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Received through the CRS Web

Terrorism: Background on Chemical, Biological, and Toxin Weapons and Options for Lessening Their Impact

Updated June 30, 2003

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Summary

The catastrophic terrorist attack of September 11, 2001 and the subsequent anthrax mailings have sensitized the nation to acts of domestic terror. The confirmation of terrorist interest in weapons of mass destruction and the vulnerability of the United States to such attack have highlighted the potential that these weapons may be used as weapons of terror. The framework of weapons of mass destruction includes chemical, biological, and toxin weapons.

Chemical, biological, and toxin weapons can produce mass casualties if effectively disseminated, but have varying and different effects. Chemical weapons, predominantly man-made chemicals, require the largest amounts of material to be effective and cause their effects in minutes to hours. Biological weapons made of naturally occurring pathogens require the least material to be effective, but generally have an incubation period of several days before symptoms show themselves. Toxin weapons, chemical agents formed by biological processes, are intermediate between the two in both amount and timescale. Treatment protocols for chemical, biological, and toxin weapons vary on a per-agent basis, ranging from weapons with effective treatment and prophylaxis to weapons which have no known cure nor protection.

Chemical, biological, and toxin weapons pose additional concerns beyond mass casualties. Chemical, biological, and toxin weapons may contaminate the area in which they are used, emergency vehicles, and first responders. The wide array of potential symptoms from chemical, biological, and toxin weapons makes identification of the causal agent difficult and complicates treatment. Additionally, public fears relating to disease and poisoning could increase the effect of a chemical, biological, or toxin attack, as worried, unexposed people request treatment from medical facilities. In extreme cases, public hysteria has been postulated as an outcome from mass dissemination.

Several initiatives are underway to reduce the potential value of chemical, biological, and toxin weapons. One approach has been through funding significant increases in the public health system's preparedness and response capacity. Additionally, facilities and researchers possessing "select agents" have been registered in a national database. Non-governmental agencies, such as the National Academy of Sciences, and professional societies have also been active in developing policies and options to lower the threat of terrorist attack.

Potential options to further decrease the odds of chemical, biological, and toxin terrorism include regulating and registering domestic purchase of "dual-use" equipment; further development of the public health system; federal incentives for research and development into chemical, biological, and toxin medicines, vaccines, countermeasures and detectors; informational public outreach programs to properly inform the public about the risks involved; and voluntary media codes. This report will be updated as circumstances warrant.

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Introduction

The domestic approach to potential terrorist attacks using chemical, biological, or toxin weapons attempts to balance a “post-event” consequence management approach with a “pre-event,” preventative approach. Legislation and plans have been developed to address the casualties from chemical, biological or toxin weapons, generally focused on the physical consequences of such weapon use and methods to provide prompt consequence management. Further efforts regarding public outreach, enhancing treatment and prophylaxis through federal initiatives, or additional regulation of materials used in developing chemical, biological, and toxin weapons are areas policymakers may revisit as preventative approaches to reduce the enhanced terror aspect of these weapons

This report provides a general overview of chemical, biological, and toxin weapons and their treatment; a summary of why some of these weapons may be more attractive to terrorist groups than conventional weapons; select aspects of the current response against chemical, biological and toxin terrorism; and potential options towards lessening these weapons’ impact.

Chemical, Biological, and Toxin Weapons

The widespread public unease following the anthrax mailings and the continued concern regarding possible terrorist use of weapons of mass destruction – nuclear, chemical, biological, or radiological – have highlighted the potential these weapons may have to a terrorist group.¹ This report focuses on chemical, biological, and toxin weapons, whose impact and nature differ from each other and from nuclear or radiological weapons.

Chemical weapons are chemical compounds that have a strong, deleterious effect on the human body, even when encountered in small doses. The different types of chemical weapons include vesicants, which blister and burn on contact; choking agents, which cause lung damage; and nerve agents, which interfere with the

¹For an overview of the potential terrorist use of weapons of mass destruction, see CRS Report RL31332 *Weapons of Mass Destruction: The Terrorist Threat*, by Steve Bowman.

nervous system and may lead to death. The effects from chemical weapons may occur very quickly after exposure, on the order of minutes to hours.²

Biological weapons are pathogens that cause disease and illness in infected humans. Because the pathogens multiply within the victim, a small initial amount of pathogen is sufficient to cause infection. As a consequence, biological weapons require much less material than chemical weapons to produce equivalent casualties and generally take longer to produce effects. Biological weapons include diseases that are primarily incapacitating, such as Q fever, as well as those that are lethal, such as smallpox. Some biological weapons are contagious pathogens, such as smallpox, and have the potential to spread the effects of an attack by traveling from victim to victim. The symptoms from a biological weapon attack would require some time to develop, so a covert biological attack might not be recognized for several days.³

Toxin weapons are primarily illness-inducing chemicals formed from living creatures, such as bacteria, fungi, plants, and animals. Toxins range in effect from disabling to acutely toxic. The most deadly compound currently known, botulinum toxin, is a bacterial toxin. Toxins are more potent than chemical weapons, requiring less material to produce equivalent casualties, but they are not self-reproducing, so they require more material than a biological weapon. Symptoms from toxin exposure typically appear on a timescale intermediate between chemical weapons and biological weapons, generally appearing over the course of several hours.⁴

Terrorist Development of Chemical, Biological, and Toxin Weapons

The difficulty of obtaining or developing chemical, biological, or toxin weapons has made their use very rare, but chemical, and biological weapons have been used for terrorist purposes. Sarin, a chemical nerve agent, was used in the Tokyo subway system in 1995 by the Aum Shinrikyo cult.⁵ Anthrax bacteria, a biological agent, was used in 2001 to attack individuals in New York, Florida, and the District of Columbia. Also, salmonella bacteria was used by the Rajneeshee cult in 1984 in an attempt to influence local election turnout.

