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Polio research gives new insight into tackling vaccine-derived poliovirus

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A vaccine-derived strain of poliovirus that has spread in recent years is serious but it can be tackled with an existing vaccine, according to a new study published today in the *New England Journal of Medicine*.

Vaccine-derived polioviruses can emerge on rare occasions in under-immunised populations, when the attenuated virus contained in a vaccine mutates and recombines with other viruses, to create a circulating vaccine-derived strain.

The researchers behind today's study say their findings highlight the importance of completing polio eradication. They also say that should wild-type poliovirus be eradicated, routine vaccination with oral polio vaccines will need to cease, in order to prevent further vaccine-derived strains of the virus from emerging.

The study was carried out by researchers from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, working with the Government of Nigeria and the World Health Organization (WHO) research teams.

Poliovirus is highly infectious and primarily affects children under five years of age. Around one in 200 of the people infected with polio develop permanent paralysis, which can be fatal.

Polio was virtually wiped out by the early 2000s following a major vaccination drive by the Global Polio Eradication Initiative, but since

then the number of cases of paralysis reported has plateaued, remaining roughly constant at between one and two thousand each year from 2003 to 2009, dropping only recently in 2010.

The first reported polio outbreak resulting from a circulating vaccine-derived poliovirus, known as a cVDPV, occurred in Hispaniola in 2000. Prior to today's study, there was little evidence available about the severity and potential impact of this kind of poliovirus.

Although billions of doses of oral vaccine have been distributed in the last decade, just 14 cVDPV outbreaks have been reported, affecting 15 countries. These outbreaks have usually been limited in size.

For the new study, researchers looked at the largest recorded outbreak of a cVDPV to date, which began to circulate in Nigeria in 2005. The authors examined data from 278 children paralysed by this cVDPV, and compared them with children paralysed by wild-type poliovirus in the country. Their analysis showed that this serotype 2 cVDPV is as easily transmitted and likely to cause severe disease as wild-type poliovirus of the same serotype.

The study also shows that vaccination with trivalent OPV, one of the main types of vaccine currently used to combat polio, is highly effective in preventing paralysis by this serotype 2 cVDPV.

The research shows that it is even more effective against cVDPV than against the wild-type polioviruses that are currently circulating, which can also be targeted with a different vaccine.

The new findings mean that it is particularly vital that efforts to vaccinate children with trivalent OPV continue in Nigeria and neighbouring countries, to protect children against all strains of polio. The scientists hope their findings will help countries to devise the right

vaccine strategies to eradicate polio.

Helen Jenkins, the lead author of the study from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, said: "Our research shows that vaccine-derived polioviruses must be taken seriously and that we have the right tools to tackle them. We've had a lot of success against polio in the past and we're optimistic that ultimately we should be able to eradicate it completely.

"However, our study shows that we can't be complacent about the virus. It's still vital for us to protect children from this dangerous and debilitating disease and we have to make sure we continue to vaccinate as many children as possible in affected countries for as long as wild-type poliovirus continues to circulate," added Ms Jenkins.

Senior study author Dr Nicholas Grassly, also from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, added: "There has been some debate about the significance of circulating vaccine-derived polioviruses for the eradication initiative. Our research shows these viruses can be as pathogenic and transmissible as wild-type polioviruses and outbreaks must be responded to with just as much vigour."

Dr Bruce Aylward, Director of the Global Polio Eradication Initiative at WHO, added: "These new findings suggest that if cVDPVs are allowed to circulate for a long enough time, eventually they can regain a similar capacity to spread and paralyse as wild polioviruses. This means that they should be subject to the same outbreak response measures as wild polioviruses. These results also underscore the need to eventually stop all OPV use in routine immunization programmes after wild polioviruses have been eradicated, to ensure that all children are protected from all possible risks of polio in future."

More information: "Implications of a circulating vaccine-derived poliovirus (cVDPV) in Nigeria for polio eradication" New England Journal of Medicine, Wednesday 23 June 2010

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