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

Group name: Sensory Transduction and Nociception
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Title of the MRP/TFM:
Modelling Oxaliplatin-Induced Peripheral Neuropathy in Human iPSC-Derived Sensory Neurons: Excitability and Pharmacological Modulation

Summary of the Project:

The project presented here focuses on understanding the mechanisms involved in chemotherapy-induced peripheral neuropathy (CIPN). Chemotherapy-induced neuropathic pain (such as that caused by oxaliplatin) is a significant cause of both acute and chronic suffering, disability, and impaired quality of life in millions of cancer patients. Until recently, a major translational challenge in CIPN research has been the lack of relevant human models of peripheral sensory neurons. The generation of sensory neurons derived from human iPSCs (hiPSC-SN) represents a transformative platform. In our research group, along with other groups, we have established that the hyperexcitability of primary sensory afferents is a key factor in pain chronicity, suggesting that attenuating their activity in early stages could improve symptoms and their temporal evolution, thus preventing chronicity. Peripheral nerve blockade in patients with neuropathic pain produces almost immediate pain resolution, which recurs when the blockade effect wears off, demonstrating the relevance of peripheral input for the maintenance of chronic pain. However, sensory inputs are molecularly and functionally diverse, and the contribution of specific ion channels to pain symptoms under specific conditions remains unknown.

Specific objectives:

- Establish a neuronal culture of hiPSC-SN (human induced pluripotent stem cells).
- Examine the acute and long-term effects of oxaliplatin on the excitability of human sensory neurons derived from hiPSC-SN, including human nociceptors and thermoreceptors.
- Examine the effects of different drugs used in humans and K^+ channel modulators on the acute and long-term effects of oxaliplatin on hiPSC-SN

Methods and technology involved in the MRP/TFM Project:

- **Culture of hiPSC-SN**
- **Transfection of mammalian expression vectors**
- **Infection of mammalian expression vectors**
- ***In vitro* calcium imaging**
- **Electrophysiology recordings (MEA-Multielectrode Array)**
- **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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