

A terror eradicated: Edward Jenner, Smallpox and its long-lasting impact

Edward Jenner was born on 17th May 1749 in Berkeley, Gloucestershire, England. His father was the vicar of Berkeley, the Reverend Stephen Jenner and his mother, Sarah Jenner. He was the eighth of nine children. Jenner was an orphan by age five and moved in with his older brother. During his formative years, Jenner developed a keen interest in natural sciences that persisted throughout his adult life. Jenner became an apprentice at 13 for a surgeon and apothecary in Sodbury, near Bristol.¹ In Sodbury, Jenner overheard a dairymaid state: 'I shall never have smallpox for I have had cowpox. I shall never have an ugly pockmarked face.'² At the time, it was a commonly held thought that dairymaids were somehow safe against the ravages of smallpox.

At the age of 21, Jenner started as an apprentice for John Hunter, who was, at the time, working at London's St George Hospital. Hunter was a very distinguished scientist and surgeon. Hunter and Jenner enjoyed a close personal and professional friendship prior to Hunter's passing in 1793. Jenner retained a wide range of interests; he researched geology and conducted experiments in human blood. Along with his schooling and expertise in biology, Jenner made advancements in clinical surgery while training under Hunter, including creating an enhanced method for readying a medication called tartar emetic. After two years of working with Hunter, Jenner went back to Berkeley and set up as a local doctor, where he experienced great success as he was well-liked, skilled and very capable.³

While Jenner had an interest in using cowpox to protect from smallpox for many years earlier, in 1796, he made the initial steps in a lengthy process which would result in the eradication of smallpox. Smallpox was the second most feared disease, subsequent to the plague, in 18th-century Europe. Smallpox is a product of a virus from a group called Orthopoxviruses, which includes the variola virus that causes smallpox. Cowpox is another Orthopoxvirus markedly different from smallpox as it is mainly a mild, self-containing cattle disease.

¹ Stefan Riedel, 'Edward Jenner and the History of Smallpox and Vaccination', *Baylor University Medical Centre Proceedings*, 18.1 (2005), 21-25.

² Susan Brink, *NPR* (2018) <<https://www.npr.org/sections/goatsandsoda/2018/02/01/582370199/whats-the-real-story-about-the-milkmaid-and-the-smallpox-vaccine>> [accessed 2nd May 2023]

³ Stefan Riedel, 'Edward Jenner and the History of Smallpox and Vaccination', *Baylor University Medical Centre Proceedings*, 18.1 (2005), 21-25.

Cowpox gives humans milder, more flu-like symptoms, but this disease is historically significant, as Edward Jenner ascertained towards the end of the 18th century.⁴

Smallpox origins

The origins of smallpox are unknown. However, some believe it first emerged around 10,000 BC when the initial agricultural settlements in Northeastern Africa began. It likely spread from there to India through Egyptian merchants.⁵ There is evidence of lesions on mummies, which could be smallpox, from the 18th and 20th Egyptian Dynasties. Smallpox had been described in accounts from Asian civilisations around 1000 BC; there is a report that the disease was in China in 1122 BC. Smallpox was brought to Europe around the 5th to 7th centuries, and there were regular outbreaks during the Middle Ages. Smallpox considerably affected the expansion and progress of Western civilisations.⁶

Spanish and Portuguese invaders spread the smallpox virus to the Americas. 'In these settings, smallpox had a transformative importance in clearing the land of its inhabitants and thereby promoting settlement by Europeans who possessed a robust immunity.'⁷ The British also used smallpox as biological warfare to decrease the Native American population. The precedent for this was instituted by Sir Jeffery Amherst, a British Army Officer, who provided Native Americans with blankets contaminated with smallpox to bring down their population. Which is significant and relevant as the fear of biological warfare is as present now as ever. Its effective utilisation in the 18th century displays why smallpox is ranked on the top of the list of 'biological agents most feared by public health authorities.'⁸

⁴ Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present*, (New Haven: Yale University Press, 2019)

⁵ Tomislav Meštrović, *Medical News* (2021) <[⁶ Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present*, \(New Haven: Yale University Press, 2019\)](https://www.news-medical.net/health/Smallpox-History.aspx#:~:text=The%20origin%20of%20smallpox,means%20of%20ancient%20Egyptian%20merchants.> [accessed 4th May 2023]</p></div><div data-bbox=)

⁷ Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present*, (New Haven: Yale University Press, 2019) p.102.

⁸ Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present*, (New Haven: Yale University Press, 2019) p.104.

