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

Thesis Project Form

Title (tentative): Investigating astrocytic calcium dynamics in organotypic brain slice cultures

Thesis advisor(s): Pastorino Laura, Prof. Andreas Hierlemann,

E-mail: Laura.Pastorino@unige.it

Address: Via Opera Pia 13

Phone: (+39) 010 33 56547

Description

Motivation and application domain

Astrocytes are among the most abundant cell types in the brain. Although these cells are not electrogenic, they exhibit complex, intracellular calcium signals that propagate in space and time. However, the information transmitted with these signals remains unclear and poses intriguing open questions in neuroscience. In-vitro 2D monolayer cultures of astrocytes lack the complex morphological phenotypes observed in-vivo, which may ultimately affect calcium signal dynamics. Organotypic brain slices represent a more physiological in-vitro alternative, as they preserve cellular organization and tissue heterogeneity. However, it is difficult to repeatedly perform high-resolution imaging under sterile conditions ex vivo over longer periods, as the slices require culturing on a porous membrane at an air-liquid interface.

General objectives and main activities

To address, these limitations, we have developed a dynamic microfluidic platform that enables continuous live-cell imaging of organotypic brain slices via high-resolution microscopy. The platform can be sealed under sterile conditions, allowing repeated investigations of astrocytic calcium dynamics during prolonged periods of time.
The proposed project is based in fundamental life-science research, with potential pharmaceutical application as the effect of compounds on calcium dynamics will be tested.

Training Objectives (technical/analytical tools, experimental methodologies)

Within this project, the student will get acquainted with numerous techniques required for fundamental research activities

Place(s) where the thesis work will be carried out: Department of Biosystems Science and Engineering, ETH

Additional information

Maximum number of students: 1