Additionally, there have been arrests and news reports of individuals and terrorist organizations that have tried to develop chemical, and toxin weapons. Videotapes acquired and broadcast by CNN have shown the effects of a chemical

²For an overview of chemical agents see chapters 1 - 17 of *Medical Aspects of Chemical and Biological Warfare*, Frederick R. Sidell, Ernest T. Takafuji, David R. Franz, Eds., found online at [http://ccc.apgea.army.mil/products/textbook/HTML_Restricted/index.htm].

³For an overview of biological agents see *ibid.*, chapters 18 - 29.

⁴For an overview of toxin agents see *ibid.*, chapters 30 - 34.

⁵ For an overview of the Aum Shinrikyo use of sarin in the Tokyo subway system, see David E. Kaplan, "Aum Shinrikyo (1995)" in Jonathan B. Tucker, Ed., *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, (Cambridge, MA: MIT Press) 2000.

agent on test animals.⁶ In 1993, a man was arrested after attempting to cross the US-Canada border while in possession of 130 grams of ricin, a toxin made from castor beans.⁷ In January 2003, British law-enforcement officials arrested several people accused of manufacturing ricin in a London apartment.⁸

Previously, it had been thought that the difficulties of developing, weaponizing, and disseminating chemical, biological, and toxin weapons provided high barriers to their use by non-state actors.⁹ Advances in molecular biology, chemistry, and engineering have increased the ease by which biological and chemical compounds can be manufactured. Civilian technologies available for purchase may be applicable for manufacturing chemical, biological, and toxin weapons.¹⁰ The ease of assembling the requisite equipment was illustrated by the Defense Threat Reduction Agency. Under Project BACUS, a biological agent production facility was successfully built in Nevada from dual-use technology without drawing regulatory attention.¹¹ Some experts maintain that the technological barriers to chemical, biological, and toxin use has significantly decreased.

Medical Treatment for Chemical, Biological, and Toxin Weapons' Effects

Chemical, biological, and toxin weapons also differ in their medical treatment and the availability of effective prophylaxis.¹² Chemical weapons, with their quick-acting effects, must be treated as promptly as possible. Because of the large range of potential effects caused by chemical weapons, there is no universal treatment for chemical weapon exposure. Exposure to nerve agents can be directly treated with medication to prevent or reduce symptoms.¹³ Exposure to vesicants, such as mustard

⁶Nic Robertson, "Disturbing Scenes of Death Show Capability with Chemical Gas," *CNN*, August 19, 2002, found online at [<http://www.cnn.com/2002/US/08/19/terror.tape.chemical/index.html>].

⁷Richard Mostyn, "Stopped at Border, Man Carried Lethal Toxin," *Yukon Times*, February 23, 1996.

⁸For more information on the toxin ricin, see CRS Report RS21383 *Ricin: Technical Background and Potential Role in Terrorism*, by Dana A. Shea and Frank Gottron.

⁹U.S. Congress, Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction*, OTA-BP-ISC-115 (Washington, DC: U.S. Government Printing Office) 1993.

¹⁰Such technologies which have both a civilian and a military use are commonly referred to as "dual-use" technologies.

¹¹As reported in Judith Miller, Stephan Engelberg, and William Broad, *Germs: Biological Weapons and America's Secret War*, (New York: Simon and Schuster) 2001, p.121.

¹²Prophylaxis is generally spoken of in terms of medical or chemical treatments to protect individuals from chemical, biological, and toxin weapons. In some cases, it also includes mechanical measures such as protective suits or masks.

¹³Atropine and diazepam can be used to treat the effects of nerve agent exposure. See (continued...)

gas, is generally untreatable; most people exposed will exhibit the agent's effects. The symptoms of vesicant exposure, primarily blisters and lesions, can be treated. In addition, injury from exposure to choking agents, such as chlorine, can be ameliorated by prompt medical treatment to limit permanent lung damage.

Many biological agents either respond to medical treatment or have effective prophylaxis. Single or combination antibiotic regimens are effective against many bacteria that might be used as biological weapons, if the antibiotics are employed early in the course of the disease. This may be difficult if recognition of a bioterror event is delayed. Some viruses targeted as biological weapons have effective prophylaxis in the form of vaccines, while others reportedly respond to antiviral drugs.¹⁴ However, some potential biological weapons lack prophylaxis, treatment, or cure. Additionally, biological weapons can be engineered, with some effort, in a laboratory to be resistant to specific antibiotic treatment.

Treatment of injuries sustained from toxin weapons may be more complicated. Anti-toxins and toxoid vaccines can be developed against toxin weapons, but the process for doing so is involved and time-consuming. Consequently, stores of these medicines are limited in scope,¹⁵ and a large number of toxin weapon casualties could exhaust local supplies. Some toxins, such as botulinum toxin, cause death by paralyzing the muscles used for breathing. These toxins can be treated with supportive care, through artificial ventilation and other means, until the patients recover.

For bioterror events, it is difficult to project the likely treatment success rate. Many treatments of chemical, biological, and toxin weapons rely on providing medication within a narrow time window. If medication is not provided fairly quickly after exposure or the development of symptoms, depending on the weapon, full recovery is unlikely.

¹³(...continued)

National Center for Environmental Health, Centers for Disease Control and Prevention, *Emergency Room Procedures in Chemical Hazard Emergencies. A Job Aid*, found online at [<http://www.cdc.gov/nceh/demil/articles/initialtreat.htm>].

