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### Authors

Koenig, Kristi L

Kahn, C A

Schultz, C H

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Medical Strategies to Handle Mass Casualties from the Use of Biological  
Weapons

Kristi L Koenig, MD

Professor of Clinical Emergency Medicine

Director of Public Health Preparedness

[kkoenig@uci.edu](mailto:kkoenig@uci.edu)

Christopher A Kahn, MD

Fellow, Emergency Medical Services and Disaster Medical Sciences

[ckahn@uci.edu](mailto:ckahn@uci.edu)

Carl H Schultz, MD

Professor of Clinical Emergency Medicine

Director of Disaster Medical Services

[schultzc@uci.edu](mailto:schultzc@uci.edu)

Department of Emergency Medicine

University of California, Irvine

101 The City Drive South, Route 128

Orange, CA 92868

(714) 456-5239

## **Introduction**

Biological weapons have been used since antiquity. In 184 BC, Hannibal ordered earthen pots to be filled with serpents of every kind and hurled onto the decks of Pergamene warriors. Military leaders during the Middle Ages tossed plague-infected victims over the walls into the city of Kaffa. In the 15th century, Pizarro presented indigenous peoples of South American with variola-contaminated clothing, and in 1754 the English gave American Indians smallpox-laden blankets. In modern times, concern for the use of biological weapons has increased, particularly in the United States in the aftermath of 9/11, when anthrax-laden letters were sent to members of Congress. This article reviews the definitions of biological weapons and mass casualties. In addition, it discusses the main operational and logistical issues of import in the medical management of mass casualties from the use of biological weapons. Strategies for medical management of specific biological agents will also be highlighted.

## **Definition of Biological Weapon and Threat**

A biological weapon can be defined as “a microorganism (or a toxin derived from it) which causes disease in man, plants or animals or causes deterioration of material.”<sup>1</sup> Biologic warfare is the use of biologic agents to kill or sicken people, animals or plants *with the intent* to intimidate or coerce a government or civilian population to further political or social objectives.

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Biological weapons are relatively inexpensive, but difficult to deploy effectively, i.e., make into a form such as an aerosolized preparation that can cause harm (weaponization). Some biological agents are easy to obtain whereas others are more closely guarded. For example, anthrax is present in soil worldwide, but there are only two known locations of the smallpox virus (one in the U.S. and one in Russia). These weapons can induce fear of the unknown. This is analogous to the early days of the AIDS epidemic when modes of transmission for the human immunodeficiency virus were poorly understood. First responders could be seen responding to such patients in Level A personal protective equipment.

Biological weapons have the potential for dissemination over a large geographic area. Modeling performed by the World Health Organization determined that only 50 kg of weaponized anthrax aerosolized over an urban population of 500,000 persons would result in 95,000 deaths and 125,000 persons becoming ill. The use of 50 kg of weaponized tularemia would kill 30,000 and sicken similar numbers.<sup>2</sup> Clearly, such a scenario would overwhelm the existing health and medical resources of any nation.

An attack may be overt or, more likely, covert. Unless a terrorist announces the attack or uses a biological agent in an obvious manner (e.g., anthrax powder in a letter), realization that an attack has actually occurred may be difficult. There would be no obvious explosion as in the conventional terrorist use of bombs, or the rapid presentation of multiple victims suffering from a clear toxidrome as in the use of a chemical agent, or a quick and reliable method of

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detection such as use of a Geiger counter for a radiological attack. Patients could present in small numbers at multiple disparate locations such as doctors' offices, clinics or emergency departments. These sites could be located at significant distances from the initial release point of an unannounced biological agent. Therefore, it could be days until the release is detected. It may not even be initially recognized that a wave of illness represents terrorism. The onset of pandemic influenza may be perceived as "naturally occurring" until further investigation proves otherwise. A similar situation was the case in the U.S. in 1984, when a religious cult intentionally sprayed salmonella in salad bars of local restaurants in an attempt to make people too ill to vote and sway an election. While the attempt to change the election results was unsuccessful, people did in fact become ill. It was not until years later that investigators determined the outbreak was an act of terrorism.

