



# Biothreat agents and pathology laboratories

Ann Nelson, MD,<sup>a</sup> Michael L. Wilson, MD<sup>b,c</sup>

From the <sup>a</sup>Division of AIDS Pathology, Department of Environmental and Infectious Disease Sciences, Armed Forces Institute of Pathology, Washington DC;

<sup>b</sup>Department of Pathology and Laboratory Services, Denver Health, Denver, Colorado; and the

<sup>c</sup>Department of Pathology, University of Colorado School of Medicine, Aurora, Colorado.

## KEYWORDS

Biothreat agents;  
Bioterrorism;  
Histopathology;  
Surgical pathology;  
Autopsy

Pathologists and laboratory staff are likely to be among the first health care workers to be aware that a potential bioterrorism attack has occurred. To prepare for such an event, it is necessary to be familiar with 1) the characteristics of bioterrorism attacks versus natural disease outbreaks, 2) which pathogens are potential bioterrorism agents; 3) the types of lesions that each causes; 4) the microbiological characteristics of each agent; 5) the Laboratory Response Network and reporting requirements, and 6) what resources are available.

© 2007 Elsevier Inc. All rights reserved.

The use of biological weapons goes back to medieval wars when plague-infected bodies were catapulted into villages in an effort to infect the villagers. Native Americans died by the thousands when small pox was spread through contaminated blankets distributed by soldiers. More recent examples of the use of biologic weapons have not been in the context of war, but rather have been used to influence politics or create panic, a use that makes it a form of terrorism. Perhaps the best examples occurred in the United States. The first was in 1984, when *Salmonella* was obtained from a commercial source and spread in salad bars in Dalles, Oregon in an effort to disrupt a local election. In 2001, anthrax spores were spread through the USA postal system on the east coast, killing a number of persons and causing widespread social and economic impact. The latter

event has prompted a sustained interest in ways for governments and healthcare providers to prevent, respond to quickly and effectively, and mitigate the effects of a bioterrorism act. For healthcare providers, the emphasis is primarily on response and, to a lesser degree, mitigation.

Although the threat of bioterrorism is real, there are a number of questions that need to be answered to develop an effective response. Is such an act likely? If so, when and where might it occur? Why might terrorists use biothreat agents rather than explosives or other methods? How can intentional releases be distinguished from naturally emerging infectious disease outbreaks? Which agents might be used, and why? Last, what steps should anatomic pathology departments and clinical laboratories take to prepare for potential acts of bioterrorism? This review will address each of these issues, with particular emphasis on descriptions of the biothreat agents and the steps that can be taken to safely process and handle specimens.

The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as representing the views of the Departments of the Army and Defense.

**Address reprint requests and correspondence:** Michael L. Wilson, MD, Department of Pathology and Laboratory Services, Mail Code #0224, Denver Health Medical Center, 777 Bannock Street, Denver, CO 80204-4507.

E-mail: michael.wilson@dhha.org.

## Terrorism: an overview

Terrorist acts are, by design, unpredictable so as to minimize the ability of governments to prevent them. Thus,

determining the probability of a terrorist act occurring in a given time or place is difficult or impossible to calculate. It is, however, somewhat easier to predict where terrorist acts might occur, because the nature of terrorist acts has changed through time. Whereas the terrorist acts of the 1970s and 1980s were clearly linked to political or other agendas, and the terrorists made claims to the acts so as to draw attention to the agendas, it was the intent of the terrorists to limit casualties so as to minimize the political and military response against the terrorists. More recent terrorist acts have become anonymous or linked to sponsors against whom reprisal is more difficult. With the threat of reprisal lessened—or eliminated—the acts have been designed to kill or injure as many persons as possible. As a result, terrorist acts are more likely to occur in areas where large numbers of persons congregate at predictable times and places. Examples include the train bombings in Madrid in 2004 and the subway bombings in London in 2005.

There are a number of reasons that biothreat agents might be used in a terrorist act. First, terrorists are likely to use methods that kill or injure the highest number of persons, and biothreat agents have the potential to be among the most effective methods for this purpose. Second, because the effects of most of these agents require at least a few days to become apparent (due to the incubation period), and the initial clinical presentation is likely to be a nonspecific febrile illness, recognition of the attack is likely to be delayed substantially, providing the terrorist ample time to leave the area. Third, they are relatively inexpensive to produce and transport. Fourth, they are unlikely to be detected before being released, at which point it may be too late to mount an effective response (although this depends on the type of agent used). Last, their psychological and economic impact, as was seen with the 2001 anthrax event, may far exceed their direct impact on individuals.

Distinguishing between naturally occurring disease outbreaks and acts of bioterrorism requires familiarity with the natural history and epidemiology of diseases that have the capability of causing epidemics. During the early phases of an epidemic or bioterrorism attack, the small number of patients, the possibility that cases might occur in different areas, and unfamiliarity with previously uncommon diseases all would confound the initial investigation. As noted above, this initial confusion as to the nature of the event is one potential reason for terrorists to use biothreat agents. Some of the clues that would suggest a bioterrorism attack are shown in Table 1. If the number of cases is too low to be detected or there is no systematic disease surveillance in a given area, both naturally occurring and intentionally initiated disease may go unrecognized and unreported. On the other hand, when a disease outbreak has reached public attention, there is an added challenge of excluding true cases from those with similar presentations. For primary care providers and laboratories, there is the potentially over-

**Table 1** Characteristics of a bioterrorism attack

- The sudden or abrupt occurrence of a large epidemic
- Unusually severe disease or unusual routes of exposure
- Unusual geographic area, unusual season, or absence of normal vectors
- Multiple simultaneous epidemics of different diseases
- Outbreak of zoonotic disease
- Unusual strains of organisms or antimicrobial resistance patterns
- Higher attack rates in persons with common exposures
- Credible threat, as determined by authorities, of biologic attack
- Direct evidence of an attack

whelming workload of screening concerned citizens who are at little or no risk of infection.

## Biothreat agents

The public health system and healthcare providers must be prepared to address various biological agents, including pathogens that are rarely seen in the United States. As shown in Table 2, there are established threat categories based on ease of dissemination or transmission, potential for major public health impact (eg, high mortality), potential for public panic and social disruption, and requirements for public health preparedness.

The pathologist needs to be familiar with or have easy access to information on the clinical syndromes and diagnostic modalities associated with these agents of bioterrorism. Although pathologists do not provide primary patient care, because of their diverse roles within laboratories, they will be among the first to be aware of a potential bioterrorism attack. These roles include the interpretation of specimens submitted for histopathologic and cytopathologic analysis, consultation on difficult or unusual cases, hospital autopsies, forensic autopsies, and (in most hospital laboratories) responsibility for the clinical microbiology laboratory.

## Anthrax

Anthrax is a zoonotic disease of extremely low prevalence in the USA; most cases around the world occur in people who handle animals or contaminated animal products. It is caused by *Bacillus anthracis*, a large spore-forming, nonmotile, nonhemolytic Gram-positive bacillus with a box-car appearance on Gram stain. It is a highly virulent pathogen by direct exposure, easy to cultivate, and can exist for decades as environmental spores. It is not transmitted from person-to-person. Vaccines are available, and treatment/prophylaxis is effective when started early. Decontamination of the environment is essential.

Download English Version:

<https://daneshyari.com/en/article/4138657>

Download Persian Version:

<https://daneshyari.com/article/4138657>

[Daneshyari.com](https://daneshyari.com)