

POLIO

- Polio is an untreatable viral infection that can cause paralysis.
- The majority of countries, including the UK, have eliminated polio through vaccination; the infection still persists in a handful of conflict-torn areas of Africa and Asia.
- The fight against polio is one of the great success stories in microbiology that should inspire current vaccine development efforts.

SUMMARY

Polio is a serious viral infection that can cause paralysis. It has been eliminated in the majority of the world due to effective vaccination, while on-going vaccination campaigns are driving it towards extinction in the tiny handful of countries where it still persists, notably Afghanistan, Nigeria, and Pakistan. The polio vaccines, originally developed in the late 1950s and early 1960s, represent one of the great success stories in microbiology. The fact that these vaccines eliminated the disease in Britain and other countries demonstrates the public health benefit of concerted vaccine research.

WHAT IS POLIO?

Polio is caused by a virus and spread by swallowing materials contaminated with faeces or saliva from an infected person. Symptoms range from mild fever, to serious, debilitating paralysis. There is no cure. Vaccination is the only means to tackle the disease.

CURRENT POLIO RISK

The last case of polio infection acquired in the UK was in 1984. The Department of Health currently considers the risk of infection 'low'.³ Nevertheless, vaccination remains important to protect health.

Since 1984, imported polio cases have been seen in Britain, and the infection has the potential to spread amongst the unimmunised.⁴

Currently, polio vaccinations are given to babies at 2, 3 and 4 months old, and as a booster at around 3 years old, and to teenagers.⁵

The presence of polio virus in untreated sewage would give the early warning that could allow us to launch a vaccination campaign aimed at unvaccinated individuals. Not everyone in Britain will have received a fully protective vaccine schedule.

FIGHTING POLIO IN POST-WAR BRITAIN

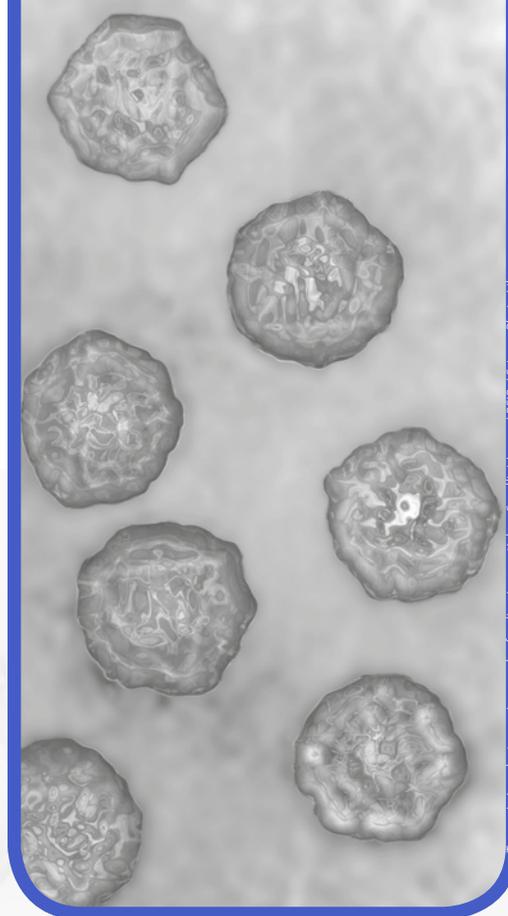
Polio was a major threat to children's health in the early and middle parts of the 20th century. In Britain the infection paralysed up to 8,000 people per year in the 1940s and 1950s. The disease rightly generated considerable fear.

Due to scientific research in the USA backed by the US government, private firms, and a philanthropic body (The National Foundation for Infantile Paralysis), American scientists developed effective vaccines in the late 1950s and early 1960s.

In 1958, Britain's National Health Service launched its first major national polio vaccination campaign, with the inoculations offered free of charge.

Vaccination uptake in the UK rose rapidly. By the end of 1959, 6.4 million people had received the required two inoculations. By the early 1960s, vaccination had cut polio rates to below 1 case per 100,000.¹

There are an estimated 120,000 people still living in Britain who survived polio before the introduction of widespread vaccination. These individuals currently represent our last contact with the severity of the disease.²



Transmission electron micrograph of polio virus particles. Cavallini James / BSIIP / Science Photo Library

GLOBAL ERADICATION

Polio has now been eliminated from most countries around the world. Due to vaccination, cases decreased from an estimated more than 350,000 in 1988, to 223 reported cases in 2012.⁶ However, the infection still poses a threat in a handful of countries where serious political unrest disturbs health provision.

In 1988, governments committed to eradicating polio worldwide. The latest mechanism to achieve this is The Global Polio Eradication Initiative, a public–private partnership. The UK government has made a strong financial commitment to polio eradication through this programme.⁷

The National Institute for Biological Standards and Control in Hertfordshire plays a critical role in quality control for the global programme, as well as conducting research to develop safer and more effective vaccines.

The most recent global eradication strategy, published this year by the World Health Organization, calls for an end to poliovirus transmission by 2014, followed by certification of a polio-free world by 2018.⁸

Until complete eradication is achieved, there is the continuing danger the disease will rebound, as is happening presently in Somalia.⁹

WHY VACCINES MATTER

Vaccines like polio have proved to be remarkably effective public health interventions, and also represent commercial opportunities in the global health market.

