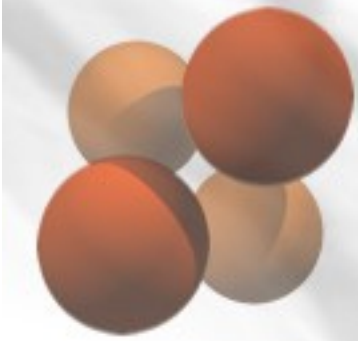

MSE AND BME SEMINAR

Materials Science and Engineering
Biomedical Engineering
Michigan Technological University

Tuesday, April 28, 2015
1:15 pm – 2:15 pm
Room U113, M&M Building

Biomaterial design to interrupt pathological tissue remodeling processes

John & Virginia Towers Distinguished Lecture Series

Prof. William R. Wagner
University of Pittsburgh

Abstract

Tissue remodeling occurs in disease and following trauma, often yielding results that are dysfunctional and which may ultimately progress towards tissue failure. In the case of mechanically active soft tissues, the mechanical environment in which the damaged tissue heals impacts the direction and outcome of the remodeling process. To develop biomaterial-based approaches to improve soft tissue repair we have created degradable supports that act as scaffolds for new tissue generation or as temporary load bearing elements during the remodeling process. Efforts have been directed at the adverse ventricular remodeling process that occurs following myocardial infarction resulting in dilated ischemic cardiomyopathy, and the remodeling of veins used in arterial grafting and tissue engineered blood vessel development. Two general types of supporting biomaterials have been developed and tested in at least one of these settings. In the first approach thermoplastic elastomers, typified by poly(ester urethane)urea, have been synthesized and processed to form microporous elastic patches or wraps. Molecular design parameters can be selected to tune mechanical and degradation properties. In the processing steps, composites with natural materials, such as extracellular matrix digests and components, have been generated. A second approach has focused on the development of thermoresponsive, injectable copolymers that “set up” quickly in situ to provide mechanical support to tissues under load, but then degrade to become soluble over time. The application of these materials in vivo has been shown to alter remodeling patterns and to facilitate tissue generation with associated functional improvements.

Biography: Dr. William R. Wagner is the Director of the McGowan Institute for Regenerative Medicine and a Professor of Surgery, Bioengineering and Chemical Engineering at the University of Pittsburgh. He also serves as Scientific Director of the NSF Engineering Research Center on “Revolutionizing Metallic Biomaterials” and Chief Science Officer for the Armed Forces Institute of Regenerative Medicine. He holds a B.S. (Johns Hopkins Univ.) and Ph.D. (Univ. of Texas) in Chemical Engineering. Professor Wagner is the Founding Editor and Editor-in-Chief of one of the leading biomaterials journals, Acta Biomaterialia, and is a past-president of the American Society for Artificial Internal Organs (ASAIO). Currently he serves as Chairman for the Tissue Engineering and Regenerative Medicine International Society (TERMIS), Americas region. He is a fellow and former vice president of the American Institute for Medical and Biological Engineering and has also been elected a fellow of the Biomedical Engineering Society, the International Union of Societies for Biomaterials Science and Engineering, and the American Heart Association. In 2006 he was selected to the “Scientific American 50”, the magazine’s annual list recognizing leaders in science and technology from the research, business and policy fields. His research has generated numerous patents and patent filings that have resulted in licensing activity, the formation of a company that is currently engaged in clinical trials, and University of Pittsburgh Innovator Awards in 2007, 2008, 2009, 2010 and 2014. In recent years he has been awarded the Society for Biomaterials Clemson Award for Applied Research, the Chancellor’s Distinguished Research Award by the University of Pittsburgh, and the Senior Investigator Award by TERMIS-Americas. Dr. Wagner's research interests are generally in the area of cardiovascular engineering with projects that address medical device biocompatibility and design, tissue engineering, and targeted imaging.

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