WWTF Project LS13-092

Organ-on-a-Chip

Abstract

The aim of the proposed research project is the integration of a human synovial organ model into a multifunctional lab-on-a-chip to elucidate how systemic stress factors impart architectural remodeling of the synovial tissue. We hypothesize that the reorganization of the synovium that takes place in arthritis is intimately linked to altered tissue functions in support of the perpetuation of inflammation as well as joint destruction. To date no work has systematically addressed the interdependence between tissue reorganization and tissue function. The successful cultivation of a complex living system in a microanalytical analysis platform would therefore yield substantial insights into rheumatoid arthritis pathogenesis and open new avenues for exploring the mechanisms of inflammation-induced tissue fibrosis and organ failure. The three main objectives of the proposed research include (a) the development of a computer-controlled fully automated miniaturized cell culture system; (b) the establishment of a functional human synovial organ culture in the lab-on-a-chip; and (c) the examination of synovial tissue structure-function relationships using optical and electrical transduction methods. A total of five levels of cell analysis will be performed, including electron microscopy (TEM, SEM), impedance spectroscopy, light scattering measurements and optical/fluorescent imaging, as well as off-chip analysis of cell metabolites from culture supernatants (time-resolved ELISA).

Scientific disciplines:
301304 - Medical biology (50%) | 106006 - Biophysics (30%) | 304005 - Medical biotechnology (20%)

Keywords:
Biomimetics, Tissue Architecture, Lab-on-a-Chip

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Collaborators:	Peter Ertl (Austrian Institute of Technology GmbH) (Co-Principal Investigator)

Status: Completed (01.03.2014 - 28.02.2019) 60 months

Funding volume: EUR 771,800

Further links about the involved persons and regarding the project you can find at
https://archiv.wwtf.at/programmes/life_sciences/LS13-092