

# Responding to Chemical, Biological, or Nuclear Terrorism: The Indirect and Long-Term Health Effects May Present the Greatest Challenge

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**Abstract** The possibility of terrorists employing chemical, biological, or nuclear/radiological (CBN) materials has been a concern since 1995 when sarin gas was dispersed in a Tokyo subway. Contingency planning almost exclusively involved detection, containment, and emergency health care for mass casualties. However, it is clear that even small-scale CBN incidents—like the recent spread of anthrax spores through the mail—can cause widespread confusion, fear, and psychological stress that have lasting effects on the health of affected communities and on a nation's sense of well-being. More emphasis therefore needs to be placed on indirect effects and on the medical, social, economic, and legal consequences that follow months to years afterward. To respond effectively to CBN attacks, a comprehensive strategy needs to be developed that includes not only emergency response, but also long-term health care, risk communication, research, and economic assistance. Organizing an effective response challenges government institutions because the issues involved—eligibility for health care, the effects of low-level exposure to toxic agents, stress-related illnesses, unlicensed therapeutics, financial compensation—are complex and controversial.

Now that a deadly biological weapon, anthrax spores, has been spread through the mail, attention has focused on the possibility that future terrorism using chemical, biological, or nuclear/radiological (CBN) mate-

The following article was written over one year prior to the September 2001 terrorist attacks on the World Trade Center and the Pentagon and the mailing of anthrax spores to news organizations and political leaders. Sadly, some of the concerns raised in the original manuscript about the acute health effects of a terrorist attack have come to pass. What we underestimated in our original analysis was the impact that a terrorist attack would have on every segment of society, not just the targeted community but also the general population and its leaders. As a consequence, we have revised the original manuscript to reflect these recent developments.

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rials could cause mass numbers of casualties (Falkenrath 1998; Franz et al. 1997). For example, it has been estimated that 100,000 deaths could result from an airborne release of anthrax spores over a large urban area (Inglesby et al. 1999). As a consequence, considerable funding, resources, and training are being devoted to the rapid detection and containment of a CBN attack and to the provision of emergency health care (Brennan et al. 1999; *New York Times* 2001).

Although a catastrophic attack is conceivable, it is more likely that limited casualties would result from direct exposure to CBN agents because of technical difficulties in using these weapons against civilian populations (Betts 1998). Nevertheless, the confusion, fear, and long-term health consequences still may be severe. As demonstrated by recent events involving letters containing anthrax spores, even a small-scale incident with CBN materials can have a profound impact on the health of a community and a nation's sense of well-being (Guillemin 1999:245; Okie 2001) and lead to protracted social and economic problems (Falkenrath 1998). Why are terrorist attacks using CBN materials so devastating? Mainly because terrorism already is frightful, but the use of unconventional weapons is even more so. CBN agents are terrifying because they cause injury and death in strange and prolonged ways (Franz et al. 1997). In addition, we feel more vulnerable to these weapons than conventional explosives because they can harm large numbers of ordinary citizens in places generally considered safe, such as in the workplace and residential neighborhoods.

Other characteristics of CBN weapons place them in the category of health hazards that are likely to cause both public fear and heightened anxiety (Renn 1997). A large body of research has indicated that the following features of a health threat are associated with prolonged effects: (1) involuntary threats that occur without warning (as opposed to personal choices like cigarette smoking), (2) manufactured threats versus natural disasters ("acts of God"), (3) unfamiliar threats with unknown health effects, and (4) threats that pose a danger to children and future generations (Bennett 1999a; Smith et al. 1986). It is clear that CBN weapons fulfill all of the criteria for creating a major catastrophe. Not only are these weapons intended to cause death and terror, but a CBN incident also has the characteristics of disasters that induce lingering medical, psychological, and social reactions.

In order to combat acts of mass terror, contingency planning has to involve more than just emergency response. An effective strategy will have to consider a broader array of immediate and long-term conse-

quences, which will arise regardless of the type of toxic exposure or number of casualties (Holloway et al. 1997; Institute of Medicine 1999).

### **Immediate Harm**

The first casualties of a terrorist attack result from the direct effects of the CBN agent. Emergency response training is ongoing for this eventuality. This aspect of medical care may appear clear cut but could cause immediate controversy. Prophylactic measures that have been used to protect against biological and chemical warfare agents—like the anthrax vaccine and pyridostigmine bromide pills—have been postulated to cause chronic medical problems (Presidential Advisory Committee 1996:114, 117; Institute of Medicine 2000). Attempts to use these problematic drugs and vaccines fuel controversy and add to a traumatized community's health concerns (Rosen 2000; Weiss 2001).

