

## The Legacy of James Phipps in the 21<sup>st</sup> century: A commentary

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James Phipps (1788-1853) was an 8-year old boy in 1796 who was not aware of the major event he would become part of that over time reached throughout the world, even to the 21<sup>st</sup> century (1). He was feeling fine but those around him were worried that he could become involved in a pandemic with an ancient scourge of humankind—smallpox infection. This young boy benefitted from a local family physician who was objectively observant and intensely interested in helping others. This physician was Edward Jenner (1749-1823) of Gloucestershire, England. Dr. Jenner was impressed with the perception of his time that young females who traditionally milked cows did not become infected with smallpox. He received the permission of James Phipps' family to inoculate this young boy with cowpox in May of 1796 in an attempt to prevent him from getting smallpox (1).

Not only did this young boy not get smallpox, the effort of many scientists over the next two centuries with the smallpox vaccine resulted in removal of smallpox from the world one hundred and eighty four years after this now famous cowpox inoculation by the now celebrated Edward Jenner (2). It was a great triumph for science to remove this DNA variola virus (*Variola major*) of the genus *Orthopoxvirus* from the world except for isolated stockpiles in certain countries (3). The removal of this infection with a 30% mortality rate is still celebrated in science and medicine throughout the world.

Another part of the legacy of the James Phipps cowpox inoculation was the fear of vaccines and the anti-vaccine movement that has arisen over the past two centuries (4,5). The 21<sup>st</sup> century fear of vaccines can be linked to Alfred Russel Wallace (1823-1913), co-discovered of natural selection, and a leader of the 19<sup>th</sup> century anti-smallpox vaccination movement; this was based on concerns about the potential for severe adverse effects from the vaccine, the theorized need to allow immunity in humans to arise from natural infection, and the proposed unethical nature of forcing vaccination on the public (6).

Indeed, the smallpox vaccine was not the safest vaccine in contrast to those that would be developed in the 20<sup>th</sup> century for other infections. Studies in the 1960s concluded that death occurred in 1 in every million primary smallpox vaccinations; death was from vaccine complications of eczema vaccinatum, post-vaccinal encephalitis, progressive vaccinia, and acute myocarditis (7, 8). Mass smallpox vaccination was stopped in the United States in 1972 because health experts concluded that risks from the smallpox vaccination were greater than risks of getting smallpox at that time (1). An improved smallpox vaccine was eventually developed based on recombinant DNA technology (9).

As new vaccines are developed for various infections, the fear of vaccines and the anti- vaccine movement persist in modern society. As the numbers of persons with autism

spectrum disorders increased, anti-vaccine leaders falsely blamed autism on vaccinations (4,5,10). The 20<sup>th</sup> century legacy of the poliomyelitis vaccines also confused the general public with such negative events as the 1955 Cutter incident in which 200,000 children in some parts of the United States received a defective polio vaccine resulting in 40,000 polio cases, over 200 with some form of paralysis and 10 deaths (1, 11). Controversies over the oral attenuated polio vaccine (OPV) versus the inactivated poliovirus vaccine (IPV) in the latter part of the 20<sup>th</sup> century caused additional public confusion over vaccine safety (1,12).

As we enter the third decade of the 21<sup>st</sup> century, the world is facing a pandemic threat from the coronavirus infectious disease 2019 (COVID-19) caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2); it is the third dangerous coronavirus to enter the population of *Homo sapiens sapiens* on planet earth (13). After extraordinary efforts of many steadfast scientists, based on recent developments of mRNA vaccinology, mRNA SARS-CoV-2 vaccines have been and are being produced to enable a traumatized world eventually get back to its normal state of existence until the next pandemic arises (14-18).

What have we learned from the history of pandemics and the past two centuries of vaccine development? There are a few lessons from the lasting legacy of James Phipps and established education we have gained since his historic cowpox inoculation:

1. The general public is confused and concerned about both threatening pandemics and the vaccines that have been developed to deal with these threats (1,18).
2. Such concern goes back to the dawn of vaccinology and is understandable (1,4-6).
3. Some vaccines have adverse effects that must be carefully explained and managed by knowledgeable, caring healthcare professionals (19-21).
4. We must teach that rare and potentially severe adverse effects do not negate the importance of modern vaccines to control disease and pandemics (19-21).
5. We must teach that mRNA vaccines are new, appear safe, and new knowledge will develop over time (13-18).
6. All who wish to have a mRNA COVID-19 vaccine after appropriate education should be able to receive such a vaccine and any needed vaccine-related healthcare regardless of socioeconomic status, level of income, or racial background (22-30).

*Let both sides seek to invoke the wonders of science instead of its terrors. Together let us explore the stars, conquer the deserts, eradicate disease, tap the ocean depths, and encourage the arts and commerce. John F. Kennedy (1917-1963)*

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