

Chemical and Biological Terrorism: Research and Development to Improve Civilian Medical Response

The tragic events of September 11, 2001 have put terrorism in the national and international spotlight, but the federal anti-terrorism efforts began in earnest after the bombings of the World Trade Center in 1993 and the Alfred P. Murrah Federal Building in 1995. The 1995 nerve gas attack on the Tokyo subway by an apocalyptic religious cult and subsequent revelation of its attempts to acquire and use biological weapons added a new dimension to plans for coping with terrorism. Therefore, the Institute of Medicine (IOM) was asked by the U.S. Department of Health and Human Services' Office of Emergency Preparedness (OEP) to:

- (1) collect and assess existing research, development, and technology information on detecting potential chemical and biological agents and protecting and treating both the targets of attack and health care providers, and
- (2) provide specific recommendations for priority research and development.

This report describes current civilian capabilities as well as ongoing and planned research and development (R&D) programs. It identifies some areas in which innovative R&D is clearly needed, and assesses current R&D work for its applicability in coping with domestic terrorism.

Each chapter draws some conclusions about a single aspect of that response and makes recommendations for desirable research and development. There are, nevertheless, some general conclusions that pervade the report as a whole. The most basic of these is that terrorist incidents involving biological agents, especially infectious agents, are likely to be very different from those involving chemical agents and thus demand very different preparation and response. For both types of incidents, however, there is an existing response framework within which modifications and enhancements can be incorporated. An attack with chemical agents is similar to the hazardous materials incidents that metropolitan public safety personnel contend with regularly; to the infectious disease outbreaks that public health departments are often faced with identifying and suppressing; and

to the poisonings from both chemical and biological sources that poison control centers deal with on a daily basis. Strengthening these existing mechanisms for dealing with unintentional releases of hazardous chemicals, for monitoring food safety, and for detecting and responding to infectious disease outbreaks is preferable to building new systems focused solely on potentially devastating but low-probability terrorist events

A second general conclusion relates to whether military approaches to chemical and biological defense are applicable to domestic civilian situations involving these agents. The committee was impressed with the extent to which differences in prior knowledge about the identity of the enemy and the time and place of attack lead to important differences in the needs of military and civilian medical communities. As a result, the committee emphasized treatment over prevention and focused on broad spectrum drugs, detection with familiar or multi-agent equipment, clinical diagnosis based on commercial technology, decontamination without agent-specific equipment or solutions, and modification of familiar or multipurpose protective clothing and equipment.

Detailed, specific lists of R&D needs are offered at the end of each chapter (61 in all), and they are summarized below in the form of eight overarching recommendations.

Recommendation 1. Every state and major metropolitan area needs a system to ensure that medical facilities, including the state epidemiology office, receive information on actual, suspected, and potential terrorist activity.

Recommendation 2. The committee endorses continued testing of commercial protective clothing and equipment for suitability in incidents involving chemical warfare agents, but research is still needed addressing the bulk, weight, and heat stress imposed by current protective suits, developing a powered air respirator with greatly increased protection, and in providing detailed guidance for hospitals on dermal and respiratory protection.

Recommendation 3. First responders, emergency medical personnel, and medical laboratories all need faster, simpler, cheaper, more accurate instrumentation for detecting and identifying a wide spectrum of toxic substances, including but not limited to military agents, in both the environment and in clinical samples from patients. The committee recommends adopting military products in the short run and supporting research to adapt civilian commercial products in the long run.

Recommendation 4. Improvements in CDC, state, and local surveillance and epidemiology infrastructure must be undertaken immediately, and supported on a long term basis.

Recommendation 5. Operations research is needed to identify methods and procedures for triage and rapid, effective, and inexpensive decontamination of large groups of personnel, equipment, and environments.

Recommendation 6. Optimize the utilization of currently available antidotes for nerve agents and cyanide through operations research on stockpiling and distribution, and give high priority to research on an effective treatment for vesicant injuries, investigation of new anticonvulsants and antibody therapy for nerve agents, development of improved vaccines against both anthrax and smallpox, development of a new anti-smallpox drug, and research on broad spectrum antiviral and novel antibacterial drugs.

Recommendation 7. Educational materials on chemical and biological agents are badly needed by both the general public and mental health professionals.

Recommendation 8. The committee recommends support for computer software R&D in three areas: event reconstruction from medical data, dispersion prediction and hazard assessment, and decontamination and reoccupation decisions.

**COMMITTEE ON R&D NEEDS FOR
IMPROVING CIVILIAN MEDICAL
RESPONSE TO CHEMICAL AND
BIOLOGICAL TERRORISM INCIDENTS**

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