

NANOBIOTECH NEWS

The global nanobiotechnology intelligence source

Volume 1

Number 20

December 17, 2003

Brighter, more durable and benign

Nanomagnetic particles may work better than most contrast agents

By Rosemary Clandos

Biophan Technologies, Inc. (OTCBB:BIPH) is developing a contrast agent with nanomagnetic particles that would be swallowed or injected for improved magnetic resonance imaging (MRI) testing and reduce potential adverse effects caused by currently available imaging agents.

The particles, which are about 4 nm, would be delivered in a suspension and provide brighter and longer lasting illumination of organs. For some patients, the new formula may offer an alternative to the current ingestible and injectable contrast agents that sometimes cause adverse side effects.

"We believe we have something brighter, more durable and more benign for patients," said Michael Weiner, CEO of Biophan, a Rochester, NY-based biomedical company. "They're made of known biocompatible materials. Although iron is the best material for a good response, it tends to oxidize. We've formulated our materials so they don't oxidize."

Still in the early stage of development, the contrast agent is part of a group of technologies designed to reduce negative effects of MRI imaging. Biophan is primarily using the nanomagnetic particles in a coating for metal medical devices in order to reduce image interference and tissue damage during MRI.

"Our mission is to make all biomedical devices safe and image compatible with MRI," says Weiner.

Currently, patients who have implanted cardiac pacemakers and neurostimulators are unable to have MRI imaging. For more than 3 million people with implanted pacemakers, MRI imaging could reduce performance of the device and increase heart rate. Radio frequency energy emitted by the MRI can interfere with visual images and cause dangerously high heating of tissue near the metal. In tests involving a 1.5 Tesla MRI, the technology showed a

20% to 50% reduction in heating.

Lee Woldenberg, associate professor and chairman of the department of radiology at Medical College of Ohio said, "The technology may be very useful with magnets in the new MRIs. The new magnets are two to six times stronger than those in the originals MRIs. Most of the scanners are 1.5 Tesla; the new ones will be 3 Tesla. For research, the magnets would be up to six times stronger. Therefore, there is more concern for secondary effects of radio frequency resonance in the higher strength magnets."

Biophan's nanoparticle coating is about 200 nm thick and composed of iron, aluminum oxide and other materials. The geometric shape and space between the particles work together on a thin film to vary electrical properties -- resistance and capacitance. Combined with non-conductive material, the particles partially absorb and re-emit energy to create a layer of magnetic shielding.

Solutions for various medical devices

Highly adaptable, the multiple layers of the film could provide different effects and benefits for different devices, says Weiner. "The solution for a pacemaker will be different than for a long guide wire that goes to the vascular system. We have a suite of technology that can craft solutions for devices."

In addition to protecting tissue, the technology also improves imaging for devices that don't heat up in MRI. Screws, sternum wires, aneurysm clips and artificial knees are some devices that create a blacked-out spot on the image. Biophan's nanomagnetic particles could change all that.

Biophan has the exclusive worldwide rights to the medical market for the nanomagnetic particle technology, which was developed in conjunction with Nanoset, LLC, an East

Rochester, NY, company that spun out of Alfred University.

Nanoset owns U.S. patent number 6,506,972 for the nanomagnetic particle technology. Three more patents are expected to be issued within six months, and 10 more patents are pending. These technologies and the contrast agent technology are licensed exclusively to Biophan.

The company also developed carbon composite coatings, novel shield designs and licensed technology for a radio frequency filter from Johns Hopkins University. Combining the technology will produce an added safety margin.

Seeking more funding

SBI Brightline, a division of SoftBank International, recently made a funding commitment of \$2.9 million. "That's good for more than a year of operation," says Weiner. To generate additional funds, Biophan signed a deal with

Boston Scientific Corp., Natick, MA, in November for the adaptation of Biophan technology for one of their product lines. Their sales team is rattling doors at the major biomedical companies and about 30 mid-sized ones.

For the contrast agent, preliminary proof of concept has been developed. "We are in discussions with several large organizations that currently manufacture and market contrast agents," says Weiner.

There's a hefty annual \$10 billion market for medical devices that could be adapted with the Biophan technologies. Weiner says that if one-third of the \$10 billion product market used their solutions and paid a 5% royalty, Biophan would see revenue of \$150 million; if it were a 3% royalty, they would be looking at \$99 million. In either case, it would be a several-year wait until the well-shielded devices would be in the marketplace.

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