5. Psycho-social impacts of bioterrorism and stress in the wake of 9/11

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INTRODUCTION

Biological warfare (BW) and bioterrorism (BT) use microorganisms (bacteria or viruses) or toxins (products of living organisms) to induce death and disease. Ultimately, bioterrorism would be used to attack a society by inducing fear and vulnerability in the public. The public perception of bioterrorism changed dramatically in October 2001, following the recognition of casualties, including deaths, due to anthrax in the US mail (CDC, 2001). Mother Nature has also terrorized humans with infectious disease outbreaks, including three plague pandemics (for example, the infamous Black Death during the Middle Ages), the 1918 Spanish influenza pandemic, numerous smallpox epidemics throughout the world, several Ebola hemorrhagic fever outbreaks in Africa, and, most recently, the Severe Acute Respiratory Syndrome (SARS) which emerged from China in 2002 and rapidly spread around the world in a matter of weeks. Currently, many people are concerned (or even fearful), that a new influenza pandemic (perhaps involving avian influenza) may strike the world.

Although terrorism has been around for ages, the recognition of the psycho-social impact of terrorism has been more recent. In 1995, the world was shocked by two major terrorist attacks – the Aum Shinrikyo sarin attack in the Tokyo subway system and the large truck bomb attack of two home-grown American terrorists, Timothy McVeigh and Terry Nichols, on the Murrah Federal Building in Oklahoma City. Since then, Al Qaeda has been responsible for two embassy attacks in Africa, the infamous September 11, 2001 attacks on New York City and Washington, DC, the Madrid train attacks, and the London bombing attacks. In each of these

* Disclaimer: The ideas expressed in this chapter are private views of the author and do not reflect the policies or positions of the US Department of the Army, the US Department of Defense, or the US government.
terrorist attacks, the psycho-social impact and trauma have been tremen-
dous.

In this chapter, we shall introduce and explore the psycho-social impact of bioterrorism. As can be imagined, the impact will be both widespread and complex. We shall begin with the topic of risk, risk perception, and the media. Much of the psycho-social impact will be based on risk perception, which is influenced by risk communication by leaders and information and reporting by the news media. We shall follow that with an introduction to bioterrorism and natural outbreaks of infectious disease. The BW agents will be introduced with various possible bioterrorist scenarios that might occur. Outbreaks of contagious disease, whether bioterrorist induced or natural will also be discussed. We shall then explore who will be affected – community, healthcare workers, and patients and their families.

RISK, RISK PERCEPTION, AND THE MEDIA

How people act and react to a bioterrorist attack changes during the sequence of events that occur. Much of the action and reaction will be based on risk. One approach to risk communication states that risk equals hazard plus outrage (Sandman, 2003). The hazard is a scientifically based risk assessment, whereas the outrage is made up of less-quantifiable factors of the public’s concern and perception of the biological exposure event. Thus, the risk continuously changes and evolves, based on the risk perception not only to the initial event, but to each event that ensues, including the actions and risk communication of leaders, media representation of the event and the response, and the success or failure of the various actions taken in response to the event.

In a BT event, the beginning and extent of the danger will not be known immediately. Unless the perpetrator is caught, there may well be a dread of possible multiple attacks spread over time. In a bioterrorist attack or natural contagious disease outbreak, information becomes extremely important. The public is eager for information and needs to know what precautionary measures should be taken to protect themselves. Public health authorities and public officials must calculate the extent of the threat, and inform the media and the public about the event and what precautionary measures to take. Mayor Rudy Giuliani of New York City was extremely effective following the events of September 11 and the ensuing anthrax attacks in October, 2001. He demonstrated the value of daily or twice-daily scheduled briefings with the media and the public.

According to experts, the initial US government response to the 2001 anthrax attack in Florida violated many of the risk communication
guidelines for handling crises (Goode, 2001; Chess and Celia, 2002). Key principles include: full disclosure of what is known and not known; avoid speculation; detail what is being done to counter the threat; and give recommendations on how to protect oneself (Goode, 2001). Unfortunately, the early failures in risk communication undermined the government’s credibility. For example, the Health and Human Services Secretary provided inappropriately reassuring information when he announced that the anthrax exposure of the first victim was probably due to an exposure while hunting (ibid.). Federal officials also downplayed uncertainty when they initially dismissed the possibility of a threat to postal employees from mail containing anthrax (Lipton, 2001).