### *Indicators of a Bioterrorist Attack*

There are several signs that should point to the possibility of a covert biological attack. These include: the occurrence of a single suspected case of an uncommon disease (e.g., smallpox), clusters of similar disease in the same time frame in different locales (e.g., multiple patients with flu-like symptoms presenting to several locations who were all at the same sporting event several days prior), unusual clinical, geographical, or seasonal presentations (e.g., lots of

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“influenza” patients in non-flu season or plague patients in a non-endemic region of the U.S.), and increased deaths in the animal population.

### *Types of Biologic Agents*

The U.S. Centers for Disease Control categorizes biological agents into categories A, B, and C, with Category A agents thought to be the most serious threats. Category A agents are those that pose a risk to national security as a consequence of their ease of dissemination or person-to-person transmissibility, high potential mortality rates, potential for major public health impact, potential for public panic and social disruption, and requirements for special action to maintain public health preparedness. The six agents currently on the Category A list include smallpox, tularemia, viral hemorrhagic fevers, botulism, plague, and anthrax.<sup>3</sup>

Traditionally, biological agents have been thought of as separate from chemical agents, but not necessarily separate from toxins such as botulinum. However, some experts suggest that toxins should be considered a separate category since they may have features of both chemical and biologic agents. For the purpose of completeness, toxins will be included in this chapter along with viral and bacterial biological agents (Table 1). Key clinical considerations for selected bioterrorist agents are detailed in Table 2.<sup>4</sup>

### **Definition of mass casualties**

.Although the focus of this paper is on mass casualties, it is important to keep in mind that the terrorists' goal may not be to simply kill or sicken people, but rather to induce fear and disrupt society or a certain way of life. Further, the term "casualty" is ill-defined. In some cases, casualty means death, whereas in others it implies a patient with a treatable injury or illness. It is not always clear whether the injury or illness results from a certain event or would have occurred anyway. A bioevent may or may not cause mass casualties. Clearly, an aerosolized release of a biological agent has the potential to produce tens of thousands of patients, yet an event such as the U.S. anthrax letter attacks in late 2001 infected fewer than two dozen patients. However, there was still a large impact on the health care infrastructure as significant numbers of patients required antibiotic prophylaxis. In addition, if one considers the "psychological casualties" and the fact that the effects of the terrorist attack were far-reaching, one could conclude that "mass casualties" did indeed occur.

The absolute number of patients needed to define an event as producing "mass casualties" is less important than the functional impact to the existing health care system. Any incident that overwhelms the resources of a given system at a specific point in time can be considered to be a mass casualty event. In a classic bioterrorism attack (e.g., covert release of an aerosolized agent over a geographic area), casualties will present over hours to weeks rather than all at once, which is more typical for a chemical or radiological event. This type of mass casualty event produces a public health emergency that will require several

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types of systems and strategies to manage. A more appropriate paradigm than absolute numbers of casualties, however they are defined, is consideration of the functional impact of a bioevent on the local health delivery system. A system such as PICE may be useful in this regard. PICE, or “potential injury-creating event”, is a standardized nomenclature using functional terminology to allow concise, accurate communications regarding the geographic and disruptive extent of a mass-casualty incident and the need for additional response assets.<sup>5</sup>

## **Operational and Logistical Issues**

### *Incident Management System*

The clinical management of casualties exposed to biological agents is similar to clinical care for patients with more common viruses and therefore relatively familiar to most practitioners. There are a few key differences that will be discussed later in the article. It is the operational management aspects that are unfamiliar to most clinicians. An important strategy for orchestrating medical care for mass casualties resulting from exposure to a biological weapon is to implement an Incident Management System (IMS). Each organization (e.g., fire, police, emergency medical services, hospitals) needs some type of IMS with an Incident Command System (ICS). The basic components of an ICS are the Command or Management component (headed by the Incident Commander) and 4 sections – Operations, Planning, Logistics, and Finance (Figure 1).<sup>6</sup> When



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more than one entity works together, a “joint command” is used. The Command is responsible for overall operations and liaisons with other agencies. The Operations Section houses the “doers,” the Planning Section looks ahead to address the “what if” scenarios, the Logistics Section gets “stuff” to keep operations going, and the Finance Section tracks and authorizes expenses and personnel. The ICS provides a flexible infrastructure that can expand and contract as time evolves depending on the size and complexity of the event. All personnel have clearly defined roles and responsibilities, which are based on previously described functions rather than on specific individuals.

