

BIOE DISTINGUISHED SEMINAR



Date

Wednesday
Sep. 7, 2022

Time

12:00 – 12:50 p.m. CST

Location

Everitt Lab 2310

ABOUT THE SPEAKER

DR. MICHAEL R. KING is the J. Lawrence Wilson Professor and Department Chair of Biomedical Engineering at Vanderbilt University. He has co-written two textbooks and has received several awards including the NSF CAREER Award, and Outstanding Research Awards from the American Society of Mechanical Engineers and the American Society of Clinical Chemistry. King is a Fellow of the American Institute for Medical the Biological Engineering, the Biomedical Engineering Society, the American Association for the Advancement of Science and the International Academy of Medical and Biological Engineering. He is the Editor-in-Chief of Cellular and Molecular Bioengineering, and is currently the Chair-Elect of the AIMBE College of Fellows

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The Shear Force Is All Around Us: Mechanotransduction of Cancer and Immune Cells In Fluid Flow

Michael R. King
Vanderbilt University
Department of Biomedical Engineering

Many types of cancer metastasize via the bloodstream, where circulating tumor cells (CTCs) originating from the primary tumor can travel through the circulation or lymphatic system and engraft in distant organs. Previously our laboratory found that cancer cells exposed to physiological levels of fluid shear stress (FSS) are dramatically more susceptible to undergoing apoptosis via TRAIL protein, inspiring a new therapeutic drug delivery approach to target metastatic cells in the circulation. The FSS response of CTCs and their neutralization by lipid nanoparticle conjugation to the surface of circulating immune cells has been demonstrated with in vitro cell line experiments, orthotopic mouse models of metastasis, and analysis of primary CTC aggregates isolated from metastatic cancer patients. We later learned that this shear stress is primarily mediated by Piezo1 activation and is modulated by interacting with aggregated stromal cells such as cancer-associated fibroblasts. Interestingly, we recently found that FSS activation of Piezo1 also dramatically enhances the activation of T cells and dendritic cells, which may have important implications for various immunotherapy applications.