BIOENGINEERING SEMINAR

SPRING 2022

Applications of Echogenic Nanobubbles for Personalized Cancer Medicine —From Diagnosis to Precision Therapy

Abstract

Gas-core nanoparticles (also known as nanobubbles) have gained momentum as a robust contrast agent for ultrasound molecular imaging. By changing the ultrasound exposure parameters, the nanobubbles can be used to treat cancer. The small size, extended stability and high concentration of nanobubbles enable new applications that can provide superior tumor detection, identify biomarkers on the vasculature and tumors cells, and improve the efficiency of drug delivery. The patterns of tissue enhancement under nonlinear ultrasound imaging of nanobubbles are distinct from conventional microbubbles (MB), especially in tissues exhibiting vascular hyperpermeability. The NB kinetics in each of these tissues, quantified via time-intensity curve analysis, typically show a marked delay in the washout rate and significantly increased area under the curve compared to MB. This effect is further enhanced by molecular targeting to cellular biomarkers, such as the prostate-specific membrane antigen (PSMA). In these cases, targeted NB show a significant increase in accumulation in tumors over time compared to untargeted NB. This presentation will discuss our work exploring the unique properties of nanobubbles in contrast-enhanced imaging for the early detection of cancer, the development of companion diagnostics for determining tumor susceptibility to nanomedicine-based pharmacologic interventions in oncology and other targeted theranostic strategies.

Biography

Dr. Agata Exner, Ph.D. is Professor and Vice Chair for Basic Research in the Department of Radiology, Professor of Biomedical Engineering at Case Western Reserve University School of Medicine in Cleveland, Ohio and Adjunct Professor of Physics at Ryerson University in Toronto, Canada. Dr. Exner is also the Director of the Division of Radiology Research, co-Director of the Case Center for Imaging Research and Associate Director of the Case Medical Scientist Training Program.

Her research focuses on developing nanobubble contrast agents for ultrasound molecular imaging and ultrasound-enhanced drug delivery for cancer detection and therapy and engineering drug-eluting polymer implants for intratumoral chemotherapy. She is a Fellow of the American Institute for Medical and Biological Engineering, Distinguished Investigator of the Academy of Radiology Research, chartered member of the Gene and Drug Delivery Systems study section, Ultrasound Section Editor of Molecular Imaging and Biology Journal and Associate Editor of the Annals of Biomedical Engineering. She received her PhD from CWRU in 2003.

Agata Exner, PhD

Professor and Vice Chair - Department of Radiology, Professor - Biomedical Engineering
Case Western Reserve University School of Medicine, Cleveland, OH and Adjunct Professor – Physics at Ryerson University, Toronto

Thursday, March 31st
12:00-1:00 pm

Fairfax Campus:
Horizon Hall, Rm 2010
SciTech Campus:
Katherine Johnson Hall, Rm 258

COVID protocol
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