

# NANOBIOTECH NEWS

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## NVE awarded patent for key element of lab-on-a-chip

By Steve Lewis

NVE Corporation (NASDAQ:NVEC), an Eden Prairie, MN-based firm that develops and sells devices using "spintronics," a nanotechnology it helped pioneer, has been granted a biosensor patent<sup>1</sup> relating to the detection of magnetizable beads in connection with biological and chemical assays.

Detection of magnetizable beads is a key element of lab-on-a-chip systems. In such systems, a magnetic biological marker nanobead adheres to the immobilization surface when a targeted biological agent is present. A spintronic sensor (which uses electron spin rather than electron charge to acquire, store and transmit information) detects a very small perturbation in the magnetic field caused by adhering beads. This field perturbation is used to detect and quantify the presence of even very low levels of biological or chemical materials such as pathogens.

The company's goal is to provide disposable nanosensor elements for hand-held testing devices, approximately the size of glucose monitors, which will provide biomedical test results in minutes rather than hours or days.

"In the lab-on-a-chip, we provide the sensor element in the microfluidics," explains Daniel A. Baker, PhD, NVE president and CEO. The user interface is similar to a PDA. Such a device could test for all the biomarkers available today for conventional testing, "But it would be more sensitive, and allow for much more miniaturization than is used in most medical labs or testing instruments today," says Baker.

### **DARPA project 'exciting'**

This current work, part of an ongoing Defense Advanced Research Projects Agency (DARPA) grant, represents "one of our most

exciting prospects," Baker observes. "Its part of what DARPA has code-named its Bio-Magnetic Interfacing Concepts (BioMagneticICs) program," he explains. "We toured the lab at Cal-Tech where they make the microfluidics. You combine that with our nanosensors to realize the dream of a lab-on-a-chip."

NVE's contribution, he continues, will involve using the magnetic nanobeads (ferrous materials in minute balls) that can attach to biological materials, and then aggregate. "The key is that our sensors can detect these nanobeads to see if there's been an antibody/antigen reaction," Baker explains.

On Dec. 4, 2004, NVE said it had demonstrated in the lab a low femtomole detection of pathogens like the Anthrax lethality factor. This was part of the first phase of its work with DARPA, and was completed ahead of schedule. Subsequently, DARPA awarded NVE an additional \$470,000, bringing its total funding to date to \$1.71 million

"The prototype has been independently tested and it has been verified that we met the criteria set up for the first phase," says Baker. "Now, we have moved into the development of a production process."

NVE has a one-year contract for this phase. "When the year is done, we would have a production process developed," says Baker. "We may not be in production, but we would be able to begin selling small quantities in-house." While those small quantities could be self-financed, he continues, NVE would certainly be interested in obtaining additional grants.

NVE, the owner of 34 patents, retains the intellectual property rights. "Other folks would own the IP to other pieces of the lab-on-a-chip, but the way we'd make money is by selling our disposable sensors," Baker explains.

The market for biomedical nanosensors is expected to reach approximately \$800 million

in 2008, while the market for nanosensors for military and homeland defense applications is projected to reach \$827 million, according to NanoMarkets, LC, a Sterling, VA-based industry analyst firm.

### **Other medical applications**

NVE has been marketing its spintronics-enabled technology in the medical field for several years, most notably with St. Jude Medical. "Our sensors are in all St. Jude pacemakers and implantable cardiac defibrillators," says Baker. St. Jude placed orders totaling about \$1.2 million for components delivered in calendar 2003.

This fall, NVE received an order from Starkey Laboratories for custom-designed spin-

tronic sensor integrated circuits, to replace electromechanical sensors in Starkey hearing aids. The order has a value of more than \$100,000, with shipments scheduled to begin in early 2005. NVE hopes to eventually see its circuits used in all Starkey hearing aids.

NVE's stock closed at \$17.84 per share on April 11, 2005, or about one dollar per share above its 52-week low of \$16.75. The stock's 52-week high is \$54.85.

*Editor's Note: Contact Daniel Baker at (952) 829-9217.*

### **Reference**

1. U.S. Patent Number 6,875,621. Magnetizable bead detector. ©