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BioWatch: Enhancing Biological Threat Detection

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In 2001, just one week after 9/11, letters laced with anthrax were found in the U.S. mail system addressed to offices on Capitol Hill and major media outlets. In response, the newly formed Department of Homeland Security (DHS) deployed the BioWatch program, which seeks to detect the release of dangerous pathogens into the air, providing early warning to government and public health officials on the threat of a biological attack.

In the nearly 10 years since BioWatch's deployment, however, perceived false alarms and program shortfalls have led some to question continued investments in the next generation of the program. While the continued threat of bioterrorism—and even the recent H1N1 outbreaks—prove enough of a threat to justify further spending, in moving forward,

DHS should better address these continued challenges.

Current BioWatch Limitations.

Deployed in more than 30 metropolitan areas, BioWatch uses air sampling equipment and program stations to collect samples over a 24-hour collection period. The samples are then taken to a lab for analysis in hopes of early detection of aerosolized pathogens. While BioWatch has generated dozens of BioWatch Actionable Results, none has been connected with evidence of bioterrorism or cases of human illness.

BioWatch is intended to provide rapid and early warning of a biological threat, but the current process of removing, transporting, and analyzing the samples detracts greatly from the early detection desires of DHS Office of Health Affairs. One of the main reasons for this is the 24-hour collection period.

Current manpower and the need to remotely test the samples does not allow for a shorter collection period. The complete process, therefore, can take anywhere between 10 and 36 hours, allowing for potential widespread of a pathogen before its detection while also inhibiting situational awareness and efforts at interdiction.

Another challenge has seemed to be the ability of the system to

distinguish between dangerous pathogens and related yet non-lethal agents. As the National Academy of Sciences explains, "Several agents of concern, and their close genetic relatives, exist naturally in water or soil. ... Distinguishing natural background levels of endemic agents from a bioterrorism threat and separating genetic 'near neighbors' from the target agent present technical challenges."¹

The problem is that BioWatch systems must be sensitive enough so as not to miss traces of potentially deadly pathogens dispersed over a large area yet discriminating enough not to set off continual false alarms, a balance that is very difficult to achieve. Repeated false alarms run the risk of increasing complacency in the risk of a true bioterrorist attack.

Program Realities. To date, BioWatch has cost the U.S. taxpayers approximately \$1 billion, and the latest iteration of the program, known as Generation 3, is expected to cost approximately \$3.1 billion over the next five years. These costs, along with perceived false alarms, have led many to question whether the program is a potential waste of funding or research.

Thankfully, no bioterrorism events have tested the capabilities

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of the current BioWatch system. Yet with currently biological advances and the amount of information available to the general public, biological attacks have been given a high priority as a potential threat. While greater refinement is needed in the BioWatch system, early detection is the best way to prevent widespread illness and loss of life.

With this in mind, BioWatch Generation 3 will replace existing equipment with fully automated sampling and analysis devices. By eliminating the need for collection and transport to a remote lab, the process is expected to take approximately four to six hours, drastically improving the response time to any biological event. This benefit will also be compounded by the decrease in required manpower that consumes a great deal of the BioWatch funding and increases in the number of jurisdictions participating in the program.

Further, while the majority of current sampling sites are outdoors, the third iteration of BioWatch will also look to advance indoor detection, as well as greater outdoor detection in major cities. This will allow for enhanced detection of bio-pathogens.

At the same time, terrorism is not the only enemy BioWatch is attempting to uncover. The current generation of BioWatch has already seen some success with monitoring pathogens previously not detectable

(*Francisella tularensis*, the rodent spread cause of tularemia, or rabbit fever). However, the environmental levels were not high enough to present an actual threat to humans.

Planning for the Future. The world is too mobile and major cities are too populated to rely on the detection of bio-threats by the revelation of medical staff as symptoms pile up. By the time that a virus is detected through normal medical intervention, countless damage and spread may have already occurred. The National Bio-surveillance Integration System looks to medical, veterinary, agricultural and water systems monitoring alongside the BioWatch program to provide the greatest amount of surveillance for potential disease spread. Both programs, however, are behind schedule and require greater development and refinement.

Yet in the event of a release of a bio-pathogen, early detection can mean the difference between life and death. While greater work is needed to refine both systems and ensure the timely and accurate detection of potentially hazardous pathogens, BioWatch is far from an “unnecessary expenditure.”

Congress should thus continue to fund the program, while also calling upon DHS’s Science and Technology Directorate and the Office of Health Affairs to better work together to promote enhanced research and

development for the BioWatch program.

In developing the next generation of BioWatch, DHS should also work to enhance collaboration with the Environmental Protection Agency, Centers for Disease Control, National Science Foundation, and the Departments of Health and Human Services and Defense. Dual-use opportunities for the system might also be sought, such as monitoring pollution levels as well as pathogens, to enhance the system’s effectiveness.

Detecting and Countering Bio-Threats. Terrorist interests in biological weapons and natural outbreaks, such as H1N1, pose a threat to the well-being of the American people. While more work is needed to augment and refine the BioWatch system, early detection holds the key to preventing widespread illness and loss of life from the release and occurrence of bio-pathogens. Congress, DHS, and other federal actors should work together to enhance BioWatch to ensure that the country can detect and counter future biological threats.

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1. National Research Council, *BioWatch and Public Health Surveillance: Evaluating Systems for the Early Detection of Biological Threats: Abbreviated Version* (Washington, DC: National Academies Press, 2011), http://www.nap.edu/catalog.php?record_id=12688 (accessed July 9, 2012).