Singapore Med J 2004 Vol 45(11) : 507

Medicine in Stamps

Edward Jenner (1749-1823): conqueror of smallpox

S Y Tan, MD, JD
Professor of Medicine and
Adjunct Professor of Law, University of Hawaii

Looking back, it seems incredible that millions of lives could have perished from the scourge of a viral illness called smallpox. This highly-contagious disease, with its high fever, vomiting, prostration and characteristic pustular rash, destroyed peasants and princes alike. By some accounts, the epidemic in Rome at the turn of the first millennium took 7 million lives. In the early 16th century, the Spaniards brought the disease to Mexico and within a hundred years, its population of 25 million was decimated to a mere 1.6 million. And as recently as thirty years ago, up to 15 million people worldwide contracted the disease annually, with two million perishing. Called the "speckled monster" for the scarring it left its survivors, smallpox counts among its casualties Marcus Aurelius of Rome; Emperors Ferdinand IV of Austria, Gokomyo of Japan, and Fu-Lin of China; Queen Mary II of England; Tsar Peter II of Russia; and King Louis XV of France.

If the devastation of smallpox seemed preordained, its subsequent eradication by the simple process of vaccination was nothing short of miraculous. This scientific conquest, arguably the most momentous of all medical endeavors, was the result of the genius of one man – Edward Jenner.

The Man: Edward Jenner was an Englishman born to a vicar in Gloucestershire in 1749. He was a turn-of-the-19th-century country doctor, and a graduate of Edinburgh Medical School. Initially under the tutelage of two well-known British surgeons, Daniel Ludlow and John Hunter, Jenner's career eventually blossomed under the latter's mentorship at St. George's Hospital in London in 1770. Stocky, handsome and well-dressed, Edward Jenner was known as a kind and competent physician, an accomplished naturalist and zoologist, and a writer of music and poetry. His zoological talents did not escape Captain Cook, who invited him to join his second expedition to the Pacific. But the young Jenner declined the invitation, and instead focused his attention on his clinical practice and on finding the cure for the deadly smallpox.

Of Variolation, Cowpox and Smallpox: Smallpox was feared for its high contagion and fatality, yet everyone knew that survivors were forever immune to a repeat attack. In an attempt to imitate nature, physicians of the day hoped to induce some degree of immunity by introducing samples from smallpox vesicles into the scratched skin or nostrils of healthy subjects. Called variolation, the procedure was practiced in China a hundred years before Jenner's time and was also widely used in India, the Ottoman Empire and Europe. In England, an aristocrat by the name of Lady Montague, wife of the English Ambassador to Turkey, introduced variolation by demonstrating its effectiveness in her own children. Lady Montague was herself a victim of smallpox, which had ravaged her beauty. Under the watchful eye of court physicians and the Royal Society and College of Physicians, experiments were then undertaken to variolate six prisoners in exchange for a full pardon. The experiments may have been unethical, but all of the prisoners survived and won their freedom. Yet variolation was not without risk; lethal smallpox developed in 2-3% of those who were variolated. Still, in children, the case fatality rate was 1:14 in those who were not inoculated versus 1:91 in inoculated patients.

Edward Jenner himself was variolated at 8 years of age, and never caught smallpox. As a youngster, he had heard from farmers that children who have had cowpox, a related but substantially milder disease in

those exposed to infected cattle, were somehow protected against smallpox. While still an apprentice to Dr Ludlow, he heard a dairymaid say "I shall never have smallpox for I have had cowpox. I shall never have an ugly pockmarked face."