In Hong Kong, most respondents to a survey reported actively seeking SARS information on a daily basis, and relied more on mass media (television, newspapers and radio), than on medical professionals, friends, or the internet (Lau et al., 2003). Substantial misinformation and false beliefs persisted in Hong Kong adults even at an advanced stage of the SARS epidemic, despite constant media and public service announcements (Leung et al., 2003). Although information existed on precautionary measures, recommended measures were not practiced uniformly. Many people did not understand transmission routes – only one-third of respondents avoided direct contact by touch with contaminated objects (fomites) and less than half practiced at least five of the seven recommended precautions.

Risk perception is an important driver of the outrage component in risk communication. In the risk literature, a number of factors have been shown to increase the perception of risk, including potentially fatal illness, involuntary exposure (lack of control), catastrophic event, presence of an unknown perpetrator, delayed detection and reaction by authorities, and potential effect on future generations (Covello et al., 2001; Brecher and Flynn, 2002). A number of factors may further amplify risk perception – scapegoating, distrust of governmental and industrial experts, and news media hype and misinformation.

Death is always frightening and some of the BW agents are lethal, including several that have a long history of epidemics and death (for example, smallpox, plague, anthrax, and Ebola). BW agents are invisible and odorless, which leads to uncertainties of exposure, amount of exposure, and the possibility of disease and death. In many cases, the extent and location of an aerosol attack may be unknown until suddenly, throngs of sick and dying converge on hospitals. The BW agents may initially induce non-specific, flu-like symptoms – for example, fatigue, headache, nausea, dyspnea, dizziness, and muscle/joint ache. These ubiquitous symptoms may lead many people to seek treatment, even in the absence of any possible exposure. Thus, a bioterrorist attack would be likely to trigger a multitude
of risk perception factors, including involuntariness, uncontrollability, unfamiliarity, unfairness, uncertainty, dread, and distrust of institutions (Covello et al., 2001).

The news media can act as an important risk amplifier depending on how they select and frame risk messages to inform the public. Any ensuing media hype can create waves of fear due to intensive reporting (ibid.). Unfortunately, in the 2001 anthrax attacks, the news media hype and worst-case theorizing may have inflated the actual scope of the crisis and public fears (Goode, 2001). Mass media presentations of terrorist attacks such as the Oklahoma City bombing and the September 11, 2001 attacks have been shown to have a strong effect on post-traumatic stress symptomatology in both children and adults (Pfefferbaum et al., 2001; Schuster et al., 2001; Ahern et al., 2002; Schlenger et al., 2002). Mass media has also played an important role in various outbreaks of multiple unexplained symptoms (OMUS) (Vasterman et al., 2005).

BIOTERRORISM AND NATURAL OUTBREAKS OF INFECTIOUS DISEASE

Although the use of infectious diseases as weapons is very old, sophisticated use of pathogens is relatively recent. Development of offensive biological warfare programs began in earnest during and after the Second World War (Woods et al., 2005). Both the Former Soviet Union and Iraq had known offensive BW programs (Davis, 1999). What seems to be more recent is the use of BW agents in BT acts. Although the anthrax attacks through the mail in the US in 2001 are well known, much less publicized were the attempted use of anthrax by the Aum Shinrikyo cult in Tokyo (Takahashi et al., 2004) and the successful bioterrorist use of a salmonella strain in The Dalles, OR in 1984 (Torok et al., 1997). Of special note is that, as of August 2007, the perpetrator(s) of the US anthrax attacks has not been captured.

Bioterrorists have a wide choice of organisms and toxins to choose from, but some are more frightening and effective than others. The US Centers for Disease Control and Prevention (CDC) convened a meeting of national experts who differentiated biological agents into three categories of concern (Rotz et al., 2002). Category A agents were of most concern because of lethality, public fear, and public health requirements. The Category A agents include botulinum toxin and the organisms responsible for anthrax, smallpox, plague, tularemia, viral hemorrhagic fevers (for example, Ebola and Marburg). Category B agents can also be disseminated widely, but would be less lethal, and Category C agents were emerging threat agents.
In 1970, the World Health Organization (WHO) estimated the effects of 50 kilograms of a dried powder containing various biological agents released as an aerosol over an urban population of approximately 500,000 people (WHO, 1970). Mortality estimates ranged from 150 to 500 for Category B agents (Q Fever, Venezuelan Equine Encephalitis, and Brucellosis) to 30,000 to 95,000 for Category A agents (tularemia, plague, and anthrax). Morbidity and incapacitation ranged from 35,000 to 125,000 for the three Category B agents and from 100,000 to 125,000 for the Category A agents. The US Department of Homeland Security (Homeland Security Council, 2004) has published five biological scenarios: aerosol anthrax, pandemic influenza, pneumonic plague, food contamination with anthrax, and a foreign animal disease (Foot and Mouth Disease). These scenarios were developed to help communities test response capabilities and resources. Fatalities in these scenarios range from 300 in the food contamination scenario to 87,000 for the pandemic influenza.

