

# Biography

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## Edward Jenner and the First Vaccination

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Of all the diseases that have afflicted mankind, one of the most devastating was smallpox. The disease is highly contagious, and prior to preventive control it spread rapidly through the population. The death rate during epidemics frequently ranged from thirty to fifty percent. Many of those who survived were hardly, if any, more fortunate than those who died, since they were often seriously crippled or blinded as well as having hideous pockmark scarring of the body and face. Records from the sixteenth, seventeenth, and eighteenth centuries indicate that only twenty percent of the population escaped the disease. In those days, a mother feared to count her children until they had contracted and survived smallpox.

Centuries ago, it was noticed that persons who had recovered from smallpox very rarely caught it again, and if they did it was not fatal. Therefore, it was more advantageous to have suffered a mild case of smallpox, than to never have had the disease at all. A mild case gave protection, whereas those who had never experienced smallpox lived in fear of catching it and of the possibility of being subjected to a severe and perhaps fatal case of the disease. These observations led to the practice of inoculation, the deliberate infection with variolous (smallpox) matter taken from a pustule (pus-containing blister) of a person with a mild case of smallpox. The practice involved considerable risk to the

person inoculated and also to the community. Inoculation with variolous matter from a mild case of the disease could give rise to severe smallpox. Furthermore, inoculated smallpox was contagious and sometimes caused epidemics of the disease.

In 1798, Edward Jenner reported that inoculation with cowpox protected human beings from smallpox. The two diseases are closely related; but, unlike smallpox, cowpox causes a mild disease in human beings. Moreover, inoculated cowpox remains localized at the infection site of the inoculated person. Such was the dread of smallpox that Jenner's discovery was accepted with relatively little opposition. Today, because of Jennerian vaccination, smallpox has been virtually eradicated from the world, and within the next few months the World Health Organization expects to announce complete elimination of the disease. Therefore, this is an appropriate time to reflect on Edward Jenner and the eventful first vaccination.

Edward Jenner was born in 1749 at Berkeley, Gloucestershire, in western England. His father, the vicar of Berkeley, died when Jenner was only five years of age, and thereafter he was brought up by a much older brother and his wife. At the age of thirteen, Jenner, who was competent in school subjects, was apprenticed as he wished to Danial Ludlow, a surgeon in the nearby town of Sodbury. During his seven-year

apprenticeship, Jenner became impressed by the belief, commonly held by farm workers, that a person who had previously had cowpox was not susceptible to smallpox. He was already aware that cowpox caused only a mild disease in human beings, in marked contrast to the horrors of the dreaded smallpox. Jenner himself had personal experience with smallpox. When he was eight, he was inoculated with smallpox, and then shut up in a so-called inoculation stable until the disease had run its course. The experience changed him from a healthy boy into a sickly one, and a number of years passed before he regained good health. On occasion his brother had to withdraw him from school and tutor him at home because of his poor health. It is believed that Jenner's suffering from inoculation contributed to his interest in finding a better method to prevent smallpox.

After completing his apprenticeship in 1770 Jenner, on the recommendation of Ludlow, went to London for advanced study with the eminent Scottish surgeon, John Hunter. Hunter was very much impressed by Jenner's ability, and asked him to remain in London and practice surgery. Jenner declined the invitation. How much his purpose to investigate cowpox and smallpox had to do with this decision is not known.

In 1773, at the age of twenty-four, Jenner returned to Gloucestershire to practice surgery in his home town of Berkeley. At that time medicine

and surgery were separate professions, but, physicians often performed surgery, and surgeons frequently practiced medicine. This was especially true in rural areas. In 1775, for the first time since starting his practice, Jenner was able to turn his attention to the scourge of smallpox. His initial studies were quite disconcerting and dampened his enthusiasm. A considerable number of persons who reported having had cowpox had subsequently become the victims of smallpox. After his disappointment eased, Jenner continued his investigations. A thorough study was made of cowpox. He discovered that cows were subject to a variety of skin eruptions, several of which could be transmitted to human beings. Furthermore, farming people commonly called all these diseases cowpox. Jenner classified the diseases as either true or spurious cowpox based on the knowledge he gained. Jenner's professional duties required him to administer smallpox inoculation. Such occasions gave him opportunities to observe the effects of smallpox inoculation on persons with a previous history of true cowpox. He reported that "an efflorescence of a palish red colour soon appeared about the parts where the matter was inserted, but died away in a few days without producing any variolous symptoms." Jenner's studies were dependent upon cowpox and smallpox being present in or around Berkeley, and when the diseases disappeared his investigations were interrupted. The diseases were never absent for very long, and further opportunities arose for studies on the course of naturally caught and inoculated smallpox in patients with or without a history of cowpox. Jenner also determined from case studies that cowpox gave long-lasting protection against smallpox. In 1792 Jenner was awarded a medical degree by St. Andrew's University, Scotland, and he thus officially became a physician as well as a surgeon. By 1796, after twenty-one

years of exacting investigations, Jenner had acquired enough information to justify inoculation with cowpox. "The matter was taken from a sore on the hand of a dairymaid, who was infected by her master's cows, and it was inserted, on the 14th of May, 1796, into the arm of the boy by means of two superficial incisions, barely penetrating the cutis, each about half an inch long. . . he was inoculated the 1st of July following with variolous matter, immediately taken from a pustule. Several slight punctures and incisions were made on both his arms and the matter carefully inserted, but no disease followed."

The dairymaid with cowpox was Sarah Nelmes. The recipient of the matter taken from one of several sores on her hands and wrists was James Phipps, an eight-year-old boy. Why was James Phipps the subject of what has now become a classical experiment in microbiology and medicine, and how dangerous was the procedure for the child? His parents had requested that the young boy be protected from smallpox by inoculation. The risk would be no greater, and probably much less, than that of the usual method of smallpox inoculation. Because of this, and the prolonged and diligent studies by Jenner, James Phipps was not the victim of an unwise and rash experiment. He would benefit greatly if inoculated cowpox protected him against smallpox; if it did not, he faced the same danger and suffering that would be associated with routine smallpox inoculation, which he was to have whether or not he received prior inoculation with cowpox.

Jenner conducted further experiments to confirm the success of the first vaccination (from *vacca*, the latin for cow). He also went on to demonstrate vaccination with cowpox matter taken directly from the animal and to prove that inoculated cowpox, unlike inoculated smallpox, was not contagious. Jenner submitted information concerning the first vaccination for publication in

*Philosophical Transactions* of the Royal Society. It was rejected, and he was cautioned not to risk his reputation by presenting to that learned body anything that appeared so much at variance with established knowledge. In 1798 he published the work, together with additional cases of vaccination, at his own expense, and Jenner then had the satisfaction of seeing vaccination rapidly and successfully adopted in England and abroad.

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Nothing in education is so astonishing as the amount of ignorance it accumulates in the form of inert facts.

Henry James

Education is . . . hanging around until you've caught on.

Robert Frost

Let early education be a sort of amusement; you will then be better able to find out the natural bent.

Plato