### *Surge Capacity and Alternate Sites of Care*

No matter how good the IMS, if the health care system lacks the capacity to provide patient care to large numbers of casualties, people will die. In modern times, there is little to no excess capacity. This is very cost-efficient under normal circumstances, but problematic following any type of disaster or public health emergency that produces large numbers of casualties. Even a small increase in the number of patients from a bad influenza season stresses the current health care system. Therefore, a strategy to improve system capacity (surge capacity) is critical to optimize preparation and management of mass casualties from bioterrorism.

Barbisch has proposed a model for improving surge capacity that contains 3 components: “Staff,” “Stuff,” and “Structure,” with “Structure” consisting of both

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the management infrastructure as well as the physical buildings required to provide patient care.<sup>7, 8</sup> Using this model, personnel, supplies, equipment, physical space, and a management infrastructure consistent with the needs of the event would be identified and provided.

One strategy for dealing with mass casualties from a bioterrorist event is to use alternate sites of care. Traditionally, hospitals have been thought of as the major or only places for medical care. However, hospital resources can easily be exceeded, or the hospital could become non-functional due to contamination. Therefore, to emergently expand patient care capacity, and as required by JCAHO standards, all facilities must designate appropriate alternate sites of care.<sup>9, 10</sup> Though initially designed for earthquakes rather than bioterrorism, the Medical Disaster Response concept is one example of such an approach.<sup>11</sup> The local administrative jurisdiction (EMS or public health) should also be involved in community and regional planning for alternate care sites. To adequately staff this expanded capacity, decision-makers should consider innovative concepts to provide emergency credentialing of personnel. One technique is to temporarily grant privileges to providers by honoring the credentialing process of neighboring institutions.

### *Detection/Epidemiologic Investigation*

As mentioned above, the covert release of a biologic agent may be difficult to initially uncover. Therefore, several strategies now exist to potentially improve

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the early detection of a biological weapon's release. These detection systems range from hand-held devices with relatively poor sensitivity and specificity to detectors such as those in the Biowatch program to syndromic surveillance. The concept behind syndromic surveillance deserves further discussion.

Patients infected with a biological agent may initially appear to have a routine medical illness (e.g., flu-like illness and early anthrax, pneumonia and plague). Syndromic surveillance uses changes in numbers of patients with these signs and symptoms to alert health care providers of a potential biological attack before identification of the specific agent is possible. Syndromes associated with biological weapons are tracked by such entities as emergency departments and clinics and sometimes even EMS systems. Daily tallies are made of these visits and compared regionally to the number of patients with the same symptoms who presented in previous years. An unexpected increase in patients with these syndromes triggers an alert. Theoretically, this would then lead to earlier interventions such as mass prophylaxis and vaccinations. Although there are currently over 100 surveillance systems in existence, it is unclear whether any of them decrease morbidity and mortality. Some experts argue that the astute clinician may be more adept at identifying a suspicious presentation. While this is likely true for an unusual presentation such as a patient with the classic rash of smallpox, many of the biologic agents present with simple flu-like symptoms and therefore would most likely go unnoticed. If a clinician does suspect an agent, laboratory personnel must be notified so that they can take appropriate infectious precautions and also so that they will know to test for an agent that may not be

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routine. A useful reference to assist local planners with surveillance is the  
“Biological Threat Interrogatories” developed by the Department of Veterans  
Affairs, Emergency Management Strategic Healthcare Group Technical Advisory  
Committee.<sup>12</sup>

