CARNEGIE MELLON UNIVERSITY
BME 2021 SUMMER SEMINAR SERIES

3D Bioprinting Human Tissues and the Path Towards Translation

PRESENTED BY

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SCHEDULE

Thursday,
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(9:00AM-10:00AM)

Over the past decade, 3D bioprinting has rapidly expanded from a niche technology and into a versatile platform for fabricating tissues with complex geometries and features ranging from the cellular to organ length scales. Recent advances include engineering the 3D cell microenvironment, hierarchical vascular networks in thick tissue constructs and regenerative tissue scaffolds implanted in animal models and human patients. However, there remain a number of disadvantages with current approaches, and the need to understand how we can improve the structure and function of the engineered tissue constructs. To address this, we have developed novel biofabrication approaches focused on building extracellular matrix (ECM) scaffolds that mimic the structure and composition of the heart and other tissues and organs. Termed Freeform Reversible Embedding of Suspended Hydrogels (FRESH), we can 3D bioprint collagen, fibrin, decellularized ECM, growth factors, and a wide range of cell types into complex 3D architectures. This includes using FRESH to create large, organ-scale constructs based on patient-specific MRI scans that incorporate functional arteries and valves within full-size, whole hearts. Ongoing work is focused on cellularizing these constructs with human iPSC-derived cardiomyocytes to create beating cardiac tissues and extending these approaches to additional tissue and organ systems for in vitro disease modeling and in vivo regeneration.

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