"Bioengineering 3D tissue models, from blood vessels to the brain"

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Abstract: This talk will discuss historical and state-of-art approaches for bioengineering 3D tissue models. Because the vasculature is necessary for supporting large-size (>500 µm) tissue and organ growth, the early days of tissue engineering have focused on the engineering of blood vessels. With the development of modern technologies such as computer-aided-design and 3D printing, more complex tissue systems have been attempted, including the brain. This talk will chart a personal path of research in tissue engineering of the microvasculature and the brain. Using these first-hand experience as pivots, the talk will overview the evolvement of the thinking that drives the fronts of 3D tissue engineering, and the technologies involved including lithography, biomaterials, bioreactors and 3D printing. The talk will also discuss the clinical relevance of 3D tissue models. The goal of this talk is to foster discussions among the biomedical engineering community for better integration with the clinical world.

Bio: Dr. Tang-Schomer has extensive interdisciplinary training in tissue engineering and neuroscience. She obtained PhD in Biomedical Engineering at Boston University, followed with two postdoctoral training periods, at Center for Brain Injury and Repair, University of Pennsylavnia, and in David Kaplan’s laboratory at Tufts University, respectively. Her doctoral studies focused on micropatterning of extracellular matrix (ECM)-based hydrogels for building three-dimensional (3D) tissue structures. These early investigations led the front of 3D tissue engineering when micro-scale patterning was still restricted to 2D printing of proteins and cells. As a graduate student, she made important original discoveries of non-adhesive surface chemistry and water-based protein conformation changes that were instrumental for developing technologies for 3D gel patterning. After completing her thesis work on tissue engineering of microvascular networks, she set her mind on a research path that could have major impact on studying and treating diseases.

With a long-standing interest in the nervous system, Dr. Tang-Schomer obtained her first postdoctoral training in neuroscience, specializing in traumatic brain injury. During this period, she developed innovative neural tissue models, with which she identified key mechanical mechanisms underlying axon injury. These mechanistic studies have been continuously cited in a wide range of clinical research fields including neuroimaging, brain trauma and neural modulation, etc. Later in David Kaplan’s lab, she applied silk-based material engineering to designs of novel neural-material interfaces for modulating neuronal behavior. As the Lead Author, she conceived the design and led a research team for the development of the first bioengineered functional brain tissue model. This work has generated public interest from the New York Times, Washington Post and National Geographic, etc.

Dr. Tang-Schomer recently joined the Connecticut Medical Center (CCMC) with an Assistant Professor appointment in UConn Health, Department of Pediatrics. At her current position, she plans to develop patient-derived 3D tissue models for translational research. Collaborating with a team of physicians and surgeons, she will apply innovative engineering approaches to addressing clinical needs.