Universidad de Navarra
Facultad de Ciencias

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

Project Nº 28

Title: *Ketogenic diet induced astrocytic metabolic rescue in Alzheimer's disease*

Department/ Laboratory
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Summary

Astrocytic insulin receptor (IR) signaling is essential for maintaining brain energy homeostasis and astrocyte–neuron metabolic coupling. In our experimental model, astrocyte-specific IR deletion disrupts cerebral metabolism, suggesting that impaired astrocytic support contributes to neuronal dysfunction and may accelerate Alzheimer's disease (AD) pathology. This project aims to evaluate whether a ketogenic diet (KD) can compensate for these metabolic deficits by promoting ketone body utilization as an alternative energy source.

To address this, control, $IR^{\Delta GFAP}$, APP/PS1, and APP/PS1-$IR^{\Delta GFAP}$ mice will be exposed to either ketogenic diet or control chow for 8 weeks starting at 2 months of age, prior to the onset of cognitive impairment. Brain metabolic changes will be assessed at 4 months using proton magnetic resonance spectroscopy ([^{1}H]MRS), while cognitive performance will be evaluated through Morris water maze and fear conditioning tests.

To investigate the mechanisms underlying metabolic rescue, astrocytic calcium activity will be monitores by fiber photometry.

We expect KD to partially restore metabolic homeostasis, improve astrocyte–neuron communication, reduce neuroinflammatory and degenerative astrocyte signatures, and ultimately improve hippocampal-dependent cognition in APP/PS1-$IR^{\Delta GFAP}$ mice.

yes	X
no	

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