How smallpox operates

Smallpox is exceptionally contagious. Infected people disperse millions of infectious germs into their direct vicinity from their skin rash or exposed wounds in their throats. One is infectious from just before the rash is visible until the final scab comes off. It is estimated that the probability of a person contracting smallpox from an infected person in their household was 50/50. The disease is spread in three ways. The first is by an infected person spraying droplets into the air by exhaling, sneezing, or coughing and then the droplets being breathed in by others in the vicinity. Smallpox is most often spread when in a confined space over an extensive period, within a household, a classroom, a hospital ward, a close contact workplace, or a workhouse, particularly throughout cold, dry winter months.⁹

A notable reason for the extreme fear of smallpox was the atrocity it inflicted on the human body and the lifetime scarring that followed. In high populated European places, smallpox was primarily a childhood illness, as one-third of childhood mortality throughout the 17th century was due to smallpox. These aspects were as significant as the terror of death in the spread of fear. Doctors who tended to patients suffering from smallpox strongly believed this disease was the worst of all human illnesses. Donald Hopkins writes in his book:

‘In the suddenness and predictability of its attack, the grotesque torture of its victims, the brutality of its lethal or disfiguring outcome, and the terror that it inspired, smallpox is unique among human diseases.’¹⁰

Day-to-day stages

The incubation period usually endured for around twelve days; meanwhile, sufferers exhibited no symptoms, increasing the disease’s spread. The beginning of symptoms included a high fever and an experience of sudden restlessness, which began a month-long misery. Initial symptoms were acute back pain, nausea, and throbbing tension headaches. Children commonly suffered convulsions. Occasionally, the

⁹ Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present*, (New Haven: Yale University Press, 2019)

¹⁰ Donald Hopkins, *Princes and Peasants: Smallpox in History* (Chicago: University of Chicago Press, 1983) p.3.

virus would be so overpowering and crushing that an infected person would die within 36 hours with no physical symptoms.¹¹

On the third day of symptoms, sufferers often felt significantly better; this is when the rash would first appear. Three days after this, lesions that appeared with the rash would increase in size, change colour from red to purple, and the lesions would fill with fluid. At this point, doctors would diagnose the illness to be smallpox. Sufferers would experience escalating difficulty swallowing and speaking as blisters covered their throats.¹²

When the rash had been there six days, the blisters started to fill with pus, and the sufferers would feel noticeably worse. Their fever would spike, and parts of their body would become badly swollen; these include nose, tongue, lips and eyes. Sufferers would not be able to swallow and would gradually deteriorate as they become mainly drowsy during the day and restless at night. They frequently fell into delirium and attempted to escape. These psychological issues were not only a symptom of a spiked fever but the viruses effect on the central nervous system. For those effected and lucky to live through the disease, the injuries to the brain were probably long-lasting and to give lifelong damage.¹³

By the ninth day, women often suffered from uterine haemorrhages; if women were pregnant, they would undoubtedly miscarry. At this stage, sufferers were unable to drink at all as the throat would experience extreme burning sensations. Sufferers would undergo excessive weight loss, and some would suffer from starvation. They would start to resemble a corpse. Eyes often became pockmarked, leaving the sufferer with lifelong blindness.¹⁴

The rash forms scabs from the tenth to the fourteenth day. The live virus was held in the scabs, which was extremely infectious and largely attributed to the increasing cases of the disease. Large sections of the

¹¹ Centres for Disease Control and Prevention, *CDC: Clinical Disease* (2016) <<https://www.cdc.gov/smallpox/symptoms/index.html>> accessed 5th May 2023]

¹² Centres for Disease Control and Prevention, *CDC: Signs and Symptoms* (2016) <<https://www.cdc.gov/smallpox/symptoms/index.html>> accessed 5th May 2023]

¹³ Centres for Disease Control and Prevention, *CDC: Signs and Symptoms* (2016) <<https://www.cdc.gov/smallpox/symptoms/index.html>> accessed 5th May 2023]

¹⁴ Centres for Disease Control and Prevention, *CDC: Signs and Symptoms* (2016) <<https://www.cdc.gov/smallpox/symptoms/index.html>> accessed 5th May 2023]

skin would peel off, leaving wounds exposed and vulnerable due to this, the likelihood of infections increased, and death was most common during this time. Good nursing, quality hygiene, and balanced nutrition decreased the chances of developing an infection and therefore dying. This meant that wealthy people were more likely to live as they could buy quality nursing. Finally, the blisters dried up for the survivors, the scabs fell off, and recovery started.¹⁵

Treatment and Inoculation

It was common knowledge that patients that survived this disease had immunity from contracting it again. Hunting for a cure for smallpox had been taking place for centuries. Throughout the medieval period, there were many herbal treatments, in addition to cold therapy and special linen, to treat and prevent smallpox. One doctor, Dr Thomas Sydenham, believed in cold treatment, which meant refusing to heat the room, leaving the windows open, covering the sufferer in multiple blankets and giving the sufferer constant beer.¹⁶

