

Mental Health Consequences of Bioterrorism

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The threat of a large-scale incident involving intentional release of biologic agents is a matter of great concern for the medical community. Since the horrific mass casualty terror attacks on 11 September 2001, and several malicious anthrax attacks identified worldwide, we should be alert to diseases caused by chemical and biologic warfare and exposure to radiation [1]. Biologic weapons are regarded as weapons of mass destruction, capable of bringing about a catastrophic effect on the health of large populations. The sudden presentation of a huge number of contaminated individuals will introduce an overwhelming challenge for the emergency response systems [2].

Unlike other disasters with large numbers of casualties, victims of bioterrorism do not witness a defined “event” with tangible elements of impact. Unique stressors should be anticipated, including ambiguity regarding the threat and means of defending against it, uncertainty in the face of protracted exposure and continuously increasing numbers of victims, overwhelmed medical systems, and depletion of crucial resources. The response of the public health authorities, including practices of detection, decontamination, immunization and antimicrobial therapy, may contribute to the fear and confusion. Community disruption may be aggravated by relocation or quarantine and compromise the capacity for adequate coping.

Government and medical responders should be aware of the mental health consequences of bioterrorism. In addition to adverse and possibly serious psychiatric morbidity, psychological reactions may increase the case load, impose an additional diagnostic burden, and hinder cooperation with preventive efforts. Furthermore, healthcare workers and other disaster responders are at risk for adverse psychological outcomes and their own psychological needs must be adequately addressed.

Mental health consequences of disasters

Disasters are serious traumatic events that overwhelm both individual and community resources. The individual trauma has been defined as “a blow to the psyche that breaks through one’s defenses so suddenly, and with such brutal force that one cannot react to it effectively.” The collective trauma, on the other hand, is defined as “a blow to the basic tissue of social life that damages the bonds attaching people together and impairs the prevailing sense of community” [2]. The traumatizing effects of disasters extend far beyond those who are directly exposed to the event to include all “people whose lives have been affected adversely by their direct or indirect exposure to catastrophe, whether or not they might have contributed to their misfortune” [3].

A role delineation model defines victims as *primary victims* – people directly exposed to the elements of the disaster; *secondary victims* – people with close family and personal ties to the primary victims; *tertiary victims* – people whose occupations require them to respond to the disaster; and *quaternary victims* – concerned and caring members of communities beyond the impact area.

Individual reactions to traumatic events vary and may change over time. In addition to the experience of life threat and physical injury, many victims (primary, secondary, tertiary or quaternary) suffer significant losses and have to cope with extremely stressful situations, such as concern for missing family members, destruction of home and relocation, or serious health problems. Many of the (directly or indirectly) exposed individuals will exhibit some symptoms, understandable as “a normal response to an abnormal event.” Most of them will recover and will not suffer long-term psychiatric morbidity. Some may even experience trauma as a growth-enhancing experience that changes their perspective on life and enables them to experience the new strength they find in themselves, their family and their community [4]. Some, however, will suffer an enduring psychiatric disturbance, including post-traumatic stress disorder, depression, substance abuse, anxiety and somatization.

The human response to extremely stressful events is related to the cognitive appraisal – the evaluative process that intervenes between the encounter and the reaction – and to the efforts made to manage stressful demands, namely coping mechanisms. Coping is a dynamic process, changing through continuous appraisals and reappraisals of the shifting person-environment relationship. Coping serves the functions of managing the environmental problems and demands of the event (problem-focused coping) and regulating the emotional response of the exposed individual (emotion-focused coping). Emotion-focused forms of coping often include cognitive strategies directed at lessening emotional distress, such as avoidance, minimization, distancing, selective attention, positive comparisons, and attribution of positive meaning to negative facts. Denial (disavowal of reality) is often regarded as inherently maladaptive: it may lead to failure to engage in appropriate problem-focused coping. Yet in certain extremely stressful circumstances, some degree of denial (i.e., realization of the facts while denying some of their implications) may be appropriate. Problem-focused efforts include strategies directed at problem-solving (such as problem definition and weighting alternatives) as well as strategies directed inward, such as shifting the level of expectations, reducing ego involvement, improving personal skills, and adopting new standards of behavior [5].

