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For advertising and inserts contact:

Marketing Department
 Biochemical Society
 Charles Darwin House
 12 Roger Street
 London WC1N 2JU
 tel.: +44 (0) 20 7685 2411; fax: +44 (0) 20 7685 2469
 email: marketing@biochemistry.org

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Charles Darwin House
 12 Roger Street
 London WC1N 2JU
 tel.: 020 7685 2410
 email: biochemist@biochemistry.org
 website: <http://www.biochemist.org>
 Registered charity no. 253894

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email: licensing@portlandpress.com

Science Editor: Freddie Theodoulou (Rothamsted Research, UK)

Editorial Panel: Rob Beynon, Sheila Graham, David Pye, Nicola Gray, Fraser MacMillan and Chris Willmott

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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.

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