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Microfluidics fabrication of ECM-based microstructures and their 3D printing

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Soft microtissues comprising living cells and the supportive matrices have been attracting growing research attention by their potential as in vitro organ models that acquires the patient's heterogeneity, as well as building blocks for artificial organs or regenerative tissues. To recapitulate the native tissue structures and functions in vivo, the engineered microtissues shall recapitulate the mechanical and biological properties of the matrices in their native counterpart tissues. Using extracellular matrix (ECM) or ECM-derived materials is an option. However, the structural components of natural ECM are low in modulus (usually less than 1000 Pascal) and slow-gelling (generally taking tens of minutes to gel at 37°C), which may challenge the structural integrity in engineering and raise limitation in the production rate. Microfluidics has been known for its capability to produce monodisperse microstructures in high-throughput. This talk summarizes our progress on microfluidics fabrication of ECM-based microstructures and soft microtissues, and the challenges still faced by this technique. It also covers the chemical and physical functionalization of ECM-like materials to render higher compatibility with biomanufacturing, without sacrificing their biological competence.

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