

Book Review

Tales of Disease Eradication: The Extreme Edge of Public Health

**Global Disease Eradication:
The Race for the Last Child**
By Cynthia A. Needham and Richard Canning
Washington, D.C.: ASM Press (2003)
196 pp. \$39.95

Do you think things are already complicated enough at the subcellular level? Are you worn down by the academic competitiveness within your field and departmental politics within your institution? Try stirring complexities such as geographic isolation, poverty, political turmoil, international diplomacy, market forces and corporate interests, plus the implications of bioterrorism, into the mix and you begin to appreciate the complications that might await should your hard won research results find their way through the lengthy development pathway to reach fruition as a vaccine or drug. The new book, *Global Disease Eradication: The Race for the Last Child*, does a skillful job of conveying the scientific, logistical, and moral dilemmas that must be faced in order to bring new disease control methods to the developing world. It does so through a series of chapters describing unsuccessful (malaria), successful (smallpox), and ongoing (polio and guinea worm) eradication efforts. In this way, the authors manage to illustrate in a highly readable manner many of the major challenges associated with the design and implementation of massive public health campaigns. Likewise, they manage to illuminate the dedication, determination, and inventiveness of those individuals committed to the humanitarian goal of eradicating infectious diseases.

As described early in the book, “eradicating a disease—that is, stopping all transmission, pulling it out by its roots—is quite different from controlling or eliminating it from a part of the world. Control and elimination are important steps along the way, but they are not the same; they are not the ultimate public health goal—zero transmission—that defines eradication” (pg. 9). The World Health Organization (WHO) and its partners are currently engaged in a number of elimination efforts, aimed at interrupting the transmission and/or reducing the prevalence of diseases such as leprosy, filariasis, Chagas’ disease, measles, and trachoma, with the goal of decreasing disability and rendering continued control more manageable by local health systems. As complicated as these efforts are, they do not approach the long, hard slog required to achieve eradication. By focusing their discussion on the extreme edge of public health, the idealistic goal of banishing a particular disease from the face of the earth, the authors cut right to the heart of the diversity of opinions and interests that influence decision making on the international scale. To quote again, “ultimately...decisions are made in the real

world of global politics, social and cultural pressures, and financial realities.”

Through accounts of earlier eradication campaigns as well as speculation on what lies ahead, the authors explore the central question of how the global community enters into a commitment to disease eradication. According to Needham and Canning (pg. 120), each of the previous and current eradication programs have hinged largely on the efforts of one individual who became convinced of the possibility of success and dragged the rest of the world along, sometimes kicking and screaming. This conviction in turn arose from the discovery of “ideal” control tools—chloroquine and DDT in the case of malaria, easy to administer vaccines for smallpox and polio, a simple water filtration technique for guinea worm. The stories of how these individuals moved their agendas forward to obtain the buy-in of world leaders then, of course, diverge in the particulars. Yet the authors have used them to forge an instructive overall lesson on the essentials for success. Thus, we are shown how the global malaria eradication campaign of the 1950s and 1960s ultimately collapsed as a result of the inflexibility of its design, which failed to take social and ecological differences into account or to incorporate a field research component that could have detected changes in the biology of the parasite and its mosquito vector. In juxtaposition, the authors’ focus on the willingness of the leadership of the smallpox eradication campaign to incorporate innovations, such as the surveillance/containment strategy and the bifurcated needle, into its design as a major reason for its success. Likewise, innovations have played an important role in the polio eradication campaign. These included the use of national immunization days as a way to overcome both the inadequacy of local medical infrastructure and the shortcoming of vaccine instability, the development of new methods to respond to surveillance requirements, and the inclusion of a nongovernmental organization (Rotary International) as a major funding partner. According to Needham and Canning, three conditions are prerequisite to eradication: a method for interrupting transmission; a means of detecting levels of infection that will permit transmission; and a life cycle in which the human host is essential. Only when these requirements are met can one begin to contemplate an eradication strategy. The “lessons learned” regarding the likelihood of success for future eradication efforts are summarized in four strategic areas: biological feasibility, financial resources, political will, and social benefit.

Both within the disease-specific chapters and that on the future of eradication efforts, the authors provide important insights into the logic that has been employed to obtain the often reluctant commitment of world leadership. “Because eradication would cost so much, there was a need to convince governments and funding agencies that the end of malaria was more or less in sight. They could be promised immediate and permanent benefits in return for heavy, if short-term investments” (pg. 17). “Polio eradication was sold to the world in part like

