Preparing for the Next Outbreak:
Is America Asking the Right Questions?

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Microbe: Are We Ready for the Next Plague?
Alan P. Zelicoff, M.D. and Michael Bellomo

In 1993, the filtration process that ensures the capture and removal of particulate matter from municipal water systems failed on a massive scale in Milwaukee, Wisconsin. In the largest infectious disease outbreak in a single month in the history of the United States, over 400,000 people became ill with cryptosporidiosis before public health officials were advised that something was wrong—and not by medical practitioners, but by pharmacists who thought it odd that they had completely run out of diarrhea medicine.¹

Using examples such as the Milwaukee cryptosporidiosis outbreak, Microbe: Are We Ready for the Next Plague? offers a crash course on the recent history of novel infectious disease outbreaks, focusing on the weaknesses in America’s public health infrastructure. Authors Alan Zelicoff and Michael Bellomo argue convincingly for the institution of an electronic early-response Syndrome-Based Disease Surveillance System (SBDSS) that would help physicians, veterinarians, public health officials and even school nurses coordinate information and catch emerging infectious disease threats as close as possible to the index case, the earliest documented case of a disease. Two primary themes are identified early in the book, which highlight the importance of early detection and the need for an integrated communication system that allows real-time tracking of emerging diseases in human and animal populations. From a health policy perspective the concept of prevention can be conceived broadly to include government policy and campaigns to change health and social behaviors. However, the definition of prevention employed in Microbe is limited to catching an infectious disease outbreak at its inception in order to prevent its spread, which limits the scope of the authors’ policy analysis to actions taken once an outbreak has already begun.²

For Zelicoff, former senior scientist at Sandia National Laboratories’ Center for Arms Control and National Security, Microbe is the most recent chapter in a long campaign to promote the use of syndrome reporting in the United States. Over the past few decades, the World Health Organization, the European Union and other international bodies have begun to move toward such systems, focusing on the
importance of early detection and enhanced communication techniques in the fight against infectious disease and bioterrorism. In a February 2005 interview with Dr. Moira Gunn on National Public Radio's weekly program BioTech Nation, Zelicoff characterized the U.S. public health infrastructure:

[1] If you sat down with a blank sheet of paper and tried to design a system that was poised to fail, you could not do better than what we have now. Remove the stove pipes, and instead of going up and back down vertically through a bureaucracy, just go horizontally by sharing the data among all the user communities who need it.

In line with the theme of much of Zelicoff's published work, Microbe illustrates the ways in which improved SBDSSs—funded by the federal government and implemented at a nationwide level—could give the United States a better chance to prevent disaster in the event of a serious outbreak of infectious disease or a bioterrorist attack.

In the first ten chapters of Microbe, Zelicoff and Bellomo note examples of recent infectious disease outbreaks, both in the United States and abroad, and underscore the ways in which a lack of open and rapid communication between medical practitioners, veterinarians and public health officials exacerbated each incident. The tenor of this discussion appeals to a certain U.S. nationalism and a mentality of constant fear and alertness reminiscent of the Cold War that has reemerged with the War on Terror. SARS in China and smallpox in the former Soviet Republic of Kazakhstan are the only international examples, and the authors use ideologically loaded language to critique the functioning of the public health systems in both countries. In the case of domestic disease outbreaks, the authors' circumscribed definition of "prevention" blurs the disparate policy implications of an outbreak caused by a bioterrorist attack and one that is not. Once an outbreak has begun, there is little difference between responding to a bioterrorist attack or to a naturally occurring episode. However, if we understand prevention and intervention to be processes that begin with policy decisions taken before an outbreak occurs, then blending the analysis of these two scenarios obscures the need for distinct policy analyses and diagnoses, depending on the source of the threat.

Despite these shortcomings, the authors' assessment of one major weakness in the U.S. public health system is right on target. In most of the recent outbreaks of novel infectious diseases in the United States, more people seem to have died than necessary because of slow moving agencies and a lack of communication among health professionals. To mention just one example, West Nile fever has now become endemic to the United States partly because public health officials repeatedly ignored the warnings of a dedicated veterinary pathologist at the Bronx Zoo who tried to sound the alarm. Furthermore, the authors' hypothetical scenarios of bioterrorist attacks using anthrax, avian influenza and smallpox suggest that with the kind of response time that is currently the norm when an outbreak occurs, there would
be no hope of stopping the spread of illness caused by such weapons—at least not in time to save hundreds of thousands of lives.

One of the central themes of the book, and of Zelicoff’s continuing work, is the need for what David R. Franz calls “one medicine”—an understanding of the connections between animals, humans and “the bugs.” With the exceptions of smallpox and botulism, all of the diseases listed by the Centers for Disease Control and Prevention as “highest risk” bioterrorism diseases are zoonotic, that is originating in animals before being transmitted to humans. Zelicoff aptly notes that while the vast majority of current SBDSSs are only designed to integrate reporting on human patients, the episodes of Sin Nombre Hantavirus in New Mexico (1993), West Nile fever (1999-2000), human plague in New York (2001), cryptosporidiosis in Milwaukee (1993), SARS (2002-2003) and H5N1 avian influenza (1997, 1999, 2005-2006) all had animal sources.

