Smallpox Vaccine Beginnings

By David Paquette, MHSA

Smallpox has a long legacy of tormenting humans. Our earliest evidence of the disease comes from the Middle East. Egyptian mummies dating from 1500 to 1000 BC have visible signs of what appear to be pox marks. Microscopic examinations of skin samples support the smallpox diagnosis. It killed kings, brought armies to submission, decimated native populations, and humbled empires.

Abu Bakr Al-Razi, in ninth-century Persia, wrote a remarkable work, a book titled in Latin *De variolis et morbilis* (Book on Smallpox and Measles). In it, Al-Razi presented the first detailed and accurate descriptions of smallpox. Al-Razi described the signs and symptoms of the disease. He is the first to trace the course of the disease and its possible outcomes, including scarring, blindness and death. He did not address cause or prevention.

Variolation, as inoculation with smallpox was called, had been practiced in China since at least 1549. The common approach was to blow month old scabs up the nose of the patient. Unbeknown to its practitioners, this had the effect of killing off or weakening much of the viral material, reducing the risk of a bad case of smallpox.

Smallpox inoculation as practiced in the Ottoman Empire was written up by Britain's Royal Society in 1714. It was popularized in England early in the eighteenth century through efforts of Lady Mary Wortley Montague, wife of British ambassador to Constantinople. She learned of inoculation practiced in the Ottoman empire and had her son inoculated there. Later in 1721 in England, she brazenly had her daughter inoculated in front of group of leading physicians.

In the summer of 1721, a smallpox epidemic was raging in Boston. More than 100 deaths were being tallied every week – in a town of only 10,000 people. Ships were not allowed in the port, trade was severely restricted, and people with means fled for the relative safety of the countryside. A war of words and wills was being contested between the town's clergymen and its doctors. It was a heated debate that centered on a controversial "new" medical technique aimed at protecting the public against the ravages of smallpox- inoculation. It involved the direct transfer of infectious matter from a pustule on a patient with active smallpox to a healthy, uninfected individual.

This inoculation, it was believed, would create a mild form of the disease in the recipient, illness that had little chance of causing death. The benefit would be lifelong resistance to smallpox thereafter. 2% to 3% of inoculated persons died from the disease, became the source of another epidemic, or suffered from diseases (e.g., tuberculosis and syphilis) transmitted by the procedure itself.

The chief proponent of the procedure was the Reverend Cotton Mather, a prominent Puritan minister. Mather had ministerial concern about the souls of his flock as well as all townspeople, imploring them to repent their sinful lives. But he was also a scientist who sought to advance the good of mankind with scientific and medical discoveries to improve and save lives, starting with his fellow Bostonians.

Like other religious leaders of the day, Mather believed in witches and witchcraft. He believed that illness was caused by sin and cured as a result of prayer and redemption. But he believed in the science. He felt that inoculation was sent by God – the answer to his prayers. He felt the science supported his religion and faith. In the late seventeenth and early eighteenth century, Puritans reconciled science and religion into a coherent whole. The warfare between science and religion (or politics for that matter) is a phenomenon starting in the nineteenth century. Mather believed that God gave humans reason so that they could discover the natural laws in God's creation, thus science would glorify God.

Evidence that Mather held a colonial-wide and international reputation as a scientist was his election to the British Royal Society in 1713. Mather wrote to the Britain Royal Society to say that his slave who he named Onesimus (birth name unknown), who had been born in southern Libya, had undergone the inoculation procedure. Onesimus stated that it was common practice in his homeland to take infectious pus from the pustule of someone with smallpox and scratch it into the skin of an uninfected person. That person would get a mild form of the disease, recover, and have lifelong resistance to smallpox thereafter. To Onesimus, this was a *fact.* Mather believed Onesimus.

At Mather's urging, Dr. Zabdiel Boylston inoculated two Africans enslaved by him and his own son by applying pus from a smallpox sore to a small wound on the subjects, the method previously used in Africa as described by Onesimus. This was the first introduction of inoculations to North America.
This was called the Boston Experiment, gained national attention, and has been cited as the first great moment in American public health history.