Fascinated by the idea that cowpox may somehow prevent smallpox, he awaited the experiment that would replace anecdote with scientific proof – to actively innoculate subjects with cowpox and then to deliberately expose them to smallpox and determine the presence of immunity. The opportunity came in 1796 on a farm in Gloucestershire. A dairy maid, Sarah Nelmes, contracted cowpox. Edward Jenner took the pus-material from her skin and scratched it onto that of an 8-year-old boy named James Phipps. Jenner described the reaction of the boy in this fashion: *"On the seventh day he complained of uneasiness in the axilla and on the ninth he became a little chilly, lost his appetite, and had a slight headache. During the whole of this day he was perceptibly indisposed, and spent the night with some degree of restlessness, but on the day following he was perfectly well."* A month later, he innoculated the pus from a man with smallpox into the young boy, *"but no disease followed."* The experiment was repeated a few months later, and again the boy did not come down with smallpox.

Edward Jenner had unlocked a precious secret. In an era when microbes and the germ theory of transmission were yet to be described, Edward Jenner's empiric experimentation on a single patient had uncovered a scientific truth: exposure to a milder or variant disease form can confer protection against the development of its more lethal cousin.

Rebuff and Recognition: Jenner performed additional experiments, including administering "variolous matter" to those unprotected with cowpox inoculation; these subjects went on to develop smallpox. The Royal Society initially rebuffed his findings, but eventually he won recognition and international accolades from many quarters including Native Americans, the Dowager Empress of Russia, Napoleon Bonaparte, and George Washington. England bestowed upon him a handsome pension, although he was never knighted. The most sincere compliment came in 1805, when the King of Spain decided to vaccinate the population of his colonies. The King dispatched a ship carrying twenty-two children, two of whom were every ten days inoculated with cowpox pus. When the ship arrived in Caracas, Venezuela, the living vaccine carried on the persons of these children enabled the inoculation of 50,000 additional persons. Similar inoculations were carried out on another ship with twenty-six children that sailed for the Philippines and China.

The End of Smallpox: With modification of Jenner's methods and mass vaccination, the smallpox epidemic quickly abated. Jenner himself saw this coming when he wrote: *" ... the annihilation of the small pox, the most dreadful scourge of the human species, must be the final result ..."* In 1806, Thomas Jefferson praised Jenner with these words: "Future generations will know by history only that the loathsome smallpox existed and by you has been extirpated." Indeed, less than 200 years after the vaccination of James Phipps, smallpox came to an unceremonious end. The last case was observed in a Somali cook named Ali Maow Maalin, who developed the characteristic smallpox rash in 1977. On May 8, 1980, the World Health Organization declared the world free of smallpox.

Politics of Fame: Edward Jenner died in 1823 from a stroke and is considered one of the ten most influential medical persons of the millennium. A plain memorial marks his grave at St. Mary the Virgin in Berkeley, Gloucestershire. Fame rightfully belongs to this country doctor whose crude but scientific methods saved the lives of millions, and ultimately led to the eradication of smallpox. The house where he lived is now a museum, and an international effort resulted in the erection of a statue in Trafalgar Square in 1858 that was later moved to the more obscure Kensington Gardens in London.

Elsewhere, fame and fortune escaped another worthy of recognition. A tombstone for "an honest upright man" in Dorset reads in part: " . . . 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 1774." The man's name was Benjamin Jesty, and his work preceded Jenner's by over 20 years. Unfortunately, Jesty never published his findings and he had few political connections. It is true he did not re-challenge his inoculated patients with smallpox, and "so he remained and died a brave but unknown local farmer."

BIBLIOGRAPHY

1. Barquet N, Domingo P. Smallpox: The triumph over the most terrible of the ministers of death. Ann Int Med 1997; 127:635-42.
2. Bender GA. Great Moments in Medicine. Detroit: Northwood Institute Press, 1966.
3. Clendening L. Source Book of Medical History. New York: Dover Publications, 1960.
4. Ford JMT. Medical Memorials: Edward Jenner, MD FRS (1749-1823). J Med Biog 2003; 11:241.
5. Nuland SB. Doctors:The Biography of Medicine. New York: Vintage Books, 1988.
6. Scally G, Oliver I. Putting Jenner back in his place. Lancet 2003; 362:1092-3.
7. Shampo MA. The millennium and medicine: The 10 most influential persons. Mayo Clin Proc 2000; 75:119-21.