

The Infectious Disease Physician and Microbial Bioterrorism

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1. INTRODUCTION

On the morning of September 11, 2001, and later in the weeks that chronicled the spread of anthrax through the U.S. mail, our global consciousness of the terrorist threat was altered. We had awakened to a nightmare. Microbes are a perfect metaphor for our fears: our world seemed *infected* with terrorists, unlimited in virulence, waiting to emerge from dormancy. The metaphor had become real. Although the atmosphere evokes cold-war fears, the world of this century is more complex than that of the McCarthy-era. The infectious disease physician's role in bioterrorism response must be framed in this context.

2. THE EVOLUTION OF THE GLOBAL COMMUNITY, INFECTION, AND BIOTERRORISM

Modern bioterrorism attacks at the level of the individual, but its origins are global, and we must acknowledge its roots in the sociopolitical and ecological changes of the last half-century. The decline of colonial empires and the breakup of the Soviet block have left a power vacuum in many parts of the

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world, and both repressive governments and radical dissidents have sometimes risen to fill it. Meanwhile, poverty, political oppression, and cultural inequalities inflame the disaffected, providing terrorist organizations with a steady flow of manpower. Decades of violence—especially in the Middle East, the African continent, and the former USSR—propagate the very conditions that first lead to militancy. Perhaps, most disturbingly, first-world governments often send a mixed message to fledgling nations. With no viable means of enforcing international bans on biological warfare, many countries continue to pursue biological weapons programs.

Although social and political instability fuel terrorist movements, microbial evolution arms them with new weapons. Human forces have affected microbial ecology in several ways. First, the use of pesticides and antimicrobials in agriculture and animal husbandry has selected for resistance. In the late 1970s, fresh from the victory against smallpox, many experts fully expected that infectious disease was a dead science: the microbial threat was to be conquered by the end of the twentieth century. But germs fought back: the adaptability of biological agents to human assaults has become a demonstration project of sorts for evolutionary science—sometimes with adverse consequences for national defense. At the time of writing this, for example, multidrug-resistant *Acinetobacter* (now endemic to many areas of the Middle East) has unexpectedly spread to the U.S. military and veterans—care facilities, via injured active duty personnel who have acquired this pathogen during warfare.^(1,2) Second, the spread of humans into new environments permits exposure to new pathogens, particularly from animal hosts. Many pathogens originating from wild animals are potential bioterrorist agents—including anthrax from deer, monkeypox from illegally imported giant Gambian rats,⁽³⁾ Ebola hemorrhagic fever from game animals, and SARS-associated metapneumovirus from palm civet cats. The increasing ease of human travel can quickly spread these infections from remote geographic areas. Third, human-driven environmental influences may impact microbial spread and evolution. Global warming may change migratory patterns and local biodiversity, allowing microbes to infect new hosts and reservoirs, including humans. Pesticide resistance in the *Anopheles* mosquito and favorable climactic change has recently complicated control of malaria in the Amazon.⁽⁴⁾

Although sociopolitical and ecological factors help us understand the proliferation of both terrorists and germs, how have the two become connected—and how has bioterrorism reached our hospitals? A look at the global communications network may offer insight. Thanks to the internet and other forms of digital communication, access to information on weapons manufacture and microbiology is readily available and virtually impossible to regulate. Meanwhile, as radio and television networks provide 24-hour coverage of world events, terrorists rely upon these institutions to propagate fear. Finally, the global media makes Western affluence and liberalism increasingly visible among impoverished or oppressed populations. The West has become an easy scapegoat for radical movements. But while global communications may facilitate bioterrorism, it also strengthens our response. International e-mail listserves, such as

ProMED,⁽⁵⁾ the Federation of American Scientists Program for Monitoring Infectious Diseases, allow rapid notification of potential outbreaks throughout the world. Information may prove both a poison and an antidote.

