Proposal of Master Research Project / Proyecto fin de Master for the academic year 2023-24

Group name: Generation and Regeneration of Bilateral Neural Circuits
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Title of the MRP/TFM: Transcriptomic characterization of a population of neurons that connect both retinas during perinatal stages

Summary of the Project:

In this project we aim to characterize the transcriptomic profile of a transient population of neurons that connect both retinas (retino-retinal population of retinal ganglion cells, R-R RGCs). Our previous work demonstrated the existence of this type of RGCs that specifically expresses the guidance receptor Unc5c (Murcia-Belmonte *et al* 2019 *Curr Biol).* However, the function of this R-R population is still unknown.

To get insight into the role of this R-R population, we are investigating its transcriptomic profile. For that, we have performed single cell (sc)RNA-seq sequencing of RGCs from the embryonic retina and analyzed the data. Unbiased clustering of the data has rend a specific cluster with cells expressing Unc5c. By computational analysis we have identified other genes specifically expressed in this Unc5c population.

The student will be in charge of confirming the expression of the multiple candidate genes identified in the analysis of the scRNA-seq data by classical *in situ* hybridization and/or optimize RNAScope techniques in embryonic retinal tissue.

Unveiling the genetic profile of the RGCs population that project to the opposite retina we could delve into the mechanisms that regulate the correct development of the visual system and neuronal connectivity.

Methods and technology involved in the MRP/TFM Project:

Identify molecules expressed in the RGCs Unc5c+ cell population, obtained previously in the scRNAseq analysis by:
- Generation of plasmids and RNA probe to perform *in situ* hybridization (ISH) or RNAscope technique: design of primers, PCR, cloning, RNA probe transcription, ISH colorimetric and fluorescence.
- Preparation of mouse retinal tissue: perfusion, cryosectioning, vibratome.
- Imaging: immunohistochemistry, confocal microscopy, imaging analysis.

Member/s of the lab who will act as tutor/co-tutor of the project (if different from the group IP): VERÓNICA MURCIA-BELMONTE

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