The responses to a disaster are related to the nature of the event. Thus, man-made disasters cause more symptoms than do natural disasters, particularly events involving victimization, such as terrorist incidents, torture or physical assault [6]. In technological disasters involving radiation or toxic emission, the actual "event" cannot be seen, and illnesses (such as malignancies and genetic malformations) may emerge after a long time. The absence of tangible aspects of the destructive agent and the lack of a predictable course, together with the public's perceptions and fears regarding hazardous materials, make these disasters more psychologically harmful [7]. In events with little or no visual impact, the community may have less sense of shared experience and victims may feel alienated, abandoned or stigmatized. Long-term studies of people exposed to contamination disasters revealed persistent high levels of emotional distress that actually increased over time [8]. Typical symptoms include somatization, intrusive thoughts, troubled concentration, anxiety, hostility, and low grade agitation and depression. Unlike PTSD, the pathology is less likely to include nightmares and reenactments.

Other factors that may influence the response to disaster are related to the severity of exposure to elements of the disaster. Risk for adverse outcome is greater when survivors experience injury or life threat, bereavement, horrors, separation from family (especially for young children), relocation or displacement, extensive property loss, significant community disruption, or exposure to death [9]. Groups that may have special difficulties to utilize psychosocial resources may be at higher risk for developing psychological problems. These groups include children, frail elderly, people with serious mental illness, racial and ethnic minorities, and people with special needs, such as those with visual or hearing impairment, limited mobility, or serious chronic illnesses.

Normative post-disaster reactions of individuals and communities form a relatively predictable pattern from the onset of the disaster through the subsequent 18–36 months. Four phases of response have been identified [10]: impact, early post-disaster, disillusionment, and recovery-reconstruction.

- *The impact phase* is the immediate phase of impact. Most people will respond in a manner appropriate to the perceived threats and the realistic demands of the situation. During this phase, often referred to as "the heroic phase," inordinate levels of energy are directed into activities of rescuing and helping. Survivors are often also the first responders to the disaster, initiating rescue activities at the disaster site. Increased physiologic arousal and behavioral activity may last from a few hours to a few days. At this stage, some people may exhibit maladaptive reactions, such as disorganized or apathetic behavior, and may not be able to respond appropriately to protect themselves. Symptoms of extreme "peritraumatic" stress reactions may include dissociation, intrusive re-experiencing, avoidance, anxiety, hyperarousal, depression, and – in its most extreme form – even psychotic symptoms such as delusions and hallucinations.

- *The early post-disaster phase* or "honeymoon" period is often characterized by community and survivor optimism. Public and media attention, VIP visits, and influx of resources reassure survivors that their normal life can soon be restored. Gradually attention and resources are withdrawn, the energy experienced initially is replaced by fatigue, and denial alternates with intrusive symptoms. At this phase a minority of survivors experience symptoms that warrant the diagnosis of acute stress disorder. To meet DSM IV diagnostic criteria, the disturbance must last from 2 days up to 4 weeks, and is marked by dissociative symptoms (sense of numbing, detachment, reduced awareness to surroundings, derealization, depersonalization, or amnesia), and distressing re-experiencing of the event (recurrent images, thoughts, dreams, illusions, flashback episodes, or the sense of reliving the experience on exposure to reminders of the traumatic event) [11].

- *The disillusionment phase* usually follows, as the survivors experience the reality required to restore their lives. This phase lasts up to a year and is marked by disappointment and resentment. The sense of community diminishes, while complaints of betrayal, abandonment, lack of justice, bureaucratic red tape and incompetence are ubiquitous.

When symptoms of acute stress disorder persist for longer than 1 month, the diagnosis of PTSD should be considered [11]. Some survivors who seemed to do well in the immediate aftermath of the disaster may suffer a delayed-onset PTSD that may appear months or even years after exposure. The predominant manifestations of PTSD include symptoms of persistent and distressing re-experiencing of the event, persistent avoidance of stimuli associated with the trauma, and symptoms of increased arousal, such as irritability, outbursts of anger, impaired concentration, sleep disturbances, hypervigilance, and exaggerated startle reaction. PTSD may become a chronic disorder with significant psychiatric impairment.