### *Multi-Disciplinary Coordination and Communications*

Once bioterrorism is suspected, non-traditional partners must be notified and participate in coordination of the event. These include: local law enforcement and the Federal Bureau of Investigation (FBI) (a terrorist attack is a crime), public health (populations of patients rather than simply individuals are involved), the EMS agency, city/county administration, the Laboratory Response Network (LRN) of the CDC, the media, mortuary affairs, and faith-based leaders. Clear procedures must be in place to maintain the “chain of evidence” and notify proper authorities such as public health and the FBI when collecting biological samples. A 24/7 reporting system must be implemented so notifications can be readily made whether it is during normal business hours or 3 a.m. on a Sunday. Although a biological attack is less likely to damage the physical communications infrastructure, appropriate redundancy planning must consider alternate forms of communications and notification systems. In past disasters, communications networks have been crippled significantly by massive simultaneous utilization by the affected population. So many individuals access various telecommunications

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systems at the same time that no calls can get through, even though the system remains physically intact.

### *Health Risk Communications*

Another key component of the medical strategy to manage biological casualties is the evolving science of health risk communications. Fortunately, there is limited experience with mass casualties from bioterrorism. However, this means that health care providers and the public lack a basic understanding of both the true risks associated with biological weapons and the effectiveness of mitigation measures that can limit morbidity and mortality. Clear concise messages – ideally prepared in advance of an event – that are delivered by a credible medical spokesperson can positively influence outcomes. One of the challenges is that the scientific knowledge necessary to support appropriate prevention and treatment recommendations may initially be absent. This was the case during the anthrax letter attacks in the U.S. in late 2001. Prior to that time, it was not known that anthrax could be weaponized and transmitted via the mail system. Furthermore, the initial prophylactic antibiotic choice administered to the Congressional staff was ciprofloxacin. It was later determined that the drug was poorly tolerated. The side effects such as diarrhea were so frequent that drug compliance was poor. Therefore, when postal workers required prophylaxis, doxycycline was used. However, due to ineffective health risk communications, there was a misperception that the postal workers were receiving doxycycline

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because it was cheaper and that the decision was racially motivated. The actual medical reasons for recommending doxycycline were not effectively communicated to the population at risk. This played out negatively in the court of public opinion.

In the event of a bioterrorist attack with an aerosolized agent, effective risk communication will play a critical role in providing vital information to the public and healthcare professionals. Examples of such practical and time-sensitive information include whether the agent is transmissible person-to-person, what types of respiratory and hand hygiene precautions are necessary, locations for obtaining prophylactic antibiotics, and how long to continue the medication.

Public information is readily available at several locations, particularly government websites such as <http://www.ready.gov/america/biological.html> and <http://www.bt.cdc.gov>. These sites may be invaluable for the continued dissemination of information after an attack. Information regarding when and where to seek treatment, how to recognize symptoms of particular biological agents, techniques for sheltering in place, and methods of disease mitigation would likely help decrease the “surge” burden to emergency response systems. Back up communications systems, such as radio and television emergency alert systems, are essential since some will not have access to the internet or it may be non-functional for many reasons including a concurrent cyber or electromagnetic pulse terrorist attack.

*Quarantine and Isolation*

In situations where exposure from a contagious biological agent occurs, such as plague or smallpox, quarantine of exposed individuals and isolation of ill persons may be necessary. Quarantine authority varies by jurisdiction and has not been invoked for many years in the U.S. The balance between civil liberties and the protection of public health remains a challenge when such interventions are contemplated.

### *Other Legal Aspects*

In addition to quarantine legislation, several other laws and regulations may be problematic in the face of mass casualties from bioterrorism. These include Consolidated Omnibus Budget Reconciliation Act/Emergency Medical Treatment and Active Labor Act (COBRA/EMTALA) regulations that normally limit transfer of patients to specific pre-defined circumstances and require facilities with capability and capacity for a higher level of care to accept patients in transfer, and Health Insurance Portability and Accountability Act (HIPAA) privacy regulations. There is an emergency exception in the HIPAA regulations, but case law is lacking to determine whether this would be sufficient to allow appropriate medical information to be transmitted in a mass casualty situation.