Before the invention of vaccination, the most successful way of tackling smallpox was inoculation. Inoculation is comprised of giving a mild dose of smallpox to a healthy individual through a lancet with the object of protecting a person from catching an acute or deadly case later on. The practice of inoculation appears to have emerged separately when doctors in multiple countries were dealing with widespread epidemics. However, people were concerned that this practice would spread other diseases, namely syphilis. This practice was used in India, Africa and China well in advance of Europe's implementation in the 18th century.¹⁷

The widespread use of inoculation in Britain can be attributed to Lady Mary Wortley Montague. She suffered a severe case of smallpox in 1715, which left the known beauty's face badly maimed. When living in Istanbul, she inoculated her children, and when she came back to Britain, she started a campaign to make inoculation widespread in Britain. Her high social status, intellect, and dedication to the cause attained a large audience. She persuaded the Princess of Wales to inoculate her own daughters, which greatly attributed to it becoming popular. It is approximated that inoculation killed 1 to 2 percent of

¹⁵ Centres for Disease Control and Prevention, *CDC: Clinical Disease* (2016) <<https://www.cdc.gov/smallpox/symptoms/index.html>> accessed 5th May 2023]

¹⁶ A.W. Sloan, 'Thomas Sydenham, 1624-1689', *Sabinet African Journals*, 72 (1987), p. 275- 278

¹⁷ Stefan Riedel, 'Edward Jenner and the History of Smallpox and Vaccination', *Baylor University Medical Centre Proceedings*, 18.1 (2005), 21-25.

people, compared to 25 to 30 percent dying when catching smallpox naturally. There was also a fear that as inoculation utilised natural smallpox, there was a constant risk that inoculation could ignite a widespread outbreak.¹⁸

Creation of vaccination

Jenner was not the first doctor to observe the link between cowpox and smallpox. However, he was the original doctor to verify it by collecting medical histories of milkmaids and then proceeding to take the necessary steps to conduct experiments. He carried out the experiment on 14th May 1796; he took biological material from a lesion of Sarah Nelms, a milkmaid suffering from cowpox, and vaccinated his gardener's 8-year-old son, James Phipps. Phipps contracted a mild case of cowpox, and in July 1796, Phipps was inoculated, for the second time, with live smallpox. Phipps did not develop smallpox, and Jenner deemed the experiment a success and proof of his observations.¹⁹

Obviously, Jenner's actions were extremely unethical by today's standards. On the 21st June 1798, Jenner self-published his work entitled '*An Inquiry into the Causes and Effects of the Variolae Vaccinae, a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox*'.²⁰ Due to his many efforts in making vaccinations common and far-reaching, by 1800, it had extended to most European countries and the British government proclaimed the vaccination as one of the most remarkable findings in modern medicine.

Edward Jenner's impact

The smallpox vaccine was the bedrock for a modern way of public health not just to prevent smallpox but also influenza, polio, shingles, rabies and many other deadly diseases. Unlike inoculation, vaccination was low risk for individuals and had no risk to the large population. Jenner sent vaccinations to anybody who requested them, although occasionally, supplies were lacking. While he obtained worldwide acknowledgement and multiple commendations, he made no effort to

¹⁸ Stefan Riedel, 'Edward Jenner and the History of Smallpox and Vaccination', Baylor University Medical Centre Proceedings, 18.1 (2005), 21-25.

¹⁹ Stefan Riedel, 'Edward Jenner and the History of Smallpox and Vaccination', Baylor University Medical Centre Proceedings, 18.1 (2005), 21-25.

²⁰ Kendall A. Smith, 'Edward Jenner and the Small Pox Vaccine', *Frontiers in Immunology*, 2.21 (2011)

gain financially from his findings. Slowly but surely, vaccination supplanted inoculation, which was banned in 1840.

Conclusion

On the 26th of January 1823 Edward Jenner sadly passed away and buried alongside his family. Jenner's persistent advocacy and devotion to vaccination research altered how medicine is conducted. A worldwide campaign was launched in 1967 under the leadership of the World Health Organisation (WHO). On 8th May 1980, they declared that smallpox was globally eradicated and that vaccinations for smallpox would stop. WHO stated:

‘The world and all its people have won freedom from smallpox, which was the most devastating disease sweeping in epidemic form through many countries since earliest times, leaving death, blindness and disfigurement in its wake.’²¹

Edward Jenner's findings and vaccination advocacy facilitated the elimination of smallpox: this is Edward Jenner's legacy.

²¹ Izabella Parowicz, ‘Dr. Leopold Goeppner's (1766-1824) Pioneering Fight Against Smallpox’, in *Genealogy and Social History: Understanding the Global Past through Family Case Studies*, ed. By Eric Martone (Newcastle upon Tyne: Cambridge Scholars Publishing, 2022) pp. 27-69 (p.52)

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