Part I

Introduction

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Planning for the psychological effects of bioterrorism

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The microbial world is invisible, mysterious, frightening and unknown to many, including leaders, members of the media, and the general public. Bioterrorism differs from natural disasters and other forms of terrorism in a number of fundamental ways (see Table 1.1). Bioterrorism is an act of human malice intended to injure and kill civilians and is associated with a higher rate of psychiatric morbidity than are "acts of God." A hurricane is usually an isolated event with subsequent consequences. In contrast, a terrorist attack with a biological agent, due to the incubation period of microorganisms and evolving echoes of exposure, fear, and possible spread of contagion, is a process trauma with consequences spread widely over time. In addition there is the threat of further attacks, announced or covert. The nature of biological weapons means that the threat is difficult to bound by time and space as in most other disasters because of the mode of distrubution. Global travel can spread infected, asymptomatic individuals widely and quickly. Because the agents responsible for infectious diseases cannot be discerned by our unaided senses, they are powerful stimulants of uncertainty, vulnerability, and fear.

A bioterrorist attack does not produce a conventional disaster scene. The "first responders" to bioterrorism are not only the traditional fire and police groups but also health care providers. Command-and-control teams for bioterrorism consequence management are, therefore, also different than those in other disasters. Following a bioterrorist event, public health, medical institutions, politicians, and law enforcement have lead roles. The intelligence and law enforcement communities are essential to preventive efforts. Because bioterrorist attacks are decentralized they require multiple levels of intervention and create additional challenges by inspiring copycats and hoaxes.

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Table 1.1. Similarities and differences in bioterrorism and natural disaster

Dimension	Bioterrorism	Natural disaster[1]
Threat/risk	widespread	local
Knowledge of responders/physicians	low	high
Public health preparedness	low	moderate
Impact phase	slow onset	sudden
Duration	chronic	acute
Hoaxes/copycats	yes	no
Altered perception of safety	widespread	local
Potential for altered trust in officials	high	moderate

[1]Natural disaster, e.g., hurricanes, tornadoes, earthquakes.

Terrorism: community and individual responses

A bioterrorist event is firstly a terrorist attack. Terrorism is a special type of disaster, one caused by human malevolence, which usually produces higher rates of psychiatric casualties than do natural disasters or technological accidents (North, 1995). Terrorism disrupts society by creating intense fear and disorganization and can be distinguished from other natural and human-made disasters by its primary goal of propagating terror in large populations (Levy and Sidel, 2003). Terrorist attacks result in extensive fear, loss of confidence in institutions, feelings of unpredictability of the future, and a pervasive experience of loss of safety. Terrorism violates the basic underpinnings of daily life by attacking where one lives, works, and plays thereby shattering our usual routines, their predictability, our beliefs in a just world, and our sense of personal and community safety (Holloway and Fullerton, 1994).

Terrorists have used bombings, contamination, and weapons of mass destruction including biological and chemical agents. In fact, terrorists have used biological weapons for centuries (see Joy, 1987). In 1347 during the siege of Caffa in Crimea, the Tartar army hurled bodies infested with plague over the walls of the city (Derbes, 1966) and in 1710 Russian troops hurled the corpses of plague victims over the city walls of Reval during Russia's war with Sweden. During the French and Indian War, the English general Sir Jeffrey Amherst gave smallpox-laced blankets to Native Americans loyal to the French leading to a successful British attack on Ft. Carillon (Tucker, 2001).

Terrorist events such as the Tokyo subway sarin gas attack, the bomb that exploded on a busy shopping street in Omagh, Northern Ireland, the World Trade Center attack on September 11, the 1998 embassy bombing in Nairobi, Kenya, and the bombing in Oklahoma City, United States, vividly demonstrate the strong

psychological and social responses engendered by terrorism (North *et al.*, 1999; Pfefferbaum, 1999; Murakami, 2000; Tucker *et al.*, 2000; Schuster *et al.*, 2001; Galea *et al.*, 2002; Koplewicz *et al.*, 2002; Luce *et al.*, 2002; North *et al.*, 2002) and their impact on our beliefs and values (Jernigan *et al.*, 2001; MMWR, 2001). The sarin nerve gas release in Tokyo, March 20, 1995, and the anthrax attacks in the United States in October, 2001 demonstrated the particular ability of chemical and biological weapons to create fear and social disruption far beyond the number killed or injured. After the sarin gas attack, although only 11 died, over 5000 people sought medical care for possible exposure. The anthrax attacks forced the desertion of commercial and public buildings, disrupted the distribution of mail, occasioned social conflict, and evoked considerable fear and concern.

