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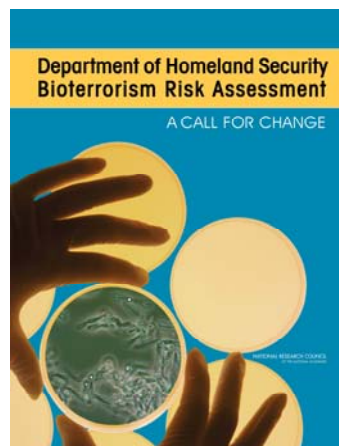
Department of Homeland Security Bioterrorism Risk Assessment: A Call for Change—*Report Brief*

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In 2004, the President issued a homeland security directive that, along with the National Strategy for Homeland Security published in 2002, mandated assessments of the biological weapons threat to the nation and assigned responsibility for those assessments to the Department of Homeland Security (DHS). The first such assessment—the Biological Threat Risk Assessment (BTRA) of 2006—is a computer-based tool to assess the risk associated with the release of each of 28 biological threat agents. To assist in its preparation of this version of BTRA as well as the 2008 version, DHS asked the NRC to carry out a study of the methodology used by the agency to prepare BTRA of 2006. This NRC report presents an introduction to the challenge; an analysis of the critical contribution of risk analysis to risk management; a description of the method used to produce the BTRA of 2006, which is the foundation for later assessments; a discussion of risk assessment for unknown and engineered bio-threats; and ways to improve bioterrorism consequence assessment and the BTRA methodology.

Findings and Recommendations

The consequences of an attack on the United States using biological agents—either natural or bioengineered—could be millions of casualties. To help address this danger, DHS was tasked with conducting biennial assessments of biological threats. The first result of this exercise, the BTRA of 2006, was intended to be an "end-to-end" risk assessment producing prioritized groups of biological threat agents. This list would then be used to identify gaps in the nation's ability to defend against such threats.

Overall Assessment There are fundamental problems with the BTRA of 2006. They range from unnecessarily complicated probability models that are not supported by the existing data to basic questions about how terrorist behavior should be modeled. The

current version is not acceptable for use for bioterrorism risk assessment. There are, however, steps that can be taken to simplify and improve future such risk assessments.

Risk Assessment Lexicon The BTRA of 2006 report uses imprecise and inconsistent technical language. An explicit risk analysis lexicon that clearly defines technical terms used in the report should be included with the report and related presentations.

Determining Terrorist Decision Probabilities While DHS has made an important contribution by attempting to model a bioterrorist attack, there are significant weaknesses in that model. The model should be decision-oriented and recognize that terrorists are intelligent adversaries who adjust to defensive preparations. Terrorist decisions cannot be modeled exclusively as random variables as would be appropriate for natural disasters.

Terrorist decisions, as well as those of defenders, should be the output of a decision support model, not inputs. Probabilities assessments from subject matter experts should not be obtained for decisions points of the model, only for random events occurring within the model.

Decision Support Systems Risk management—informed by risk assessment—is necessary to reduce risk. To make effective use of BTRA to support risk-informed decision making, transparent and user-friendly decision support models are needed. Subsequent revisions of BTRA should increase its emphasis on risk management, maintain a high level of transparency in the model, and enable a more rapid decision support system to allow assessment of new assumptions and data.

Rapid Assessment Strategy For BTRA to be applied to enhanced or engineered biological agents, DHS should develop a rapid assessment strategy to quickly estimate threats from emerging or suspected agents. BTRA should be broad enough to encompass a variety of threats.

Consequence Models The model within BTRA used to analyze the health consequences of a bioterrorist attack requires data that do not exist and parameters that are unknown. It is more detailed than existing knowledge will support and should be made as simple as possible consistent with existing clinical and epidemiologic data about the pathogens on the BTRA list.

DHS is planning to incorporate second-order economic effects in its biennial update of BTRA. This is a positive step and other measures of societal loss such as agricultural and environmental effects should be included as well.

Modeling Intelligent Adversaries A realistic model of the behavior of intelligent adversaries is essential if BTRA is to be of any value. Currently, BTRA uses probabilities based on past behavior whereas an actual terrorist is prospective in that he would constantly change tactics to exploit weaknesses in U.S. defenses. In addition to the event tree representation, DHS needs to explore alternative models of terrorists.

A realistic representation of adversary behavior is applicable to other types of threats—that is, chemical and/or radioactive. This would allow comparisons of consequences and of risk management strategies.

Use of BTRA in its Current Form   BTRA in its present state should not be used to assess bioterrorism risks and should not be extended to chemical and radioactive threats. The deficiencies identified in the report and summarized here need to be corrected. An independent technical advisory committee should be constituted by DHS to oversee this activity. Failure to properly model intelligent adversaries and continuing the unnecessary complexity of the current BTRA will not help defend against bioterrorism threats. An improved BTRA is needed as a more credible basis for risk management.

For further information

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