

Tissue engineering strategies to shape iPSC-derived tissues/organoids

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Background

Nowadays, the most effective method to build tissues consists of either seeding cells in prefabricated 3D porous scaffolds or exploiting the cellular self-assembling behavior in 3D structures. These methods, however, do not allow to create identical tissue replicas and controlled structures. In this contest, this project is originated and motivated by the research need of developing approaches, techniques, and devices to build high-quality and well-ordered tissue samples in a repeatable way.

Objectives

The project aims at first to create Human Specific Cell MultiLayers (HSC-ML) composed of a single cell species by means of developed test Bio-Microreactors. The samples will be experimentally characterized both during the growth of cell layers and at the end of the process.

Methodologies

Acoustic waves and InterDigitated Transducers will be used as actuators to steer and confine cells dispersed in liquid culture medium in a Micro-Bioreactor as well as sensors to measure the mechanical properties of the assembled biological samples.

Expected Results and Impact

Validated methods, techniques, and solutions to steer and confine cells in liquid by means of acoustic waves, and microfluidics systems to mix and trap different cell species, bring oxygen and nutrient to cells into Micro-Bioreactors to build HSC-ML and ordered and well-connected HE-T samples. R2. Established sensing techniques to detect mechanical properties or activity of cells and tissue during growth by means of acoustic waves. This is an extremely innovative project for the original development of microsystems merging acoustics, microfluidics, and sensing capabilities.

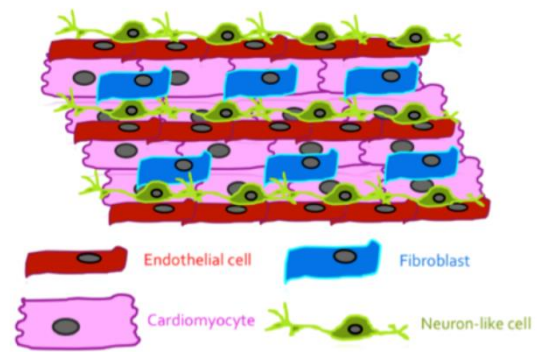
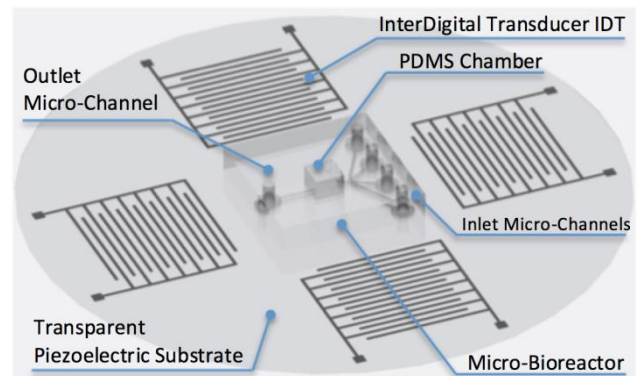


FIGURE 1. SKETCH OF MICROSYSTEM MERGING ACOUSTICS AND FLUIDICS TO BUILD HE-T AND SKETCH OF ORDERED TISSUE STRUCTURE