### *Triage*

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In the setting of mass casualties, the goal of triage shifts from doing the best for an individual to “doing the most good for the most patients.” There are several systems available to manage a large influx of casualties. In the U.S., the most common system for initial triage is START (Simple Triage And Rapid Treatment). Of note, patients exposed to a contagious biologic agent must be triaged in a manner that minimizes the possibility of transmitting the infectious agent to others.<sup>13</sup>

### *Securing Healthcare Facilities*

In the event of a biological attack, hospitals will become a natural center of public attention. However, maximizing public health will require limiting access to contagious victims. Additionally, crime victims are typically afforded some protection by local authorities. As a consequence, a security plan must be in place that limits access to the hospital or the appropriate ward(s) so only authorized personnel and, if appropriate, patient visitors may enter. It is also possible that hospitals could be the site of an attack. Attention to current threat profiles is an essential component of ongoing hospital security. Finally, some patients may wish to leave against medical advice. While each patient’s right to accept, decline, or modify therapy must be respected, it may become necessary to involuntarily isolate exposed victims (e.g., plague victims) until lack of contagion can be assured. This will likely require close collaboration between hospital security, local law enforcement, and public health authorities.



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Other logistical interventions are important in minimizing biologic agent transmission. When the agent is released within an enclosed space (e.g., anthrax into a building), the ventilation systems must be immediately shut down to prevent rapid spread throughout the area. Facilities with automated or centrally controlled high-volume ventilation systems (HVAC) must have continuous, immediate access to persons with the capability to secure the system. Hospitals must also segregate ventilation systems among wards with and without exposure to certain high-level biological agents.

### *Decontamination*

In general, decontamination would be unnecessary after a covert exposure to a biological agent. By the time the release was detected (usually several days), most individuals will have changed clothes and showered. However, certain types of events sometimes termed “SIDS events” (sudden-impact, defined-scene) could involve biological weapons (e.g., anthrax powder) and would require standard decontamination of patients via the “Strip and Shower” method with soap and water.<sup>14</sup> Otherwise, events likely to cause mass casualties would probably involve release of an aerosolized agent with patients presenting with symptoms days later. While these patients may be contagious, they would not require decontamination.

### *Personal Protective Equipment (PPE) for Health Care Providers*

Standard precautions should be used for all patient encounters. In addition, for those agents that are spread person-to-person, the respiratory droplet mode is the most common route of transmission. Therefore, appropriate respiratory PPE must be donned. Ideally, the types of masks required would be determined after identification of the infectious agent to include its size and degree of transmissibility. There is some controversy regarding what types of masks would be protective if the agent is unknown. For agents transmitted by respiratory droplets, an N-95 mask would theoretically be adequate. Fomites of this size should be effectively trapped. When dealing with agents such as smallpox, however, these masks may be less effective. The smallpox virus remains infectious for hours outside the body. It is possible the viral particle itself could become aerosolized. Due to its small size, the variola virus could penetrate an N-95 mask. In this situation, a HEPA filter mask might be more appropriate. This issue is currently unresolved.

### *Stockpiling*

A key consideration in the strategic planning for mass casualties from biologic agents is stockpiling of necessary medications, supplies, and equipment. Since most hospitals employ a “just-in-time” strategy for providing pharmaceuticals and equipment to their patients on a daily basis, the ability to rapidly expand resources to meet the needs of a large influx of casualties does

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not exist. This mimics the lack of surge capacity for other items, such as physical space, hospital beds, and personnel.

To identify the components of a stockpile, hospitals and laboratories should perform a hazards vulnerability analysis. This examination will determine the events that pose the greatest threat. An inventory of supplies and equipment can then be compiled to address these threats. One type of equipment that is likely to be in short supply after a biological attack is ventilators. Consideration should be given to purchasing portable disposable ventilators and training staff in their use. In addition, family members may need to be trained ad-hoc on bag-valve-mask techniques to keep their relatives alive.

In terms of pharmaceutical stockpiling strategies, a key question is how quickly each intervention would be needed. If the event unfolds quickly, such as a toxin exposure, storage of antidotes must be close by. Drugs that arrive after 6 to 12 hours will have little impact. In dealing with mass casualties from an anthrax release, storage of antibiotics at a more distant location is acceptable. It will take several days for the disaster to fully develop and there is time to request additional antibiotics and other equipment from a remote location. In general, a combination of local, regional, statewide, and federal caches is the ideal approach. Care must be taken that multiple entities are not dependent on the same supplier. In the case of a bioevent, casualties are likely to be widespread and medications may be in demand from multiple sources. Ideally, medications and other perishable items from the stockpile could be rotated into local or regional usage to minimize losses.