3. THE EVOLVING PRACTICE OF INFECTIOUS DISEASE

Largely in response to the trends discussed above, the practice of infectious diseases has evolved from a fairly esoteric subspecialty of internal medicine to a broad and diverse field involving both academic and community-based clinicians. Infectious diseases practice today may encompass patient care, direction of public health initiatives, epidemiologic monitoring, infection control in inpatient facilities, and management of HIV infection (on the verge of becoming a subspecialty in itself), among many others. The many roles of the infectious disease physician have not always been recognized by the public health and military sectors. Effective involvement of infectious disease physicians in preparedness-planning requires communications between physicians and public agencies. In spite of the many directions in which they are pulled, infectious disease physicians are deeply interested and concerned about preparedness against all microbial threats and have organized on the regional and national level (most notably via the Infectious Diseases Society of America) to effectively advocate for supportive public policy, as well as for the inclusion of infectious disease and other civilians in preparedness planning.⁽⁶⁾

Though infectious disease was once a largely academic subspecialty, preparedness requires extensive involvement of community-based physicians. While academic infectious disease physicians are likely to provide leadership in the integration with public health, it must be recognized that a community-based physician was the first to detect the case of anthrax in the attacks of 2001 and the West Nile virus cluster in New York City.^(7,8) This said, it must be noted that the infectious disease physician in private practice is exceedingly busy and subject to increasing economic constraints; thus rapid contact with the community physician is likely to be difficult. Coordination of efforts between public health facilities, and community physicians with diverse missions and economic constraints may be challenging. From a practical standpoint, once recognition occurs in an institution, the immediate response will be implicitly deferred to infection control staff and local infectious disease physicians.⁽⁹⁾

4. INTEGRATING THE INFECTIOUS DISEASE PHYSICIAN WITH PUBLIC HEALTH RESPONSE

From a public health perspective, the infectious disease physician will interface with bioterrorism response primarily in three ways, among some others (Fig. 1). First, early case recognition and communications with the public health system will likely fall on the shoulders of infectious disease physicians and first line providers. Second, infectious disease physicians must

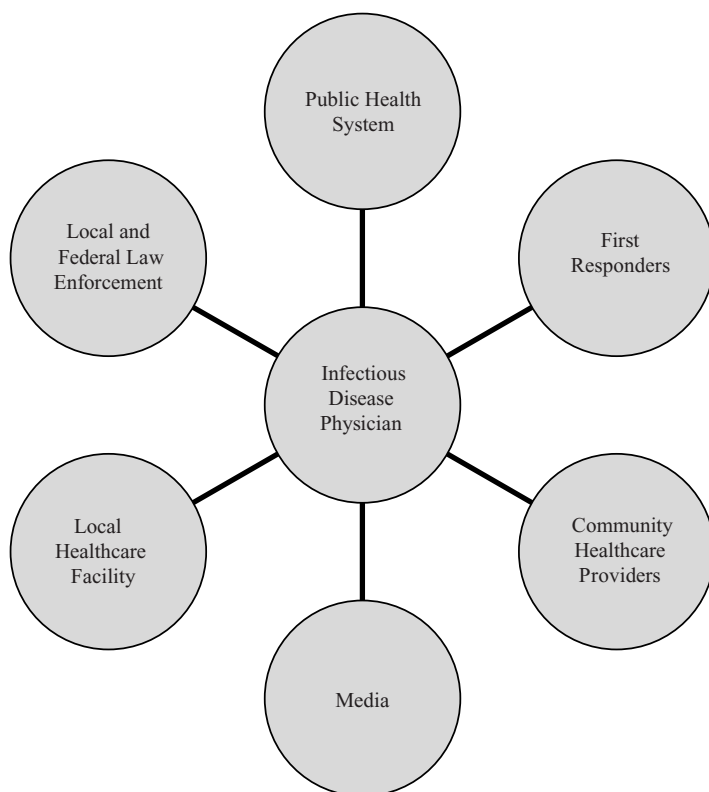


FIGURE 1. The infectious disease physician wears many hats in academic and community practice. While the infectious disease physician's response to a bioterrorist incident may be affected by many factors, he/she will likely be involved at the site of patient care, and will communicate with other health care providers, first responders, involved health care facilities, the public health system, local and federal law enforcement, and the media. Infectious disease physicians will likely serve in the education of the health care community as well.

