Polio provocation: The health debate that refused to go away

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A Clinical Center physician prepares an injection for a young patient. Credit: History of Medicine (NLM)

For much of the 20th century, health professionals were locked in debate about one possible cause of paralytic polio. Some argued that the viral infection could be provoked by medical interventions; others hotly contested this theory. Historian Dr Stephen Mawdsley looks at the unfolding story of polio provocation.

In 1980, public health researchers working in West Africa detected a startling trend among children diagnosed with paralytic polio. Some of the children had become paralyzed in a limb that had recently been the

site of an inoculation against a common paediatric illness, such as diphtheria and whooping cough. Studies emerging from India seemed to corroborate a similar association between diagnosis of polio and recent immunisation.

These reports reignited a debate known as the theory of polio provocation that has waxed and waned since the early 1900s – and, at times, shaped immunisation policy. The theory of polio provocation argued that paralytic polio can be provoked by medical interventions, such as injections or tonsillectomy. The controversy that surrounded the debate forced medical professionals into the uncomfortable position of considering whether programmes and practices intended to prevent some illnesses might be also causing another.

In a blog published today by Oxford Journals, Cambridge University historian Dr Stephen Mawdsley looks at the ways in which the theory of polio provocation was debated in the US and beyond throughout the 20th century. His blog draws on his historical research, published in the *Social History of Medicine*, into the polio provocation debate.

Polio is a terrifying disease. Most infections of polio pass unnoticed but, in a small percentage of cases, the virus can enter the blood stream, where it targets the motor neurons of the spinal cord. Depending on the severity of the infection, the disease can cause paralysis of the limbs and respiratory muscles, which can lead to further complications or death. For those who survive the acute phase, the rehabilitation process is lengthy and some are left with lasting paralysis and health complications.

After over 50 years of debate, medical researchers have shown that polio provocation can occur in certain circumstances. Although the current danger of contracting the disease through this route is likely to be slight, health professionals need to consider safeguards to reduce the risks even further. "Worldwide uptake of the polio vaccine is important since only

through building herd immunity can the disease be eradicated. Research indicates that people who are not immunised against the disease and are living in polio endemic regions may face the risk of polio provocation," said Dr Mawdsley.

"Awareness of this risk informs health policy today. Increasingly, health professionals are considering the importance of immunisation sequence (the order in which injections against childhood diseases are given), the type of vaccine to use, and the age at which children should be immunised. We will never know precisely how many people were exposed to polio provocation in the past, or how many contracted polio by this route, as there is no reference point from which we might measure a correlation."

Dr Mawdsley's research, based on records from the March of Dimes Archives in New York and historical medical journals, shows how successive generations of public health officials and policy makers made decisions with far-reaching consequences for the population. These professionals were obliged to debate whether polio provocation existed, and decide how best to balance the risks to individuals against the benefits of herd immunity, at a time when the mechanism behind the theory had yet to be understood.

Polio, which was first identified in the 19th century, was (and still is) a feared disease: haunting images of polio survivors with withered limbs or children housed in respirators (iron lungs) serve as potent reminders of the suffering caused and underline the importance of polio vaccination. In the US, outbreaks often peaked in the summer and children were particularly vulnerable. One Minnesota physician remembered the 1948 epidemic: "The people of Minneapolis were so frightened that there was nobody in the restaurants. There was practically no traffic, the stores were empty. It just was considered a feat of bravado almost to go out and mingle in the public."

The first vaccine against polio, developed by Dr Jonas Salk at the University of Pittsburgh, was field tested in 1954 and subsequently licensed for use in mass immunisation programmes by April 1955. Polio incidence in the US and other developed countries plummeted from that time and polio was slowly eradicated from the list of life-threatening children's illnesses. Immunisation offered protection and the debate about polio provocation slipped from public consciousness.

While parents in developed countries no longer fear polio, the disease remains a threat in some developing countries – such as Afghanistan, Pakistan and parts of Africa. Growing concerns raised by major aid organisations prompted a team at the State University of New York to unravel the mechanism behind polio provocation. In 1998 scientists Drs Matthias Gromeier and Eckard Wimmer were able to show that tissue injury caused by certain injections gives the polio virus easy access to nerve channels, thereby increasing its ability to cause paralysis.

"In the light of this discovery it is fascinating to look at how polio provocation, which some experts contested simply did not exist, migrated from being a theory to a clinical model – and trace its history and the waves of debate about it, both in the US and beyond," said Dr Mawdsley."At various junctures during the 20th century, health professionals were divided in opinion, which meant that it was difficult to establish a coherent public health policy. Medical scientists were also frustrated by the difficulties this debate posed to anyone conducting field trials using injections."

One of the first procedures to be implicated as provoking polio was tonsil surgery. In 1910, doctors observed that children who underwent throat surgery during a polio epidemic faced an elevated risk of contracting polio within seven to 14 days of the operation. Supporters of the polio provocation theory warned fellow clinicians that operations to the nose and throat should not be performed during epidemics when the

risk of contagion was highest. Medical opinion, however, remained split: while the US Army and some leading public health officials advised against tonsil and adenoid operations during polio outbreaks, other health professionals continued to assure clinicians that the danger was minimal.

Anxiety about the hypothesis peaked in 1950 when a rise in tonsillectomy operations coincided with a spike in the diagnosis of polio. Once again, although clinical evidence suggested that tonsillectomies appeared to treble the risk of children contacting polio, not all doctors agreed – though many heeded the advice to postpone procedures until the summer polio season was over. In the absence of a consensus, doctors made decisions on a case-by-case basis.

Shifts in notions about the causes of polio outbreaks – which was first considered to be an infection spread by immigrants or poor hygiene, and later as an affliction targeting prosperous, active people – were accompanied by changing theories about the possible causes of polio provocation.

Along with tonsillectomy, implicated at different times were injections of a wide range of drugs and paediatric immunisations. By 1952, leading medical and health organisations in the US agreed that injections against common infectious diseases such as diphtheria, whooping cough and tetanus should be postponed during periods of high polio incidence, while other injections such as vitamins and hormones were thought to be safe.

"The decision to reform public health policy in the US was handled differently in various areas, but appears to have been taken with great care, since it was clear that withholding certain immunisations would jeopardise herd immunity," said Dr Mawdsley. "Delaying injections until after polio epidemics subsided was an expedient means to achieve a compromise."