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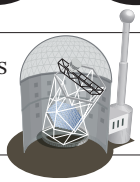


ABIR SULTAN/EPA/ALAMY

A child receives an oral vaccine against poliovirus in Israel, where the virus has been silently spreading since February without causing paralytic disease.

INFECTIOUS DISEASE

Polio risk looms over Europe

Cases in Syria highlight vulnerability of nearby countries to the viral disease.

BY DECLAN BUTLER

To many Europeans, poliomyelitis is an ancient foe. But for the first time in years, there is a risk that the crippling paralytic disease is about to make an unwelcome return. Poliovirus has re-emerged on Europe's southeastern flank — in Israel and Syria — leaving public-health officials concerned that the disease could be imported and again become established on the continent.

Europe is surprisingly vulnerable. The World Health Organization (WHO) declared its European region, which now spans 53 countries from Portugal to Russia, free of polio in 2002. But many countries have since dropped their guard. Surveillance systems are often incomplete and of poor quality, and suboptimal vaccination rates mean that many countries, including the United Kingdom and Germany, are considered to be susceptible to outbreaks sparked by imported cases[1,2] (see 'Polio threat').

The situation is "a wake up call", says Marc Sprenger, director of the European Centre for Disease Prevention and Control (ECDC) in Stockholm. Given the weaknesses in European polio defences, the extensive levels of travel between Europe and Israel, and the millions of refugees fleeing Syria, the ECDC thinks that there is a real risk of outbreaks in the European Union (EU). Member states are taking the threat of import "extremely seriously", Sprenger adds.

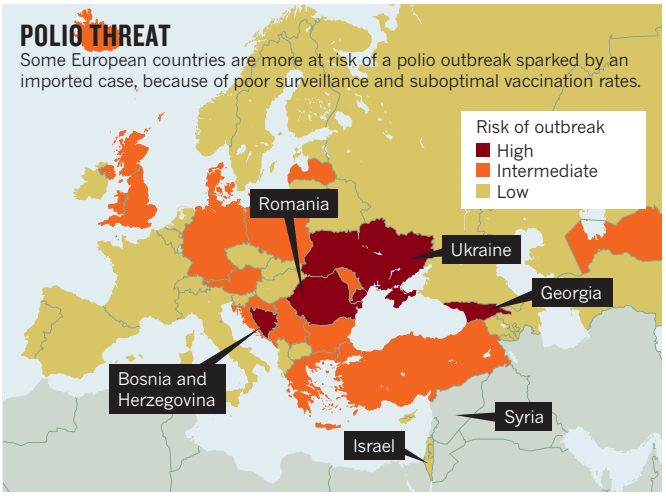
The effort to eradicate polio has made great strides since the launch of the Global Polio Eradication Initiative in 1988. Then, 350,000 children were paralysed annually in 125 countries. That toll has been slashed in the past 25 years by more than 99%, with just 223 cases last year. Polio is now endemic in only three countries: Afghanistan, Nigeria and Pakistan. Sporadic imported cases continue to occur, however, particularly in Africa, with a Somalian outbreak causing 174 cases so far this year.

The latest threat emerged on 19 October, when the WHO reported a cluster of cases of acute flaccid paralysis — a classic polio symptom — in Deir-ez-Zor, a conflict-ridden province in eastern Syria. Two of the 22 cases were confirmed as polio by national authorities, and on 29 October, the WHO confirmed a total of ten. Officials had assumed the worst. "Everyone is moving to outbreak-response mode," Oliver Rosenbauer, a spokesman for the Global Polio Eradication Initiative at WHO in Geneva, Switzerland, told *Nature* last week.

The cases are probably a result of a steep fall in child immunization rates in Syria owing to the ongoing war. Because there tend to be about 200 non-paralytic cases of polio for every paralytic one, the cluster is probably "only the ▶

tip of the iceberg", says Sprenger. There is a major risk that the disease could become endemic in Syria, adds Rosenbauer.

Israel faces a different but also concerning situation. It has high levels of child immunization against polio, but wild poliovirus has been found in sewage in several towns in southern Israel since February. The virus has also been detected in the West Bank and Gaza. The ECDC and the WHO estimate a high risk of international spread of poliovirus from Israel, given the prolonged circulation of virus over a large area.