¹⁴See L. Borio, T. Inglesby, C.J. Peters, A.L. Schmaljohn, J.M. Hughes, P.B. Jahrling, T. Ksiazek, K.M. Johnson, A. Meyerhoff, T. O'Toole, M. S. Ascher, J. Bartlett, J.G. Breman, E.M. Eitzen, Jr., M. Hamburg, J. Hauer, D. A. Henderson, R.T. Johnson, G. Kwik, M. Layton, S. Lillibridge, G.J. Nabel, M.T. Osterholm, T.M. Perl, P. Russell, and K. Tonat, "Hemorrhagic Fever Viruses as Biological Weapons: Medical and Public Health Management," *Journal of the American Medical Association*, 2391-2405 (May 8, 2002).

¹⁵See Arturo Casadevall, "Passive Antibody Administration (Immediate Immunity) as a Specific Defense against Biological Weapons," *Emerging Infectious Diseases*, Vol. 8, No. 8 (August, 2002)

Potential Impacts of Chemical, Biological, and Toxin Weapons

By their nature, terrorist events are unexpected, shocking, and often perceived as random, and they evoke a sense of fear and uncertainty. Chemical, biological, and toxin weapons use may contribute additional considerations. In part, this is because chemical, biological, and toxin weapons have the potential to cause mass casualties. Effectively disseminated, a single release of a chemical or biological weapon could cause tens of thousands of casualties.¹⁶ This ability to inflict great numbers of casualties may cause terrorists to view chemical or biological weapons as a viable means for promoting an agenda of terror and destruction. The impact of these weapons may be magnified by other factors.

The use of chemical, biological, or toxin weapons in terror attacks could complicate emergency response due to the need to establish special care facilities for the victims, such as decontamination areas, and the need to protect first responders from the weapon's effects. Inadequate first responder protection or contamination of emergency vehicles could lead to increased casualties and greater social disruption if responders became victims.

Furthermore, chemical or biological weapons may produce a wide array of effects. Terrorists may believe they can select chemical, biological, or toxin weapons to produce specific results for certain situations. They may believe that these weapons increase their operational flexibility.¹⁷ Since for some chemical, biological, and toxin weapons there exists a delay before symptoms develop, terrorists may feel that their use will increase the chances of successfully avoiding arrest. The variety of potential effects and timing can complicate medical treatment and preparedness, as it might not be readily apparent what chemical or pathogen has caused the symptoms nor what antidote will prove most effective.¹⁸

The use of chemical or toxin weapons could generate a disproportionate public response because of a broad public perception that their use is akin to poisoning. According to experts, there has long been fear of and antipathy towards the use of poison. It is especially frightening to the victim, as the symptoms may seem to appear from nowhere. Poisons lacking an antidote may raise concerns further, as the victim perceives that there is no recourse or cure available. The dread generated from the inability to control the situation, and oftentimes one's own bodily safety, is

¹⁶U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, OTA-ISC-559 (Washington, DC: U.S. Government Printing Office, August 1993).

¹⁷For an overview of potential terrorist motivations with respect to chemical or biological weapons, see CRS Report RL31831 *Terrorist Motivations for Chemical and Biological Weapons Use: Placing the Threat in Context*, by Audrey Kurth Cronin.

¹⁸This was strikingly illustrated by the hostage deaths surrounding Russian soparific gas use. P. Baker and S.B. Glasser, "U.S. Ambassador Critical of Russia In Hostage Crisis: Gas Secrecy May Have Cost Lives, He Says," *The Washington Post*, October 30, 2002.

common to victims of chemical weapons, and multiplies anxieties related to these weapons' use.¹⁹

Biological weapon use may evoke deep-seated concerns regarding epidemic disease and sickness.²⁰ Plagues have historical and religious associations,²¹ and recent epidemics have left their mark on society.²² Furthermore, victims of diseases that manifest symptoms externally, such as smallpox, may enhance concerns with respect to contagion. Individuals infected by biological weapons may develop marked anxieties in response to the uncertainty of their medical treatment options, health condition, and prognosis.²³ Trauma associated with being a victim of a biological attack may itself inhibit understanding and recovery from the illness.²⁴ Dread may also arise in those who have not been exposed, but fear that they may have. These anxieties may cause common events to take on new negative meanings. For example, during the anthrax mailings, there were many reports regarding white powders found at people's workplaces which were forwarded to law enforcement authorities; the vast majority were not anthrax related.²⁵

Because of heightened individual health anxieties about chemical, biological and toxin weapons, some have suggested that their use could have the potential to result, at the extreme, in panic. When sarin was introduced into the Tokyo subway system in 1995, over 5,500 people arrived at hospitals requesting medical treatment, but only 1,051 people had medical symptoms indicative of sarin exposure.²⁶ In the case of a widespread dissemination of chemical or biological weapons, the number of people requesting treatment, and the difficulties involved in separating those with

¹⁹For an overview of public perceptions of chemical, biological, and toxin weapons, see J. Stern, *The Ultimate Terrorists*, (Cambridge, MA: Harvard University Press) 1999.

²⁰H.C. Holloway, A.E. Norwood, C.S. Fullerton, C.C. Engel, and R.J. Ursano, "The Threat of Biological Weapons: Prophylaxis and Mitigation of Psychological and Social Consequences," *Journal of the American Medical Association*, Vol. 278, 425 (1997).

²¹The Black Plague is estimated to have killed up to 25% of the total population of Europe. The Old Testament of the Bible regularly refers to plagues being brought down upon unbelievers.

