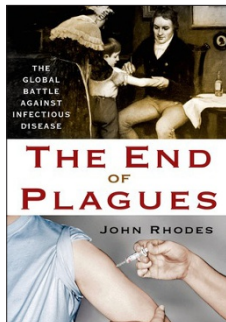


## Eradicating infectious disease



### The End of Plagues: The Global Battle Against Infectious Disease

John Rhodes

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Reviewed by William R Jacobs Jr

*The End of Plagues* as a book title may sound like an exaggeration, particularly in light of Africa's current Ebola virus outbreak. However, I believe the title is meant as a statement of optimism for the future. In his book, John Rhodes provides a lucid and scholarly tale of the history of vaccination. The major focus of the book is a comprehensive description of the successful eradication of smallpox, the ongoing efforts at eradicating polio and the tremendous successes vaccines have had in reducing morbidity and mortality from diverse diseases including diphtheria, whooping cough, tetanus, measles, mumps, rubella and influenza.

Numerous infectious diseases have caused considerable morbidity and mortality to the human population throughout history. Bubonic plague was caused by the bacterium *Yersinia pestis* and killed more than one-third of the European population, approximately 25 million people. The plague was eventually controlled through public health measures, such as quarantining infected individuals and introducing better bathing habits. In the mid-seventeenth century, Europe was plagued by another deadly epidemic, smallpox. Control of smallpox required a novel public health intervention: vaccination. *The End of Plagues* centers on how the world's first vaccine was developed. It had been observed in Asia that variolation, or the exposure of an uninfected individual to material from an individual infected with smallpox, led to protection from smallpox, and variolation was later implemented by Lady Mary Wortley Montagu in London and Catherine the Great in Russia. However, variolation often resulted in disease rather than protection. Edward Jenner's concept of vaccination was based on this folklore and on the observation that milkmaids who had been infected with cowpox were resistant to a smallpox infection. The book takes us through the courageous experiment that Edward Jenner performed to test the hypothesis that inoculation with cowpox material would protect from smallpox. Having observed that variolation failed to cause disease in a boy who had been vaccinated with cowpox was Jenner's initial validation of success, and Jenner went on to vaccinate his own children. The book describes Jenner's struggle to get this initial observation published, which is a worthwhile story for young scientists to read to inspire them during their own battles to publish their work.

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*The End of Plagues* articulately describes the struggles that led to the eventual eradication of smallpox from around the world, and Rhodes effectively captures the excitement of the early experiments as well as the hardships fought to gain acceptance of the process of vaccination. Those who understood the promise of the vaccine, such as Thomas Jefferson in the United States and Viktor Zhdanov in the Soviet Union, knew it would change history.

Rhodes continues by describing how the concept of vaccination was used by others to treat different diseases, for example polio in America. Polio infected hundreds of thousands of children each year. Each summer, parents were haunted by the fear that polio would claim one of their children. Efforts to find a vaccine were pushed forward probably too hastily, before the virus's tropism for the human gut was fully appreciated. Surprising to me was the role of the March of Dimes and how the ability to raise money from the general public played a key role in the development of the polio vaccine. President Franklin Roosevelt, who had been stricken with polio years earlier, founded the organization in 1938. The foundation was an alliance between scientists and volunteers, with volunteers raising money to support research and education efforts in hope of finding a cure for the poliovirus, and it eventually succeeded in funding the vaccine developed by Jonas Salk. It is gratifying to see that the foundation continues to be a prominent funder of scientific research to this day. Nevertheless, the story of the polio vaccine revealed the pressure that can be imposed on scientists when the public passionately wants a cure.

The polio vaccine story also reflects some of the challenges to public acceptance of vaccines. Nigeria, Afghanistan and Pakistan are the only countries that continue to report cases of polio, yet the Global Polio Eradication Initiative has had trouble delivering the vaccine to all regions in these countries, and there is a general mistrust in their populations of the vaccine itself. The US is facing similar vaccine mistrust, as seen in the resurgence of diseases such as the measles because people decline to get their children vaccinated. This book provides important insights into the challenge of distributing vaccines and the need to communicate their value to the general population.

Although vaccines for many infectious diseases have been successfully developed, we still lack efficacious vaccines for HIV, tuberculosis and malaria. Unfortunately, *The End of Plagues* does not delineate the many possible reasons for this failure. Perhaps a future book could be dedicated to exploring these issues.

The take-home message of this book is optimism for the future in the hope of controlling all infectious diseases. The book clearly points out the importance of observation, discovery and the scientific method, as well as the many challenges that scientists face. It loudly proclaims one of the greatest human achievements of mankind—the eradication of smallpox. *The End of Plagues* is a must-read for medical students, graduate students in the biological sciences, and all students interested in how historical applications of science have benefitted modern research. Moreover, it should be read by politicians and the general public to gain an understanding of the challenges of overcoming infectious diseases.

#### COMPETING FINANCIAL INTERESTS

The author declares no competing financial interests.