

Polio detectives: CDC partners track stubborn disease's crippling resurgence

M.A.J. MCKENNA

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Sometime today, an international courier will deliver a small package to a lab at the Centers for Disease Control and Prevention in Atlanta.

Scientists Olen Kew and Mark Pallansch are expecting to receive frozen samples of polio virus found last week in four paralyzed children in Yemen.

The discovery represents polio's first appearance in Yemen since 1996, a fresh beachhead gained by a disease that has resisted 17 years of international efforts to destroy it.

No one knows where the virus came from --- but Kew and Pallansch expect to be able to say. Their group of scientists and technicians, the premier lab in the international effort to eradicate polio, will tease the virus apart, hunting for its relationship to other viruses found in other countries.

It is a task they have performed successfully thousands of times before.

Kew, 58, and Pallansch, 51, have been best friends and research partners for more than two decades.

They met in 1977 at the University of Wisconsin. Pallansch, round-faced and deep-voiced, was finishing a Ph.D. in biochemistry; Kew, tall and rangy, was a post-doc with a degree in microbiology. Two years later, the CDC hired Kew. In 1984, he lured Pallansch to join him.

Today, Kew is chief of the agency's molecular virology lab, and Pallansch heads the enterovirus team, which researches the family to which polio belongs. They operate with an easy familiarity, finishing each other's sentences and trading only the punchlines of jokes.

"Our thinking is so congruent in so many areas that we have to find things to quibble over," Kew said.

They have been part of the polio eradication effort since 1985, when the Pan American Health Organization resolved to eliminate polio in the Americas, asking Kew for help deriving the genetic fingerprints of viruses to track the disease. When the international effort launched three years later, the two men and their 40-person group took on the task worldwide.

They work inside a suite in a new CDC office tower where the glass walls of the labs are papered over with maps that show polio's slow retreat from the hundreds of countries where it once circulated, into the six countries it retreated to by 2003.

Some of the data show how persistent polio is: From six countries two years ago, it has rebounded into 19. The maps illustrate why. In August 2003, three Nigerian provinces blocked vaccination, calling it a Western plot against their Islamic residents. Two relented within months, but one held out for a year.

On the maps, dots representing hundreds of cases stream from Nigeria to Guinea on the Atlantic Coast and Sudan on the Red Sea and reach across to Saudi Arabia. Individually, the dots document the genetic changes of the virus over time and geography. As a whole, they transmit a different message.

"We can spend as much time as we like on the science," Pallansch said. "But in the end, science will be trumped by social issues and by politics."

### Tremendous challenges

World health authorities resolved to eliminate polio after the successful campaign to eradicate smallpox. Polio was an obvious target because it killed or crippled hundreds of thousands of children a year, and a reasonable one because it affects only humans. If enough people could be vaccinated, polio would not survive.

But there were tremendous challenges. Only one out of every 150 polio victims becomes paralyzed; the rest show no symptoms but can transmit the infection to others. Other organisms cause almost-identical paralysis. And the weakened virus in one form of polio vaccine can revert to full strength and paralyze just as the wild virus does.

Those problems made lab analysis essential to the effort. The World Health Organization --- which has no labs or lab scientists of its own --- recruited a worldwide network: 145 labs in individual countries to identify polio cases, an additional 17 more sophisticated labs to sort the viruses, and seven specialized labs that trace the origin of the wild viruses through their genetic code.

The tests and techniques the top labs use were developed by Kew and Pallansch's group at the CDC.

"The CDC lab is extremely important to the lab network," said Christopher Maher, chief epidemiologist in the WHO's polio eradication group. "I don't know whether we could have done the things we have done up to now without their being as heavily involved as they are."

### Tempered success

The CDC group revealed not only the origins of outbreaks but relationships among them as well.

In 1979, Kew traced a polio outbreak among the Pennsylvania Amish through Amish in Canada and the Netherlands to Turkish guest workers on the Dutch-German border. In another case in 1994, the group saved \$10 million in vaccination costs by proving resurgent cases in China were confined to a group of migrants from Nepal.

They developed an understanding of polio's "molecular clock" --- the rate the 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. That concept led to further discoveries: For instance, when a long-lost poliovirus surfaced recently in the Sudan, the CDC team used the molecular clock to conclude that disease surveillance had bypassed part of the war-torn country for at least five years.

Their pleasure in doing sophisticated science is tempered by the difficulties it reveals. The WHO cannot declare the eradication of polio until no wild polio virus is found anywhere for three years. The date when the three-year clock begins ticking has been

pushed back twice, from 2000 to 2002 and then to 2005. Some polio experts say privately it will be pushed back a third time, probably to 2007.

Kew and Pallansch expected polio eradication would have been declared by now, and that they would be spending the years before retirement writing up their lab's accomplishments. Instead, they continue to untangle the persistence of polio.

"We can be very proud of what has been done in the 20 years we have been involved in this program," Pallansch said. "But if the job doesn't get finished, this will never be satisfying."