

The Department of Mechanical Engineering
Presents

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Winston Chung Hall 205/206

Micro- & Nanotechnologies in Engineering Stem Cells & Tissues

Abstract:

Human tissues are intricate ensembles of cells of different types embedded in complex and well-defined structures of the extracellular matrix (ECM). However, most of our knowledge about cell and tissue function is based on experimentation with cells on flat, infinitely rigid surfaces of the tissue culture dishes and flasks. In this talk, I will present our interdisciplinary efforts to develop micro/nanotechnology-enabled biomimetic approaches for controlling cell-microenvironment interactions and advanced cell/tissue engineering. Inspired by ultrastructural analysis of the native tissue microenvironments, I will particularly focus on three different settings in normal and disease contexts, in which controlling cell-material interactions on the nanoscale can have dramatic consequences: tumor cell invasion, stem cell engineering, and cardiac/skeletal muscle tissue engineering. As novel approaches to address these problems, I will introduce scalable, nanotopographically-controlled cell culture and tissue models developed in our laboratory, including micro/nano-engineered stem cell niche environment, microfabricated tumor invasion model, and tissue-engineered cardiac and skeletal muscle patch. Using these tools in combination with traditional molecular and cell biology approaches, I will highlight how these biomimetic tissue models enabled by micro and nanotechnologies help to gain better understanding of the structure-function relationship in engineered cells and tissues, and allow us to establish general principles for development of more precise and defined scaffolds for advanced stem cell and tissue engineering.

About the Speaker:

Dr. Deok-Ho Kim is currently an Assistant Professor in the Department of Bioengineering at the University of Washington. He received the Ph.D. degree in Biomedical Engineering from the Johns Hopkins University School of Medicine in 2010. From March 2000 to June 2005, he worked as a Research Scientist at the Korea Institute of Science and Technology (KIST), including his 7 months academic visit at the Swiss Federal Institute of Technology at Zurich (ETH-Zurich). His research interests include development and applications of advanced biomaterials and micro/nano-technologies in cell mechanobiology, stem cells and tissue engineering. He has published more than 120 peer-reviewed journal and conference publications, 1 book, and 19 patents issued or pending in the areas of micro/nanotechnology, biomaterials, and tissue engineering. His papers have been cited > 2100 times in total (H-index: 26) and highlighted in Science Magazine, the JHU Gazette, the UW Today, and many newspapers. Among the award he has received are Samsung Humantech Thesis Award (2009), the Harold M. Weintraub Award in Biological Sciences (2010), Perkins Coie Award for Discovery (2011), American Heart Association Scientist Development Award (2012), KSEA Young Investigator Award (2013), Outstanding Paper Award from ASME Congress on NanoEngineering for Medicine and Biology (2013), and BMES-CMBE Rising Star Award (2013). Dr. Kim is currently an Associate Editor for Biomedical Microdevices and IEEE Transactions on NanoBioscience, and serves as a member of the editorial boards of numerous journals including Scientific Reports, Theranostics, International Journal of Nanomedicine, IET Nanobiotechnology, and Journal of Laboratory Automation.