- *The recovery-reconstruction phase* may last from a few months to a few years. Recovery involves regaining an adequate level of functioning, resolution of psychological symptoms, and resumption of pre-disaster energy. Often the first year anniversary of the disaster triggers some post-traumatic symptoms. In the aftermath of destruction and pain, many experience personal and social transformation, feelings of increased understanding of the fragility of life, and the adoption of a sense of moral commitment – that the personal and group trauma must be converted into a community asset and not remain a personal experience or catastrophe [12].

Uniqueness of bioterrorism

Compared to other forms of terror, bioterrorism is unique in several aspects:

No single impact event

In virtually all forms of terror other than bioterror, there is one event (or a chain of singular events) that initiates a cascade of casualties. For example, explosive devices and chemical weapons create an impact event to which both the authorities and the general

PTSD = post-traumatic stress disorder

population can refer. Bioterrorism is typified by the lack of such an impact event. Thus, bioterrorism is exposed only by its consequences (i.e., patients suffering from specific infectious diseases).

Invisibility

Actions of terror are, in most cases, visible. In many instances, the visibility of the terror action may be central to their occurrence and serves the targets of the terrorists. Bioterrorism actions are non-visible in essence. The public is not exposed to the actual action of terror (e.g., dispersion of the biologic agent) but rather to its consequences. This has immense effect on the public reaction to the act of terror: People experiencing other forms of terror or catastrophe (e.g., fire, flooding, etc) generally act responsibly, even altruistically, because they have sensory cues that enable them to assess the threat and to plan their rescue [13]. In bioterrorism, such sensory cues do not exist and thus individuals will be deterred from providing help to those who are afflicted. In addition, the very idea of infection caused by invisible agents touches a deep human concern about the risk of being destroyed by a powerful, evil, imperceptible force. These beliefs activate emotions that are extremely difficult to direct with the tools of reason [14] and create a unique informatory and communicational challenge.

Self-expanding nature of bioterrorism

Terror other than bioterror is usually self-limiting. Thus, the effect of exploding devices and chemical agents is brief. Bioterrorism, in contrast, is typified by its tendency to expand in a non-limited (and sometimes logarithmic) manner. Thus, if bioterrorism remains uninterrupted, the harmful biologic agents will not be diminished.

Contiguosness

One basic element in bioterrorism is dispersion through contiguosness. This has many implications on the general population, and in particular on the personnel who come in contact with afflicted individuals. The matter of contagion raises various societal and ethical dilemmas, exemplified by the potential necessity to isolate given areas in order to prevent further dispersion of the hazardous bio-agent.

Tendencies to minimize and deny the implications of bioterrorism

The invisibility of bioterrorism invites various psychological defense mechanisms that result in minimizing, and even denying, its possible harmfulness. Several studies have shown the centrality of avoidance coping mechanisms in AIDS patients. It was shown that a stressful environment [13], depression, and lack of social support [14] are all related to minimizing and denying the possibility of being infected with AIDS. Such avoidance coping mechanisms may, in the case of AIDS, result in infrequent condom use [15] and a wider dispersion of the disease [16]. It is more than probable that similar coping mechanisms will also dominate the reactions of a large portion of the population in the case of bioterrorism. Such minimizing or denying mechanisms might prevent early diagnosis and treatment, and may interfere with the preventive efforts that are undertaken at the individual and community levels.

Postponed effect of bioterrorism

In bioterrorism, there is a time lag between exposure and onset of the first symptoms and the development of the full-blown disease [17]. Thus, the disease will be dispersed before professionals will become aware that an attack has occurred. In addition, in diagnosis time many individuals may already be (or think they are) affected by the bio-agent, thus increasing distress and anxiety.

