Hochschule Kaiserslautern
University of Applied Sciences

Applied Research Center
IMS & HTS

TELMa - Tissue engineering in complex hydrogels by means of three-dimensional electrical and magnetic stimulation

The aim of the project is to create an artificial intestinal wall from smooth muscle cells and nerve tissue from the intestine. The complex individual alignment of the cells is to be achieved by a targeted influence with electric and magnetic fields. This tissue can be used, for example, as replacement tissue for short bowel diseases and for pharmacological drug testing.

In order to achieve this goal, a micro-electro-mechanical system (MEMS) is being developed in which complex three-dimensional direct and alternating fields of different strengths can be generated around a central cavity by combining micro and nano components (electrical coils, concentrators, hard magnetic micro components, nanoparticles). The cells absorbed in a hydrogel are placed in the cavity and supplied with culture media. The nerve and muscle cells or their progenitor cells used should be histologically correctly oriented and grow together into a functional tissue unit.

The planned novel approach is more gentle on the cells and therefore allows the expectation of a much more complex tissue functionality than would be possible with 3D printing techniques and the shear forces applied there.

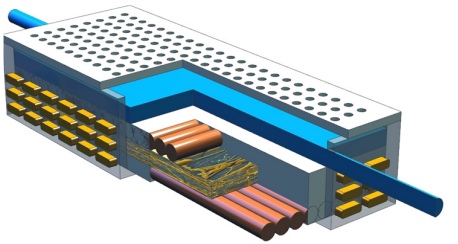

Figure 1: Micro-electro-mechanical system with muscles and nerve cells in hydrogel

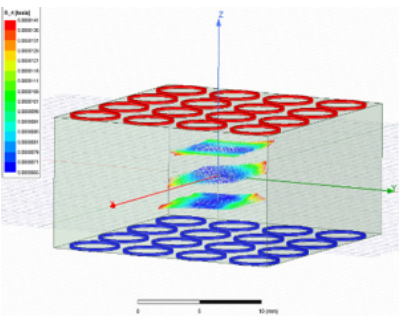

Figure 2: Simulation of the strength of magnetic fields generated by electromagnetic devices as an example

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