Many of the BW agents pose problems with diagnosis because they initially present with flu-like symptoms which are non-specific. In the absence of a specific diagnosis, empirical treatments are often attempted, but not all the agents respond well to typical first-line treatment. Most of the bacterial diseases have effective antibiotics, but they may not be the typical empirically prescribed treatment. The only existing treatment for many of the viral diseases and botulism is supportive care. Finally, regardless of whether effective treatment or supportive care exists, most cities do not have adequate resources, drugs, medical equipment or medical personnel, to handle a large outbreak of hundreds to thousands of patients.

Another important differentiation among the different biological agents is whether they are contagious. According to Stedman’s Medical Dictionary (Pugh, 2006), contagious means ‘communicable or transmissible by contact with the sick or their fresh secretions or excretions’. Fortunately, most of the biological agents are not contagious. For non-contagious biological agents (for example, anthrax, tularemia, botulinum toxin), the threat will be from the initial dissemination of the agent. However, smallpox and pneumonic plague are contagious via respiratory droplets, while the viral hemorrhagic fevers (for example, Ebola and Marburg) are transmissible via direct contact with secretions or excretions. Two epidemic diseases found in nature, influenza and SARS, are also transmissible via respiratory droplets. Transmission via respiratory droplets typically requires close, intimate face-to-face contact (3–6 feet), which is why healthcare providers are at risk unless properly protected with personal protective equipment (PPE). Unfortunately, the general public probably will not recognize that most biological agents are not contagious and may stigmatize infected people, regardless of whether they pose a risk.
Contagious diseases present the horror of a continuing epidemic, as infected people may transmit their infection to non-protected people. Protection may be from PPE, such as gloves and masks, and for some diseases, from prophylaxis, such as a vaccine or prophylactic antibiotics. Contagious diseases require an enormous public health effort for medical evaluations, medical surveillance, and possibly, quarantine of people exposed to infected people. Given the current managed medical care in many countries, there is very little surge capacity to handle large numbers of sick patients.

During an outbreak of an infectious disease, initial identification of the disease organism may take some time and will probably occur as a result of multiple people converging on hospitals with similar symptom syndromes. Disease outbreaks caused by initially unknown agents are likely to provoke anxiety in the general public. Distinguishing between a natural and a covert intentional outbreak may also take time. However, once an attack has been identified as an intentional bioterrorist attack, the public may well react with additional anxiety and fear. A large-scale aerosol BT attack may be very deadly, and the resulting fear may last for a long time, especially if the perpetrator is not caught.

WHO IS AFFECTED?

Many different kinds of psycho-social effects are likely to be seen following a bioterrorist attack. We shall look at three different groups affected by a bioterrorist attack or natural outbreak of epidemic disease: the community, healthcare workers, and patients and their families.

Community Response

Collective (group) responses

Mass panic Community response can be broken down into collective or group responses and individual responses. For most planners, the most common fear is that there will be a collective response of mass panic. Strictly speaking, mass panic means an acute fear reaction marked by loss of self-control and followed by non-social and unreasoning flight (Quarantelli, 1954). However, flight can be a normal reaction to the presence of a perceived immediate danger. Flight becomes a mass panic only when large numbers of people stampede without regard to others in an attempt to escape danger. Most commonly, mass panic occurs in situations with an immediate danger and limited escape routes, for example, fires in a
building with limited escape routes. In 1994, following a pneumonic plague outbreak in Surat, India, an estimated 4–6 hundred thousand people fled the city, including hospital staff, private medical practitioners, and municipal workers (Kumar, 1994; Madan, 1995; Ramalingaswami, 2001). However, there was no report of a mass panic involving non-social behavior. In this case, many people may have lacked confidence in the local government’s response to the outbreak and took the precaution of leaving the area. Due to the nature of a bioterrorist attack, by the time the event has been identified as an attack, it will be long after the event. Thus, mass panic will be very unlikely. However, mass flight might be a possibility.


**Worried well**  Another common fear is that hospitals will be swarmed by the ‘worried well’. This presupposes that the worried well are not suffering real symptoms and have not been exposed, but are simply worried that they might be ill. However, after a BT event, many people may have an unknown exposure and may or may not be symptomatic. The term ‘worried well’ is a pejorative term and should not be used as it may interfere with the doctor–patient relationship. Unfortunately, there is no generally acceptable term that has taken its place. Perhaps we should take note of a diagnosis that was used in the First World War – NNYD – Nervous, Not Yet Diagnosed (Salmon and Fenton, 1929).