In addition to direct harm from a CBN agent, the impact on those not exposed may be almost as traumatic, as amply demonstrated since the terrorist attacks on the World Trade Center and Pentagon. In the immediate aftermath of a large-scale CBN attack, there is fear and bewilderment (Holloway et al. 1997). Everyone involved worries about his or her family and friends. Accidents can occur from people fleeing the disaster area (Erikson 1990). Essential hospital employees may be incapacitated by secondary exposure to the CBN agent or leave work out of personal concerns (Guillemin 1999:54). The normal reaction to an unfamiliar, life-threatening event—fear, confusion, and flight—could cause greater damage than the attack itself (Bleich et al. 1991).

Until the nature of the CBN exposure is clearly determined, uncertainty and fear will be present even among skilled rescue and medical personnel (Holloway et al. 1997). Although prophylactic drugs and vaccines and the use of gas masks and protective clothing help alleviate anxiety among “first responders,” dramatic and hurried activities of rescue workers frighten residents of the disaster area (Barker and Selvey 1992). The perceptions of a much larger population can be affected by television and newspaper reports of emergency medical care and decontamination efforts (Jones et al. 2000). Media images of spacesuit-clad investigators unsettled a worldwide audience during recent anthrax scares (Dobbs 2001). With uncertainty about the identity of the perpetrators and the extent of anthrax contamination, no person is certain that he or she will not be involved in a terrorist attack.

Following reports of a CBN attack, health care facilities can become

quickly overrun by both medical and psychological casualties and concerned citizens (Falkenrath 1998). For example, after recent anthrax deaths, it has not been possible to satisfy public demand for ciprofloxacin, an antibiotic approved for the treatment of anthrax; patients have inundated emergency rooms seeking reassurance; and, the public health system has been stretched to the limit trying to screen populations that may have been exposed to contaminated letters (Firestone 2001; Prial 2001). For another example, after the incident in Goiânia, Brazil, in which accidental exposure to a medical radiation source led to several hundred casualties and four deaths, 10 percent of the population (more than 100,000 people) sought medical checks (Collins and Carvalho 1993; Peterson 1988).

Urgent questions can be expected about the causes of common physical (somatic) complaints because nonspecific symptoms are often the first manifestation of injury from CBN agents (Bleich et al. 1992; Rosen 2000). However, somatic symptoms are frequently reported in healthy populations of adults and become even more prominent under stressful circumstances (Barsky and Borus 1999; Schwartz, White, and Hughes 1985). There already have been reports of increased complaints of pain, sleeplessness, headaches, palpitations, and other somatic symptoms since the 11 September 2001 terrorist attacks in the United States (Morin 2001; Goldstein 2001). Common flu-like symptoms, such as cough and fever, are particularly frightening after an attack with anthrax spores. Symptoms that arise from normal fear and uncertainty in a chaotic emergency, like headaches and difficulty concentrating, are indistinguishable from the early effects of nerve gas exposure (Bleich et al. 1991). The non-specificity of these symptoms and the resulting difficulty in rapidly determining their causes can misdirect and deplete emergency medical care and containment resources.

Even though there has been acknowledgment that the indirect consequences of a CBN incident will be substantial (Falkenrath 1998), official planning may nevertheless underestimate the potential scale of the response. With uncertainty about who was exposed and whether further exposures were occurring, large numbers of both endangered and unaffected residents will present to medical care providers with health concerns, as occurred after the release of sarin in a Tokyo subway (Woodall 1997) and more recently following potential exposure to anthrax spores (Prial 2001). Additionally, stress, fear, worry, and grief can exacerbate existing medical and psychological problems in the entire community.

As one example of indirect outcomes, a widely reported CBN incident could act as a powerful trigger for outbreaks of “mass sociogenic illness” (DiGiovanni 1999). In fact, several outbreaks have occurred in the aftermath of recent terrorist attacks (Wessely, Hyams, and Bartholomew 2001). These episodes of physical symptoms suggestive of acute injury, which have been misleadingly called mass hysteria, can be set off by toxic exposures, unusual odors, or even rumors of contamination (Boss 1997). The immediate response to multiple casualties, such as the arrival of emergency workers wearing decontamination clothing and television cameras, accelerates the spread of this illness (Krug 1992; Selden 1989). It is important to realize that, given the appropriate circumstances of stress, fear, and confusion (Boss 1997), mass sociogenic illness can affect any population. Because there is limited understanding of this phenomenon, symptoms of mass sociogenic illness frequently are medicalized rather than treated with education and reassurance, which subsequently leads to protracted controversy in affected communities.