The deliberate infliction of pain and suffering as occurs in a terrorist attack is a particularly potent psychological stressor. In a nationally representative survey in the United States conducted the week after the September 11 terrorist attack, 44% of the adults reported one or more substantial symptoms of stress, and 90% reported at least low levels of stress symptoms (Schuster *et al.*, 2001). In the area most directly effected by the September 11 attack, 17.3% of the population were estimated to have post-traumatic stress disorder (PTSD) or depression 1–2 months after the attack (Galea *et al.*, 2002). In a national study 1–2 months after September 11, rates of probable PTSD were 11.2% in New York City, 2.7% in Washington DC, 3.6% in other metropolitan areas, and 4.0% in the rest of the United States (Schlenger *et al.*, 2002). Approximately 35% of those directly exposed to the Oklahoma City terrorist bombing developed PTSD by six months (North *et al.*, 1999). An ongoing threat of terrorist attacks affects both the severity and duration of post-traumatic stress responses (Shalev, 2000).

Terrorism's primary goal is to destabilize trust in public institutions. In a longitudinal national study of reactions to September 11, 64.6% of people outside of New York City reported fears of future terrorism at 2 months and 37.5% at 6 months (Silver *et al.*, 2002). In addition, 59.5% reported fear of harm to family at 2 months and 40.6% at 6 months. Terrorism is one of the most powerful and pervasive generators of psychiatric illness, distress, and disrupted community and social functioning (Holloway *et al.*, 1997; North *et al.*, 1999).

Biological agents of terror

Biological agents possess a number of characteristics that make them especially effective terrorist agents. Conventional weapons produce immediate and tangible health consequences. In contrast, with biological agents it is not easy to assess whether or not one is at risk. Most biological agents are invisible and odorless, making them imperceptible to humans. Many produce delayed illness and can only

be detected by the use of special equipment. The uncertainty about exposure, the fact that the agents have varying lengths of incubation periods, and the fact that some of these agents produce grotesque forms of death, as in smallpox, increase the potential for terror. Biological agents also instill terror in communities. An outbreak in one spot or in multiple spots simultaneously can spread disease, illness, distress, and community disruption for days to weeks to months to years. The social propagation of the resulting fear and distress can spread disruption throughout community groups and the social infrastructure.

Biological agents cause unfamiliar diseases that represent diagnostic and treatment challenges. Today's medical community has limited experience with the diseases produced by biological agents such as anthrax or smallpox (see Table 1.2). Naturally occurring outbreaks of infection may be difficult to distinguish from intentional attacks. Patient presentations and at-risk populations differ in a terrorist attack from naturally occurring outbreaks because of the different routes of dissemination and possibly altered microorganisms. In a bioterrorist attack – perhaps targeted to a healthy work group – this is not seen. Resulting quarantine, forced evacuation, mandatory vaccination, and mandated treatment can curtail many civil liberties for which the public is little prepared (see Barbera *et al.*, 2001). The tendency for community leaders to use these draconian means may also increase as fear and anxiety increases (Glass and Schoch-Spana, 2002). The demand for these actions as well as the failure to use them may contribute to community conflict and erode the public's confidence in the government. There is a limited availability of medical treatment for many of these weapons and, in many cases, there is uncertainty about the effectiveness of treatment due to possible modification of the agent.