### *Mass prophylaxis and Vaccination*

Post-exposure vaccination and antibiotic or antiviral prophylaxis are important strategies to decrease morbidity and mortality after a bioterrorist event. It is critical to identify the health care providers and other personnel that are essential to the response effort and ensure that these individuals receive these early interventions. Special attention should be paid to healthcare personnel and laboratory personnel who may have had, or are likely to have, early exposure to the biological agent. The scope of the event may require that distributions be made from the Strategic National Stockpile or another regional resource to ensure sufficient and timely distribution of prophylactic materials.

### *Psychological Aspects*

As was noted so vividly in the fall of 2001, the effects of a biological attack are likely to spread far beyond those who have documented exposure. Following the anthrax attacks in Florida and the US Congress, healthcare and emergency response services across the country spent months responding to nervous citizens who believed they may have been exposed as well. Typical seasonal upper respiratory infections caused concern for inhalational anthrax.

A key component of any bioevent response will be providing psychological care to exposed victims, involved emergency personnel, affected communities,

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and the country at large. Close integration with health risk communicators may help to mitigate some of the psychological trauma which is likely to follow an attack. Although the myth of panic is often propagated, in reality panic is unlikely to occur.<sup>15</sup> Yet, the incremental effects of increased call volume, hazardous materials team responses, and concerned patients with unexplained medical symptoms visiting the emergency departments can prove to be highly detrimental to public health and emergency response services.

*Providers – who will come to work?*

A particular aspect of psychological trauma involves the impact of a bioevent on the human infrastructure participating in response and recovery activities. Whether particular persons are exposed (and isolated), sick (and quarantined), or merely concerned about the effects of the agent on themselves and their families, the net effect is the same: loss of personnel. This decrement in personnel can affect the efficiency and success of the overall response effort. Health risk communications among key infrastructure personnel, both before an event occurs and during the event, can help optimize personnel resources. Careful attention to personal protective equipment and post exposure prophylaxis can similarly help prevent losses of personnel infrastructure to illness. Families and dependents of essential personnel may need to be considered as a special population for monitoring and preventative efforts to help secure the services of those persons who may otherwise need to care for their families. Stress

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debriefing and other psychological care services may also help in this regard, although the efficacy of certain techniques is unclear and may actually be detrimental.<sup>16, 17</sup>

### *Mortuary Affairs*

At the time of this publication, no bioevent since the 1918 influenza pandemic has resulted in overwhelming numbers of deaths. The consequent lack of recent experience in mortuary affairs must therefore be remedied, at least in part, by careful preparation and training. Although they remain an excellent resource, federal assets such as Disaster Mortuary Operational Response Teams may not be immediately available to assist. Therefore, planning at the local and regional levels must take into consideration safe locations for the storage of possibly contagious remains. Criminal investigation and public health concerns, as well as the availability of mortuary services during a surge of mortality, may be in conflict with families' wishes for rapid disposition of remains and religious concerns regarding timing and method of disposition. For example, remains may need to be stored for an extended period of time or cremated. Inclusion of local religious leaders into ongoing planning/drill events involving mortuary affairs may help mitigate some of these concerns. Religion-neutral, compassionately devised health risk communications via the media as well as individual discussions at the time of death notification may also help alleviate public concern. This will enhance the ability of law enforcement and public

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health agencies to carry out their duties while maintaining appropriate respect and dignity for the deceased.

### **Special populations**

Specific populations are likely to be at higher risk of morbidity and mortality as a result of a bioevent. These include geriatric, pediatric, and pregnant persons, as well as those with limited communications abilities due to physical (deafness, blindness), cognitive (mental illness), or language barriers. Persons who are homebound or who are reliant on home health nursing and materials may also be at higher risk, as are persons who are in high-density populations such as shelters and prisons. Particular attention should be given to education and surveillance in these populations with a tendency toward early quarantine/isolation and treatment as needed.

