



MÁSTER EN INVESTIGACIÓN BIOMÉDICA
Research Project Proposal
Academic year 2026-2027

Project Nº 50

Title: Precision therapy for Parkinson's disease: RNA-Nanoparticles in hydrogel to modulate neuroinflammation

Department/ Laboratory: Department of Pharmaceutical Sciences, Pharmacy and Pharmaceutical Technology Area, School of Pharmacy and Nutrition

Director 1 Elisa Garbayo Atienza

Contact: egarbayo@unav.es

Codirector: María J. Blanco Prieto

Contact: mjblanco@unav.es

Summary

Parkinson's disease (PD) is a neurodegenerative disorder characterized by the progressive loss of dopaminergic neurons and persistent neuroinflammation in the central nervous system. This inflammatory component accelerates neuronal damage and contributes significantly to disease progression. Among emerging RNA-based therapeutic strategies with anti-inflammatory potential, microRNA-124 (miRNA-124) has shown particular promise. Preclinical studies demonstrate that miRNA-124 reduces microglial activation, decreases pro-inflammatory cytokines, and improves neuronal function. However, the intrinsic instability of RNA requires advanced delivery systems to ensure therapeutic efficacy.

This Master's project aims to develop a precision medicine approach for PD based on a lipid nanoparticle-hydrogel (LNP-HG) system designed for localized and sustained release of miRNA-124. The objective is to engineer a biocompatible platform capable of modulating neuroinflammation.

The work plan includes:

1- Development and characterization of the LNP-HG system. This task will focus on the development of miRNA-124-loaded LNPs using microfluidics, and on their physicochemical characterization, including size, zeta potential, morphology, encapsulation efficiency, and RNA release. These LNPs will then be incorporated into an injectable hyaluronic-acid-based supramolecular HG optimized for brain-like microenvironments. The resulting LNP-HG will be evaluated for mechanical properties, degradation, and RNA controlled release behavior.

2- In vitro evaluation in microglial and neuronal models. Biocompatibility, cellular uptake, and anti-inflammatory activity of the LNP-HG system will be assessed using relevant cell models.

This project offers hands-on experience in nanomedicine, biomaterials, and neuroinflammation within a multidisciplinary team experienced in brain repair strategies.

Table with 2 columns and 2 rows: yes, no, X

Does the project include the possibility of supervised animal manipulation to complete the training for animal manipulator?



Universidad
de Navarra

Facultad de Ciencias