

National laboratory tests commercial biodetection products

Biodetection: How does your equipment stack up to the threats?

With hundreds of biodetection products on the market - how do you know which one to pick? Pacific Northwest National Laboratory (PNNL) has made that decision a little easier.

Researchers at PNNL conducted more than 5,000 tests with nearly three dozen field biodetection products to assess their performance for anthrax and ricin detection. Their findings are published in *Health Security* to aid first responder organizations in the purchase and use of field biodetection equipment.



A statistically rigorous approach was used to evaluate 28 different general biological indicators and immunoassay products and five portable polymerase chain reaction (PCR) instruments. Indicator products (e.g., protein tests) are simple and widely used but suffer from high false positives. Biological indicators do not identify a specific biothreat agent, but can be useful for distinguishing a protein-containing material from other chemicals. Immunoassays are also simple and perform well if used properly, but can suffer from false positives in some situations. PCR is by far the most sensitive and accurate field screening tool for biothreats, although some sample handling is required and most take about an hour to obtain a result.

Biological field screening should never replace the need to send the bulk of the sample to the Laboratory Response Network (LRN) lab if the FBI-WMD coordinator determines there is a credible threat (per ASTM E2458). The FBI-WMD coordinator also must approve of any biological field screening in situations where there is a credible threat.

In general, the testing found that:

- **Biological indicator products like protein tests** produce numerous false positives with commonly encountered suspicious powders;
- **Immunoassays** performed better for ricin detection than for anthrax detection. 7 of 12 immunoassays met the researchers' most stringent performance criteria for anthrax, while 9 of 12 met the most stringent criteria for ricin. Most of the immunoassays also detected ricin in three different crude castor seed preparations, which are materials that could be found in real-world situations;
- 3 of the 5 **PCR systems** met the most stringent performance criteria. These systems gave nearly no false-positive results with common powders and can be considered the gold-standard for biological field screening.

The detailed results of these studies are available in two open-access articles published in *Health Security*:

- [Evaluation of Immunoassays and General Biological Indicator Tests for Field Screening of Bacillus anthracis and Ricin](#). *Health Security*. February 2017, 15(1): 81-96. doi:10.1089/hs.2016.0044.
- [Evaluation of PCR Systems for Field Screening of Bacillus anthracis](#). *Health Security*. February 2017, 15(1): 70-80. doi:10.1089/hs.2016.0043.

This research is part of PNNL's work with the U.S. Department of Homeland Security Science and Technology Directorate under Contract HSHQDC-08-X-00843 (Dr. Angela Ervin) to assess available technologies and provide convenient and useful resources for the first responder community. A detailed field biodetection product guide, demonstration videos, and mobile app are available at <http://biodetectionresource.pnnl.gov>.