smallpox eradication, as a way to free up scarce health care resources” (pg. 109). Such arguments capitalize on an inclination to save money while doing good. Indeed, the authors remind us of the estimates that smallpox eradication saves approximately \$1 billion annually in the costs previously associated with vaccination and control, while potential global savings from polio eradication are currently placed at \$1.8 billion annually. To the authors’ credit, they do not shy away from thought provoking issues, one of which is the reality of such financial incentives. For example, within the chapters on smallpox and polio, they talk about the threat of ongoing exposure. In so doing, they raise the issue that cost savings resulting from disease eradication may not be as substantial as originally envisioned. Thus, they discuss the fact that no decision has been reached within the global community about destruction of known smallpox stocks, the possibility that live poliovirus could reenter circulation accidentally due to laboratory release or hidden human reservoirs, and the potential for bioterrorism using either virus. Recent events add emphasis to the considerations mentioned in this book. Occasional reports of paralysis resulting from vaccine-derived poliovirus have prompted WHO to call for more research and continued surveillance (Report of the interim meeting of the Technical Consultative Group on the Global Eradication of Poliomyelitis, WHO/V&B/03.04, 2003). Reports of *in vitro* generation of pathogenic poliovirus from cDNA constructed from sequence information (Cello, *Science* 297:1016-8, 2002), and of genetic alteration of a smallpox-related mouse virus to overcome immunity (Jackson, *J. Virol.* 75:1205-10, 2001) have increased awareness of additional possibilities by which infection might be reintroduced. With the horrific realization of our vulnerability that resulted from terrorist activities in 2001, came recognition of the difficulties involved in preparing ourselves for the future. One such difficulty is the fact that industry generally does not continue manufacturing products for which there is no market. Thus, with the banning of DDT for environmental reasons DDT production facilities shut down (pg. 29). With the eradication of smallpox, the vaccine market likewise disappeared (pg. 122), requiring a sizeable influx of government biodefense funding recently in an effort to reinvigorate production and reinstate the vaccine delivery infrastructure in this country. Therefore, should the need for surveillance and protection against each eradicated disease prove ongoing, the expected resource savings resulting from eradication may be more difficult to sell as an incentive in the future. While the authors raise the dilemma posed by disease eradication, in terms of increasing the terrorist potential of the disease agent, they cite the opinion of eradication campaigners, such as Walter Dowdle, former deputy director of CDC: “Do we ensure that the disease continues in poverty stricken countries so that rich countries are not threatened by bioterrorism? ...It’s ridiculous; that option is simply not viable” (page 71). Even in the absence of such concerns, the ultimate costs of eradication can be unpredictable. This is illustrated by the problems being experienced in the final stages of the current polio campaign, where a recent outbreak in Nigeria has spread to neighboring countries, requiring a new mass immunization campaign in that area at the cost of unanticipated millions of dol-

lars. For many reasons, one comes away from this book understanding that eradication programs are not to be entered into lightly, and that the rationale would be better focused on life saving rather than cost saving. The authors most clearly sum up their perspective at the end of the chapter on the future of eradication, saying that “it is clear, however, that given these circumstances—limited resources, unlimited need—eradication will have a future, and that it will continue to be risky and thus controversial.”

These stories of success and failure also illustrate that the more things change, the more they stay the same. It was dismaying, yet perhaps perversely amusing, to read the historical accounts of arguments and positions taken decades and even centuries ago that continue to be voiced in conference rooms around the world today. As mentioned above in the context of the malaria eradication campaign, the argument to deemphasize research in order to devote all available resources to current control measures continues to play itself out within development agencies and public health initiatives. This scenario was revisited in the recent past with tuberculosis, where the research infrastructure had to be rebuilt almost from scratch upon recognition of a resurgence of disease due to multiple drug resistance and HIV/AIDS. How many current programs for mass chemotherapy, immunization, or vector control fail to incorporate long-term monitoring components to assess adaptations in the biology or transmission patterns of the pathogen that may influence the future course of infection, all in the name of cost effectiveness? The merits of vertical (targeted) versus horizontal (general) approaches to public health, another cost effectiveness controversy that continues to be raised in disease control debates, are likewise well described and compared in the chapter on polio eradication. The discussions of the late 1950’s leading up to the smallpox eradication campaign are also of extreme relevance today, as the authors contrast the negative opinions of nations where the disease had already been eliminated with those who still believed “when it came to infectious diseases, the world was fairly small” (page 52). What a surprise the U.S. and other developed countries could have avoided over the last decade, due to so-called emerging and reemerging infectious diseases, had this perspective been remembered! Descriptions of wavering public interest in immunization similarly provoke a feeling of “*deja vu*.” Thus, we are reminded that in the late 19th century “surprising numbers of people opposed vaccination, and small pox remains a dangerous presence” and “as the disease receded, people began to take it less seriously” (page 49). Does this not call to mind the recent outbreaks of measles and pertussis in the U.S. and other industrialized countries due, at least in part, to a failure on the part of parents to accept available vaccination for their children?

Whereas I found this book praiseworthy for managing to touch on so many of the important and contentious issues associated with multinational efforts in general and eradication programs in particular, it does have a few weak points. While the history of each program is told in an enjoyable as well as informative way, the transition between chapters is interrupted by sections describing the pathogens themselves. One wonders

whether this lack of integration was the product of two authors who could not find a way to make their contributions mesh or an attempt to make the science less necessary for those readers more interested in the history. Likewise, there is an epilogue that consists of individual consultations with various “voices from the eradication campaigns.” While useful for expanding on the personal recollections sprinkled throughout the historical accounts, this piece also feels as if it may have been tacked on at the end because the authors had gone to the effort of conducting interviews and didn’t want their work wasted. Last, but not least from a parasitologist’s perspective, was the error of calling protozoan *Plasmodium* parasites multicellular (page 72). Nonetheless, the book is a worthwhile read for those interested in how their own research might someday integrate with public health. As there is a growing call for increased assimilation between biomedical and public health training in this country (*Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century*, National Academy of Sciences, 2003), this book might be a good tool for provoking that interest among students.

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