

Historical Article

Who invented vaccination?

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Abstract

Edward Jenner, whose *Inquiry* (1798)¹ was the first published report of vaccination against smallpox, is widely seen as the inventor of vaccination. However, other individuals could lay claim to this title, notably his contemporaries, Benjamin Jesty and John Fewster. Jesty, a Dorset farmer, performed vaccinations in 1774, 22 years before Jenner's first vaccination in 1796. Fewster, an apothecary-surgeon who knew Jenner personally, is also reported to have performed the procedure several years before Jenner. However, neither Jesty nor Fewster published or publicised their work and both were recognised retrospectively, notably by critics of Jenner. This article compares the contributions of these three putative 'inventors' of vaccination.

Introduction

Smallpox, which emerged in human populations several millennia ago, was one of the most destructive diseases in human history. It killed millions of people each year between the 17th and 20th centuries, and was a key factor in the fall of two major empires, those of the Aztecs and Incas². 2010 marked the 30th anniversary of the eradication of smallpox, arguably the most significant success yet in the history of preventative medicine. Smallpox is the first, and only to date, human infection to be completely wiped out by mankind. Its eradication was the ultimate proof of efficacy of vaccination, a versatile technology which originated in the battle against smallpox.

Keywords

Vaccination discovery, cowpox, variolation, Edward Jenner, Benjamin Jesty, John Fewster

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Vaccination, as first reported by Edward Jenner in his *Inquiry* of 1798¹ was the inoculation of healthy subjects with cowpox pus in order to protect against smallpox. Jennerian vaccination rapidly superseded an earlier protective measure, variolation, in which smallpox pus was scratched into the skin of a healthy individual³. If performed with care, variolation carried a mortality rate of only 2% (compared with 20-50% for the natural infection) and conferred lasting immunity against smallpox – but variolated subjects were highly infectious and often spread smallpox.

Vaccination provided lasting (but not-life long) immunity⁴, and during Jenner's lifetime was shown to be capable of clearing smallpox from large regions, if applied intensively. Ultimately, in the 1950s, the World Health Organisation (WHO) took the first concerted steps towards clearing the whole world of smallpox, leading to the intensive global eradication campaign of the 1970s which culminated in success towards the end of that decade. On the 8th May 1980 the WHO officially declared that the disease was extinct.⁵

The origins of vaccination are difficult to unravel, because some important early work was not published or recognised at the time, and also because opponents of Jenner attempted to undermine his claim to have discovered vaccination. The general assumption is that Edward Jenner pioneered vaccination.⁶ However, there is clear evidence that others experimented with vaccination before Jenner, notably a Dorset farmer called Benjamin Jesty, John Fewster (a friend and colleague of Jenner), and others in France and Germany. This paper focuses on the contributions of Jenner, Jesty and Fewster; the role of the latter in particular has received little attention.

Edward Jenner

Edward Jenner (1749-1823) was born in Berkeley, Gloucestershire, in the south-west of England.⁷ At the age of 14, he was apprenticed to Daniel Ludlow, a surgeon-apothecary in nearby Chipping Sodbury, and later (1770-3) studied in London under the tutelage of John Hunter (1728-1793), who inspired Jenner's interest in science. In 1788, Jenner was awarded Fellowship of the Royal Society – not for vaccination, but for his research into the enigmatic breeding habits of the cuckoo.⁸

According to Jenner's biographer, John Baron, Jenner's attention was first drawn to the protective effect of smallpox when a milkmaid at Chipping Sodbury told him that she could

not catch smallpox as she had already had cowpox.⁷ This conversation probably took place around 1768, when Jenner would have been 19 years of age.⁹ Jenner later hypothesised that that cowpox induced artificially would also protect against smallpox, and Baron reported that he discussed it repeatedly at the local doctors' 'Convivio-Medical Society'.¹⁰

However, Jenner took over 25 years to put his hypothesis to a practical test. On 14th May 1796, he took cowpox pus from Sarah Nelmes (a local milkmaid who had active cowpox lesions on her hand, acquired from a cow called Blossom) and scratched it into the skin of eight year-old James Phipps, his gardener's son.⁷ This is the first properly reported deliberate inoculation of a human with cowpox, and the first recorded human-to-human transfer of cowpox.¹¹ Phipps developed a typical cowpox lesion at the inoculation site and remained well, apart from transient systemic symptoms. On 1st July 1796, Jenner tested whether the boy was protected against smallpox, by variolating him. Phipps did not react at all – indicating to Jenner that the boy was immune and thus proving that vaccination was effective.

Jenner reported, in variable detail,¹² numerous cases of spontaneous cowpox followed by apparent protection against smallpox, and further experimental vaccinations, in his famous *Inquiry* of 1798.¹ The *Inquiry* contained clear clinical descriptions of cowpox, so that other practitioners could use the technique; the benefits over variolation were obvious to most, and the *Inquiry* was generally well received.³ Indeed, publication of the *Inquiry* projected Jenner into the limelight, and he was soon acclaimed around the world as the discoverer of this revolutionary technique.

