



# CASE

CASE WESTERN RESERVE UNIVERSITY

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## **CASE WESTERN RESERVE UNIVERSITY GROWS HEART HEALTHY COMPANIES FROM ITS RESEARCH**

*Recent launch of CardioInsight Technologies Inc. brings number to 3 companies*

CLEVELAND—Case Western Reserve University is helping the world understand how the heart beats through new diagnostic tools and cell therapy. Over the past three years, Case has grown three new companies that help doctors understand how the heart functions and make it healthier when diseased.

“What’s remarkable about these new cardiac-themed companies is that they developed from three very different directions—biomedical engineering, radiology and hematology/oncology,” said Michael Haag, Case’s director of Technology Transfer - Biomedical Licensing.

The new companies—CardioInsight Technologies Inc., Arterioocyte and Interventional Imaging, Inc. (I<sup>3</sup>MRI)—are also adding to Northeast Ohio’s “brain gain” as each new venture has decided to base its company locally, according to Haag.

All companies got their launch through collaborations between Case and University Hospitals of Cleveland. The companies also benefited from the investments both institutions have made in cardiology and imaging, and have brought new intellectual property and technology from other centers and regions to this area—such as I3 from Minneapolis, Aterioocyte from Stanford University and Cardioinsight from Washington University in St. Louis.

Case’s tech transfer office has supported the companies by pulling together a business plan and management team to take the patented technologies to the next step.

According to Mark Coticchia, Case’s vice president of research and technology management, “These companies have the potential to change the lives of people in a number of ways from generating better health to growing more jobs through research, hospital clinical trials, manufacturing, distribution and sales of the new technologies.”

### **CardioInsight Technologies Inc.**

Many diseases of the heart are either caused by or result in electrical abnormalities.

CardioInsight Technologies Inc., a bioscience start-up company, was launched this year to commercialize electrocardiographic imaging technology.

The new technology analyzes data from a vest with several hundred electrodes which measures electrical activity on the torso. It combines that information with 3-D spatial data produced by a computerized tomography (CT) scan, which shows the spatial relationship between the surface of the torso and the surface of the heart to generate images showing electrical activity on the surface of the heart for each heart beat.

Currently this level of data can only be obtained from an invasive electrophysiology study where an imaging catheter is inserted inside the heart.    

Using this kind of data produced by CardioInsight's technology, doctors will be able to guide and design therapies such as identifying areas of cardiac tissue which interfere with proper electrical function for surgical destruction or optimizing patient selection and lead replacement for cardiac resynchronization therapy devices which use electrical stimulation to pace the heart.

With millions of people being diagnosed with conditions caused by electrical malfunctions of the heart or which can be treated by electrical means, the company has the potential to ultimately generate hundreds of millions of dollars of revenue.

Thus far, proof of concept has been demonstrated in studies on 30 human patients, the results of which have been published in leading journals such as *Nature Medicine* and have received worldwide attention.

CardioInsight grew out of a collaboration of company founders, Charu Ramanathan and Ping Jia, who earned their doctorate degrees in biomedical engineering from Case.

The company, under the direction of CEO Warren Goldenberg, Jia and Ramanathan, is constructing a more advanced prototype device and plans to conduct additional studies at University Hospitals Case Medical Center where the company plans to lease space.

The company was developed through a collaboration of Case, JumpStart, Draper Triangle Ventures and BioEnterprise.

## **Arteriocyte**

In 2004, Arteriocyte began to commercialize a non-embryonic (adult) stem cell-based therapy to grow new blood vessels where they are damaged or weakened due to strokes and coronary diseases.

The therapy was developed by Mary Laughlin, a hematologist, and Vincent Pompili, a cardiologist, both of Case, University Hospitals of Cleveland and the Center for Stem Cell Regenerative Medicine, which is funded through a State of Ohio Third Frontier grant. CSCRM is also a subgroup of the National Center for Stem Cell Regenerative Medicine.

The new cell therapeutic is administered intravenously to patients after they have undergone angioplasty to remove plaque that builds up on the walls of blood vessels. During the angioplasty, some

cells in the blood vessel's wall are stressed and weakened, which can result in blood leakage and aneurysms.

The new cell therapy is introduced to rebuild weakened vessel walls. The stem cells preferentially travel to the weakened vessel wall sites. While it can be used following angioplasty, it has the potential to also rebuild new vessels damaged due to injuries.

Arteriocyte CEO Don Brown has worked with Cleveland-based start-up incubator BioEnterprise Corp. to develop the cell therapeutic company. The company has initiated a phase-one clinical trials for FDA approval at University Hospitals Case Medical Center.

### **Interventional Imaging, Inc. (I3)**

Launched in 2003, I3 has developed a new generation of MRI technology that enables new and improved therapies through the delivery of high-resolution interventional magnetic resonance (MR) images. For cardiovascular diseases, I3's intravascular products will aid clinicians at several steps in treatment—at early detection, therapy guidance, delivery and evaluation.

I3 was formed in co-operation with Case and is based on novel technologies developed in the department of radiology at the University Hospitals by the founders, Dr. Jonathan Lewin and Dr. Jeffrey Duerk.

Lewin, formerly a Case professor, is the Martin Donner Professor and chair of the Russell H. Morgan Department of Radiology and Radiological Science at Johns Hopkins University. Duerk is professor of biomedical engineering, radiology and oncology at Case and University Hospitals. He also is director of the newly established Case Center for Imaging Research. The UH/Case team has a long-standing sponsored research agreement with Siemens Medical Solutions, whose partnership has produced I3's core technologies.

This technology consists of proprietary micro-coils. When inserted into a blood vessel, the coils can generate high-resolution images of the vessel walls. In addition, the 3-D location of these coils can be tracked by the MR scanner. These coils and associated circuitry are attached to the tip of a catheter, providing for a procedure analogous to conventional catheterization. These MRI catheter coils represent a novel approach to magnetic resonance imaging from *within* the body, or Intravascular MRI.

I3's technology advantages holds potential as the visualization technology of choice during several site-specific treatment interventions for atrial fibrillation using RF or cryo-ablation, cardiovascular stent deployment, coronary brachytherapy, renal artery angioplasties and neurovascular interventions.

I3 is developing a catheter, code-named "PVI", for the treatment of atrial fibrillation as its first therapeutic product. In addition, I3's technology can also be used in an imaging mode; the company's product, "MReye", targets vessel wall imaging and characterization of atherosclerotic plaque.

To date, I3 has raised approximately \$2 million, primarily from angel investors, in addition to two grant awards by the National Institutes of Health, totaling nearly \$500,000 and include Case as the research institution.

According to Haag, these cardiac companies build on Northeast Ohio's medical strengths and are "three shots" at generating new business that can boost the area's economy and the health of its residents.

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**Case Western Reserve University** is among the nation's leading research institutions. Founded in 1826 and shaped by the unique merger of the Case Institute of Technology and Western Reserve University, Case is distinguished by its strengths in education, research, service, and experiential learning. Located in Cleveland, Case offers nationally recognized programs in the Arts and Sciences, Dental Medicine, Engineering, Law, Management, Medicine, Nursing, and Social Work. <http://www.case.edu>.