



Thesis Project Form

Title (tentative): Electrical stimulation of 3D assembloids derived from human induced pluripotent stem cells coupled to high-density devices.

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Description

Motivation and application domain

Three-dimensional neuronal networks derived from human induced pluripotent stem cells (hiPSCs) opened new perspectives in the neuroscience and neuroengineering fields. The ability to manipulate the networks' activity provides a solid baseline for future exploitation of in vitro human-derived experimental models in the field of personalized medicine.

General objectives and main activities

The goal is to investigate the response to electrical stimulation of 3D modular neuronal networks derived from hiPSCs. In particular, the aim is to understand the role of modularity in the evoked response and the possibility to manipulate the directionality of the signals between the modules.

The activities involve the implementation of cell culture protocols for the realization of 3D homogeneous and heterogeneous models and the maintenance of such neuronal cultures on long-term. The activities include the definition and execution of experimental protocols for the electrical stimulation of the neural networks, the acquisition, and the analysis of the electrophysiological activity.

Training Objectives (technical/analytical tools, experimental methodologies)

Data acquisition platform (3Brain)
3D neuronal cultures' generation
3D neuronal cultures' maintenance
Electrical stimulation methodologies
Software tools for electrophysiological recordings
Software tools for data analysis

Place(s) where the thesis work will be carried out: Bioengineering Lab (DIBRIS)

Additional information

Maximum number of students: 1