Joint Department of

BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

"Photodynamic Therapy: An Enabling Technology to Improve Brain Drug Delivery and Tumor Control"

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Huang-Chiao (Joe) Huang is an Assistant Professor of Bioengineering at the University of Maryland, College Park. He completed his Ph.D. in Chemical Engineering at Arizona State University and his postdoctoral training in photomedicine from the Harvard Medical School in 2018. His work is funded by NSF, NIH, private foundations, and industry. He has been recognized with several distinctions, such as the NIH Pathway to Independence Award and the NIBIB Trailblazer Award. His research interests center around developing new photo-responsive tools to detect and treat disease.

ABSTRACT

Most primary brain tumors are managed by maximal safe resection followed by adjuvant chemoradiation to treat residual and potentially infiltrative tumor cells. However, these adjuvant approaches do not effectively treat the tumor-invaded brain regions due to an intact blood-brain barrier (BBB) that restricts drug penetration or a high risk of toxicity to nearby neural structures. The strength of the BBB in protecting brain tumors from exposure to circulating drugs is maintained by not only the intact endothelial tight junctions, but also a range of ATP-bind cassette (ABC) drug efflux transporters on endothelial and cancer cells. We are interested in using low dose photodynamic therapy (PDT) to open the BBB tight junctions and shut down ABC transporters without damaging normal tissues. This approach offers a more specific and less disruptive strategy to deliver drugs to recurrent or residual brain tumors effectively. Furthermore, we will discuss a surfactant-free approach to prepare amorphous photosensitizer nanosuspensions using the FDA approved verteporfin. The verteporfin nanosuspensions can be activated upon cancer cell uptake, enabling PDT and fluorescence imaging of tumors in vivo. We demonstrate up to a 10-fold increase in anti-cancer efficacy of the verteporfin nanosuspensions in glioblastoma cells and animal models, compared to the clinically used liposomal verteporfin formulation. We will also discuss the planning of a clinical trial to evaluate verteporfin nanosuspensions for PDT of brain cancer.

Friday, February 11th
12:00 Noon

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