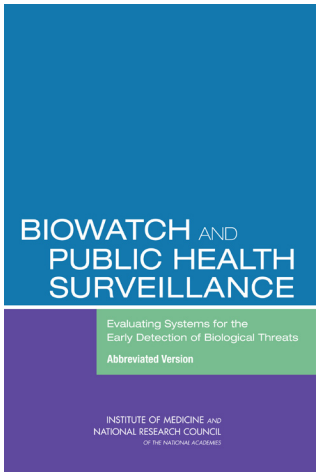
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES
Advising the nation / Improving health

For more information visit www.iom.edu/biowatch

BioWatch and Public Health Surveillance

Evaluating Systems for the Early Detection of Biological Threats

Abbreviated Version



Concern about acts of bioterrorism and infectious disease epidemics following the attacks of September 11, 2001, and the anthrax letters increased interest in developing ways to detect biological threats as quickly as possible. In response, in 2003, the Department of Homeland Security (DHS) introduced the BioWatch program—a federal monitoring system intended to speed detection of specific biological agents that could be released in aerosolized form during a biological attack.

In 2008, at the direction of Congress, DHS asked the Institute of Medicine and the National Research Council to convene a committee to evaluate the costs and merits of both the current BioWatch program and the plans for a new generation of BioWatch devices, to examine infectious disease surveillance through hospitals and public health agencies in the United States, and to consider whether BioWatch and traditional infectious disease surveillance are redundant or complementary.

In its report, *BioWatch and Public Health Surveillance: Evaluating Systems for the Early Detection of Biological Threats*, the committee concludes that the current BioWatch system requires better testing to establish its effectiveness and better collaboration with public health systems to improve its usefulness.

. . . the committee concludes that the current BioWatch system requires better testing to establish its effectiveness and better collaboration with public health systems to improve its usefulness.

The BioWatch System

BioWatch air sampling devices are deployed in more than 30 major U.S. cities. The air samples typically are tested daily for signs of the particular biological agents being monitored. The current BioWatch system generates a signal

when laboratory testing confirms the presence of genetic material consistent with one of the biological agents that the system monitors. This signal is known as a BioWatch Actionable Result (BAR), but the committee finds the term misleading because it sees a BAR alone as unlikely to be a sufficient basis for public health action.

While DHS is responsible for the BioWatch program, the program operates as part of a broader system. DHS works in collaboration with the states and localities in which BioWatch air samplers are deployed, and with other federal agencies, including the Department of Health and Human Services (HHS). In making its recommendations, the committee assumed that the current BioWatch system can be shown through operational testing to provide useful information. However, the committee identified several concerns about the program's management and priorities and about the system's technical performance. To address these concerns, the committee recommends that DHS and other federal agencies take steps to:

- *Strengthen the relationship between BioWatch and the state and local jurisdictions in which it operates*: Public health officials need greater assistance in developing the necessary capabilities to interpret and respond to BARs. Detection of DNA consistent with that of a bioterrorism agent does not automatically mean that an attack has occurred or that people have been exposed. In addition, the BioWatch program should reimburse cities and states for their financial and in-kind costs to support its operation.
- *Conduct systematic testing and evaluation of current and planned technology*: DHS needs to thoroughly test the BioWatch system to establish a more systematic, scientifically sound, and stakeholder-approved approach to technology acquisition, development, testing, and deployment than was possible when the BioWatch program began.
- *Pursue opportunities to advance future biodetection systems*: DHS should work with other agencies in support of research and development needed to achieve goals such as lowering the cost of biodetection and improving the knowledge base for interpreting surveillance results.
- *Make BioWatch planning risk-based and responsive to user needs*: DHS should emphasize using the BioWatch system to aid a timely response to a biological attack, not just successfully detecting genetic material that may indicate a terrorist event. BioWatch planning and evaluation should include a careful analysis of both the risks of an airborne biological attack and the most effective ways to manage these risks. DHS and HHS should collaborate in the continued development of the BioWatch system, with advice from an independent panel of external stakeholders and subject-matter experts.

BioWatch and Public Health Surveillance

In principle, BioWatch and infectious disease surveillance through the public health and health care systems are complementary. Yet while BioWatch has the potential to provide a more timely alert than the public health and health care systems, the promise remains theoretical. Warnings from BioWatch would only be more timely under specific circumstances: if a large-scale aerosol attack were to use certain biological agents and occur where BioWatch is deployed, and if BioWatch successfully detects the biological agent.

While surveillance through the public health and health care systems needs improvement, it is an integral part of daily public health activities across the country at the local, state, and federal levels. These surveillance activities are broader and more flexible than BioWatch, permitting

Warnings from BioWatch would only be more timely under specific circumstances: if a large-scale aerosol attack were to use certain biological agents and occur where BioWatch is deployed, and if BioWatch successfully detects the biological agent.

detection of a wider range of infectious diseases and disease resulting from sources of exposure that BioWatch is not designed to detect. State and local authorities have legal responsibilities as well as knowledge of endemic health risks that make them essential and valuable partners not only in the BioWatch program but also in broader national biosurveillance and emergency preparedness efforts.

Enhancing National Surveillance Capacity and Resources

The public health and health care systems face many challenges in meeting preparedness goals, which include improving the effectiveness of their infectious disease surveillance and developing better capabilities for analysis and exchange of information. The differences in capabilities across local and state health departments contribute to inefficiencies and to the potential for surveillance gaps. Although emergency preparedness has improved since 2001, further improvements are needed, and federal funding covering all aspects of preparedness has declined since the initial post-2001 increases. The committee recommends several actions by HHS and others:

- *Develop and evaluate new opportunities in infectious disease surveillance and detection*: Detecting and responding to infectious disease threats is a core function for the public health and health care systems. HHS, in partnership with state and local public health agencies, should coordinate research, development, and evaluation of improved public health surveillance methods.
- *Develop and evaluate decision support for clinical case recognition and reporting by health care providers*: Early detection of a bioterrorism event or other serious disease outbreak may depend on astute clinicians' ability to recognize suspicious cases. HHS should promote the development, testing, and evaluation of technologies that strengthen the accuracy, timeliness, consistency, and completeness of clinical diagnosis of significant infectious diseases, and that facilitate timely reporting to public health authorities.
- *Improve information sharing and situational awareness*: The current geographic and programmatic compartmentalization of information generated by health care providers, laboratories, and health departments can impede detection and ongoing management of natural and bioterrorism-related infectious disease outbreaks. DHS and HHS should facilitate the development of an interoperable, secure, bidirectional, nationwide health information-sharing infrastructure and ensure that local and state health officials have ready access to the system.
- *Build and sustain capacity to detect and respond to health emergencies*: Despite tar-

geted funding for emergency preparedness, investment in the basic public health infrastructure has been more limited. HHS and DHS should give high priority to building and sustaining sufficient public health workforce strength and competencies, along with associated laboratory and information management capacities, needed by all states and communities to detect a bioterrorism attack or other public health emergency.

Conclusion

The enhancements DHS has proposed to the BioWatch system to make testing automated and more frequent are appropriate, but because they are very ambitious, they will be possible only if significant and long-standing scientific and technical challenges can be overcome. The committee also sees a need for evaluation and improvement of infectious disease surveillance and disease detection resources in both the public health and health care systems. Together with the BioWatch system, these resources should be better linked to a broader and more effective national biosurveillance framework that will help provide state and local public health authorities and the health care system with the information needed to determine the appropriate response to biological threats.

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES
Advising the nation / Improving health

500 Fifth Street, NW
Washington, DC 20001
TEL 202.334.2352
FAX 202.334.1412

www.iom.edu