This by most accounts was a medical miracle. However, the approach was not universally embraced. The town's clergy were in strong support, it's doctors in strong opposition.

The medical men, the men of science, opposed inoculation on religious principle. It was, they contended, a direct affront to God. They also felt that it was "folk medicine" and not proven science. It was not bad enough that the inoculators violated the will of God and introduced a dangerous innovation, the knowledge of inoculation has been acquired from Africans and Muslims – both seen as heathens by the Puritans.

The greatest opponent to inoculation, Dr. William Douglass, among others, made blatantly racist arguments in disparaging these groups. Douglass held the greatest scorn for Africans. He believed them to be blundering and inferior race of man who were deceptive by nature. He was not accepting of a procedure brought to them by an African slave.

Douglass had studied medicine at the most prestigious centers of learning and training, including universities of Edinburgh, Leiden, and Paris. He was the only physician in Boston who had actually taken a medical degree rather than read and apprentice with a practitioner who had been trained in the
same way. He was a bitter rival to Mather and Boylston, advocating for the procedure to be against the law. This rivalry played out in the press and pamphlets.

Today, Douglass would be considered an "influencer". He had great credibility among physicians. Several years later he softened somewhat and agreed in principle to inoculation. For years, however, his prejudices blinded him to the science.

The ministers advocated for inoculation. They were convinced that true virtue lay in preventing the human suffering created by smallpox. They argued that inoculation was part of Gods plan, and the procedure was given to man by God just as were other medical treatments.

By December 1721, the smallpox epidemic was expiring. The virus became a victim of its own success. It had infected a total of 5,889 people in a population of nearly 11,000. So, more were infected than not. 844 persons reportedly died during the epidemic.

By middle of the eighteenth century, the practice of vaccination had spread throughout Europe and the Americas, surging whenever an epidemic threatened. The practice was argued continually throughout the latter eighteenth century, it never reached enough people to stop ravages of the disease. The US suffered an intense smallpox epidemic during the formative years 1775 to 1782. In 1777 General George Washington ordered the compulsory variolation of all new recruits into the Continental Army.

In England, Edward Jenner was intrigued that many English country folk believed that a bout of cowpox would protect them for life from smallpox. The matter rested there until the 1780's, when Jenner began gathering case studies of people who had resisted smallpox years or decades after suffering from cowpox. In a legendary experiment in 1796, he took pus from cowpox blisters on the hand of a milkmaid and scratched it into the eight-year-old son of his gardener. An advantage to Jenner's approach is that it cannot transmit smallpox, as cowpox virus is used. The child developed a fever and didn't feel well for a short time, but soon recovered. When Jenner then injected him with pus from actual smallpox lesions, in the manner described by Onesimus, the boy remained disease free.

Jenner wrote up his results in *An Inquiry Into The Causes And Effects Of The Variole Vaccinate* (Latin for "pustule of cows", from whence the word "vaccine") published in 1798. Having proven his theory and the benefit, Parliament recognized Jenner as the discoverer of vaccination by 1806. Jenner is considered the "father of vaccination".

Jenner was not the first to use cowpox to vaccinate against smallpox. Some Estimates are that up to 22 others used the technique before Jenner. Some Of the earliest statistical and epidemiological studies were performed in 1727 And 1766. In 1768 Dr, John Fewster reported that variolation induced no reaction in persons who had cowpox.

Jenner was the first to publish scientific journal findings and formally report to the British Royal Society, and so he is generally credited with popularizing cowpox-based vaccine for smallpox in humans. Jenner's approach also had advantage that the vaccine could be transported.

Let us not forget that the idea germinated with an African Slave and Puritan Minister. Jenner's achievement was the beginning of the end for smallpox, in small part to having privilege and opportunity others did not have.

References:

"Deadliest Enemy", Osterholm, PhD, MPH, Michael T and Olshaker, Mark. Little, Brown and Company, 2017
"Medical Firsts: from Hippocrates to the Human Genome", Adler, Robert E. John Wiley and Sons, Inc., 2004
"The Plague Cycle: The Unending War Between Humanity and Infectious Disease," Kenney, Charles. Scribner, 2021
"American Plagues", Gehlbach, Stephen H., Rowman and Littlefield, 2016