

Engineering Organotypic Disease On-a-Chip Models; Harnessing Innovations in Microfluidics, Biomaterials and Single-Cell Resolution Analysis

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Ex vivo Three-dimensional (3D) organotypic tissue models have emerged as pivotal tools in both biomedical and pre-clinical research arenas. Tissue-on-a-chip technologies have enabled a better understanding of complex human diseases, surpassing the limitations of traditional animal models. These innovative technologies have also greatly streamlined the process of drug development and discovery through establishing scalable and high-throughput miniaturized platforms for efficiently assessing the effectiveness of multiple drugs and compounds. In this seminar, Dr. Nikkhah will introduce his laboratory's multidisciplinary research focus on the integration of microfluidics technologies, advanced biomaterials, and single-cell level analysis to engineer the next generation of physiologically relevant organotypic tissue-on-chip platforms for disease modeling and drug testing applications. The seminar will particularly highlight their work in engineering tumor microenvironment (TME) models, aimed at studying the earliest stages of cancer progression in the metastatic cascade. Additionally, he will briefly touch upon the development of a 3D vascularized human stem cell-derived tissue-on-a-chip model designed for investigating cardiovascular and cerebrovascular diseases.