In the first Persian Gulf War, Israel was attacked with scud missiles. Initially, many Israelis feared that the missiles would contain sarin, a lethal nerve agent. Following the initial scud attack, there were 22 minor injuries, but also 172 stress casualties and 171 people who had injected themselves with atropine, a nerve agent antidote (Bleich et al., 1992).

Depending on the situation, there may or may not be an increase in patients who are ‘asymptomatic’. After the anthrax attacks in the US, there were hundreds of prescriptions for ciprofloxacin (used to treat anthrax) doled out to people who had no reason to believe that they had been exposed (Steinhauer, 2001). Hospitals reported that their already busy emergency rooms were filled with people anxious about anthrax, many demanding treatment.

The picture is less clear with SARS, due to a lack of reporting in the literature. One urban emergency department in Taiwan reported that there was a more than 30 percent drop in the number of patients when comparing the 30 days previous to the first reported hospital associated transmission of SARS (period 1) to the 30 days after (period 2) (Chen et al., 2005). There was almost a 4 percent drop in non-trauma patients younger than 18 years, a 2.5 percent increase in patients with a body temperature greater than 38° C, and a 4 percent increase in patients with a chief complaint of fever. In comparing the ratio of patients with fever divided by those
complaining of fever, the percentage increased from period 1 (56 percent) to period 2 (80 percent), which suggests that people were more accurate about a suspected fever.

**OMUS** Another important collective behavior phenomenon has variously been called mass psychogenic illness, mass hysteria, and epidemic hysteria (Colligan et al., 1983; Wessely, 1987; Boss, 1997). Unfortunately, these terms all have a pejorative connotation. For example, ‘hysteria’ presupposes an overemotional response to an event and implies that mostly females are involved. Use of the term ‘mass hysteria’ by media, medical personnel, and/or public officials can lead to a negative perception of medical personnel and public officials by the people affected by an event and vice versa. Similarly, mass psychogenic illness implies that symptoms are ‘all in the head’ and thus, not real. A preferred term is ‘OMUS’, an acronym for outbreak of multiple unexplained symptoms (Pastel, 2001). Although clumsy, this term is still relatively neutral. OMUS is also descriptive – the symptoms are real and unexplained, not ‘all in the head’.

It should also be clear that not all OMUS occurs in young, school-age females. For example, in one incident, 1800 men were evacuated from their barracks due to an epidemic of coughing, dyspnea, and chest pain that broke out at a military recruit training center (Struewing and Gray, 1990). Over 350 men were taken to local hospitals, with eight being admitted. Although recruits and medical personnel suspected an airborne toxin, none was detected.

The cause of OMUS is not an either/or phenomenon that can be deduced by ruling out toxic or infectious agents. Symptoms of psychological origin can co-occur with exposure to an actual agent. In other words, some casualties may have psychological reactions in addition to reactions caused by a toxic agent. However, not all symptomatic casualties may have been exposed to a toxic agent (Singer, 1982). A case in point occurred in 1987, when the radiation accident in Goiania became public. The threat of possible radiation exposure caused an estimated 125,000 people (10 percent of the population) to be screened for contamination (Pettersson, 1988). Approximately 5000 (8 percent) of the first 60,000 people to be screened presented with symptoms that mimicked radiation sickness (rash around neck and upper body, vomiting, diarrhea and so on), but none of these individuals was contaminated (ibid.).

In the fall of 2001, the US was shocked by anthrax letters in the mail which led to 22 cases of anthrax (11 inhalational and 11 cutaneous) (CDC, 2001). Less well-known or remembered is that following the airplane attacks of September 11, 2001 and prior to the first case of anthrax, there had already been increased purchases of gas masks and ciprofloxacin.
There were anecdotal reports of people not opening their mail, or only opening it outdoors.

The outbreak of SARS, a new and emerging infection, created much fear and anxiety. In Beijing, schools and universities were closed, hundreds of companies closed their doors, and some surrounding villages shut themselves off (Pomfret, 2003). Rumors of neighborhoods being quarantined led to people stockpiling food (Eckholm, 2003). Although officials asked people to avoid travel, thousands of businessmen, migrant workers, and college students left Beijing.

Individual responses

Risk communication

Risk communication will be critical in a bioterrorist event or a natural outbreak of a contagious disease. In one study of multiple focus groups, participants reacted with increasing fear and concern as the scenario of an attack with plague evolved with increasing casualties and deaths (Wray and Jupka, 2004). They wanted to understand: (i) the nature of the threat, (ii) the protective actions they should take if they had not been exposed, (iii) the steps to take if they might have been exposed, (iv) the steps to take if they had been exposed and (v) information related to the actual event. Participants indicated that they would look for information from local civil authorities, emergency responders, medical personnel, and local and national media.