The UK authorities now offer routine vaccination against 14 different infections, protecting vaccinated individuals against serious, and sometimes untreatable, diseases such as measles, meningitis, seasonal influenza, and whooping cough. A vaccine against rotavirus, introduced last month, protects under-5s from an infection causing diarrhoea and vomiting than can lead to hospitalisation.¹⁰

However, we still lack vaccines against sexually transmitted infections, notably *Chlamydia*; neonatal infections causing severe respiratory disease; and against the major hospital-acquired infections that afflict elderly people, massively decreasing their quality of life, and increasing care costs. There is also an urgent need for vaccines that protect against multiple strains of the influenza virus.

Looking further afield, potentially lethal diseases such as HIV, malaria and tuberculosis also remain without effective vaccines.

THE SEARCH FOR TOMORROW'S VACCINES

- Develop a plan for research and development for new vaccines that emphasises interdisciplinary approaches to the scientific and commercial problems holding back vaccine development.
- Define and reinforce research where scientific understanding is lacking, such as the workings of the human immune system and which parts of the pathogen will elicit a strong, protective immune response.
- Modify the regulatory approach to vaccine development to reduce licensure timelines.
- Innovation must not stop when a vaccine enters the market; continual product improvement should be encouraged, e.g. needleless vaccines, single-shot vaccines, long-shelf-life vaccines, and combination vaccines.
- Ensure vaccine uptake is maintained at a high level. An effective vaccine cannot protect public health unless it is used.

SGM BRIEFINGS

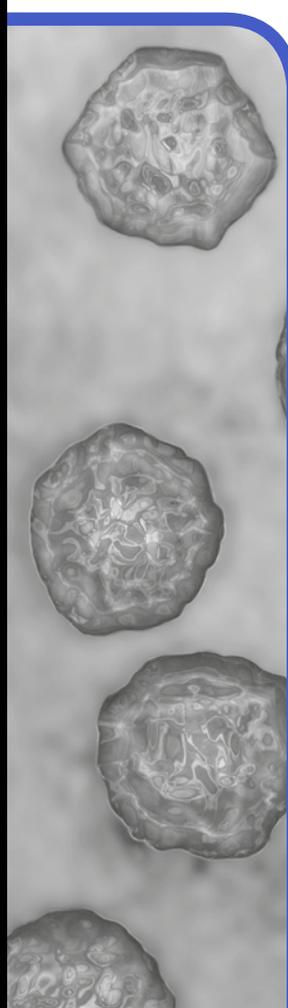
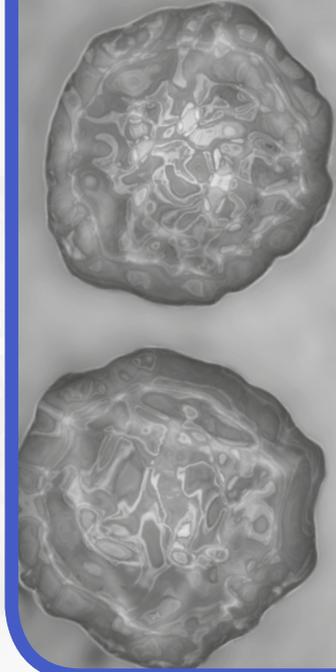
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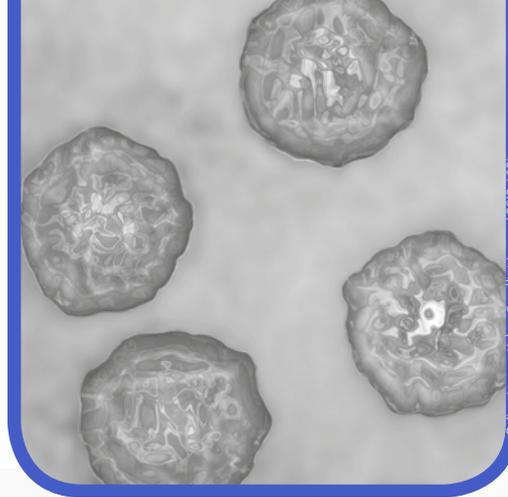
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REFERENCES

- ¹ Lindner, U. & Blume, S. S. (2006). Vaccine innovation and adoption: polio vaccines in the UK, the Netherlands and West Germany, 1955–1965. *Med Hist* **50**, 425–446; Yaqub, O. & Nightingale, P. (2012). Vaccine innovation, translational research and the management of knowledge accumulation. *Soc Sci Med* **75**, 2143–2150.
- ² Atwal, A., Giles, A., Spiliotopoulou, G., Plastow, N. & Wilson, L. (2013). Living with polio and postpolio syndrome in the United Kingdom. *Scand J Caring Sci* **27**, 238–245.
- ³ Public Health England (2013). Chapter 26: Polio, in: *Green Book*, Updated 19 April 2013, p. 314.
- ⁴ Public Health England, *ibid.*, p. 314; World Health Organization (2013). Does polio still exist? Is it curable? April 2013; <http://bit.ly/yEw9RW>
- ⁵ NHS (2012). The NHS vaccination schedule. 12 March 2012; <http://bit.ly/YLRnIm>
- ⁶ World Health Organization (2013). Does polio still exist? Is it curable? April 2013; <http://bit.ly/yEw9RW>
- ⁷ Department for International Development (2013). UK to protect up to 360 million children against polio. 25 April 2013; <http://bit.ly/15PcaQA>
- ⁸ Global Polio Eradication Initiative (2013). *Polio Eradication & Endgame Strategic Plan 2013–2018 Executive Summary*, World Health Organization, p. 7.
- ⁹ Somalia data: Global Polio Eradication Initiative (2013). Polio this week – As of 17 July 2013; <http://bit.ly/9BJAP4>
- ¹⁰ Department of Health (2012). New vaccine to help protect babies against rotavirus. 10 November 2012; <http://bit.ly/1cFVmxo>