²²The influenza epidemic of 1918 is estimated to have killed over 500 thousand people in the United States and over 20 million people worldwide. J.K. Taubenberger, A.H. Reid, A.E. Krafft, K.E. Bijwaard and T.G. Fanning, "Initial Genetic Characterization of the 1918 "Spanish" Influenza Virus," *Science*, Vol. 275, 1793 (1997).

²³W.J. Broad and D. Grady, "Threats and Responses: The Victims; Science Slow to Ponder the Ills That Linger in Anthrax Victims," *New York Times*, September 16, 2002.

²⁴S. Wessely, K.C. Hyams, and R. Bartholomew, "Psychological Implications of Chemical and Biological Weapons: Long Term Social and Psychological Effects May Be Worse Than Acute Ones," *British Medical Journal*, Vol. 323, 878 (2001).

²⁵For example, in Arizona, health authorities reportedly received and tested 1,100 samples of substances that people feared might be contaminated. "Avoiding Panic Over Smallpox; Our Stand: Educational Campaign Will Help Us Ward Off Bioterror Attack," *The Arizona Republic*, September 25, 2002.

²⁶T. Ballard, J. Pate, G. Ackerman, D. McCauley, and S. Lawson, "Chronology of Aum Shinrikyo's CBW Activities," Monterey Institute of International Studies, March 15, 2001.

actual illness from those with panic-induced symptoms, could greatly complicate effective healthcare and possibly lead to greater public hysteria.

Public panic might have weighty ramifications. If a chemical or biological weapon was disseminated widely, especially in the case of a contagious pathogen, there might be government intervention to quarantine individuals or groups of individuals.²⁷ Panicked flight from areas of perceived danger could complicate response efforts. Additionally, due to the newsworthy aspects of a chemical, biological, and toxin weapon attack, public panic could propagate through media reports to locations not affected by the attack.

While hysterical, widespread panic is cited as a potential public response to mass dissemination of a chemical, biological, or toxin weapon, it is not clear if this is a likely outcome. The loss of public confidence and angry, perhaps violent, competition for medical treatment have been suggested as possible results from a chemical or biological weapon attack.²⁸ On the other hand, public response after natural disasters has not led to public hysteria or unreasoned aggression, even when there has been significant anger directed towards government officials.²⁹ In previous crises, public anxiety has been successfully reduced by government response.

Approaches Preventing Terrorist Use of Chemical, Biological, and Toxin Weapons

Federal, State, and Local Government Actions

Federal policymakers have addressed reducing terrorist use of chemical, biological, and toxin weapons through programs ameliorating these weapons' destructive aspects and through increased vigilance in detecting and preventing terror attacks in general. Local response to terrorist attack has been further developed through federal programs providing state health departments grant-based funding in order to address vulnerable aspects of their response system.³⁰ These improvements

²⁷Issues relating to quarantine and state and federal response to chemical and biological attack were explored in an exercise called TOPOFF. An exercise review can be found in T.V. Inglesby, R. Grossman, and T. O'Toole, "A Plague on Your City: Observations from TOPOFF," *Clinical Infectious Diseases*, Vol. 32, 436 (2001).

²⁸H.C. Holloway, A.E. Norwood, C.S. Fullerton, C.C. Engel, and R.J. Ursano, "The Threat of Biological Weapons: Prophylaxis and Mitigation of Psychological and Social Consequences," *Journal of the American Medical Association*, Vol. 278, 425 (1997) and C.S. Fullerton and R.J. Ursano, "Behavioral and Psychological Responses to Chemical and Biological Warfare," *Military Medicine*, Vol. 155, 54 (1990).

²⁹H. Granot, "Planning For The Unthinkable: Psychosocial Reaction To Chemical and Biological Warfare (CBW) Weapons," *Australian Journal of Emergency Management*, Spring, 21 (2000).

³⁰For more information on the development of state and local public health systems' bioterrorism preparedness efforts, see CRS Report RL31719 *An Overview of the U.S. Public* (continued...)

include: further development of hospital and laboratory capacity; development of response networks for timely communication during a bioterror event; development of protocols for communicating between local, state, and federal responders; and improved education of physicians and health care providers. A concerted federal effort is underway to develop emergency reserves of medicines to combat chemical, biological, and toxin casualties. This effort includes completing acquisition of a national supply of smallpox vaccine,³¹ developing an implementation plan for nationwide vaccination,³² and evaluating and further developing the national pharmaceutical stockpile.³³ Additionally, research proposals have been funded in the areas of detection systems and enhanced epidemiological surveillance, to detect chemical, biological, or toxin use as early as possible.³⁴

Federal law enforcement agencies now have greater power to gather intelligence on terror groups and their members.³⁵ Increased information about terrorist groups combined with apprehension of any who have chemical, biological, or toxin weapons may provide further barriers to terrorist acquisition and use of these weapons.³⁶ A registration system for researchers and facilities possessing select agents³⁷ has been developed by the Department of Health and Human Services, and additional restrictions regarding access to these agents have been made law.³⁸

On November 25, 2002, President Bush signed into law the Homeland Security Act of 2002 (P.L. 107-296). This act created the Department of Homeland Security

³⁰(...continued)

Health System in the Context of Bioterrorism, by Holly Harvey.

³¹For more information on smallpox vaccine and vaccination policy see, CRS Report RS21271 *Smallpox Vaccine Stockpile and Vaccination Policy*, by Judith A. Johnson and CRS Report RS21288 *Smallpox: Technical Background on the Disease and Its Potential Role in Terrorism*, by Frank Gottron.