In addition to increased demands for health care after a CBN attack, immediate changes in reproductive behavior may occur. Following the Chernobyl radiation disaster there was a decrease in the birth rate across Western Europe and an increase in induced abortions (Bertollini et al. 1990; Knudsen 1991). More recently, abortions and delayed pregnancy became an issue in the Balkans during aerial bombing of chemical plants (Fineman 1999). Similar fears about birth defects were expressed by victims of the 1995 Tokyo sarin attack (Watts 1999). Whether recent terrorist attacks will affect reproductive behavior is not yet known, but numerous anthrax hoaxes were perpetrated against abortion clinics in the United States immediately following reports that anthrax spores were being spread through the mail (Booth 2001).

For the emergency response to a major CBN event, planning therefore has to take into account two different health care scenarios. The first relates to managing the deaths and injuries caused directly by the attack. The second involves dealing with the fears, health concerns, and psychological reactions that normally arise in disasters. Because enormous numbers of people will feel at risk before the extent of exposure can be determined, these indirect consequences may pose the greater challenge to authority, acute health care, and public confidence. After the emergency response, many of these initial health problems may have prolonged consequences.

## Long-Term Consequences

As natural and manufactured disasters have shown, the long-term effects can be substantial. Experience indicates that following a CBN attack there would be four major health concerns: (1) chronic injuries and diseases directly caused by the toxic agent, (2) questions about adverse reproductive outcomes, (3) psychological effects, and (4) increased levels of somatic symptoms (David and Wessely 1995; Schwartz, White, and Hughes 1985; Nakajima et al. 1999). Acute injuries caused by a particular CBN exposure are manageable because they can be identified and treated according to established guidelines.

As during the emergency response, more difficulties may result over the longer term from harder to prove or disprove health outcomes. For instance, cancer, birth defects, and various neurological, rheumatic, and immunological diseases are increasingly being attributed to diverse types of chemical and radiation exposures (Neutra, Lipscomb, and Satin 1991). There are many social, historical, and cultural reasons why these health concerns would be prevalent after a CBN attack. Everyone has been sensitized by the AIDS epidemic, mad cow disease, and numerous environmental tragedies. The scientific debate over the health effects of pesticides, genetically modified food, electrical power lines, and cellular telephones also has influenced public perceptions. The result is a heightened sensitivity over environmental exposures. A terrorist attack not only would create new fears but would surely amplify existing concerns about the safety of our food, water, and air. For instance, residents downwind of an anthrax-contaminated building in Florida were concerned about the possibility of infection (Firestone 2001).

The current scientific uncertainty over the chronic health effects of low-level exposure to toxic agents will further increase anxiety in the affected communities (Brown and Brix 1998). Because health officials cannot give blanket assurances that no harm will result from brief or non-symptom-producing exposure to chemical, biological, or radiological materials (Institute of Medicine 2000), distrust of medical experts and government officials may result (Birchard 1999). Furthermore, unconfirmed and controversial hypotheses about the health effects of exposure to CBN materials can become contentious scientific and legal issues (Birchard 1998).

One contemporary example demonstrates the potential long-term impact of environmental concerns. Residents in a market town in the west of England have blamed a variety of health problems on "germ warfare

experiments” that involved aerial spraying of bacteria thirty years ago during the Cold War (Townsend 1997). What is noteworthy is the wide range of conditions attributed to the experiments: cancers, cerebral palsy, Down syndrome, miscarriages, learning difficulties, autism, and skin ulcers, to name a few. The result has been “an entire Dorset village torn apart.” Similar health fears can be anticipated on a larger scale following recent deaths from exposure to anthrax-contaminated letters.

The long-term psychological consequences of a CBN incident also can be substantial. Posttraumatic stress disorder (PTSD), which is characterized by reexperience of traumatic events, affects victims, witnesses, and rescue workers most directly involved in the initial exposure (Holloway et al. 1997). Recent estimates are that one-third of those who were most closely involved with the World Trade Center tragedy may suffer from the condition. However, PTSD will be only one of the mental health problems facing a community, as demonstrated in Japan following two terrorist attacks with the chemical nerve agent sarin (Ohbu et al. 1997; Watts 1999). And as we have recently witnessed, routine activities that once felt familiar and safe, like visiting the post office, can now seem threatening and strange (Whoriskey and Jenkins 2001). The general level of fear and anxiety can remain high for years, exacerbating preexisting psychiatric disorders and posing a challenge to the entire public mental health system. In the case of the recent World Trade Center events, thousands of children were left without a parent or orphaned, and even more more witnessed the tragedy both directly and on television (Davidson, Baum, and Collins 1982; Prince-Embury and Rooney 1988; Stepp 2001).