Benjamin Jesty

An earlier vaccinator, although not acknowledged by the medical profession until some years after Jenner's *Inquiry* was published, was Benjamin Jesty (1736-1816), a dairy farmer from Yetminster in rural Dorset.³ Jesty was evidently aware of local folklore that an attack of cowpox protected against smallpox and was struck by the fact that two of his dairy maids, Anne Notley and Mary Reade, had previously contracted cowpox and had later nursed close relatives with smallpox without themselves becoming infected.¹³

Jesty put this knowledge to the test, as Jenner would later do, when smallpox broke out locally in 1774. Jesty's wife, Elizabeth, and their two sons, Robert and Benjamin (two and three years old respectively), had not had smallpox and so were at risk. Jesty decided not to have them variolated, but instead took the surprising decision to inoculate them himself, using material from cowpox blisters. At the time, Jesty's cattle were free from cowpox, so he walked his family six miles to a neighbouring farm that had an infected cow.¹³ Using a darning needle, Jesty scratched pus from an infected cow's udder into the skin of his wife's arm, and then repeated the procedure on his two sons. The boys suffered no complications but his wife's arm became badly infected and Jesty had to summon the local doctor. The doctor is quoted as saying "You have done a bold thing but I



Figure 1: A portrait of Edward Jenner. Copyright Dr Jenner's House: Birthplace of Vaccination, UK



Figure 2: The portrait of Benjamin Jesty painted by Michael Sharp. Acknowledgments to Wellcome Trust, London

will get you through if I can".³ Jesty's wife eventually recovered but the local community was outraged that he had deliberately introduced animal material into his wife and sons. Far from being praised for his pioneering experiment, Jesty was physically and verbally abused and the family had to move away, to Worth Matravers in the Isle of Purbeck.³

Intriguingly, Jesty followed up his sons' vaccinations by challenging them with smallpox, pre-empting Jenner's validation experiment several years later. In 1789, both boys were variolated by the local doctor; they were not affected in any way, suggesting that were protected against smallpox. Perhaps because of his hostile reception, Jesty made no attempt to publicise his results himself, and made no more experiments with vaccination.

After the publication of the *Inquiry*, a local vicar, Andrew Bell, was trying to have vaccination introduced throughout the Isle of Purbeck.⁹ He heard of Jesty's experiment and was impressed. In 1803, Bell wrote to the recently formed Royal Jennerian Society in London to explain what Jesty had done. Inadvertently, Bell created direct competition between Jenner and Jesty for the discovery of vaccination – something of which Jesty was not aware.⁹

Bell's letter fell into the hands of Dr George Pearson FRS, a celebrated London physician and chemist, who was intensely jealous of Jenner and set out to deprive him of credit for his discovery. In July 1805, Pearson arranged for Jesty to be invited to the 'Original Vaccine Pock Institute', a rival institution which Pearson had set up in London.³ Jesty made the trip on horseback and in traditional country attire, accompanied by his son Robert. When asked why he had no qualms over introducing material from an animal to human, he replied "There is little risk in introducing into the human constitution matter from the cow as we already without danger eat the flesh and blood, drink the milk and cover ourselves with the skin of this innocuous animal".³ While in London, Robert was again inoculated with smallpox material, in public, to prove his immunity. Guided by Pearson, the Institute's physicians celebrated Jesty's experiment as the

first instance of vaccination, pre-empting Jenner's claim, and reported this in a paper published by the Edinburgh Medical Society.¹⁴ They presented Jesty with a pair of gold-mounted lancets, a testimonial scroll and 15 guineas for his expenses, and commissioned the famous artist Michael Sharp to paint his portrait in oils.³

Jesty returned to the Isle of Purbeck and to his life as a farmer, until his death in April 1816. His achievement was recognized in his epitaph, written by his wife (and preserved in the churchyard at Worth Matravers): 'He was born at Yetminster in this County, and was an upright and honest Man: particularly noted for having been the first Person (known) that introduced the Cowpox by Inoculation, and who from his great strength of mind made the Experiment from the (Cow) on his Wife and two Sons in the year of 1774'.

John Fewster

Another early experimenter with vaccination was John Fewster (1738-1824), a friend and professional colleague of Jenner. Born 11 years before Jenner, Fewster was a surgeon-apothecary based in Thornbury, a village seven miles south of Jenner's home town of Berkeley. Fewster practised a lucrative method of variolation devised and franchised by the well-known Sutton family,¹⁵ and with colleagues opened a 'variolation house' on the Gloucester-Bristol road between Berkeley and Thornbury where patients were quartered to be variolated.

