

# BEACON Newsletter

Special Edition

July 21, 1999

## BEACON receives \$500,000 to Support Collaborative Research Projects

***During the past two weeks, BEACON has received word that Connecticut Innovations, Inc. (CII) and the Donaghue Foundation have recommended support for the collaborative research grant proposals submitted in Feb/March 1999. These projects reflect BEACON's thrust to stimulate, encourage, facilitate and undertake collaborative research projects that will bring together experts from different disciplines and academic institutions, as well as industry, and have them work on projects of mutual interest.***

---

### **Project 1: Investigation of Flow Properties in**

***Realistic Models of Abdominal Aortic Aneurysms\****  
***Participants: R. Peattie, E. Bluth, M. Hanley, D. Howell***  
***funded by the Donaghue Foundation.***

---

The first collaborative team led by Dr. Robert Peattie focuses on the quantification of aortic arterial aneurysms (AAA) in actual patients. At present, rupture of aortic aneurysms is responsible for approximately 15,000 deaths annually in the USA. Although there is an accepted standard (AAA size of 5 cm) that clinicians use to determine whether or not to intervene, i.e. perform surgical correction, evidence suggests that this standard still puts some patients at risk. Therefore, there is a strong clinical need for accurate assessment of risk of rupture for specific individual AAAs.

The proposed studies are designed to fill this need and investigate both the fluid flow and resulting flow-induced wall stresses in models of AAAs

The second collaborative team led by Dr. Steven Goodman focuses on an innovative approach to develop

derived directly from specific patients. This proof-of-concept study will involve the latest innovations in tomographic imaging, computer animation and stereolithographic rapid prototyping to produce a physical replica of the aneurysm for subsequent testing. The overall effects of these efforts will be better understanding of the process of aneurysm rupture and improved clinical benefit to Connecticut patients by enabling clinicians to more accurately

---

### **Project 2: APhoto-Optical Free Form Nanofabrication for Cardiovascular Tissue Engineering\* funded by the Donaghue Foundation.**

---

assess risk of rupture.

---

**Participants: S. Goodman, P. Campagnola, A. Howell, J. Pitts**

---

cardiovascular tissue. The goal of the emerging new field of

---

\*BEACON, The Biomedical Engineering Alliance for Connecticut, Collaborative Team:

Trinity College, The University of Connecticut at Storrs, The University of Connecticut Health Center, The University of Hartford Hartford Hospital, The Connecticut Children's Medical Center, John Dempsey Hospital, The Yale-New Haven Hospital, Bridgeport Hospital/NovMed and the Baystate Health System

---

tissue engineering is to grow replacement organs and tissues in the laboratory or directly within a patient. In theory, this is done with a "scaffold" to induce cells (from a patient or other source) to grow into the replacement tissue. An ideal scaffold would provide a biochemistry and architecture which mimics the subcellular structure of natural tissues to induce appropriate cell growth. However, current scaffolds typically consist of a single synthetic polymer or collagen (the major structural protein), and have a relatively large (50-100  $\mu$ m) scale architecture, which is ten times larger than cells.

The proposed studies of this team are designed to develop a methodology to fabricate scaffolds with defined chemical and architectural structures at the subcellular, (sub-micron), scale of natural tissues. This technology uses highly focused light to induce chemical crosslinking between proteins, polymers, and other desired components with a microscope-like device, and provides a precision of 200-300 nm which is about 1/50 cell size. With development, this will permit building scaffolds to grow living vascular grafts, prosthetic heart valves, and other tissues by mimicking real biological tissue. As expertise is gained with laboratory fabrication, this methodology may then be applied to permit minimally invasive repair of diseased cardiovascular tissues such as aneurysmic or hemorrhagic arteries, and the delivery of therapeutic agents directly to atherosclerotic plaques, tumors, and other wounds.

---

**Project 3: Encapsulating Islet Cells in Intelligent Membranes for Successful Transplantation in the Treatment of Diabetes® funded by Connecticut Innovations Inc.**

---

---

**Participants: R. Fisher, R. Peattie, J. Bronzino, W. Fodor, and Alexion Pharmaceuticals Staff.**

---

The goal of this research program led by Dr.

Robert Fisher is to develop an unlimited source of encapsulated xenogenic islets that retain the metabolic capacity to restore normal glucose regulation and evade host immune destruction. To accomplish this, a collaborative research program between Trinity College/BEACON Partnership and Alexion Pharmaceuticals, Inc. is being established. The objectives of the research team are to provide (i) an adequate, unlimited source of islets and (ii) a biocompatible encapsulation motif to protect the islets from cell-mediated rejection, while permitting nutrient and oxygen exchange without compromising glucose regulation.

To date, there is a significant unmet clinical need for an efficient means to restore normal glucose regulation in diabetic patients. Restoration of normal glucose regulation by transplantation of encapsulated islets would circumvent the need for insulin therapy. The commercial value of such a replacement therapy is enormous when one considers that 800,000 diabetics presently require insulin treatment.

---

### **BEACON and Collaborative Research**

---

All of these proposals are at the frontier of efforts to develop technology that greatly improves health. They also represent a multi-disciplinary, interinstitutional approach to collaborative research that builds on the strengths of the BEACON partners. Furthermore, to further facilitate progress of these research efforts and dissemination of the knowledge gained from these efforts, the administrative offices of BEACON will provide oversight that includes monitoring the activities of these projects via frequent research meetings and progress reports, and encourage rapid dissemination of results throughout the biomedical research and clinical communities.

These collaborative research projects can serve as models for future academic and industrial team efforts. For more information, please contact the BEACON office at (860) 297-5364.

\*BEACON, The Biomedical Engineering Alliance for Connecticut, Collaborative Team:

Trinity College, The University of Connecticut at Storrs, The University of Connecticut Health Center, The University of Hartford Hartford Hospital, The Connecticut Children's Medical Center, John Dempsey Hospital, The Yale-New Haven Hospital, Bridgeport Hospital/NovMed and the Baystate Health System

---

\*BEACON, The Biomedical Engineering Alliance for Connecticut, Collaborative Team:  
Trinity College, The University of Connecticut at Storrs, The University of Connecticut Health Center, The University of Hartford  
Hartford Hospital, The Connecticut Children's Medical Center, John Dempsey Hospital, The Yale-New Haven Hospital, Bridgeport  
Hospital/NovMed and the Baystate Health System