Sophisticated bioterrorists will appreciate that the agents that cause illnesses in livestock and agriculture constitute important weapons that can produce devastating economic and psychological consequences (Gewin, 2003). Foot-and-mouth disease, as seen in the United Kingdom, can rapidly spread to livestock in a wide geographic region resulting in millions of dollars of loss. Bioterrorist attacks on livestock and agriculture would disproportionately affect the mental health of rural populations (Ursano *et al.*, 2001). Recent experiences with depopulation and carcass disposal after the foot-and-mouth disease outbreak in the United Kingdom underscore the importance of integrating mental health into veterinary response. Psychological and behavioral expertise is, therefore, important to agricultural preparedness and response.

Bioterrorism can strike at the public's faith in its institutions and jeopardize the continuity of society. In the case of contagious agents, neighbors may be perceived as in desperate need and at the same time as a potential source of infection. Although experience with other disasters indicates that most individuals will act with altruism, some will act to maximize their personal safety. While some individuals may desert

Table 1.2. Category A diseases

Disease	Transmit human to human	Infective dose (aerosol)	Incubation period (days)	Duration of illness	Lethality (approx. case fatality rates)	Treatment/vaccine efficacy (aerosol exposure)
Inhalation anthrax	No	8000–50 000 spores	1–6	3–5 days (usually fatal if untreated)	High	Antimicrobial agents – ciprofloxacin or doxycycline vaccine – 2 dose efficacy against up to 1000 LD_{50}
Pneumonic Plague	High	100–500 organisms	2–3	1–6 days (usually fatal)	High unless treated within 12–24 hours	Antibiotics – streptomycin, gentamicin, the tetracyclines, chloramphenicol Vaccine – 3 doses not protective against 118 LD_{50} in monkeys
Tularemia	No	10–50 organisms	2–10 (average 3–5)	≥2 weeks	Moderate if untreated	Antibiotics vaccine – 80% protection against 1–10 LD_{50}
Smallpox	High	Assumed low (10–100 organisms)	7–17 (average 12)	4 weeks	High to moderate	No proven treatment Vaccine – protects against large doses in primates
Viral hemorrhagic fevers	Moderate	1–10 organisms	4–21	Death between 7–16 days	High for Zaire strain, moderate with Sudan	No established treatment Vaccine – none
Botulism	No	0.001 μg/kg is LD_{50} for type A	1–5	Death in 24–72 hours; lasts months if not lethal	High without respiratory support	Antitoxin vaccine – 3 dose efficacy 100% against 25–250 LD_{50} in primates

(USAMRIID Blue Book, Appendix C, February 2001.)
(Centers for Disease Control, Biological Diseases/Agents Listing, April 2002 www.bt.cdc.gov/Agent/Agentlist.asp)

The US public health system and primary health care providers must be prepared to address various biological agents, including pathogens that are rarely seen. High priority agents include organisms that pose a risk to national security because they can be easily disseminated or transmitted from person to person; they result in high mortality rates and have the potential for major public health impact; they may cause public panic and social disruption; and they require special attention for public health preparedness.

the infected, others will expose themselves needlessly to carry out acts of kindness (Ursano *et al.*, 2002). All of these responses may result in disappointed expectations and unnecessary injury and community disruption.

Primary health care providers will be the first to see various biological agents, including pathogens that are now rarely seen. High priority agents include organisms that pose a risk to national security. Through their easy dissemination and/or transmission from person to person, exposure will result in high mortality rates. Although panic is a rare event in communities except when there are shortages of resources (Glass and Schoch-Spana, 2002), these agents have the potential for major public health impact and social disruption. They require special attention for public health preparedness.

The public's response to bioterrorism

Knowledge that one has been exposed to biological, chemical, or radiological toxins increases vulnerability to psychiatric distress (Baum *et al.*, 1983; Green *et al.*, 1994; Weisæth, 1994; Adams *et al.*, 2002). In this case, information itself is the primary stressor. Often times exposure to biological agents have the added stress of being clouded in uncertainty as to whether or not exposure has taken place and what the long-term health consequences may be. Living with the uncertainty can be exceedingly stressful. Typically, uncertainty accompanies bioterrorism and is the focus of much concern in the medical community preparing for responses to terrorist attacks using biological, chemical, or nuclear agents (Holloway *et al.*, 1997; DiGiovanni, 1999; Benedek *et al.*, 2002).