In 1763, Fewster noted that two brothers (named Creed) had both been variolated but that one did not react at all to variolation. On questioning, this subject had never had smallpox, but had previously contracted cowpox. This prompted Fewster to wonder whether cowpox might protect against smallpox, a notion of which he was previously unaware. He is reported to have discussed this possibility at the time over a dinner, attended by Joseph Wallis, Daniel Ludlow and his young apprentice, one Edward Jenner.¹⁵

Fewster followed up this observation, but only to a limited extent and not in writing. In 1765, he presented a paper called 'Cowpox and its ability to prevent smallpox' to the London Medical Society, but never published it.¹⁶ The topic then lay dormant for over 30 years, a delay comparable with Jenner's own experiments. In 1796, Fewster was called to visit a local boy who was ill with early smallpox and was asked by John Player, the boy's uncle, whether he would consider inoculating the boy with cowpox to save him from smallpox. According to Player¹⁵, Fewster replied that he had already thought of this but had decided against it as, in his view, variolation was very successful and an alternative seemed unnecessary.⁷ Nonetheless, Player reports, over Fewster went on to inoculate three children in Thornbury with cowpox, during spring 1796.¹⁵

These pioneering vaccinations conducted by Fewster occurred at around the same time as Jenner's first vaccination attempts. It is therefore strange that Fewster did not apparently communicate his findings, especially as he was a doctor and well placed to publish his research. However, he appears to

have drifted back into his financially successful variolation business.¹³ When he was asked later how vaccination compared to variolation he said that cowpox was a more severe disease than variolated smallpox and that variolation seemed so well understood that vaccination did not seem necessary.¹³ Fewster never made any claim to have discovered vaccination, and indeed restated this view during his last illness.⁷ Nonetheless, he was the first to publicize (in his lecture in London) the notion that cowpox may protect against smallpox. Neither can we rule out the possibility that Fewster gave Jenner the idea for experimental vaccination, or at least stimulated him to pursue it.

Other claims for the discoverer of vaccination

Folklore about the protective effect of cowpox was evidently known in other countries. Indeed, dairymaids in various regions were renowned for their beautiful faces and unmarked complexions.⁹ This was because many contracted cowpox at a young age, protecting them against smallpox and subsequent scarring.

Others apart from Jesty and Fewster were reported to have inoculated healthy subjects with cowpox before Jenner did. These included François Rabbaut-Pommier from France, Peter Plett from Germany and an Englishman named Pew. However convincing documentation is sparse or absent, except in the case of Plett who was reported to have vaccinated the two daughters of his employer in Hasselburg, Holstein in Germany. The date was 1791 and both girls proved their immunity by surviving a smallpox outbreak in 1794.¹³ Also from the cattle-farming area of Holstein came an account from Jobst Böse stating that 'many reputable people' had confirmed that cowpox protects against smallpox¹⁷ and a report from Dr. Hellwag of Eutin that some farm girls, in the last quarter of the 18th century, were actively trying to contract cowpox in order to protect themselves from smallpox.¹⁸ However, none of these accounts appears to have been taken seriously, and none made any impact on medical practice.

Who was the 'inventor' of vaccination?

There is no taking away from Jenner's achievements. He not only demonstrated the link between prior infection with cowpox and protection against smallpox, but also performed successful vaccinations. Crucially he published his results, showing how cowpox could be recognised and vaccination performed, and so pushed the concept into the public domain and the technique of vaccination into mainstream medical practice.

However, it is evident that Jenner is not the sole individual who deserves recognition for the theory and practice of vaccination. Fewster formally reported the protective powers of smallpox 21 years before Jenner's experiment on James Phipps but did not publish. Given their professional and social connections it remains possible that it was Fewster who reinforced – or even prompted – Jenner's idea of giving cowpox artificially to induce immunity against smallpox.

There is no doubt that the first documented vaccinations, followed up by variolation to verify its protective effect, were performed by Benjamin Jesty in 1774, 22 years before Jenner. Jesty had neither the background nor (probably) the inclination to publicise his experiments; it was only several years after Jenner published his *Inquiry* that Pearson's intervention, which was maliciously motivated, brought Jesty to the attention of the medical community. It is unclear whether Jenner, who lived two days' travel to the north of this remote part of Dorset, knew about Jesty's achievement but the consensus is that he probably did not.⁹

Jenner, Jesty and Fewster were all innovative thinkers and experimenters; only Jenner and Fewster were well placed to publicise their work and to change medical practice for the better, and it was only Jenner who rose to that last vital challenge. In the words of Sir William Osler, "credit goes to the man who convinces the world, not the man to whom the idea first occurs"¹⁹ Edward Jenner's place in history is assured, but we argue that the glory of the discovery of vaccination must be shared with Benjamin Jesty and John Fewster.

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