Department of Biomedical Engineering
UNIVERSITY OF WISCONSIN–MADISON

Spring 2023 Seminar Series

Vasculature-on-chip models for studying metastasis and the tumor microenvironment

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Microphysiological systems or "organ-on-chip" devices are three-dimensional models of simplified biological tissue that have greatly expanded the types of experiments and hypotheses that can be explored in vitro in recent years. My work focuses on vascularized models of the tumor microenvironment to understand the how the endothelial barrier interacts with circulating cells and stromal tissue in order to investigate factors that drive tumor growth, metastasis, and resistance to therapy. One illustration of these models is the observation of the metastatic process, which was accomplished by perfusing cells through vasculature-on-chip in the presence of plasma proteins to determine how the clotting cascade interacts with cancer cells and influences extravasation. Additionally, I have developed novel vascularized models of the tumor microenvironment using cells from surgical resections to generate patient-specific devices. The addition of primary cancer-associated fibroblasts altered several functional parameters, including vascular morphology, barrier function, angiogenesis, as well as immune cell recruitment, likely through cytokine signaling. One major challenge of performing in vitro immunotherapy studies arises from non-specific activation of T cells that occurs when mixing cells from different donors. Therefore, the combination of patient-specific cells and engineered vasculature will enable new immune-oncology studies with many possibilities, including basic science studies, precision medicine trials, and enabling rapid testing and translation of novel immunotherapies.

ABOUT the SPEAKER

Dr. Sarah Shelton earned her B.S. and M.S. degrees in Environmental Sciences and Engineering at the University of North Carolina before joining the UNC-NCSU Joint Department of Biomedical Engineering for her PhD. During her doctoral studies, she developed ultrasound contrast imaging and analysis methods to identify tortuous vasculature for improved cancer diagnosis. She earned a F99K00 award from the NIH to continue her investigation of the vascular tumor microenvironment through a postdoctoral fellowship at Massachusetts Institute of Technology, with a co-appointment at Dana-Farber Cancer Institute. Her current research is in the development of vascularized microphysiological devices to model interactions between multiple cell types within the tumor microenvironment for the identification of biomarkers of disease and opportunities for therapeutic intervention.

Thursday, February 2 at 12:30 p.m.
1003 Engineering Centers (Tong Auditorium)