

Preface

Biological Weapons and Bioterrorism



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Guest Editor

Biological agents are a threat from both natural outbreaks and deliberate use. Recent years have brought not only a resurgence of infectious agents, and the appearance of drug-resistant strains, but also newly emerged pathogens—some with extremely high lethality.

As I write this, the world is bracing for a looming influenza pandemic. As well we should, because there have already been more deaths from influenza H5N1 this year (and 2006 is only half over) than all of last year. Notably, the fatality rate among confirmed cases this year is 65% (up from 43% last year); suggesting that virulence is increasing. Only days ago, the World Health Organization announced a potential cluster of human-to-human transmission. Although their investigation is continuing, preliminary findings indicate that all confirmed cases in the cluster can be directly linked to close and prolonged exposure to a patient during a phase of severe illness. The threatening agent is influenza A virus H5N1. There have been recent indications that H5N1 may be changing its receptor-binding domain to achieve more efficient human-to-human transmission and that the human population has virtually no innate immunity to H5 antigen. If these findings prove accurate and we are facing a virus of increasing virulence and an increase in contagious rate, we need to double our efforts to prepare for this pandemic.¹

¹ For a full discussion of Avian Influenza and its potential impact of the poultry industry and on humans, see Wilson TM Agroterrorism, biological Crimes, and Biowarfare targeting Animal Agriculture. In Marty A. Clinics in Laboratory medicine, 21:549–91.

Complicating this threat from nature is the frightening reality that terrorist groups recognize that these biological agents can be harnessed for their purposes. Intelligence agencies worldwide continue to report a growing availability of technologies, materials, information, and expertise to terrorists groups for three terrifying unconventional weapons: nuclear, chemical, and biological agents. Of these three, by far the least expensive to develop and deploy are the biological agents—and biological agents can be strategic-level threats. The inherently stealthy nature of biological agents makes them highly attractive weapons for terrorists. Terrorists also know that the threat can be nearly as damaging as the actual use of these agents. Thus, as the world became aware of the deliberate distribution of anthrax spores in envelopes in the fall of 2001, laboratories, emergency response personnel, clinicians, and public health officials were confronted by an avalanche of requests for evaluation of suspicious powders. Distinguishing these powders from real agents—particularly from newly emerging threat agents—creates technical challenges for detection, diagnosis, and surveillance, even for the most technologically advanced and well-resourced countries, and the cost of the response to these real and pseudo-attacks is measured in billions of dollars.

There has been an abundance of literature on biological threat agents since we first published a work on the laboratory aspects of bioterrorism in 2001. In this new book, we attempted to fill the gaps on aspects of the problem that have been overshadowed in the literature by the better known agents and processes. A critical problem is the issue of how to safely, legally, and responsibly conduct countermeasures research for select agents. Thus, Dr. Pastel and colleagues introduce us to the regulatory and safety aspects of biosurety. Equally critical is the issue of mass casualties, thus Dr. Koenig and colleagues apply their recent experience in managing the countless patients with limited supplies during and after Hurricane Katrina to the issue of bioterrorism. Dr. Stocker shares his decades of experience to provide us with a much-needed focus on the unique aspects of the differential diagnoses of biological agents in children. The recent improvements in prophylaxis and treatment of hemorrhagic fever prompted Dr. Geisbert, Dr. Jahrling, and me to include an update on these level 4 viruses. Dr. Klassen-Fisher, who has over a decade of experience as the head of fungal infectious diseases at the Armed Forces Institute of Pathology, reminds us that fungal agents were in our original offensive arsenal in the days when the United States had an offensive program and that these agents should not be ignored in our planning. Marine toxins, which have extremely short incubation times and remarkable toxicity are the “Rodney Dangerfield” of toxins in that they don’t get the attention and respect that they deserve. They were weaponized by our intelligence agencies as assassination devices and have terrible potential as aerosol and food-borne agents, thus Dr. Salzman and colleagues provide an in-depth review of these serious marine toxins along with other highly lethal toxins of concern. Dr. Kagen has expanded and revised his work on bioregulators to reflect the ever-increasing knowledge we have of

these highly dangerous and very stealthy agents. Dr. Mattix and his colleagues provide a needed veterinary perspective on the better-known agents of bioterrorism emphasizing their zoonotic nature. Our understanding of how to manipulate agents genetically and by other means is growing at a logarithmic rate. This knowledge is pervasive and useful for good and for ill purposes, further complicating our need to handle the threat of biological agents. Dr. Daly, who understands the ease by which extremophiles can be modified and harnessed to transmit toxins and bioregulators, explains the underlying reason why those agents are so tolerant of extreme radiation doses—leaving it to the reader's imagination what can be done with such information to affect the pathogenicity and hardiness of biological organisms. Dr. Rollwagen harnesses her expertise as an immunologist to explore some unconventional ideas for the future of vaccine development. Finally, with generous contributions from my friends Dr. Sherif Zaki and Dr. Kurt B. Nolte, I added an article on the role of the anatomic laboratory and forensic aspects of biological threat agents. The role of cytology, the surgical pathology laboratory, and of the forensic pathologist in the management of a bioterrorist event, the diagnosis and surveillance of natural pandemics, and the speed with which these methods can provide definitive answers has been greatly underestimated, yet it is absolutely critical. Additionally, psychosomatic reactions may mimic the actual physical symptoms and signs, so it behooves clinicians and pathologists to develop, understand, and use techniques and tests that enable them to provide rapid and accurate diagnoses. Systems to detect bioterrorism agents in clinical, tissue, and environmental samples and to diagnose bioterrorism-related illnesses are essential components of responses to both hoaxes and actual bioterrorism events.

It is highly noteworthy, interesting, and important to understand the gearing up of national and international laboratories and of disease surveillance in response to the anthrax attacks had a very useful effect on our worldwide management of the international outbreak of severe acute respiratory syndrome and is helping in our tracking of the H5N1 outbreak. Thus, it is critical that we continue to improve the readiness of laboratory services and of ourselves, not only to defend against those who would use these agents deliberately but also for the inevitable and invaluable socioeconomic and public health benefit of a world alert to the importance of quickly diagnosing and containing infectious disease outbreaks.

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