A second study involving focus groups utilized a botulinum toxin bioterrorist scenario (Glik et al., 2004). Emotional responses included fear, anxiety, distress, nervousness, and helplessness and a concern for the safety of children. Three groups of responses were noted for behavioral intents. Most planned to ‘stock up’ on supplies, while others talked about leaving town, and a third group had a ‘wait and see’ intent. As the scenario evolved, participants’ fear increased and they were eager for information concerning health and safety for themselves and their families. Fears started to reduce as the agent was identified, but there was a continuing hunger for more specific information about the attack.

In a contagious disease outbreak, the public is especially eager for information and needs to know what precautionary measures should be taken. One study in Hong Kong found that most respondents actively sought SARS information on a daily basis, relying on television (90 percent), newspapers (71 percent), and radio (27 percent), but not many (<10 percent) sought information from medical professionals, friends, or the internet (Nickell et al., 2004). However, information seeking does not always translate into knowledge or practice. Another telephone survey done in Hong Kong at an advanced stage of the SARS epidemic revealed...
substantial misinformation and false beliefs in adults despite constant media and public service announcements (Lau et al., 2003). Lack of understanding of transmission routes led to a deficit in adopting some of the precautionary measures – specifically, only about a third of respondents avoided direct contact by touch with contaminated objects (fomites) and less than half practiced at least five of the seven recommended precautions. Recommended measures were not necessarily practiced uniformly. In Hong Kong, two studies found that the majority of respondents wore face masks and washed their hands with soap frequently, but in Singapore, they practiced hand washing, but only 4 percent wore masks (Lau et al., 2003; Leung et al., 2003; Nickell et al., 2004). All three studies also found age and gender differences associated with taking precautionary measures. Women were more likely than men to take precautions, and older people were more likely than younger people to take precautions. Two studies found that increased level of education also increased the likelihood of taking recommended precautionary measures (Lau et al., 2003; Leung et al., 2003).

**Quarantine**  The application of quarantine during the SARS epidemic became an important issue that had varied psychological effects. In Singapore, the government instituted a 10-day quarantine for persons in contact with a probable SARS patient. The quarantined homes were monitored for compliance and violators were forced to wear electronic bracelets (Grady, 2003). Taiwan did not allow non-citizens to enter from China, Hong Kong, or other affected areas and required citizens returning from affected areas to stay at home for 10 days (Nakashima, 2003). Unfortunately, compliance was low, ranging from 21–42 percent of people who registered with local health authorities. In early May, over 23,000 people were in home quarantine.

In the Greater Toronto Area, public health officials ordered a 10-day quarantine for people exposed to SARS (DiGiovanni et al., 2004). Over 15,000 persons with SARS exposure were instructed to remain in voluntary quarantine during the two SARS outbreaks in Toronto (Hawryluck et al., 2004). In one large Toronto school, 2000 students were quarantined after discovering that a student with symptoms had been attending classes for two days (McNeil, 2003). Other incidents included an infected nurse traveling on two commuter trains and an infected doctor who attended a funeral.

One study measured factors influencing compliance through interviews, telephone polling and focus groups (DiGiovanni et al., 2004). The primary motivation for compliance by nearly all the quarantined healthcare workers and the majority of the general population poll respondents was the recognition of the need to reduce the risk of transmission to others. Fear of
breaking the law played little role, except for some of the quarantined high school students who feared their parents would be punished if they broke quarantine. There were a number of obstacles to compliance, including: fear of loss of income, confusion over inconsistencies between jurisdictions in the application of quarantine measures, logistical support (medical supplies, groceries, and household supplies) and psychological stress resulting from social distancing and stigmatization. Of the quarantined healthcare workers, almost 40 percent were ‘pretty stressed’ or highly stressed.

A web-based survey of 129 quarantined persons, reported that nearly 30 percent were dissatisfied with the information they received about SARS (Hawryluck et al., 2004). They received their information from the media, public health authorities, occupational health departments, healthcare providers, word-of-mouth, and hospital or other websites. Quarantined persons reported wearing their mask in the presence of household members (85 percent) and remaining inside their home for the duration (58 percent). However, they did not comply as rigorously in self-monitoring their temperature: 33 percent did not monitor as recommended, 26 percent monitored less frequently than recommended, and 7 percent did not measure their temperature. Respondents exhibited a high prevalence of psychological distress; with 29 percent reporting post-traumatic stress symptoms and 31 percent reporting depression symptoms.