### **Conclusion**

The specter of bioterrorism presents a challenging addition to the already difficult problem of managing mass casualties. Key necessities for preparation, mitigation, response to, and recovery from these events include a high index of suspicion for bioterrorism events, ready access to current diagnostic and treatment information, and pre-existing relationships between medical, public health, and law enforcement agencies. Careful attention to education efforts and

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health risk communications planning can also help to mitigate physical and psychological casualties as well as minimize attrition among response personnel. Healthcare facilities and response agencies must be prepared to triage and treat large numbers of patients while protecting them and the responding personnel from further harm. Finally, the importance of an effective incident management system for overall incident response coordination cannot be overemphasized.



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Table 1 Summary of Bioterrorism Agents

Selected Biological Agents	
Bacteria	
	Anthrax*
	Plague*†
	Tularemia*
Viruses	
	Smallpox*†
	Monkeypox†
	Viral hemorrhagic fevers (Ebola, Marburg)* †
Toxins	
	Botulism*

\* CDC Category A Agent

† Person-to-person transmissible (monkeypox: limited person-to-person transmissibility)

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Table 2 Key Aspects of Selected Biological Agents

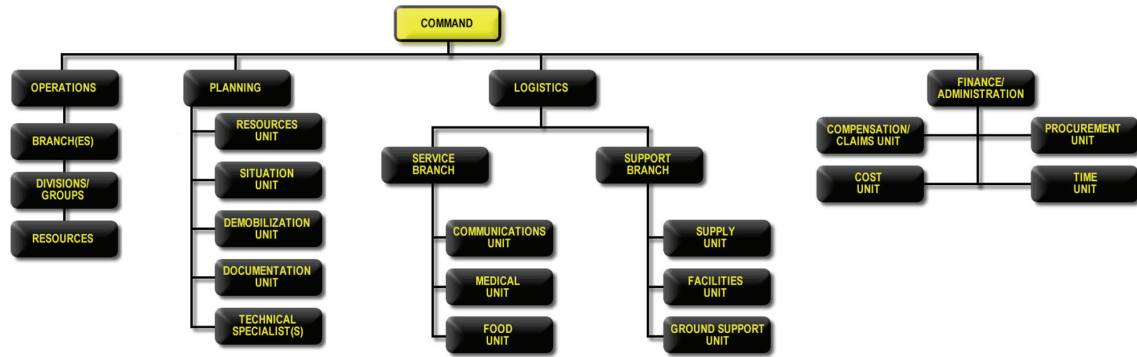
Key Aspects of Selected Biological Agents	
Anthrax	
	May mimic a chemical event (SIDS – sudden-impact, defined scene). Patients present with fever and difficulty breathing
	50% of inhalational anthrax victims develop hemorrhagic meningitis
	Medications: ciprofloxacin or doxycycline
Plague	
	Pneumonic plague is transmissible person-to-person May develop from primary bubonic plague
	48 hour isolation is needed for newly-diagnosed plague victims
	Medications: streptomycin or gentamicin preferred, ciprofloxacin or doxycycline acceptable. Add chloramphenicol for plague meningitis.
Smallpox	
	Not naturally occurring - a single case is, by definition, terrorism
	Rash spreads from extremities to trunk, and occurs on palms and soles
	All lesions are in the same stage of development

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	Medications: supportive therapies only; cidofovir use being studied
Botulism	
	Should be suspected with concurrent gastrointestinal and neurological symptoms (particularly descending paralysis)
	Medications: supportive therapy. Antitoxin useful if given early.
Tularemia	
	Abrupt fever with prostration, myalgias; pharyngitis in 25% of cases
	Case fatality rate may exceed 35% in bioterrorist attack
	Medications: streptomycin or gentamicin
Viral hemorrhagic fevers	
	Case fatality rate may be as high as 90%
	N-95 mask recommended for contact isolation; if patient is coughing, airborne isolation and HEPA filtration suggested
	Medications: supportive care only. IV ribavirin being studied.
Ricin	
	Inhaled: rapid onset acute respiratory distress syndrome
	Medications: supportive care only

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Figure 1 Incident Management System



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