UNIVERSITY OF GENOA
DEPARTMENT OF INFORMATICS, BIOENGINEERING, ROBOTICS AND SYSTEMS ENGINEERING
MASTER'S PROGRAM IN BIOENGINEERING

Dibris

Thesis Project Form

Title (tentative): Study of morphological and functional connectivity of 2D low density neuronal networks derived from human induced pluripotent stem cells coupled to high-density devices

Thesis advisor(s): Martinoia Sergio, Giuia Parodi

E-mail: Sergio.Martinoia@unige.it

Address:

Phone: (+39) 010 33 52980

Description

Motivation and application domain

The neuronal networks derived from human induced pluripotent stem cells (hiPSCs) opened new perspectives in the neuroscience and neuroengineering fields. The quantitative study of networks morphological and functional connectivity provides rich information and 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 morphological and functional connectivity of 2D low density neuronal networks derived from hiPSCs. In particular, the aim is to record the electrophysiological activity of such cultures and subsequently to perform electrical stimulation and immunocytochemistry to evaluate signal propagation and to compare the functional and morphological connectivity. The activities involve the implementation of cell culture protocols for the realization of 2D heterogeneous models and the maintenance of such neuronal cultures on long-term. Moreover, 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 data, and the execution of immunocytochemistry protocols.

Training Objectives (technical/analytical tools, experimental methodologies)

Data acquisition platforms (3Brain)
2D neuronal cultures maintenance
Stimulation methodologies
Software tools for data analysis
Immunocytochemistry protocols

Place(s) where the thesis work will be carried out: Bioengineering Lab (DIBRIS) and CBA (San Martino Hospital)

Additional information

Maximum number of students: 1