

Group Name: Molecular control of axonal myelination

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Title of the MRP: Deciphering axon-Glial synchronization in peripheral nerve repair and myelination

Summary of the MRP:

Communication between axons (neurons) and Schwann cells (glia) is essential for maintaining and repairing the peripheral nervous system. After an injury, Schwann cells reprogram to repair the nerve (regulated by the c-Jun protein) and degrade damaged myelin (via the MLKL protein). Our preliminary data suggests healthy axons release a metabolite called NAD⁺. As long as Schwann cells detect this extracellular NAD⁺, they keep their repair program turned off. When the nerve is severed or damaged, NAD⁺ levels drop drastically, signalling Schwann cells to activate c-Jun and MLKL to begin regeneration. The objective of the MRP will be to define how NAD⁺ acts as a molecular synchronization signal between axonal damage and the cellular repair response.

The student will have access to a “Beca de colaboración con departamentos universitarios”: Duration: 120 total hours. Total Grant Amount: €2,000. To have access to this fellowship, please send a Letter of Interest and CV to hugo.cabedo@umh.es by September 17, 2026.

Methods and technology involved in the MRP:

The project relies on murine models alongside advanced imaging, biotechnology, and molecular techniques:

- Optogenetics: Stimulating cultured neurons with blue light to control their electrical activity and measure NAD⁺ release.
- Calcium Imaging (using GCaMP6f sensors): Utilizing fluorescent indicators in Schwann cells to track real-time intracellular calcium signaling in response to NAD⁺.
- Massive RNA Sequencing (Bulk RNA-seq) & Bioinformatics: Conducting complete genomic analysis to evaluate how NAD⁺ alters the entire gene expression profile (transcriptome) of Schwann cells.
- Cell Cultures & Sciatic Nerve Explants: Employing in vitro and ex vivo nerve and neuron models to test specific pharmacological inhibitors.
- Western Blot & Immunofluorescence: Standard molecular biology assays to quantify and visualize key proteins like c-Jun, MLKL, and purinergic receptors.

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