According to a descriptive study of 21 quarantined individuals in Toronto, the individuals described four sequential themes: life before quarantine, finding out, being in quarantine, and life after quarantine (Cava et al., 2005). Throughout the phases were three subthemes: uncertainty, isolation, and coping. The primary uncertainties listed were fear for health (of self or loved ones), disruption of daily life, and the uncertainty of an unknown new disease, while isolation included boredom, separation from others, rejection, stigmatization, and public scrutiny. Although isolation was primarily experienced during quarantine, the participants continued to experience stigmatization and scrutiny following the end of quarantine.

**Stigma**  Amoy Gardens was the housing area in Hong Kong which had 329 confirmed cases of SARS and 42 deaths from SARS (Lee et al., 2005). One study, using a self-report questionnaire, found that over 80 percent of respondents from Amoy Gardens reported that SARS had a deep effect on their daily life, 49 percent perceived discrimination by employers, and 48 percent reported problems with colleagues or clients (ibid.). Interestingly, many residents reported persistent symptoms of low mood (73 percent), irritability (57 percent), and insomnia (34 percent). Coping strategies varied – some (38 percent) concealed their residential status, while others (41 percent) moved out, or thought of moving out (36 percent).
Healthcare Workers (HCWs)

In a bioterrorist event or a natural outbreak of disease, the hospital becomes the battleground. Contagious diseases, whether from bioterrorism or nature, pose an additional risk to healthcare providers, in that HCWs can be inadvertently exposed and suffer illness and even death. In Canada, 375 people contracted SARS and 44 died, with most of the infections and deaths occurring in Ontario. Of these 375 SARS cases, 72 percent were infected in the healthcare setting: 45 percent HCWs, 15 percent patients, and 11 percent visitors (SARS Commission, 2006). In Taiwan, 160 doctors and nurses quit work at various hospitals out of fear of SARS and fear that infection control measures were inadequate (McNeil, 2003). Thus, the effects of bioterrorism on the healthcare providers can become very important.

Ability and willingness to work

Several studies have looked at the ability and willingness of HCWs to report for duty during catastrophic disasters. The ability to work refers to the capability of the individual to report for work and includes factors such as proximity of home to work, child- or elder-care responsibilities, and financial concerns (Qureshi et al., 2005). Willingness to work refers to the personal decision to go to work. In one study (ibid.) of healthcare facilities in New York City and the surrounding metropolitan region, HCWs were least willing to work during a SARS outbreak (48 percent), radiological event (57 percent), smallpox epidemic (61 percent) or chemical event (68 percent) compared to snow storm, explosion-related mass casualty incident (MCI), or environmental disaster (all >80 percent). Barriers to willingness were mostly frequently related to fear and concern for family and self. HCWs were least able to report for work during a severe snow storm (49 percent), SARS outbreak or radiological event (64 percent), and smallpox epidemic (69 percent). Also notable was that the highest levels of uncertainty for willingness to report were for SARS (30 percent), radiation (25 percent), and smallpox epidemic (24 percent). The authors stated that the ‘most effective methods to allay fears and concerns for personal safety revolve around HCW education, provision of appropriate PPE, and assurance of effective environmental controls’ (ibid., p. 386).

Psycho-social stressors

Many HCWs had a perception of personal danger which was heightened by uncertainty, the known lethality of SARS, and the intense media coverage of the outbreak. Social support became a problem in one Toronto hospital due to requirements for wearing a mask while in the hospital, lack of meetings with colleagues outside the hospital, and lack of staff meetings.
(Maunder et al., 2003). Often hospital staff avoided identifying themselves on the outside as hospital workers because they feared stigmatization within their communities. One Hong Kong doctor wrote: ‘No one wanted to come near me for fear of getting the disease . . . Even in the carpark, people would skirt around me to avoid close contact’ (Krauss and Altman, 2003).

Staff with potential contact with SARS were quarantined for 10 days in one Toronto hospital, which led to fears about safety of self and family, stigmatization, and feelings of isolation (Maunder et al., 2003). On the SARS isolation unit, staff had spikes of anxiety in association with changes in isolation procedures, HCWs entering quarantine or treatment, and when a discharged patient was readmitted with fever. Reports of fatigue, insomnia, irritability and decreased appetite were common in SARS staff. A doctor in Hong Kong wrote:

I was worried about going home in case I would infect my family. When I did get home, I felt physically exhausted and emotionally drained, and didn’t really want to talk to anyone. I would not and could not touch my wife or children for fear of giving them the disease. I slept in a separate bedroom; I ate separately. (Krauss and Altman, 2003)