Although we have considerable information about high background levels of physical symptoms in adult populations (Hannay 1978; Mayou 1991), there is less understanding of the causes of more complex symptoms and of the factors that affect the experience and reporting of distress (Roht et al. 1985; Shusterman et al. 1991). As a consequence, when clusters of unexplained symptoms have been observed following toxic exposures (Hyams, Wignall, and Roswell 1996; Reuters 1999), there is often heated debate over the role of psychological stress in causing or contributing to reported health problems (Joseph et al. 1998; Stiehm 1992; Presidential Advisory Committee 1996:123–125). These controversies are difficult to resolve because stress is an inevitable aspect of any life-threatening experience. A population exposed to a terrorist attack experiences both direct injuries and numerous physical symptoms

due to prolonged stress, muscular tension, and sleep deprivation (Bravo et al. 1990; Nakano 1995).

As noted in the discussion of emergency medical care, public concern can arise from well-intended health care decisions. The nonstandard, off-label, and even investigational drugs and vaccines that may help save lives in a CBN attack can become protracted health and legal issues. In particular, therapeutic agents that have not received official approval, like licensing from the U.S. Food and Drug Administration (FDA), are distrusted (Berezuk and McCarty 1992). Increased symptoms and illnesses reported long after a terrorist attack may be attributed to side effects of medical interventions (Institute of Medicine 2000).

It has been difficult to obtain FDA approval for many potentially useful therapeutic and prophylactic measures because CBN materials are too toxic to expose human volunteers in required efficacy studies (Institute of Medicine 1999:110–164). To address this problem, the FDA is considering a different standard—the use of animal studies—for the approval of new vaccines and pharmaceutical products to counter chemical and biological warfare agents (Zoon 1999). These rule changes will directly impact the development of a new generation of vaccines for anthrax and smallpox because it is not ethically feasible to expose study subjects to these deadly diseases in order to demonstrate protection.

Controversy over the health effects of hazardous exposures and therapeutic interventions may impede other aspects of the recovery effort. As in any disaster, government assistance will be required to rebuild communities and restore the local economy. However, the issue of compensation for personal injuries could have a damaging effect on public faith in government (David and Wessely 1995). The reason is that many health claims will be hard to prove or to relate to the CBN incident (Huber 1992:92–110). The fear of cover-up may surface, and litigation will lead to an adversarial relationship between the public and the government. Assigning blame and legal liability could become the focus of acrimonious public and political debate, which hinders public health efforts.

The nature of the particular terrorist weapon also has a consequential impact on recovery efforts. For example, chemical nerve agents dissipate rapidly and do not pose a long-term health risk (Institute of Medicine 1999:174–183). In contrast, anthrax spores and radiological material can persist in the environment for decades; this would make decontamination efforts problematic and lead to persistent health concerns.

The demographic and cultural characteristics of an affected community, as well as the availability of public transportation and medical and



social services, further influence recovery efforts (Nakano 1995). Less well-off communities need greater medical, social, and economic assistance. In wealthy communities, however, it is difficult to monitor the health impact of the attack because residents have greater mobility and access to a diversity of health care services. The economy of a community may be permanently harmed because of fears that locally produced agricultural and manufacturing products may be contaminated with harmful CBN agents (Pettersen 1988). For the same reason, the value of individual homes and commercial property could drop precipitously, which will engender feelings of hopelessness in the community (*ibid.*).

## Recommendations

A community attacked with a CBN weapon will need both emergency intervention and long-term health care, extensive medical and risk assessment information, and economic support. Also, multiple challenges to the credibility of governmental and scientific authority could hamper recovery efforts. The following recommendations are made for dealing with these consequences.

### Health Care

Emergency response teams already train for acute medical care of mass casualties. What remains to be decided is how long health care should be provided and whether health care should be comprehensive or restricted to the probable toxic effects of the CBN agent. These are critical questions in countries like the United States, which does not have universal health care. In the event of a large-scale CBN attack, there are compelling reasons for offering comprehensive health care over an extended period of time. For one, readily available clinical care would ensure that an affected community's health care needs are met, which is arguably a prime responsibility of the government after a disaster. In addition, provision of medical care represents one of many tangible indications that the government is committed to recovery and as such helps restore confidence in public institutions (Watts 1999).

