

Group name: Neurobiology of mental, neurodegenerative and neuro-oncological diseases.

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Group web: under construction

Title of the MRP/TFM project:

Structural and functional consequences of the inactivation of the gene *Lis1* in specific types of cortical inhibitory neurons.

Summary of the Project:

Lis1 is a gene whose protein product is involved in several critical neuronal functions such as development and migration. Its mutation causes lissencephaly in human, a disease with a deep cortical disorganization, mental retardation, serious cognitive deficits and intractable epilepsy. We are currently studying the consequences on the structure and function of cortical circuits of the selective inactivation of the *Lis1* gene in different types of cortical inhibitory interneurons, which are critical for the correct working of cortical circuits.

Currently we are studying neurons expressing parvalbumin or somatostatin, and we are starting this study in a small (and less known) group of cortical inhibitory interneurons characterized by the expression of the vasoactive intestinal peptide (VIP). Our study is focused on two cortical areas with very specific functions: the anterior cingulate cortex (ACC; part of the limbic system and involved in emotional control) and the retrosplenial cortex (RSC, involved in spatial memory and orientation during movement). The project will be focused on the morphological and electrophysiological properties of VIP-expressing cortical interneurons in which the *Lis1* gene has been inactivated. The experimental work will require the use of cutting-edge technologies in the field of neuroscience, such as the combination of genetic neuron labelling and electrophysiology. The work will be carried out within a large, multidisciplinary research group, which will provide many learning opportunities and may be the starting point for a doctoral thesis.

Objectives:

1. To study the number, cortical distribution and morphology of VIP-expressing interneurons in ACC and RSC after inactivating the *Lis1* gene. This may also include the study of the perinatal migration of these neurons.
2. To study the basic electrophysiological properties in "in vitro brain slices" of the cortical circuits after inactivating the *Lis1* gene in VIP-expressing interneurons.

Methods and technology involved in the MRP/TFM Project:

The selected student will learn to independently perform the following techniques:

- Electrophysiological recordings in brain slices (extracellular and intracellular).
- Immunohistochemistry.

In addition, the student will be integrated in the daily laboratory life, and will participate in laboratory meetings and other scientific activities organized in the laboratory.

Other member/s of the lab who could act as tutor/co-tutor of the project: Diego Echevarría (diegoaza@umh.es), Emilio Geijo (emilio.geijo@umh.es)

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