**Microbe** is clearly designed to promote the Syndrome Reporting Information System (SYRIS)—an SBDSS created by Zelicoff and marketed by the ARES Corporation for which he now works as a senior scientist. To this end, the authors can claim considerable success. The detailed descriptions of past outbreaks and, in particular, hypothetical bioterrorism events, show the immediate human and economic benefits which could accrue from the comprehensive implementation of a system like SYRIS. Zelicoff’s earlier Rapid Syndrome Validation Program (RSVP) system was tested successfully at a number of sites in the United States and SYRIS, an enhanced version which has been on the market since 2004, is currently in use in forty-one western Texas counties, the City of Lubbock and the two-county California Office of Binational Border Health in San Diego.

The SYRIS system is a simple, web-based software program that connects medical practitioners, veterinarians, animal control officers and wildlife rehabilitators, public health officials, school nurses, coroners, emergency medical response teams and laboratories. Without paperwork or the need for complete diagnoses or test results, health care providers and analysts log onto the system to enter cases of new or worrisome symptoms or deaths, either in animal or human patients. This real-time interactive system allows users to automatically see when and where other cases have been reported and can even help to catch a new disease before it spreads. In a hypothetical case, a doctor treats a handful of patients who work on chicken farms and who are suffering acute respiratory failure with influenza-like symptoms. Using a system like SYRIS, the doctor could see that just a few miles away, a farm veterinarian had reported that an entire flock of domestic chickens had died suddenly, with similar symptoms, after coming into contact with sick geese that had flown off course from East Asia—setting off an alarm that this could be a new and virulent strain of avian influenza and providing important indicators as to how to proceed with treatment and containment.
Though *Microbe* presents a convincing argument for the implementation of an effective SBDSS system like SYRIS, claiming it is vastly cheaper and potentially more effective than most of the schemes currently under consideration, the book itself does a disservice to those who are trying to think critically about the broader questions of biological threats, pandemics and public health systems globally. This failure takes place on three fronts: the oversimplification of both the concept of prevention and of the policymaking making process, a Cold War-era ideological bias that makes it difficult for the reader to objectively assess the situations being described and a fundamental lack of critical analysis.

In an attempt to make a book about science and public policy more palatable to the lay American reader, the authors made the regrettable decision to downgrade the language and conceptual material far beyond a simplification of scientific terminology, resulting in a quick but clumsy read that leaves many subtle points unexplored and deeper questions unmentioned. Though attempts at impassionate scientific analysis sometimes prevail, the storytellers' attempts to liven up the material make *Microbe* read like a cross between a mystery and an action-adventure novel, with villainous governments plotting away while the “biowarriors” in America’s hospitals and public health departments attempt to save the day from dangerous pathogens in the midst of limited budgets and oversized bureaucracies. For the critical reader, getting past the literary theatrics and alarmist chapter titles like “Corona of Death—SARS” poses a challenge.

It would have behooved the authors to dedicate some ink to broader issues of historical context and institutional analysis, which cannot be divorced from assessment of the social and political choices that have resulted in certain outbreaks and their successful or unsuccessful containment. For most readers, a more in-depth analysis of overall health policy, of the economics of the public health system, of America’s own involvement in biological weapons testing and production, and of the institutional context of bureaucratic inertia would all have been germane. In the case of bioterrorism, analysis of the public health system should have been broadened to include foreign relations and defense policy. In cases like the West Nile fever outbreak in New York, analysis should have incorporated assessments of territorial power distributions and the relations between municipal, state and federal governing bodies.

The book’s ideological bias may stem from Zelcick’s long experience within the U.S. national security infrastructure. Regardless of its origin, however, the unbalanced portrayal of the governments and public health systems of China and the former Soviet Union detract from the factual analysis of the SARS epidemic and the discussion of the Aralsk smallpox incident. While analyses of poorly managed outbreaks in the United States are balanced by qualitative interviews with winsome public health heroes who did their very best under challenging circumstances, the Chinese public health system is portrayed as monolithic and guilty of criminal indifference to the
wellbeing of the Chinese people. Zelicoff accuses the Chinese government of choosing to expose thousands of people to SARS for “purely economically selfish” reasons.\textsuperscript{12}

In discussing the unbalanced image of China’s public health system, which has been emblematic of Western media coverage of the HIV/AIDS epidemic and the SARS outbreak, medical sociologist Gail E. Henderson points out:

First, Chinese government advocacy and investment in community infrastructure fostered a strong and effective public health system, which became a WHO model during the 1970s. Second, economic incentives in the post-Mao era that encouraged the development of hospital-based, high technology medical care have shaped China’s current curative health care system. In concert with the move away from collective welfare and central administration, inequalities in access to services have increased and the investment in public health infrastructure and services has declined, especially in remote rural regions.\textsuperscript{13}

