

2009-2010

Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

Professor Daniel Kelly

University of Dublin, Trinity College



Dr. Daniel Kelly received his BAI degree in 1999 and his PhD degree in 2004, both from the University of Dublin, Trinity College. For his PhD thesis he investigated the hypothesis that the mechanical environment within osteochondral defects regulates the type of repair tissue that forms within such defects. After receiving his doctorate he moved into industry, working as a research and development engineer for ClearStream Technologies, a medical device company that produces coronary and peripheral angioplasty catheters and stents. He is currently a Lecturer in Biomechanical Engineering in Trinity College Dublin and a PI of the Trinity Centre for Bioengineering. His research interests are in the area of computational and experimental mechanobiology, focusing on the applications this emerging discipline is having on cartilage tissue engineering and the design and pre-clinical evaluation of next generation medical devices. In 2008 he was the sole recipient of the President of Ireland Young Researcher Award to fund a research program investigating the mechanobiology of mesenchymal stem cells for articular cartilage repair. In 2009 he received a Fulbright Award to take a sabbatical position as a Visiting Research Scholar at the Department of Biomedical Engineering in Columbia University, New York.

Thursday, Mar. 25, 2010 4:00 – 5:00 p.m. Room 112, ME-EM Bldg.

The role of environmental factors in regulating chondrogenesis of mesenchymal stem cells – Implications for cell based cartilage repair therapies.

Articular cartilage has a limited capacity for repair. Cell based therapies such as Autologous Chondrocyte Implantation (ACI) can be used to treat cartilage defects, but there is no conclusive evidence that conventional ACI is more effective than established techniques such as microfracture. This has lead to increased interest in novel tissue engineering strategies and alternatives to chondrocytes such as mesenchymal stem cells (MSCs) for cell-based cartilage repair therapies. Central to the success of any cell-based therapy is a fundamental understanding of how the local microenvironment influences cell phenotype and subsequent matrix synthesis and organisation. This seminar will first review how our lab is using *in vitro* models to systematically investigate how MSCs respond to their biophysical and biochemical environment. Key aspects of the *in vivo* joint environment, such as oxygen tension and dynamic compression, will be considered. The seminar will then outline how the information provided by such experiments can be used to develop models of cell behaviour, which can be combined with tools such as the finite element method to develop predictive tools that can potentially be used to improve outcomes in tissue engineering and regenerative medicine.

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