If health care is offered, who should provide the care? In the United States, health care would have to be furnished by private physicians and health maintenance organizations or by the two major federal health care systems in the Department of Veterans Affairs (VA), which maintains hospitals in every state, and the Department of Defense (DOD). The VA

and DOD already are involved in the emergency response under the Federal Response Plan but would require appropriate authority and resources to provide health care for a longer period (Montello and Ames 1998).

Several arguments can be made for centralizing health care in local medical facilities. For one, this approach would ensure access to health care. Second, a smaller number of health care providers could be more intensively educated on relevant health issues and new scientific findings. Finally, a consistent set of providers would be more likely to detect the development of new or worsening health problems in the affected population.

The need for readily available health care and specially trained providers cannot be underestimated. The Gulf War syndrome controversy demonstrates how complex health issues can become after a possible CBN attack and how important it is for health care providers to have up-to-date information (Murphy et al. 1999). When a traumatized population cannot obtain answers to health questions from knowledgeable providers, misinformation fills the void and concerns multiply. Moreover, specially trained providers could maintain standardized medical records, which are important for scientific and medical-legal purposes.

Although it can be argued that freely available health care will foster the sick role and prolong disability, properly trained health care providers can help patients work through their health problems and grief, with restoration of function as the primary goal of treatment. Although offering mental health care after an act of mass terror is important, immediate grief counseling or psychological debriefing may not be the most effective approach (Raphael, Meldrum, and McFarlane 1995; Wessely, Bisson, and Rose 1999).

### Risk Communication and Management

A concerted risk communication and management effort is critical after a CBN attack in order to keep the public informed and to promote recovery (Bennett, Coles, and McDonald 1999). In the immediate aftermath of a terrorist attack, the primary method for rapidly disseminating information is through the popular news media. Accordingly, public officials and scientific experts have to be as open, clear, and forthcoming as possible with the press and avoid the development of an adversarial relationship. After a community's sense of well-being has been shattered, there is a tendency for information and reassurance to be met with disbelief and

anger (Brewin 1994; David and Wessely 1995). A frustrated press corps only makes communicating with the public harder.

To enlist the help of the press, health officials have to provide the press with the best available information. It is important for crisis managers to work cooperatively with the press to discourage the reporting of false rumors and inaccurate information, while at the same time not providing false reassurance (Modan et al. 1983). The press also has to educate itself about a new health threat in order to accurately report the news, as exemplified recently by early media reports that did not distinguish between anthrax exposure and infection. Over time, diverse methods have to be developed for communicating with the affected population (Neutra 1985). These include mass mailings, use of the Internet, and especially community meetings. Open meetings help disseminate useful information and involve the public in the recovery process, which speeds recovery and increases confidence in governmental actions (Holloway et al. 1997). Effective risk communication is a long-term process that requires a two-way exchange of information with the affected population. Public concerns should also be addressed by working closely with community leaders (Coote and Franklin 1999).

Maintaining credibility over the long term will be one of the most difficult challenges for government institutions. Precipitous decisions made in a crisis to care for casualties and to prevent further injury will be judged later in a deliberative manner using more complete and accurate information. Mistakes will be identified. The government should take responsibility for its mistakes and clearly explain the reasons for critical decisions in order to maintain trust.

As noted, unsupported health claims could become a problem. There will be nonorthodox views and hypotheses on events and scientific issues (Glassner 1999; Presidential Advisory Committee 1996:90–91). These ideas cannot be ignored, but public health policy and medical care cannot be based on unsubstantiated opinion. A successful risk communication strategy has to deal fairly and openly with unproven assertions and new hypotheses, not least because the existence of dissident views appeals to the popular media's commitment to balanced reporting (Singer and Endreny 1993).

For recovery to work, risk management efforts have to prevent demoralization and ensure that members of the affected population are ultimately characterized as survivors rather than as victims. A shift in thinking from vulnerability and dependency to pride in overcoming adversity will do more to overcome long-term health problems in both the targeted

community and the nation at large than any other health measure (Giel 1991; Summerfield 2000). Even after a devastating disaster, communities display substantial resilience when not rendered helpless and passive in the recovery process (Bravo et al. 1990). Additionally, rapid financial assistance and the rebuilding of the community's economy provide substantial health benefits (Summerfield 1999).

