BENG800: MR IMAGE-GUIDED FOCUSED ULTRASOUND FOR NANOPARTICLE DELIVERY & CANCER IMMUNIOTHERAPY (SEMINAR #4)

Speaker

Dr. Richard Price

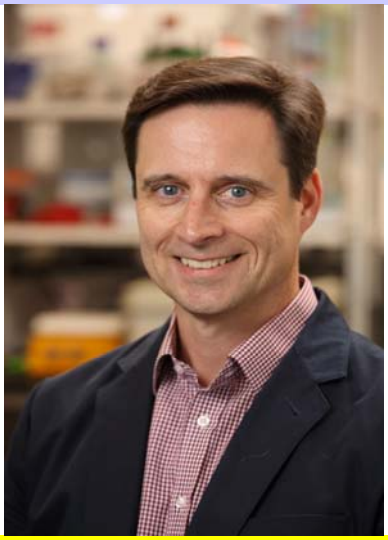
Location

Research Hall 163

Date

12:00pm-1:00pm (lunch will be provided)

Thurs. October 20, 2016



Abstract: The targeted delivery of drug and gene-bearing nanoparticles with focused ultrasound (FUS) has moved from a nascent concept to an area of robust pre-clinical investigation and emerging clinical trial activity. Treatments are typically initiated by intravenously co-injecting contrast agent microbubbles (MBs) and therapeutic nanoparticles. Upon exposure to low-frequency (~1MHz) FUS, which is spatially targeted to the region of interest using magnetic resonance imaging (MRI), the MBs oscillate and exert mechanical forces on the capillary walls. MB activation safely and transiently permeabilizes the endothelial barrier, thereby permitting nanoparticle delivery from the bloodstream to tissue via diffusion and/or convection. Precise spatial nanoparticle delivery is achieved only where US is applied.

In the first application, we are delivering non-viral gene-bearing nanovectors across the blood-brain barrier in models of Parkinson's disease to generate targeted expression of a potent neurotrophic factor (GDNF). Treated animals show marked improvements in motor function, dopamine production, and dopaminergic density, supporting continued efforts toward translation. In the second application, we are using MRI-guided FUS to deliver both cisplatin- and tumor suppressive miRNA-bearing nanoparticles to gliomas. Although still early, we are observing significant tumor growth inhibition and improved survival with these treatments. Finally, I will discuss how driving MBs with FUS at higher acoustic pressures can be used to generate inertial cavitation in melanoma tumors. By exposing the tumor to inertial cavitation, we can elicit an adaptive anti-tumor immune response that controls tumor growth and improves survival via T-cell trafficking from lymph nodes.

Biography: *Dr. Richard Price is a Professor of Biomedical Engineering, Radiology as well as a Research Director at UVa Focused Ultrasound Center. He is a Fellow of AIMBE. He received his B.S. at Rochester Institute of Technology, his M.S. in Biomedical Engineering from the University of Virginia and his Ph.D in Biomedical Engineering from UVA. His research interests are Ultrasound Targeted Delivery of Nanoparticle Drug and Gene Carriers and Regulation of Microvascular Structure by Hemodynamic Forces and Bone Marrow-Derived Cells .*

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