One study measured the psycho-social effects of SARS on hospital staff in a Toronto hospital using questionnaires (Nickell et al., 2004). Almost two-thirds of the respondents reported concerns for their own or their family’s health. Factors identified by logistic regression analysis for significant association with increased concerns were perception of a greater risk of death from SARS, living with children, personal or family lifestyle affected by the SARS outbreak, and being treated differently by people because of working in a hospital. Emotional distress (as measured by the General Health Questionnaire–12) was found in almost 30 percent of all responders, but was 45 percent in nurses, who were most at risk from infection. Factors identified for significant association with emotional distress were being a nurse, part-time employment status, lifestyle affected by SARS outbreak, and ability to do one’s job affected by precautionary measures.

Patients and Their Families

Acute effects
One hospital in Canada reported that patients, who had to identify recent contacts, often felt guilty and fearful for their friends and family (Maunder et al., 2003). SARS patients often spent hours in isolation between contacts with staff and were deprived of family visits, leading to complaints of
sadness, anxiety, boredom, loneliness, and non-specific anger and frustration (Avendano et al., 2003; Maunder et al., 2003). Fear and anxiety often waxed and waned with fever (ibid.).

Referral of 10 SARS patients for psychiatric complications was reported in a Hong Kong hospital (Cheng et al., 2004). Seven patients had ‘mild’ psychiatric problems (anger, anxiety, suicidal ideas and depressive reaction) which was treated by telephone interview due to the strict infection control and barrier treatment in the hospital. However, three patients with more ‘severe’ problems – hallucinatory and manic features – required face-to-face interviews. Causes of distress included specific effects of SARS (for example, symptom severity and isolation) and indirect effects of SARS (total social isolation due to barrier nursing). Steroid therapy was implicated in the patients with organic hallucinosis or organic manic disorder.

In a study of 26 survivors of the 1995 Ebola epidemic in Congo (De Roo et al., 1998), almost all reported experiencing fear – of suffering, death, separation from relatives and/or abandonment by family. They reported suffering from the loss of friends and colleagues who died next to them in the ward and of abandonment by hospital staff at the beginning of the epidemic. What caused the most suffering was the isolation, including not being allowed visitors. During convalescence, over one-third reported rejection by society, including family, friends, and neighbors.

Many patients with botulism require ventilation (Cohen and Anderson, 1986). Botulism leads to a descending flaccid paralysis and leaves patients unable to breathe, speak, swallow, or communicate. These patients can deteriorate rapidly, and unless monitored closely, may suffer difficulty breathing, but may be too weak to communicate with hospital staff. In one study of 12 patients, patients reported high levels of fear, anxiety, and helplessness (ibid.). Family members suffered depression in addition to fear, anxiety and helplessness.

Long-term effects
Long-term effects have been reported for various diseases. For example, during the Second World War, American soldiers were exposed to unfamiliar diseases in the Pacific theater – malaria, filariasis, scrub typhus, and schistosomiasis (Frank, 1946). The duration and amount of invalidism was reportedly greater than might be expected from the organic manifestations of illness and greater than similarly affected natives. Q-fever has been associated with a post-infection fatigue syndrome, both in England and in Australia (Marmion et al., 1996; Ayres et al., 1998). Brucellosis has also been associated with chronic fatigue (Harris and Kemple, 1954; Imboden et al., 1959; Alapin, 1976). It is unknown whether these cases of chronic brucellosis are due to subclinical infection, localized infection, or are psychophysio logically.
Both post-traumatic stress disorder (PTSD) and a decreased health-related quality of life (HRQOL) were reported among survivors of an outbreak of Legionnaires’ disease (Lettinga et al., 2002). Patients reported symptoms of fatigue (75 percent), neurologic symptoms (66 percent), and neuromuscular symptoms (63 percent), 17 months after diagnosis of illness. HRQOL was impaired in seven of eight dimensions, and 15 percent of patients experienced PTSD. Others have reported decreased HRQOL and PTSD in survivors of acute respiratory distress syndrome (Weinert et al., 1997; Schelling et al., 1998). Most of the Category A biological warfare agents (BW A) cause acute respiratory distress syndrome, so similar long-term effects might well be expected, and may explain the reports in the anthrax survivors.