³²See Centers for Disease Control and Prevention, “Smallpox Response Plan and Guidelines (Version 3.0),” November 26, 2002.

³³Funding for the national pharmaceutical stockpile increased from \$52 million in FY 2001 to \$645 million in FY 2002. See Centers for Disease Control and Prevention Financial Management Office, “FY 2003 Budget Request: Funding by Budget and Sub-budget Activity Table,” found online at [<http://www.cdc.gov/fmo/fmofybudget.htm>].

³⁴See CRS Report RL31576 *Federal Research and Development Organization, Policy, and Funding for Counterterrorism*, by Genevieve J. Knezo.

³⁵See CRS Report RS21203 *The USA PATRIOT Act: A Sketch*, by Charles Doyle.

³⁶See CRS Issue Brief IB95112, *Terrorism, the Future, and U.S. Foreign Policy*, by Rensselaer Lee and Raphael Perl for an overview of policy responses to terrorist threat.

³⁷The select agent list consists of viruses, bacteria, rickettsiae, fungi, and toxins and is determined by the Secretary of Health and Human Services. Agents on the select agent list are considered to have the potential to pose a severe threat to public health and safety.

³⁸See the USA PATRIOT Act (P.L. 107-56) and the Public Health Security and Bioterrorism Preparedness and Response Act (P.L. 107-188). For an overview of the impact of these actions, see CRS Report RL31354, *Possible Impacts of Major Counter Terrorism Security Actions on Research, Development, and Higher Education*, by Genevieve J. Knezo.

(DHS), which has the primary mission of preventing terrorist attacks in the United States, reducing national terrorism vulnerability, and minimizing damage and aiding in recovery from attacks. DHS coordinates federal preparedness and response to chemical and biological terrorism, the latter in conjunction with the Department of Health and Human Services. DHS has extended grants to local first responders to increase local preparedness against chemical or biological weapons use,³⁹ and also is developing its own funding programs for research into chemical and biological defense.⁴⁰

Select Non-governmental Proposals and Actions

Professional societies and non-governmental organizations are also involved in exploring ways to lessen the likelihood of chemical, biological, and toxin weapon use. Selected examples showing the range of activities addressing chemical, biological, and toxin weapons are provided here.

The National Academy of Sciences has completed projects related to chemical, biological, and toxin based terrorism. In addition to convening a Committee on Science and Technology for Countering Terrorism and publishing a document outlining its recommendations,⁴¹ the Institute of Medicine's Board on Neuroscience and Behavioral Health has issued a report on the psychological consequences of terrorism.⁴² Projects currently in progress include an ad hoc committee studying advanced biotechnology standards and practices⁴³ and the development of a robust, "adaptive" methodology for prioritizing vulnerabilities to terrorism by the National Academy of Engineering.⁴⁴

³⁹For an overview of Department of Homeland Security grant programs and homeland security related issues surrounding first responder preparedness, see CRS Report RL31227 *Terrorism Preparedness: Catalog of Selected Federal Assistance Programs*, by Ben Canada and CRS Report RL31490 *Department of Homeland Security: State and Local Preparedness Issues*, by Ben Canada.

⁴⁰For an overview of the Department of Homeland Security Research and Development priorities and funding, see CRS Report RS21270 *Homeland Security and Counterterrorism Research and Development: Funding, Organization, and Oversight*, by Genevieve J. Knezo and CRS Report RL31914 *Research and Development in the Department of Homeland Security*, by Daniel Morgan.

⁴¹The National Academy of Science Committee on Science and Technology for Countering Terrorism published its combined recommendations in book form. See National Research Council, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, (Washington, DC: National Academies Press), 2002.

⁴²See Institute of Medicine, *Preparing for the Psychological Consequences of Terrorism: A Public Health Strategy*, (Washington, DC: National Academies Press), 2003.

⁴³More information about the Research Standards and Practices to Prevent Destructive Application of Advanced Biotechnology Project is found at [<http://www4.nas.edu/webcr.nsf/ProjectScopeDisplay/DSCX-N-01-12-A?OpenDocument>].

⁴⁴More information about the National Academy of Engineering Project on Combating Terrorism: Prioritizing Vulnerabilities and Developing Mitigation Strategies is found at

(continued...)

The American Association for the Advancement of Science, at its annual Colloquium on Science and Technology Policy, addressed the issues of risk analysis and communication and public health preparedness in a bioterror context. The American Psychological Association has established a Subcommittee on Psychology's Response to Terrorism to aid in coordinating psychology's multifaceted response to terrorism, including coping with the threat of terrorism. These programs attempt to develop strategies to prepare for or deter the use of terror weapons.

Many think tanks have addressed the concerns that chemical, biological, and toxin weapons present to civilians. The ANSER Institute for Homeland Security has been active in providing expert briefings and simulations regarding covert biological weapon attack.⁴⁵ The Brookings Institution has held a series of forums on America's response to terrorism.⁴⁶ The Cato Institute has held briefings and provided policy suggestions on bioterrorism, with an emphasis on the debate surrounding smallpox vaccination policy.⁴⁷ The Heritage Foundation has also held briefings and provided policy suggestions on weapons of mass destruction.⁴⁸

Potential Policy Options for the 108th Congress

Increasing Production Barriers

Barriers to chemical, biological, and toxin-related terrorism within the United States may be strengthened by further legislation. One option to increase such barriers would be to address the development and production of chemical, biological, and toxin weapons. This might entail increasing the difficulty of obtaining these weapons by decreasing the ease with which "dual-use" equipment is acquired, either by regulating its domestic sale or through registering owners of such equipment, through a mechanism similar to that for select agents. However, such an option may have an adverse economic impact on those industries with legitimate need for this equipment, such as the chemical, pharmaceutical, and health industries.⁴⁹

Directed Public Health Funding

One suggestion would be to continue increased funding for public health system and law enforcement, in order to provide appropriate hospital capacity, trained medical and mental health personnel, increased screening and surveillance, and

⁴⁴(...continued)

[<http://www4.nas.edu/webcr.nsf/ProjectScopeDisplay/NAEP-R-02-01-A?OpenDocument>].