SOURCE: REF. 3

Israel has so far identified 42 people shedding poliovirus in their faeces. None of them had symptoms of paralysis, and they had been fully vaccinated with inactivated poliovirus vaccine (IPV), which is used in routine immunizations and protects against all polio strains. This is the first time that widespread wild polio has been found without any clinical cases. Most EU countries use IPV, and if exposed to imported polio they could be faced with silent spread of the virus in the environment too, putting unvaccinated populations, particularly infants, at risk. IPV gives a high level of individual protection, but provides poor gut immunity, meaning that vaccinated people might still shed the virus in faeces. An alternative is oral poliovirus vaccine (OPV), a weakened form of the live virus that provides strong gut immunity and prevents faecal shedding. It is used for mass vaccinations and outbreak control because it is effective, cheap and easy to administer. But in rare cases it can cause polio, so polio-free countries prefer to use IPV, which carries no such risk.

To stop silent transmission, Israel has since August given OPV to more than 890,000 children, and Syria has begun administering OPV to 2.4 million children. The WHO and the United Nations Children's Fund (Unicef) are planning a vaccination campaign in all neighbouring countries. The appearance of polio "is going to have implications beyond Syria", says Rosenbauer.

Israel's effective sewage-surveillance systems were able to detect the virus before any clinical cases occurred, but in Europe, only a handful of countries monitor sewage. Surveillance for acute flaccid paralysis is also often poor[2,3]. The risk that imported cases could go undetected and spread before causing outbreaks is very real, says Sprenger. Europeans who are vaccinated would be protected. But in many countries, including Ukraine, Romania and even some richer nations, polio vaccination rates can be suboptimal. Up to 12 million EU children are not vaccinated against polio.

"We need to improve environmental surveillance and not wait until we have a clinical case of polio," says Sprenger. ■

1. ECDC. *Suspected outbreak of poliomyelitis in Syria: Risk of importation and spread of poliovirus in the EU* (ECDC, 2013).
2. ECDC. *Wild-type poliovirus 1 in Israel — what is the risk to the EU/EEA?* (ECDC, 2013).
3. WHO. *Report of the 27th Meeting of the European Regional Certification Commission for Poliomyelitis Eradication* (WHO, 2013).

GENETICS

Root of maths genius sought

Entrepreneur's 'Project Einstein' taps 400 top academics for their DNA.

BY ERIKA CHECK HAYDEN

He founded two genetic-sequencing companies and sold them for hundreds of millions of dollars. He helped to sequence the genomes of a Neanderthal man and James Watson, who co-discovered DNA's double helix. Now, entrepreneur Jonathan Rothberg has set his sights on another milestone: finding the genes that underlie mathematical genius.

Rothberg and physicist Max Tegmark, who is based at the Massachusetts Institute of Technology in Cambridge, have enrolled about 400 mathematicians and theoretical physicists from top-ranked US universities in a study dubbed 'Project Einstein'. They plan to sequence the participants' genomes using the Ion Torrent machine that Rothberg developed.

The team will be wading into a field fraught with controversy. Critics have assailed similar projects, such as one at the BGI (formerly the Beijing Genomics Institute) in Shenzhen, China, that is sequencing the genomes of 1,600 people identified as mathematically precocious children in the 1970s (see *Nature* **497,** 297–299; 2013). The critics say that the sizes of these studies are too small to yield meaningful results for such complex traits. And some are concerned about ethical issues. If the projects find genetic markers for maths ability, these could be used as a basis for the selective abortion of fetuses or in choosing between embryos created through *in vitro* fertilization, says Curtis McMullen. A mathematician at Harvard University in Cambridge, Massachusetts, and a 1998 winner of the prestigious Fields Medal, McMullen was asked to participate in Project Einstein and declined.

Rothberg is pushing ahead. "I'm not at all concerned about the critics," he says, adding that he does not think such rare genetic traits could be useful in selecting for smarter babies. Influenced by a college class he took from a pioneer in artificial intelligence, and by the diagnosis of his daughter with tuberous sclerosis complex, a disease that can cause mental retardation and autism, Rothberg has long been interested in cognition. He is also in awe of the abilities of famous scientists. "Einstein said 'the most incomprehensible thing about the Universe is that it is comprehensible'," he says. "I'd love to find the genes that make the Universe comprehensible."

There is precedent to the concept of sequencing extreme outliers in a population in the hunt for influential genes. Scientists have used the technique to sift for genes that influence medical conditions such as high blood pressure and bone loss. Some behavioural geneticists, such as Robert Plomin at King's College London, who is involved with the BGI project, say that there is no reason that this same approach won't work for maths ability. As much as two-thirds of a child's mathematical aptitude seems to be influenced by genes (Y. Kovas *et al. Psychol. Sci.* **24,** 2048–2056; 2013).