educate other first line providers (such as emergency and primary care physicians, physician extenders, and nurses) and the public and media. Third, the communications stream between infectious disease physicians, epidemiologists, community health providers, the media, and the public is a complex issue that must be carefully considered in developing a preparedness program.

5. PREVENTION, EARLY RECOGNITION, AND THE INFECTIOUS DISEASE PHYSICIAN

Initial prevention remains in the hands of law enforcement agencies whose role is to gather and interpret intelligence and threats and act prior to the

release of a disease-causing agent. However, the development of new vaccines and ongoing research into more effective antibiotics are a critical role of the infectious disease researcher. Antibiotic overuse and rising antibiotic resistance strains our ability to efficiently treat infectious disease, and amplifies the burden on health care. Prevention of antibiotic resistance and research focused on vaccine development is critical to reducing the health-care burden and to improving bioterrorism preparedness.

Once an attack has occurred, the first indication of a biological incident will be an increase in persons seeking care from community physicians and emergency departments. The ability of clinicians to recognize unusual disease symptoms, order appropriate diagnostics, and notify the local health department will largely determine the final impact on public morbidity and mortality. The rapid detection of any type of pathogenic outbreak is a fundamental challenge for the current communicable diseases surveillance system. The collaboration of public health and infectious disease physicians will expedite early diagnosis, treatment, and control.⁽¹⁰⁾ However, passive disease reporting systems lack the speed and force to rapidly implement control measures such as vaccination, prophylaxis and quarantine. A variety of approaches are currently being explored to provide a more rapid identification of an outbreak occurrence. Briefly, many of these involve the monitoring of syndromic symptoms in patients. Many potential bioweapons produce nonspecific clinical symptoms, and screening for syndromes may facilitate early detection. Therefore syndromic surveillance detects a rise in reported syndromes suggestive of epidemic pathogens, such as meningitis, rash with fever, and unexplained death, and allows the public health agency to follow up on any significant deviations from the norm, typically on a per hospital basis or a pooled community. Syndromic surveillance provides an opportunity for more timely intervention with hopefully minimal overall cost and labor. Local infectious disease physicians and infection control practitioners may then be contacted for rapid institution of treatment, transmission control, and to direct investigation of other cases.^(11,12)

What constitutes an optimal syndromic surveillance system is currently under study. Cost issues appear to be low, but differ among the settings in which it has been instituted. An unforeseen benefit of surveillance that has been noted in practice is that individual emergency department physicians, however observant, usually are not on serial shifts and may not readily detect rising trends; however, using syndromic surveillance and generating daily reports has provided an early warning system for seasonal events such as rotavirus and influenza epidemics. Armed with such forewarning, providers may update themselves on current treatment recommendations, plan for infection control needs, and avoid unnecessary diagnostic tests (along with their attendant costs and discomforts to patients).⁽¹³⁾ Unfortunately, the Health Insurance Portability and Accountability Act (HIPAA) of 1996, which regulates the dissemination of personal medical information, has arguably been a hindrance to disclosure in many municipalities using syndromic surveillance.⁽⁹⁾

