Study reports faster, more economical method for detecting bioterror threats

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Texas Biomedical Research Institute scientists in San Antonio have developed a faster, less expensive route to screen suitable tests for bioterror threats and accelerate the application of countermeasures.

The new process screens for pairs of affinity reagents – molecular magnets that bind to and hold on to their targets, be they toxins, viruses or bacteria. That will enable countermeasures to be selected and utilized much faster than the current practice.

"Using crude extracts from *E. coli*, the workhorse bacterium of the biotechnology laboratory, the new route bypasses the need for purification and complex equipment, enabling screening to be performed in under an hour," said Andrew Hayhurst, Ph.D., a Texas Biomed virologist.

Normally, he said, such screening requires sophisticated costly equipment to purify and analyze the affinity reagents. Such analysis becomes a huge burden when hundreds of reagents need to be checked and can take weeks to months.

The process – funded primarily by Texas Biomed and the San Antonio Area Foundation, and in part by the Defense Threat Reduction Agency and the National Institutes of Health (NIH) – was described online in the November 5, 2012 issue of Nature Publishing Group's *Scientific Reports*.

"We need an inexpensive route to screen libraries of affinity reagents. It

had to be simple and self-contained as we eventually needed it to work in the space-suit lab or hot zone," said Hayhurst.

His surprisingly simple scheme allows scientists to make stop-gap tests to any given biological threat in a matter of days, with the screening step completed in an hour. The goal now is to speed up the entire process to work within a single day.

Hayhurst initially developed the pipeline using llama antibodies as the affinity reagents to botulinum neurotoxins, known as the world's most poisonous poisons – 100 billion times more toxic than cyanide and handled in a specialized biosafety cabinet at biosafety level 2. Satisfied that the system was working, he then took it into the biosafety level 4 laboratory with his assistant, Laura Jo Sherwood, and they generated a stop-gap test for Ebolavirus Zaire in days. This virus has been shown to be 95 percent lethal in outbreak settings and with no vaccine or therapeutic it is a risk to the U.S. through importation. Botulinum neurotoxins and Ebolavirus are among a handful of threats now categorized as Tier 1 agents, presenting the greatest risk of deliberate misuse with the most significant potential for mass casualties or devastating effects to the economy, critical infrastructure; or public confidence.

"Being able to respond quickly to known biological threats will better prepare us for combating emerging and engineered threats of the future," Hayhurst said. "However, the great thing about this test pipeline is that it can be applied to almost any target of interest, including markers of diseases like cancer."

Texas Biomed has applied for a patent on the process. It potentially could be licensed to companies for developing diagnostics to specific medical conditions, tests for environmental monitoring, or to accelerate in-house research programs.

Provided by Texas Biomedical Research Institute