Proposal of Master Research Project / Proyecto fin de Master for the academic year 2026-27

Group name: Sensory Transduction and Nociception
IP name: Felix Viana, Ana Gomis and Elvira de la Peña
Group web: http://painchannels.com/index.php/index

Title of the MRP/TFM:
Development of an *in vitro* platform to characterize mammalian nociceptors using optical methods

Summary of the Project:

Nociceptors are specialized sensory neurons responsible for the detection of damaging stimuli. Their endings cover the surface of the skin, detecting irritant chemicals, noxious temperatures and harmful mechanical stimuli. Recent transcriptomic studies have revealed a large diversity of mammalian nociceptors, explaining their different sensitivity to noxious stimuli. Nociceptors are highly polarized cells with peripheral terminals in the skin, the site of sensory transduction, and a central ending reaching the dorsal horn of the spinal cord and connecting with the central nervous system. In the skin, nociceptor terminals are in close contact with non-neuronal cells (glial cells, macrophages, keratinocytes, etc), shaping their functionality, a relevant situation under conditions of inflammation.

To better model the *in vivo* characteristics of nociceptors in their native cellular environment, the project will develop a culturing system in compartmentalized chambers based on microfluidic devices, isolating the peripheral endings from their somas. This will allow the functional interrogation of soma and terminals in isolation, and the study of non-neuronal cells and modulators on their activity. This advance is relevant for the characterization of novel analgesic drugs targeting the excitability of nociceptors for the treatment of pain.

The specific objectives of the project are:

- Establish a neuronal culture of mouse nociceptors using a compartmentalized microfluidic device
- Quantify the growth rate and axonal characteristics of nociceptors using fluorescent transgenic mouse lines
- Study the influence of peripheral non-neuronal cells and modulators on the activity of different classes of nociceptors.

To begin the project, the student must either hold certification in animal handling or be in the process of completing the TBS

Methods and technology involved in the MRP/TFM Project:

- **Culture of mouse primary sensory neurons on microfluidic devices**
- **Co-culture of sensory neurons with non-neuronal cells**
- **Transfection of mammalian expression vectors**
- **Monitoring axonal motility using optical techniques**
- ***In vitro* calcium imaging**
- **Optogenetic stimulation of nerve endings**
- **Image analysis and interpretation of results**

Member/s of the lab who will act as tutor/co-tutor of the project (if different from the group IP; PhD required to be tutor / co-tutor): Elvira de la Peña/Félix Viana

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