Management of bioterrorism

The goal of mental healthcare following a disaster is to help individuals and the community restore psychological and social functioning and reduce the incidence and severity of disaster-related mental health problems. In the case of bioterrorism, the immediate attention of mental health workers will be devoted to the possibility of direct consequences of the bio-agents. Biologic warfare agents may act directly on the central nervous system and produce a wide range of psychiatric symptomatology [see 18 for review]. Potential biologic weapon agents include anthrax, botulinum, tularemia, plague, brucellosis, Q fever, smallpox, viral encephalitis, viral hemorrhagic fevers, and staphylococcal B enterotoxin. Delirium is possible with all these agents. The viral encephalitides can also produce long-term cognitive impairment and alterations in mood. Anthrax spores can produce rapidly progressive meningitis. Depression, irritability and headaches occur in persons with brucellosis, and nearly all fatalities from this infection involve either the endocardium or the central nervous system. About one-third of patients with Q fever complain of malaise and easy fatigue, and in more advanced disease they may develop encephalitis with hallucinations. Botulinum toxins result in a progressive paralysis, with the delayed recovery of muscle power. Survivors may require months of ventilator use and may become demoralized and depressed.

The early detection of bioterrorism is crucial to contain dispersion of the bio-agent. The signs and symptoms of the various agents used in bioterrorism are common and non-pathognomonic. Mental healthcare professionals may provide valuable information and help in identifying clustering of mental and behavioral signs that could indicate a bioterrorism event.

It is most probable that after news of a biologic attack, mental and behavioral symptoms will be shared by large portions of the population and will lose their diagnostic specificity. In extreme cases, when very large numbers of individuals adopt, unconsciously, symptoms that are associated with the infecting (or presumably infecting) bio-agent, the term mass hysteria is used [19,20]. Such exceptional cases call for prompt action by the authorities, as many of these episodes could be halted with reassurance and dispersal of the affected population [18].

The directly induced psychiatric symptomatology in bioterrorism is not essentially the sole source for the emergence of behavioral and mental health problems. Thus, regardless of a possible CNS effect of the biologic agent, disorders of mood, cognition and behavior will be among the more common findings in the exposed

CNS = central nervous system

(or possible exposed) population. Many of the psychological and behavioral effects to be found would relate to the uncertainty, fear and panic that may accompany the incident. Psychological responses (anxiety, depression and dissociation) should be managed in ways that facilitate triage, and diagnosis and treatment for those exposed or infected. Debriefing, commonly used by emergency personnel following trauma, may be of help in mitigating the effects of severe trauma and can identify individuals who may need further assistance. Although some investigators question the value of debriefing [21], others believe it is effective in reducing later post-traumatic symptoms [22,23]. The traditional, office-based approach is of little use in a disaster. Bringing people together by an active outreach approach (through schools, disaster shelters, community centers, etc.) is essential since many of the affected individuals will hesitate to actively ask for help. In cases of a highly infectious bio-agent, gathering people for a debriefing may be contraindicated. In such instances, tele-debriefing is a technology that could be applied, although its efficiency is not yet known [24].

In all likelihood, any incident involving a biologic device will be handled initially by local personnel and medical facilities. Medical workers who are summoned following a biologic incident will encounter fear, anxiety, panic, somatization and grief at the individual and community level. To these expected phenomena, one should add the fear of infection. As biologic agents may be contagious, the personnel coming in contact with affected (or presumably affected) patients may be thrown into anxiety, ambivalence and even avoidance. Such patterns of behavior may be demoralizing, and should be dealt with by providing relevant information (e.g., how contagious is a given agent) and appropriate means of protection (protective clothing, vaccinations).

With regard to nationwide management of bioterrorism, an emphasis on effective communication is a matter of necessity [18,24]. Inaccurate, confusing or contradictory information provided to the public may critically affect how communities and individuals will respond. Accurate and transparent data are vital in order to diminish anxiety-provoking speculations and unreal fears. Moreover, it may reduce avoidance coping mechanisms and thus improve the overall management of biologic terrorism. A preliminary study [25] also indicated that in the case of radioactive catastrophe (the Three Mile Island accident), the handling of information by officials and the media became a major source of short and long-term anxiety for people living in the vicinity of the nuclear facility.

Another important issue to be stressed in the management of bioterrorism is preservation of the basic communal and societal structure. The social atmosphere in the case of bioterrorism may be charged with uncertainties, prejudice and fear. In such instances, the importance of unchanging communal and social structures cannot be overemphasized. Thus, drastic changes (e.g., diversion of patients from a regional medical facility to facilities outside the immediate geographic area) should be avoided.

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