



MILESTONE 1

The origins of vaccination

Edward Jenner (1749–1823), a physician from Gloucestershire in England, is widely regarded as the ‘father of vaccination’ (MILESTONE 2). However, the origins of vaccination lie further back in time and also further afield. In fact, at the time Jenner reported his famous story about inoculating young James Phipps with cowpox and then demonstrating immunity to smallpox, the procedure of ‘variolation’ (referred to then as ‘inoculation’), by which pus is taken from a smallpox blister and introduced into a scratch in the skin of an uninfected person to confer protection, was already well established.

Variolation had been popularized in Europe by the writer and poet Lady Mary Wortley Montagu, best known for her ‘letters from the Ottoman Empire’. As wife of the British ambassador to Turkey, she had first witnessed variolation in Constantinople in 1717, which she mentioned in her famous ‘letter to a friend’. The following year, her son was variolated in Turkey, and her daughter received variolation in England in 1721. The procedure was initially met with much resistance — so much so that the first experimental variolation in England (including subsequent smallpox challenge) was carried out on condemned prisoners, who were promised freedom if they survived (they did). Nevertheless, the procedure was not without danger and subsequent prominent English variolators devised different techniques (often kept secret) to improve variolation, before it was replaced by the much safer cowpox ‘vaccination’ as described by Jenner.

But how did variolation emerge in the Ottoman Empire? It turns out that at the time of Lady Montagu’s letter to her friend, variolation, or rather inoculation, was

practised in a number of different places around the world. In 1714, Dr Emmanuel Timmonius, resident in Constantinople, had described the procedure of inoculation in a letter that was eventually published by the *Philosophical Transactions of the Royal Society* (London). He claimed that “the Circassians, Georgians, and other Asiatics” had introduced this practice “among the Turks and others at Constantinople”. His letter triggered a reply from Cotton Maher, a minister in Boston, USA, who reported that his servant Onesimus had undergone the procedure as a child in what is now southern Liberia, Africa. Moreover, two Welsh doctors, Perrot Williams and Richard Wright, reported that inoculation was well known in Wales and had been practised there since at least 1600.

Patrick Russell, an English doctor living in Aleppo (then part of the Ottoman Empire), described his investigations into the origins of inoculation in a letter written in 1786. He had sought the help of historians and doctors, who agreed that the practice was very old but was completely missing from written records. Nevertheless, it appears that at the time, inoculation was practised independently in several parts of Europe, Africa and Asia. The use of the needle (and often pinpricks in a circular pattern) was a common feature, but some places had other techniques: for example, in Scotland, smallpox-contaminated wool (a ‘pocky thread’) was wrapped around a child’s wrist, and in other places, smallpox scabs were placed into the hand of a child in order to confer protection. Despite the different techniques used, the procedure was referred to by the same name — ‘buying the pocks’ — which implies that inoculation may have had a single origin.

Two places in particular have been suggested as the original ‘birthplace of inoculation’: India and China. In China, written accounts of the practice of ‘insufflation’ (blowing smallpox material into the nose) date to the mid-1500s. However, there are claims that inoculation was invented around 1000 AD by a Taoist or Buddhist monk or nun and practised as a mixture of medicine, magic and spells, covered by a taboo, so it was never written down.

Meanwhile, in India, 18th century accounts of the practice of inoculation (using a needle) trace it back to Bengal, where it had apparently been used for many hundreds of years. There are also claims that inoculation had in fact been practised in India for thousands of years and is described in ancient Sanskrit texts, although this has been contested.

Given the similarities between inoculation as practised in India and in the Ottoman Empire, it may be more likely that variolation, as described by Lady Montagu, had its roots in India, and it may have emerged in China independently. However, given that the ancient accounts of inoculation in India are contested, it is also possible that the procedure was invented in the Ottoman Empire and spread along the trade routes to Africa and the Middle East to reach India.

Regardless of geographical origin, the story of inoculation eventually led to one of the greatest medical achievements of humankind: the eradication of smallpox in 1980. And of course, it inspired the development of vaccines for many more infectious diseases, turning this planet into a much safer place.

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FURTHER READING Boylston, A. The origins of inoculation. *J. R. Soc. Med.* **105**, 309–313 (2012)