⁴⁵For more information on the ANSER Institute for Homeland Security, see [<http://www.homelandsecurity.org>].

⁴⁶For more information on the Brookings Institution, see [<http://www.brookings.org>].

⁴⁷For more information on the Cato Institute, see [<http://www.cato.org>].

⁴⁸For more information on the Heritage Foundation, see [<http://www.heritage.org>].

⁴⁹For a discussion of regulating domestic dual-use biological equipment, see CRS Report RS21422 *Dual-Use Domestic Equipment: Difficulties in Domestic Regulation*, by Dana A. Shea.

sufficient equipment in the case of a chemical, biological, or toxin terrorist attack. It has been suggested that continued spending on the order of \$10 to \$30 billion per year would provide sufficient depth of response to reduce a chemical, biological, or toxin attack's effectiveness.⁵⁰ On the other hand, some contend that the risk of terrorist attack is so small that spending more money on security measures may prove counterproductive.⁵¹

Another option to address the threat of chemical, biological, and toxin weapons is through the development of new antibiotic, antiviral, or antitoxin medicines. While many agents of concern have an acknowledged treatment, many can be improved to have higher efficacy. Alternately, further investment in new vaccines or other methods to induce immunity might provide significant deterrence to terrorist groups planning to use such a weapon. Critics of this approach have suggested that developing treatments for specific agents does not lower the overall threat of chemical, biological, or toxin attacks, but would rather force a terrorist to choose a different agent. Some experts urge that new, broad-based methods to develop resistance against a wide variety of agents must be developed.⁵²

In the 2003 State of the Union address, President Bush announced a new program designed to increase the availability of countermeasures against terror agents. This program, called Project BioShield, would provide a government-guaranteed market for manufacturers of countermeasures which lack broader applicability. The Senate bill for this program, S. 15, was introduced by Sen. Gregg and reported out of the Senate Committee on Health, Education, Labor, and Pensions. It contains an indefinite, unlimited appropriation specifically to fund countermeasure development and procurement. The House of Representatives version, H.R. 2122, was introduced by Rep. Tauzin and has reported out of the House Committee on Energy and Commerce, the House Committee on Government Reform, and the House Select Committee on Homeland Security.⁵³ It authorizes \$5.6 billion over 10 years for countermeasure development and procurement. Other legislation, S. 666, has been introduced in the 108th Congress by Sen. Lieberman. It would provide additional incentives, such as tax incentives and patent extensions, to private sector businesses to encourage the development of countermeasures to chemical and biological weapons. This bill was referred to the Senate Committee on Finance.

⁵⁰Greg Seigle, "Feds Could Make Bioterror 'Impossible', Expert Says," *Global Security Newswire*, April 9, 2002

⁵¹Roger D. Congleton, "Terrorism, Interest-Group Politics, and Public Policy: Curtailing Criminal Modes of Political Speech," *The Independent Review*, Summer 2002.

⁵²This approach has been advocated by the chief scientist for Advanced Biosystems Inc., Dr. Ken Alibek, a bioweapons expert and former first deputy director of Biopreparat. Advanced Biosystems can be found online at [<http://www.hadron.com/>].

⁵³For more information on Project BioShield and similar legislation, see CRS Report RS21507 *Project BioShield*, by Frank Gottron.

Reducing Public Concern

By addressing specific aspects of chemical, biological, and toxin weapons that exacerbate public fears, the federal government may also decrease the usefulness of these weapons to terrorists. The enhanced impact, relative to conventional weapons, of chemical, biological, and toxin weapons might be decreased if the dread felt when considering their effects could be reduced.⁵⁴ If this enhanced impact could be successfully reduced, there might be less advantage to using these weapons rather than conventional weapons.

One possible approach for reducing the terror impact of these weapons is public outreach to convey the likely risks and relative dangers chemical, biological, and toxin weapons pose. Since these weapons are high consequence/low probability events, explanation of the likelihood of their use might reduce the public concerns regarding these weapons. Additionally, further outreach by public health agencies, on either the state or federal level, providing practical information regarding the emergency measures and treatments available in the case of such an attack might further reduce public concerns that may exist.⁵⁵ People facing potential chemical or biological weapon exposure might feel that they had sufficient understanding prior to exposure, and therefore could make rational choices regarding their situation. For example, treatment options and regimens might already be known to victims, and those victims might feel greater control over events, lessening their personal anxiety. This option has been partly developed under the Centers for Disease Control and Prevention's implementation⁵⁶ of FY2002 Supplemental Funding for Public Health Preparedness and Response for Bioterrorism. "Pre-event" communications, such as community outreach and educational efforts, are listed as Enhanced Capacities,⁵⁷ for which funds may be allocated after more pressing Critical Capacities are completed.⁵⁸

⁵⁴Some have suggested that the effects of a chemical or biological terrorist attack are overstated and that consequently, the resulting panic may be worse than the threat itself. Steve Connor, "Scientists Condemn Alarmist Official Propaganda Over Bioterrorism," *The Independent*, January 30, 2003.

⁵⁵Brian Michael Jenkins, "All Citizens Now First Responders," *USA Today*, March 24, 2003.