6. EDUCATION, THE INFECTIOUS DISEASE PHYSICIAN, AND PREPAREDNESS

The need for provider and public education became evident after the anthrax attacks and the resulting hysteria in the fall of 2001. From a practical perspective, an infectious disease physician's response to an act of bioterrorism and the response to any naturally occurring infectious outbreak follow a similar template. Hantavirus, West Nile virus, SARS, and avian influenza are recently emerged pathogens to which the response has required rapid recognition, heightened case surveillance, aggressive control measures, efficient communications, and prompt education of the media, the public, and the health care infrastructure. These outbreaks have certainly served an educational purpose in response planning, and have acted as important trial runs of preparedness programs, highlighting best practices and areas for improvement. Educating the clinicians and infectious disease physicians will be paramount in the early recognition and treatment of rare and difficult-to-diagnose illnesses. Studies have shown many health professionals are not well informed about CDC class A pathogens and have poor self-perceived abilities to diagnose and manage victims of a bioterrorism attack. Clearly, improving the knowledge of health care professionals in hospitals and the community is needed to permit early recognition and treatment of victims. Additionally, health care workers are not immune to fear and hysteria; and SARS proved that health care workers, who accounted for up to one-fifth of all cases, may be directly in the line of fire during an outbreak.⁽¹⁴⁾ A provider who feels informed, necessary, and competent is more likely to report to work. Numerous venues exist for education, including professional meetings, conferences, and online resources, and these should be relevant to the audience's level of specialization, workplace, and their likely level of involvement in an outbreak. The ability of the laboratory system to actively rule out, refer, and confirm begins at the hospital and with the physician. The infectious disease physician will have a primary role in working with local academic and community partners in coordinating an appropriate sampling protocol and coordinating with the public health agency.⁽¹⁵⁾

An ongoing communication process must be in place prior to any outbreak incident. The local public health authority must be responsible for optimizing this process. Ideally, clinicians should know and have frequent contact with the public health authority in their locality. Each physician should know how to contact the local health department 24 hours-a-day to report suspect cases and for consultation purposes. In practice, the day-to-day pressures of infectious disease practice is likely to weigh more heavily on the minds of many community physicians than the lower likelihood (perceived or real) that an outbreak of significance will occur in their community on any given day, and most may expect that public health will notify the community of a problem. More complex than assuring that community physicians know their public health contacts is assuring that community infectious disease physicians can themselves be readily contacted for notification. A ready means of notifying

infectious disease physicians and primary care providers in diverse settings, and at diverse times, is certainly an area of need. Including a variety of media is more likely to optimize the success of such communications. Vital resources may include television and radio broadcasts, fax, e-mail, and wireless media such as cell phones and personal digital assistants.⁽¹⁴⁾

SUMMARY

In the light of current global ecology and sociopolitical pressures, “preparedness” against microbial terror coincides with prevention, detection, and treatment of emerging and re-emerging pathogens. Microbial threats will persist beyond real or perceived terrorist pressures, and are more likely to affect public health on a global scale than bioterrorism; diversion of resources from these issues are more likely to disrupt than benefit human health. Preparedness for both infrequent bioterrorist events and chronic daily threats may be pursued synergistically and in a multifaceted approach. Importantly, “preparedness” should not be measured or judged by perceived failures when an outbreak or terrorist event “gets past the safeguards”. The latter is inevitable as ecological mechanisms and human ingenuity adapt to public health actions. Rather, public health efforts are necessarily work-in-progress and must evolve as needs arise. This may, at times, require more flexibility than political climates currently allow.

The role of the infectious disease physician, and indeed, the public health system, continues to evolve in unprecedented ways. Infectious disease physicians are a diverse and immeasurable resource to public health preparedness and response to infectious agents. Many infectious disease physicians follow the media, recognize the likelihood that they will be involved as both experts and first-responders to an infectious disease crisis, and are anxious, therefore, to be included in preparedness efforts. Few have been. Infectious disease physicians are typically in leadership roles in their hospitals, related to infection control, and are among the first to be contacted by colleagues and local institutions seeking advice about unusual infections, their opinions regarding infectious disease issues in the news, and bioterrorism preparedness in general. At some level, it is often assumed by other health care workers that infectious disease physicians are “in the loop” with public health planning. It should be ensured that indeed they are.

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