UNIVERSITY of HOUSTON | ENGINEERING

Department of Biomedical Engineering

Michael R. King, Ph.D.
Department of Bioengineering, E.D. Butcher Chair of Bioengineering, Rice University

Date Friday, October 17, 2025
Time 12:00 to 1:00 PM
Location SEC 203

Title: *Cancer Mechanotherapy: Harnessing Cellular Mechanotransduction to Understand and Treat Metastatic Cancer*

Abstract: 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 nanoscale liposome 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 learned that this shear stress response is primarily mediated by Piezo1 activation, and is modulated by interactions with aggregated stromal cells such as cancer-associated fibroblasts. Interestingly, we also discovered that FSS activation of Piezo1 dramatically enhances the activation of T cells and dendritic cells, which may have important implications for various immunotherapy applications. Our ongoing research is also exploring whether cellular mechanosensors can be non-invasively stimulated using focused ultrasound, to improve clinical outcomes in cancer.

Bio: Michael R. King is the E.D. Butcher Chair of Bioengineering at Rice University, Associate Vice President for Research, and Special Advisor to the Provost on Life Science Collaborations with the Texas Medical Center. He is also a Scholar of the Cancer Prevention and Research Institute of Texas (CPRIT). Previously, King was the J. Lawrence Wilson Professor and Department Chair of Biomedical Engineering at Vanderbilt University, and before that was the Daljit S. and Elaine Sarkaria Professor at Cornell University. He began his faculty career at the University of Rochester. He has written textbooks on the subjects of statistical methods and microchannel flows, and has received several awards including the NSF CAREER Award, Outstanding Research Awards from the American Society of Mechanical Engineers and the American Society of Clinical Chemistry, and the Christopher Jacobs Award for Excellence in Leadership. King is a Fellow of the American Institute of Medical and Biological Engineering (AIMBE), Biomedical Engineering Society (BMES), International Academy of Medical and Biological Engineering (IAMBE), American Association for the Advancement of Science (AAAS), and the National Academy of Inventors (NAI), and served as founding Vice President of the International Society of Bionic Engineering. He served as Editor-in-Chief of Cellular and Molecular Bioengineering, an official journal of the BMES. He also previously served as Chair of the BME Council of Chairs and Chair of the AIMBE College of Fellows, and is currently the President-Elect of AIMBE.