The fear of exposure to biological agents can lead hundreds or even thousands to seek care, overwhelming our hospitals and health care systems. Belief that one has been exposed to biological agents leads individuals to seek health care and change life patterns regardless of actual exposure. After the sarin attack in Tokyo in which 11 people died, over 5000 sought care for presumed exposure (Okumura *et al.*, 1998). In Israel, after a SCUD missile attack during the Gulf War, fear of chemical weapons exposure was the reason for nearly 700 of 1000 war-related emergency room visits (Karsenty *et al.*, 1991; Bleich *et al.*, 1992). The resources demanded by such events are large and made larger by the uncertainties associated with the event. Triage of anxious and distressed individuals is critical to providing appropriate care to those who are physically injured.

Fear of contagion can have devastating consequences for all aspects of daily life after a bioterrorist event. The result may be that some communities become isolated and unable to obtain food and supplies. The lack of personnel due to infection or fear of infection can cripple basic community functions and financial institutions.

Contamination and fears of contamination are an important aspect of community response to bioterrorism. The exposure of large populations to technological disasters provides the opportunity to identify appropriate programs to foster good health care practices in populations concerned about contamination. The behavioral and psychological effects of "belief in exposure" as well as actual exposure are critical to bioterrorism health effects (Stuart *et al.*, 2003). Individuals may present with unexplained somatic symptoms, often referred to as MIPS (medical or multiple idiopathic physical symptoms) or MUPS (multiple or modified unexplained physical symptoms). Schools, clergy, neighborhoods, and the media provide important venues for education and information.

Public health planning for bioterrorism

Public health intervention following a terrorist attack requires coordination and attention to the public's mental health needs. Traditionally, health care systems, providers, and the general public have not treated psychological and behavioral health in the same manner as physical health. This infrastructure is counter to the generally agreed upon notion that psychological and behavioral disorders are determined by a combination of physical, psychological, and social factors, i.e., the public's health is dependent on psychological, behavioral and physical well-being. Carefully constructed plans for community guidance and information can organize post-disaster behavior; the absence of such plans invites chaos.

The traditional natural disaster or transportation accident models of providing health services after a disaster have limited applicability in bioterrorism. New models of monitoring shifting community health care needs in real-time (i.e., mental health surveillance) as well as innovative models for delivering care are required. The mental health care system, as part of the medical care system, must join with the public health and emergency response systems to address needs for triage, surge capacity, and health surveillance in order to best provide care for communities exposed to bioterrorism (Figure 1.1).

After a bioterrorist attack the mental health needs of the general public as well as that of three specific groups must be addressed. These groups are those who are directly exposed, those with pre-existing psychiatric illness, and those with limited support systems and resources (see Figure 1.2). Mental health intervention includes prompt and effective medical response to a bioterrorist attack. Early detection, successful management of casualties, and effective treatments bolster the public's sense of safety and increase confidence in our institutions. Mechanisms and tools that target distress responses, mental health/illness, and changes in behavior after high stress events are needed (Figure 1.3). Because the overriding goal of terrorism is to change

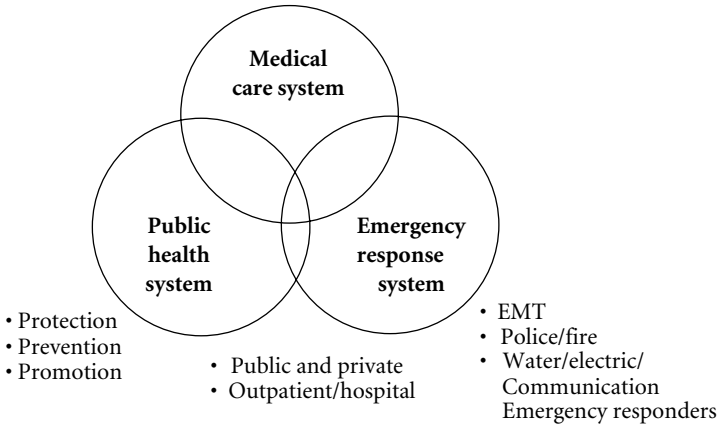

Figure 1.1. The Public's health after a bioterrorist attack is dependent on the integration of the medical care system, public health system, and emergency response system.

