perplexing discrepancy remains, however, since other areas of southern Asia — including other parts of India — have similar risk factors for the transmission of the virus because of poor sanitation and crowding and yet are now polio-free.

During the past couple of years, several outbreaks associated with vaccine-derived polioviruses have also challenged the program. One outbreak occurred during the last part of 2005 on the island of Madura in Indonesia; with 46 cases, it is the largest documented outbreak to date. Nearly concurrently, wild poliovirus was also introduced into Madura from Java, resulting in an additional eight cases in a population of only about 3 million. The source of that virus was a wild type 1 poliovirus outbreak occurring in other parts of Indonesia, sparked by an importation of Nigerian poliovirus that had spread through Chad, Sudan, and Saudi Arabia (see map). Both viruses were eliminated from Madura by means of three immunization campaigns. However, the experience offered no major insights into the risk factors for vaccine-derived polio outbreaks, beyond the known contributors of low immunization coverage and the absence of circulating, indigenous wild virus of the same serotype.

A few events have alerted experts in polio eradication to the importance of continuing to monitor the quality of surveillance activities even in the absence of poliovirus. In 2004, when Nigerian polio was spreading across

Cases of Wild Poliovirus Infection in 2006.*	
Country	No. of Cases
Pakistan	33
India	531
Nigeria	985
Afghanistan	29
Kenya	1
Somalia	32
Niger	11
Bangladesh	15
Cameroon	1
Democratic Republic of the Congo	8
Nepal	2
Ethiopia	15
Angola	1
Namibia	19
Indonesia	2
Yemen	1

* Data are from Wild Poliovirus Weekly Update.¹

central Africa into Chad and Sudan, other polioviruses that had apparently been circulating unrecognized for several years were detected in these same countries. Presumably, the outbreaks had led to enhanced surveillance activities that permitted the detection of these strains, but the fact that they had not been identified previously was disturbing. A less extreme gap in surveillance was revealed by an outbreak this year in Namibia. This outbreak was caused by a virus that had probably been circulating undetected in Angola since 2004, after an importation from India. Similarly, vaccine-

derived poliovirus outbreaks like the Madura outbreak represent the consequences of viruses that have circulated in a population for 1 year or more before being recognized. It is essential to detect all polioviruses earlier if their eradication is to be ensured, but detection is particularly challenging in resource-poor countries.

In the past few years, the initiative to eradicate polio has faced substantial challenges. Large outbreaks associated with spread from the primary global reservoirs in Nigeria and India affected 25 countries and were controlled only after more than 2 years of effort

and at least \$400 million in supplemental immunization activities. At the same time, the belief that wild type 2 poliovirus was eradicated in 1999 becomes more certain with every passing year, and the fundamental feasibility of eradication when the basic strategies are implemented continues to be demonstrated in all countries. Still, a precise timeline for eradication of the two remaining serotypes (types 1 and 3) remains unpredictable.

Very few people remember whether smallpox eradication was achieved by its target date. Indeed, success virtually ensures that this detail will be forgotten. Such a historical perspective is not yet available to the polio eradication program as it strives to reach the marathon's finish line.

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The views expressed in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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