

# NANOBIOTECH NEWS

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*Bioterror detection on a chip*

## **CombiMatrix to develop biothreat microarray systems for U.S. Army**

*By Rosemary Clandos*

The U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) has entered a cooperative research and development agreement with CombiMatrix (NASDAQ:CBMX), an operating unit of Acacia Research Corporation, to develop microarrays for environmental and medical detection of biothreat agents.

CombiMatrix has designed prototypes for their Electrochemical-Detection System, a microarray system that detects chemical and biological agents at the bench, in the battlefield and urban environments.

Although several research groups have been hunkering down on similar projects, CombiMatrix is one of the first companies to produce a detection system that identifies chemical and biological agents by using epitopes. Epitopes are areas on the surface of an antigen that elicit an immune response. They bind with an antibody to create an immune response.

The agreement will enable CombiMatrix to test their technology with anthrax, plague, and other live agents in a safe and secure setting -- the USAMRIID lead laboratory for Medical Biological Defense Research Program at Fort Detrick, MD. Scientists will be free to exchange consulting services, support, equipment and reagents in order to identify biological threats. So far, CombiMatrix has only used simulants of anthrax and chemical agents such as neurotoxins.

The detection system is a combination of three CombiMatrix core technologies -- lab-on-a-chip synthesis technology, immunochemical assays, and electronic signal detection technology.

The chip is a microelectrode array that immobilizes molecules such as DNA or protein and binds them to biothreat agents. The chip's nano-sized wires play a role in identifying angstrom-sized toxins and nerve gases, as well as micron-sized biological agents such as plague.

"We anticipate it can detect between a dozen to 100 different organisms or molecules," says

Amit Kumar, president and CEO of CombiMatrix, based in Mukilteo, WA.

But more likely, only about six nerve gases or toxins would be on a chip. In the desert, soldiers may be worried about only a few agents, because others can't live in that environment. But on a subway, more agents could survive and the chip would be programmed differently, says Kumar.

Because CombiMatrix's system is array-based, it will detect anthrax and other agents at approximately 100 locations on the chip, not just one spot.

"This is very different from what anyone else is doing," says Kumar.

The system will make measurements by sending an electrochemical signal, not an optical signal as utilized in other detection systems. The requirement for light sources and other components make optical systems less rugged, larger and more difficult for battlefield use, says Kumar. Electrochemical detection should make the system less prone to false negative or positive readings by soldiers and others.

### ***Battlefield prototype is in the works***

For the battlefield, CombiMatrix has designed a prototype that is slightly larger than a paperback novel. Soldiers would compress air into a liquid form, add a reagent and put the sample on the chip in the machine. After a few minutes or hours, the machine would indicate if biothreat agents were present, says Kumar.

In response to concerns about the long wait for results, Kumar says, "nothing is perfect, yet."

For long-term automated applications, the device may one day act in a way that's similar to a smoke detector. A compressor or blower would sample the air in a post office or subway, for example, and give a readout of the results.

Other automated applications might include using an airplane to fly over a suspected toxic area and dropping parachutes equipped with the devices. They would sample the air and radio the results to headquarters.

CombiMatrix sub-licensed the chip and some of the technology to Roche Diagnostics for DNA arrays. There are no licenses for defense applications of the technology yet.

"Our strategy is to have a major defense contractor build the system," says Kumar.

### ***U.S. government foots the bill***

Funding for the defense applications of the technology came from the government. CombiMatrix received \$1 million, and recently, they obtained a Congressional appropriation for \$6.6 million, which is expected to filter into their offices in the first quarter 2004.

"We're constantly writing and seeking more from the government, as well as having discussions with defense organizations to supplement that funding and provide us with additional capabilities," says Kumar.

In the last four quarters, the company brought in \$20 million from partnerships and they burned roughly \$21 million in developing their products.

"We have a net outflow of cash of only \$1 million, so as of the end of quarter three, our balance sheet shows more than \$19 million cash and zero debt. We're in a very strong financial position."

*Editor's Note: Contact Amit Kumar at (425) 493-2000. ©*