With respect to the Kazakhstan smallpox outbreak, in \textit{Microbe}, as well as in an earlier article, Zelicoff claims that the United States did not know smallpox could be aerosolized prior to the recent discovery that the Soviets had achieved this feat at Vozrozhdeniye Island in the Aral Sea in 1971.\textsuperscript{14} In his critique of Zelicoff’s analysis of this incident, however, Dr. Donald A. Henderson, founding co-director of the Center for Civilian Biodefense Strategies at Johns Hopkins University, notes:

\cite{studies during the 1960s in England and the United States documented the extended survival of vaccinia virus as a fine-particle aerosol. The 1970 smallpox outbreak at a hospital in Meschede, West Germany, provides a better and more ample illustration of the infectious potential of a smallpox virus aerosol.\textsuperscript{15}}

Zelicoff also paints the strain of smallpox tested at Vozrozhdeniye Island as a particularly virulent and frightening one, though Henderson points out that only one person out of an entire ship’s crew became infected, and she recovered so quickly that she attended a wedding four days after becoming ill—hardly evidence of a new and sinister type of smallpox.\textsuperscript{16}

These counterarguments not only illustrate that the book’s only forays into scenarios outside the United States are factually disputed by other scholars, but also expose the most important failing of this book: a lack of critical analysis in regards to crucial questions of policy, prevention and threats to public health. To explain how Milwaukee’s water supply became contaminated with cryptosporidium protozoa, most likely from cow manure, the reader is offered the following explanation:

\cite{due to an unseasonably heavy rainfall, huge volumes of water overwhelmed the filtration and flocculation processes. The rising water level flooded over the holding ponds where filtration took place and thus the organism passed into the city’s water supply.\textsuperscript{17}}

The authors go on to mention that, at some point, water management officials
conducted turbidity tests and simply chose not to communicate the discovery of a contaminated water supply to the public health authorities. Their analysis is limited to suggesting that “[p]erhaps officials were overwhelmed with other administrative duties, or perhaps the reporting process was slow and cumbersome because it was not electronic or Internet-based.”

Since researchers have since discovered that citywide outbreaks of cryptosporidiosis have been occurring in Milwaukee periodically and going unnoticed or unreported for many years, overwhelmed holding ponds may actually be the norm. From the perspective of prevention, the most important question would be discovering why cow manure was being dumped into the rivers upstream of Lake Michigan, and then why the ponds were flooding—were they too shallow? What needed to be done to prevent such flooding? One would proceed to ask why turbidity testing was not performed in a timely or accurate manner, and then finally why communication broke down between water management and public health officials. Because these earlier questions are ignored, the reader is led to begin an analysis of this problem after what seems to be an understandable failure of physical infrastructure, rather than beginning with the deeper questions of what decisions were made that allowed the risk to emerge in the first place, and what institutional factors have produced such ignorance and complacency in particular places at certain historical moments.

A book about the threats of infectious disease and the preparedness of the American public health system should ask such questions explicitly, rather than settle for being a convincing essay in favor of better early response systems. Though from a policy perspective the authors’ analysis is woefully lacking, Zelico's SYRIS system could provide an effective solution to the communication gaps amongst groups that must work together to prevent disease outbreaks from becoming devastating public health disasters. Microbe presents a convincing argument for the widespread institution of better disease surveillance and response systems, but leaves too many critical questions about the broader failings of public health policy and systems unexplored.

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NOTES
1 Alan P. Zelico and Michael Bellomo, Microbe: Are We Ready for the Next Plague? (New York: AMACOM Books, 2005), 127.
2 Ibid., ix, 161.


6 Zelicoff and Bellomo, 8.

7 Zelicoff and Bellomo, Microbe, x. David R. Franz is the Director of the National Agricultural Biosecurity Center at Kansas State University; the Senior Biological Scientist at the Midwest Research Institute and former Commander of the U.S. Army Medical Research Institute of Infectious Diseases.

8 Ibid., 190.

9 Karl Vantine (Director of Risk Software Products, ARES Corporation), in correspondence with the reviewer, 13 February 2006.

10 Zelicoff and Bellomo, ix.

11 In an article on the Biological Weapons Convention (BWC) Protocol, Zelicoff conducts a fairly in-depth analysis of defense policy, and weapons inspections in particular. See Alan P. Zelicoff, “An Impractical Protocol,” Arms Control Today, (May 2001). Ivan Eland, the Cato Institute’s director of defense policy studies, cites Zelicoff’s work on the BWC in discussing the correlation between U.S. intervention internationally and terrorist attacks on U.S. soil. See Ivan Eland, “Protecting the Homeland: The Best Defense is to Give No Offense,” Cato Policy Analysis, no. 306 (5 May 1998). However, these relevant discussions are notably absent from the analysis presented in Microbe.

12 Zelicoff and Bellomo, 31.


16 Ibid.

17 Zelicoff and Bellomo, 128.

18 Ibid., 131.

19 Ibid., 128.