There have been numerous reports of decreased HRQOL following SARS in Hong Kong and Singapore (Hui et al., 2005; S.T. Lau et al., 2005; Kwek et al., 2006; Tansey et al., 2007). Reported problems include decreases in pulmonary function and exercise capacity (Ong et al., 2004; Hui et al., 2005; S.T. Lau et al., 2005; Tansey et al., 2007) and tachycardia (S.T. Lau et al., 2005). Increased stress, psychological distress, anxiety and depression have also been reported (Mok et al., 2005; Sheng et al., 2005; Wu et al., 2005a; Lee et al., 2007; Tansey et al., 2007). There has also been one report of PTSD from Hong Kong, which found that of 131 patients who responded at both timepoints, 4 percent scored above cutoff on all 3 impact of event scale–revised (IES–R) subscales at 1 month and 5 percent at three months post-discharge (Wu et al., 2005b).

Newspapers reported that survivors of the US anthrax attacks have suffered symptoms of fatigue, shortness of breath, chest pains, memory problems, nightmares, and rage 6–12 months after their illnesses (Broad and Grady, 2002; Stolberg, 2002). Only one was well enough to return to work. Symptoms were similar in both cutaneous and inhalational forms of anthrax. In one published study, survivors reported significant health problems, significantly greater overall psychological distress, and significantly reduced HRQOL one year after the onset of infection when compared with US referent populations (Reissman et al., 2004). The survivors of inhalational anthrax reported worse physical health than the cutaneous anthrax survivors.

A three-year study of 22 botulism patients and 51 family members reported that perceived psycho-social dysfunction persisted longer than perceived physical dysfunction (Cohen et al., 1988). Many of the patients reported fear of death, found the experience of the intensive care unit to be anxiety producing, and felt anxiety about perceived loss of control (Hardin and Cohen, 1988). Anxiety symptoms included a sense of dread, difficulty falling asleep, and difficulty concentrating. Almost half reported panic attacks. Depression and anger were also found in most patients. More
recently, 211 people in the Republic of Georgia who had experienced botulism were interviewed regarding long-term consequences (Gottlieb et al., 2007). Most had been hospitalized for one week to one month and 25 percent had required ventilatory assistance. Over two-thirds reported having worse health at the time of the interview compared with 17 percent of the case-control group. Current health was reported as ‘fair’ or ‘poor’ in almost half of patients, but only 25 percent of controls. Fatigue, weakness, dizziness, dry mouth, and difficulty breathing following moderate exertion (for example, walking or lifting heavy items) were reported more often in former botulism patients than in controls. Positive emotional factors (full of pep, calm and peaceful, energetic, happy) were reported less, and negative emotional factors (nervous, unable to sleep) were reported more in former botulism patients.

SUMMARY

This chapter has introduced and reviewed many of the potential psychosocial effects of bioterrorism. The recent outbreak of SARS has been particularly instructive, because many articles on various psychological effects were published. In contrast, publications on the psychological effects of previous epidemics and pandemics are rather sparse.

Although SARS was a natural outbreak, it can serve as a model for likely effects of a BT attack. Such attacks have the potential to cause large-scale illness and death. Measures that may be taken to reduce contagious disease transmission, such as quarantine of exposed persons, isolation of patients, social distancing, and other measures, are likely to increase anxiety and fear in patients, healthcare workers, and the general community. Both infected and exposed persons may well be subject to social stigma. Even nations may be affected by stigma.

Risk communication will be essential and will be a critical variable in the impact of a bioterrorist attack. Although poorly done in the American anthrax attacks in 2001, risk communication was much improved for the SARS epidemic. Lessons from the anthrax attacks and the SARS epidemic are currently being applied in pandemic influenza planning.

Collective behaviors such as OMUS may be common following the attack. Some long-term effects such as syndromes characterized by fatigue and multiple unexplained physical symptoms may persist. Other collective behaviors such as mass panic will be rare. However, many people will take precautionary measures. Effective risk communication will help educate people to take effective precautionary measures, but not all people will follow that guidance.
HCWs will be at the battlefront of any bioterrorist attack. Due to changes in medical care systems, most cities and countries have no surge capacity for a large influx of patients. The influx may well include huge numbers of stress casualties, asymptomatic but worried casualties, symptomatic but non-infected casualties, and symptomatic infected casualties. Hospital staff will be overwhelmed and understaffed. In a contagious outbreak, whether terrorist or natural, necessary protective measures will enhance the fear and stress of the HCWs, as will the fear and risk of death due to patient care.

Despite these fears and stresses, HCWs and hospitals persisted in overcoming a mysterious contagious disease – SARS – which appeared in 2003. The current fears of pandemic influenza are driving increased attention to public health, including the application of lessons learned from SARS. In some areas, funding for public health has increased as well. Bioterrorism has an enormous potential for disaster. However, the increased attention to public health and risk communication may do much to mitigate the psycho-social effects of bioterrorism.

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