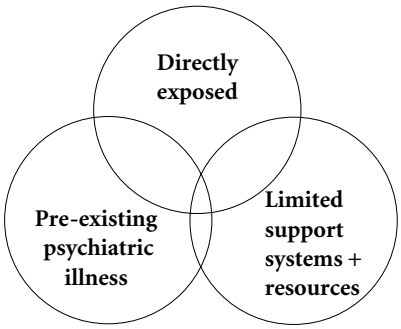

Figure 1.2. Populations at risk after bioterrorism.

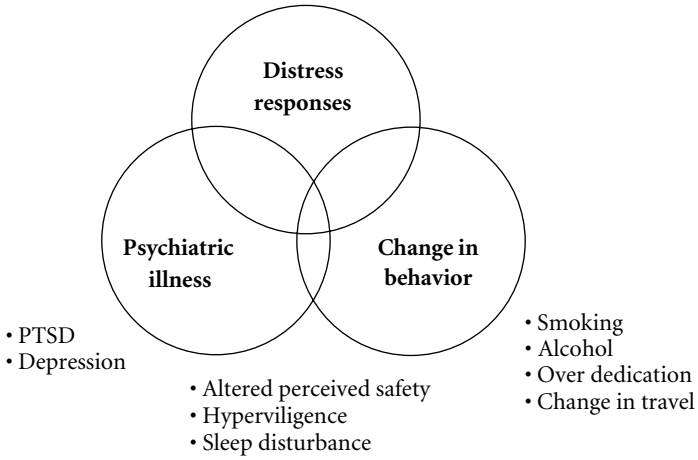

Figure 1.3. Mental health outcomes after a bioterrorist attack.

people's beliefs, sense of safety, and behaviors, mental health experts are an essential part of planning and responding to terrorist events.

Institutions that must respond to the sudden surge of need following a bioterrorist event are particularly vulnerable to disorganization and breakdown. Although organizational panic is rare in disasters (Glass and Schoch-Spana, 2002), these groups and institutions, which may be overwhelmed by mass casualties and massive demands, are at some risk of panic. An untrained, uneducated, and unprepared staff may also be at risk of a panic response. Planning and pre-disaster exercises are critical to the prevention of panic responses. In these extreme environments the use of telephone conferences, video teleconferences and other technologies for providing mental health intervention can conserve limited resources and diminish disease transmission and can aid in training and planning. Experts should help determine the skills needed for effective mental health preventive strategies and interventions. These skills can then be taught and refreshed across the medical training and education levels.

Communication, a core principle of mental health and behavioral care, is central to consequence management following a bioterrorist attack. The initial detection of disease begins a period of uncertainty in which the source of exposure, the scope of the outbreak, the number of people exposed, and the possibility of other agents being used is not fully known. The public's primary concern is about safety. Because biological agents are imperceptible without special tools and procedures, the public will actively seeks information to gauge whether they are at risk and what steps they can take to protect themselves.

The experience of feeling threatened or safe depends heavily on the information provided by the government and scientific experts (see Substance Abuse and Mental Health Services Administration (SAMHSA): http://www.samhsa.gov). Most of this information is obtained through the mass media (Tønnessen *et al.*, 2002). Risk communication and news coverage revealing the relative efficacy of the efforts to manage consequences of bioterrorism play a central role in how groups and individuals react – whether or not they perceive themselves at high or minimal risk, whether they have confidence in the government and medical response, and their determination of what protective actions should be taken.

Difficulty translating scientific information, conflicting risks and messages, and disagreement on the extent of the risk and how to assess it presents key challenges (US Department of Health and Human Services, 1999). Physicians have the ear of the community in their medical office, at community school and functions and through the media, and therefore are an important natural network for educating about risk and prevention. Importantly, health care providers and the health care system are first responders in bioterrorist events. Information from official and unofficial sources before, during, and after a disaster will shape expectations,