

# Polio is not going away without a fight – it's vital we step up our defences

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The global initiative to eradicate polio has been extraordinarily successful.

Over the last thirty years the number of polio cases across the world have dwindled from over 350,000 cases a year to just 20. The terrible toll on

victims, such as lifelong paralysis and disability, are a fading memory for many countries, and it's estimated around 16 million people have been saved from paralysis thanks to the vaccination programme.

But the virus is not going without a fight. In a tiny handful of instances (one in 500 million children vaccinated), the vaccine can trigger outbreaks of something called vaccine-derived poliovirus (VDPV). This only happens in poorer areas of the world, where there is no robust health system and vaccination is patchy.

Although scientists changed the vaccine, the historical legacy of this continues to represent an urgent threat to permanently banishing polio.

Professor Nicholas Grassly and Dr. Isobel Blake, from Imperial's School of Public Health, have just published research in the *New England Journal of Medicine* calling for intensified global efforts to eradicate cases of VDPV.

Here, they reveal why we need urgent action to banish polio to the confines of history.

## **How could the polio vaccine have led to cases of the disease?**

The oral [polio vaccine](#) contained three types, or strains, of the virus (types one, two and three). The vaccine, given to young children, is dropped onto the tongue, where it then travels through the stomach and digestive system. The live viruses in the vaccine have been weakened, so that it can't cause disease. However, in very rare cases, and only in populations where immunisation rates are low, the vaccine virus can mutate in the intestines and regain the ability to cause paralysis, resulting in VDPV. The most common of the three vaccine strains causing VDPV

has been the type 2 strain.

Although the person who received the vaccine does not develop polio, the reactivated polio vaccine leaves their body in faeces and can potentially infect others.

This is not a risk with the injectable polio vaccine, such as the one given in the UK, as the virus has been inactivated and doesn't enter the gut. However, this vaccine cannot be used alone in places at risk of polio and where immunity is low. Although it protects an individual from paralysis, it does not prevent the virus being transferred from person to person – an important benefit of the [oral vaccine](#)

## **What did scientists do when they realised the risk?**

Experts realised the only way to reduce the risk of VDPV was to stop using the oral vaccine that contained type 2 polio. This was possible as the type 2 'wild' poliovirus was last detected in 1999.

Instead, people would only be vaccinated against types 1 and 3 with the oral vaccine. However, the only way to remove this vaccine without triggering outbreaks of type 2 poliovirus was for the whole world to stop using the vaccine at the same time.

And so, in an incredible feat of worldwide coordination, in 2016 the Global Polio Eradication Initiative implemented what is now known as 'The Switch'. Over the course of just two weeks, health teams across the globe stopped using the oral vaccine that contained all three types of polio virus, and swapped to an oral vaccine that contained only types 1 and 3.

Children should also now receive the injectable polio vaccine to protect against paralysis from type 2 polio. However a limited supply, coupled

with poor health-care infrastructure in some areas, have resulted in many children not receiving the injectable vaccine.

## **Was 'the switch' successful?**

This is exactly what our latest research evaluated. The study, supported by the World Health Organisation and the Bill & Melinda Gates Foundation, showed this amazing global effort worked. The oral vaccine virus can be detected in children's faeces soon after they have received the vaccine.

After analysing stool samples from around 300,000 children taken between 2013 and 2018, we revealed that the type 2 virus, but not types 1 and 3, disappeared very quickly from the world. However, the surveillance also revealed there is still type 2 VDPV circulating among communities. Although most strains are hangovers from before 'the switch' – and are not new strains that have emerged since 2016—they pose a big problem.

For the first-time ever, in 2017, there were more cases of VDPV compared to wild-type—96 compared to 22.

## **What's the implication of this?**

In areas where there was a good level of protection against polio – and where there had been efficient vaccination programmes, this is not a problem. However, in poorer areas of the world immunity against polio is low, so the VDPV can infect others.

This is why we've seen VDPV outbreaks in the Democratic Republic of Congo, Pakistan, Syria, Nigeria Somalia and Kenya.

This could potentially cause a large-scale epidemic, and put young children at risk of paralysis where the injectable vaccine uptake has not been high.

And so now we have a new problem – many children have now not received the oral polio vaccine against type 2 polio.

Yet we still have cases of type 2 polio in the form of VDPV. Therefore we have a group of young children who could potentially be exposed to polio.

We therefore need to urgently stamp out these remaining cases of VDPV, before they become more widespread.

## **How can we eliminate the cases of vaccine-derived polio?**

We have a reserve stock of oral vaccine that protects against just type 2 polio held by the World Health Organisation which can be used to tackle outbreaks of VDPV.

Used effectively this vaccine can rapidly stop VDPV outbreaks. In Syria, the VDPV outbreak has been effectively controlled, despite the challenges of operating in a country at war. However, failure to achieve high coverage risks prolonging outbreaks, like in Democratic Republic of the Congo, and potentially further cases of VDPV.

In the longer term, scientists are also working on a new type 2 oral [polio](#) vaccine that contains a strain of the virus that is less likely to revert to paralytic strains. Trials with these [vaccine](#) candidates has successfully been completed in Belgium in 2017 and further clinical development is on-going.

This is a critical moment in the global vaccination programme – and our findings show it urgently needs heightened support and investment. Polio will not go quietly – and it will not go without a fight. We need a show of strength as a global community, and to intensify efforts to ensure the disease, and its terrible legacy, are eradicated for good.

**More information:** Isobel M. Blake et al. Type 2 Poliovirus Detection after Global Withdrawal of Trivalent Oral Vaccine, *New England Journal of Medicine* (2018). [DOI: 10.1056/NEJMoa1716677](https://doi.org/10.1056/NEJMoa1716677)

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