⁵⁶The New York City Department of Health and Mental Hygiene is in the process of developing a public outreach and educational program in conjunction with a public relations firm. Sara Calabro, "Public Health - Smallpox Issue Highlights Pros' Need to Be Prepared," *PR Week*, October 28, 2002.

⁵⁷Core Capacities are defined as "the core expertise and infrastructure to enable a public health system to prepare for and respond to bioterrorism, other infectious disease outbreaks, and other public health threats and emergencies." Enhanced Capacities are defined as "additional expertise and infrastructure (i.e., over and beyond the Critical Capacities) to enable public health systems to have optimal capacities to respond to bioterrorism, other infectious disease outbreaks, and other public health threats and emergencies." Centers for Disease Control and Prevention's implementation of FY2002 Supplemental Funding for Public Health Preparedness and Response for Bioterrorism, found online at [<http://www.bt.cdc.gov/planning/CoopAgreementAward/>].

⁵⁸For more details of the Cooperative Agreement Award governing the Centers for Disease Control and Prevention's implementation of FY2002 Supplemental Funding for Public Health Preparedness and Response for Bioterrorism, found online at [<http://www.bt.cdc.gov/planning/CoopAgreementAward/>]. (continued...)

An educational, public-outreach approach is exemplified in the current debate over smallpox vaccination policy. In addition to the series of smallpox vaccination recommendations issued by the Advisory Committee on Immunization Practices,⁵⁹ private think-tanks,⁶⁰ the National Academy of Science,⁶¹ and the national media have informed the public as to the ramifications of a smallpox attack, the potential uses of vaccine as prophylaxis and as treatment, and spurred a wide debate on the appropriateness of vaccination. Some might argue that this open debate has lessened the terror aspects of smallpox, as many people are now aware that the federal government is developing a response plan to a smallpox outbreak and people are partially informed as to the potential treatments and outcomes.

On the other hand, some have argued that an informational campaign, while decreasing the psychological effect post-exposure, may increase general, day-to-day anxiety. These critics argue that information not presented in the proper context may be counter-productive to attempts to reassure the public.⁶² For example, the efforts of the Federal Civil Defense Administration campaign of public relations and educational programs to prepare the population for the possibility of nuclear war in the 1950s may have increased daily anxiety levels while preparing the population. Also, the success of public outreach plans may be difficult to gauge. The General Accounting Office has recently reviewed several programs containing public outreach components and highlighted the difficulties in assessing outreach effectiveness.⁶³

The Department of Homeland Security began a public outreach campaign in February 2003, focusing on civilian preparedness in the case of terrorist attack, including the use of weapons of mass destruction.⁶⁴ This campaign includes print and broadcast public-service announcements, a website (www.ready.gov), and a toll-free advice number (1-800-BE READY), as well as mailed information and

⁵⁸(...continued)

Health Preparedness and Response for Bioterrorism, see [<http://www.bt.cdc.gov/planning/CoopAgreementAward/>].

⁵⁹The Advisory Committee on Immunization Practices smallpox recommendations can be found on the Centers for Disease Control smallpox website, found online at [<http://www.bt.cdc.gov/agent/smallpox/index.asp>].

⁶⁰The Cato Institute has been very active in the smallpox vaccination debate. For representative examples, see the Cato Institute website at [<http://www.cato.org/current/terrorism/threat.html>].

⁶¹The Institute of Medicine held an open forum on June 15, 2002, discussing the scientific evidence that provides the foundation for smallpox immunization policy options. More information about the forum can be found online at [<http://www.iom.edu/iom/iomhome.nsf/Pages/Forum+on+Smallpox+Vaccination+Policy>].

⁶²A. Murray, "U.S. Should Prepare Public For an Attack, Not Scare It," *The Wall Street Journal Classroom Edition*, October 15, 2002.

⁶³General Accounting Office, *Program Evaluation: Strategies for Assessing How Information Dissemination Contributes to Agency Goals*, GAO-02-923, September 2002.

⁶⁴Other outreach campaigns are being initiated at the state and city level. See "Health Officials Begin Bioterrorism Awareness Campaign," *Associated Press*, April 22, 2003.

billboards.⁶⁵ The initial outreach efforts of this campaign, called the “Ready Campaign,” included advice for preparing homes in case of a chemical or biological attack. This advice, which included suggested purchases of duct tape and plastic, garnered a mixed reception, with some suggesting that other actions might have a higher priority⁶⁶ and others being dismissive of the advice provided.⁶⁷ These efforts were criticized for heightening anxiety and providing disaster information without context,⁶⁸ and for presenting a mixed message of higher public awareness coupled with suggestions that the public should not take specific actions.⁶⁹ Others, while acknowledging that a greater effort to clearly present such advice might be required, maintained the value of such public information dissemination.⁷⁰ DHS, in cooperation with the Alfred P. Sloan Foundation and the Ad Council, have developed a series of television and print advertisements, in addition to their other outreach efforts. The success of this outreach program will be evaluated by the Ad Council through surveying public response, but initial use of the website and toll-free number have been high.⁷¹ Other privately funded studies have indicated that the outreach program had not provided a clear conceptual message.⁷²

The U.S. Department of Education has recommended to local school systems that a crisis plan be developed in order to prepare for potential terrorist events, including those using chemical or biological agents. The Department of Education has published a guide to aid communities in developing their plan⁷³ and, in conjunction with the Department of Homeland Security, has launched a new section of the Department of Education website dedicated to providing a central location for

⁶⁵Lynette Clemetson, “Reshaping Message On Terror, Ridge Urges Calm With Caution,” *The New York Times*, February 20, 2003.