### Surveillance and Research

An extensive surveillance and research effort is important following a major CBN attack. The identification of persons injured or killed by a CBN weapon will be a priority during the emergency response. Accurate detection requires the establishment of a case definition of affected individuals (Brennan et al. 1999). This case definition should be based primarily on the objective characteristics of the injury caused by the particular CBN exposure (Franz et al. 1997; Pavlin 1999). Diagnostic criteria should not rely on nonspecific symptoms that become prominent in a highly stressful situation and may be related to mass sociogenic illness (Jones et al. 2000). Misclassification of unaffected communities as exposed to a deadly CBN agent will not only misdirect emergency efforts, but will also confuse the public and result in protracted scientific and legal disputes about who was injured. The recent confusion over who may have been exposed to anthrax spores from contact with contaminated mail could easily lead to prolonged controversy.

After a major CBN attack, longitudinal surveillance studies should be initiated. Evidence-based answers have to be available for questions that will arise after a toxic exposure about increased rates of various diseases, birth defects, physical and mental symptoms, and psychiatric disorders. Failure to conduct epidemiological surveillance is likely to lead to accusations of government insensitivity, incompetence, and cover-up (Schwartz, White, and Hughes 1985). Delaying sound research also opens the door to unsubstantiated claims and may eventually preclude the initiation of definitive research studies because accurate data become less accessible over time (Institute of Medicine 2000).

Although a concerted research effort may be misinterpreted as evidence of more widespread harm than officially acknowledged (Jones et al. 2000), it is better for the responsible authorities to initiate scientific investigations rather than to be pushed into them by public and media criticism (David and Wessely 1995). By being able to respond to the pub-

lic's legitimate need for answers, fear and anxiety can be lessened and credibility of responsible authorities improved. Research is necessary, not only to answer pressing health questions but as part of the risk-management process itself.

To implement the preceding set of recommendations, a high degree of communication, coordination, and cooperation is required among governmental and social institutions. To organize an effective response is difficult given the many different groups involved, such as the civilian government agencies at the local, state, and national level; law enforcement; the military; emergency response teams; community health care providers; social services; local business interests; the court system; and the news media (Tucker 1997). Because most of these organizations are not accustomed to working together and have different priorities, conflicts arise. Therefore, clear lines of authority are essential to guide an effective response and recovery effort (Centers for Disease Control and Prevention 2000).

In the United States, lead responsibility for the initial operational response to acts of terrorism ("crisis management") has been assigned to the Federal Bureau of Investigation (PDD-39, 1995). The U.S. attorney general can subsequently transfer lead responsibility to the Federal Emergency Management Agency (FEMA) for "consequent management," that is, measures to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of terrorism. The establishment in the United States of the new Office of Homeland Security should lead to greater coordination in the government's response to acts of terrorism (Pianin 2001).

## **Conclusion**

Because of the success of recent terrorist attacks, concrete steps have to be taken now to better prepare for further threats. Along with efforts to prevent acts of mass terrorism and to mount an effective emergency response, greater discussion and awareness are needed about the potential for indirect and long-term consequences. Without a comprehensive plan of action that considers all eventualities, government agencies are more likely to respond ineffectually or to overreact, creating unnecessary panic and infringing on basic civil liberties (Stern 1999; Guillemain 1999:248; Lancaster 2001). Thorough preparedness could also aid deter-

rence efforts. In the future, terrorists may be dissuaded from attempting to use these technically demanding and unpredictable agents if they think the responses will minimize widespread injury and fear.

Responding to an actual CBN attack is an even more daunting task because many of the issues involved—eligibility for health care, the effects of low-level chemical and radiation exposure, stress-related illnesses, unlicensed therapeutics, financial compensation—are complex and controversial. Only government institutions that maintain credibility with the public will be capable of dealing effectively with the broad range of problems that evolve after a terrorist attack.

A successful recovery effort must provide for long-term health care, risk communication, and surveillance. Although advanced technologies help in the emergency response, there is a greater need for a general plan of action, central coordination, and basic education (Pincus 1999; Sharp et al. 1998). Not just the medical community but government officials, the press, and the general public have to be more fully informed about the nature of this threat. Moreover, additional research is necessary concerning the best methods of risk management and communication (Bennett 1999b).

Future chemical, biological, or nuclear terrorism should be anticipated. In preparing for these attacks, we have to walk a fine line between lack of preparedness and creating undue fear in our daily lives (Shalala 1999). Terrorism is not simply about killing people; it is also about destroying our sense of well-being and trust in government. This outcome cannot be allowed to happen either before or after a terrorist attack.

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