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Vaccination: still a challenge, always a hope

by Freddie Theodoulou, Science Editor



Which is the greater threat to humankind:
 animal disease or plant disease?

We asked this question in a quiz compiled
 by the Biochemical Society for Fascination
 of Plants Day 2017. The answer of course, is
 that both are potentially devastating. Whilst
 innumerable lives have been lost globally

to infectious diseases such as smallpox, around a million people
 starved in 19th Century Ireland when potato blight decimated their
 staple crop. Hunger kills as efficiently as viruses and bacteria. Thanks
 to vaccination, the World Health Organisation declared smallpox
 eradicated in 1980, but as diseases are eliminated or controlled, new
 ones arise: now researchers and medics confront Ebola and multidrug
 resistant bacteria, while plant scientists and farmers scramble to avoid
 losing the world's wheat crop to virulent forms of rust fungus. Whatever
 the pathogen, successful solutions to emerging diseases will depend not
 only on scientific inquiry, but also on how well the fruits of research are
 communicated and delivered to society.

The battle with smallpox can be traced to antiquity: Egyptian
 mummies bear witness to the disease which eventually spread to India
 and Europe and possibly contributed to the downfall of the Roman
 Empire a thousand years later. Introduction to the Americas by the
 Conquistadors had similarly devastating consequences. But it was
 realized as early as 430 BC that survivors had immunity to smallpox
 and although evidence is sparse, the practice of variolation- inoculation
 of non-immune individuals with smallpox virus- appears to have arisen
 independently in several countries.

Much as the scientific community faces resistance from “anti-
 vaxxers” today, variolation met with considerable opposition. Jenner
 owes a debt to a lesser-known smallpox hero, English aristocrat Lady
 Mary Wortley Montague, a passionate advocate who (unlike Tony
 Blair during the UK MMR triple vaccine controversy) persuaded
 Royal physicians to trial the practice by having her daughter publicly
 variolated in 1721. Across the Atlantic, the Rev. Cotton Mather's
 attempts to prevent the Boston epidemic of the same year resulted in
 his house being bombed, but his ground-breaking statistical analysis
 of mortality rates influenced the widespread adoption of variolation.
 Jenner himself was immunized a quarter of a century later at the age
 of 8 and survived to spend a lifetime being both honoured and abused
 for his vaccination work. The 1800s saw extensive vaccination but
 despite unquestionable success stories, modern day objections still
 mirror those of 19th Century antivaccinationists. Some problems
 have scientific solutions- producing vaccines in plants, for example,
 may satisfy anti-vivisectionists. Much harder to address are moral
 and philosophical issues, particularly the tension between individual
 choice and common good. With a limited repertoire of anti-viral
 therapies and the inexorable march of evolution, the promise of
 vaccines and the case for advocacy remain as strong as ever. ■

Further reading: Riedel, S. (2005) Edward Jenner and the history of small-
 pox and vaccination. BUMC Proceedings 18, 21–25.