FIU Biomedical Engineering

Biomedical Engineering

Lecture Series Seminar

Towards the Realization of a Functional Tissue Engineered Heart Valve Substitute: Lessons Learnt and Future Directions

Wednesday, February 25, 2009

11:00 AM, EC 2300

Sharan Ramaswamy, PhD

Sharan Ramaswamy received his Bachelor's degree in Bioengineering from Arizona State University in 1994. He obtained his Master's degree in Biomaterials with an emphasis on fabric reinforced flexible composites in 1998. He then pursued further training as French Government scholar in the area of Biomechanics of total joint replacement at École Centrale de Lyon, France, before commencing his PhD studies at the University of Iowa, focusing on cardiovascular mechanics under the direction of Professor KB Chandran. After completing his PhD in 2003, Dr. Ramaswamy engaged in research in cartilage tissue engineering and the use of MRI as a means to assess tissue development non-invasively. In early 2007, Dr. Ramaswamy took up a research faculty appointment in the department of Bioengineering/McGowen Institute of Regenerative medicine at the University of Pittsburgh where he currently works. One of his main research goals and the focus of his talk today are to integrate the various areas of his training into the synthesis of viable tissue engineered heart valves. Part of this effort resulted in a 4-year American Heart Association, scientist development grant that was awarded to Dr.Ramaswamy last year. His immediate research interest include: Heart valve tissue engineering, MRI-based methods for monitoring tissue engineered constructs, CFD modeling in engineered tissue growth studies, bioreactor design/development and cardiovascular biomechanics.

Suitable pediatric valve replacement in the treatment of congenital heart valve defects is limited primarily due to an absence of remodeling capability in the replacement valve. A potential solution to this lies in the development of functional tissue engineered heart valves (TEHVs). The goal of these constructs is to offer a permanent solution by biologically adapting, integrating and growing with the patient, without the need for additional surgical interventions. In addition, valves are contained within a dynamic mechanical environment which TEHVs need to also tolerate. While the feasibility of TEHVs has been demonstrated in an Ovine model, other important steps towards clinical applicability would include: the utilization of practical, autologous cell sources and rapid, robust tissue formation. Similar to the mechanical loading that contributes to the overall well-being of native heart valves, the right combination of form, magnitude and manner of application of different *in-vitro* mechanical pre-conditioning states may first be required as bio-mechanical cues to aid in tissue formation and allow the construct to reach a stage of readiness for implantation. In this talk, I will go through a brief background of TEHV development and our strategies of approaching this challenging problem. I will discuss the insights that we have gained through these experiences and what are the next steps that could be taken.