⁶⁶John Mintz and Lyndsey Layton, “Officials: Safe Room Is Not No. 1 Priority,” *The Washington Post*, February 23, 2003.

⁶⁷Michele McPhee and David Saltonstall, “Mike: Don’t Duct & Cover; Says New Yorkers Shouldn’t Seal Up Homes,” *New York Daily News*, February 14, 2003.

⁶⁸Linda Feldman, “Beyond Duct Tape: Blind Fear Vs. Informed Planning,” *Christian Science Monitor*, February 18, 2003.

⁶⁹David Clarke, “Letter From Nebraska Ave.: Stock Up On Water and Food, But Don’t Worry,” *Congressional Quarterly*, February 10, 2003.

⁷⁰Stephanie Strom, “Beyond Duct Tape and Sheeting, An Unlikely Proponent,” *The New York Times*, February 23, 2003.

⁷¹Kellie Lunney, “Success of Homeland Security Ad Campaign Won’t Be Easy to Measure,” *GovExec.com*, February 27, 2003.

⁷²“Americans Wary Of, But Not Prepared For, More Terror Attacks: Survey,” *Agence France Presse*, April 18, 2003.

⁷³U.S. Department of Education, *Practical Information On Crisis Planning; A Guide for Schools and Communities*, May 2003.

school emergency planning.⁷⁴ Some local school systems have developed “shelter-in-place” plans in case of large-scale biological or chemical attack.⁷⁵

Voluntary Media Codes

Another proposal initially forwarded by the National Academy of Sciences for lessening the impact of chemical, biological, and toxin weapons’ terror aspect considers the presentation of information during a chemical, biological, and toxin weapon event. By providing accurate, reliable information during a terror event, public confidence may be bolstered, significantly reducing the terror impact. Some media sources were criticized for presenting the public with incorrect, contradictory, or incomplete information during the anthrax mailings.⁷⁶ Some have voiced concern that the media reporting of events provides a confusing mixture of opinion and fact, potentially misleading viewers as to their potential role.⁷⁷ The combination of potentially faulty advice and varied expert opinion may have confused the public about what the “right” actions to maximize safety were.⁷⁸ The National Academy of Sciences advocates developing a voluntary media code regarding coverage of such attacks, to ensure accurate reporting,⁷⁹ and other groups also are exploring the role

⁷⁴The Department of Education website relating to emergency preparedness is found online at [<http://www.ed.gov/emergencyplan/>]. U.S. Department of Education, “Paige, Ridge Unveil New Web Resource to Help Schools Plan for Emergencies,” Press Release, March 7, 2003.

⁷⁵For an example, see David Cho, “Fairfax To Confine Students In Case Of Terrorist Attack,” *The Washington Post*, January 29, 2003.

⁷⁶For example, advice on personal treatment of mail was alternately disputed or supported by public health professionals and researchers. See J. Dorschner and P. Ogle, “Read This Before Ironing Any Of Your Suspicious Letters,” *The Miami Herald Sunday Gazette Mail*, October 21, 2001; D.H. Frazer, “Health Experts Warn Against Anthrax Advice,” *Milwaukee Journal Sentinel*, October 20, 2001; and J. Zagars, “Just the Facts?” *The Washington Post*, November 8, 2001.

⁷⁷David Clarke, “GOP Lawmaker Hits Bush On Local Homeland Aid,” *CQ Homeland Security*, January 28, 2003.

⁷⁸For an illustrative view of the competing aspects of media coverage of terror related events see The Brookings Institution, “The Role of the Press in the Anti-Terrorism Campaign: The Anthrax Scare and Bioterrorism: Is the Coverage Informative or Needlessly Frightening?”, Brookings/Harvard Forum, December 19, 2001, found online at [<http://www.brookings.org/dybdocroot/GS/Projects/Press/121901.htm>].

⁷⁹A precedent for voluntary development of media-controlled norms can be found in the manner by which the media reports on child crime victims. See National Research Council, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, (Washington, DC: National Academies Press) 2002.

of media reporting and terrorism.⁸⁰ Some editors additionally advocate a more restrained approach to reporting on homeland security and terrorism related news.⁸¹

In an effort to provide accurate and timely expert information, the Centers for Disease Control and Prevention has established a website providing information to those interested in likely biological, chemical, and radiological weapons.⁸² In addition to providing information for the general public, they also provide more detailed information for public health, clinical, and laboratory workers. Some have questioned what mechanism will be used to provide the public with authoritative, official information after a biological or chemical attack.⁸³ Policymakers may wish to review the role of the media in disseminating information before, during, and after a terrorist attack.⁸⁴

⁸⁰For example, the Radio and Television News Directors foundation has developed a media guide for bioterrorism reporting to aid clear, accurate reporting. Radio and Television News Directors Foundation, "Bioterrorism: A Journalist's Guide to Covering Bioterrorism," November, 2002, found online at [<http://www.rtndf.org/resources/bioterror.shtml>].

⁸¹For example, see Lori Robertson, "High Anxiety," *American Journalism Review*, April 2003.

⁸²The Centers for Disease Control and Prevention Public Health Emergency Preparedness and Response website can be found at [<http://www.bt.cdc.gov>].

⁸³Kenneth Chang and Judith Miller, "Duct Tape and Plastic Sheeting Provide Solace, If Not Security," *The New York Times*, February 13, 2003.

⁸⁴Similar consideration of the role of the media regarding terrorist events has been undertaken by the Council of Europe. For more information, see the Media Division of the Council of Europe's Directorate General of Human Rights found online at [<http://www.coe.int/media/>].