Universidad de Navarra
Facultad de Ciencias

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

Project Nº 34

Title: Plasma Proteomic Signatures Associated with Obesity and Type 2 Diabetes in Humans

Department/ Laboratory Metabolic Research Laboratory, Department of Endocrinology & Nutrition, Clínica Universidad de Navarra (Edificio CIFA).

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Summary

Background: Obesity is a major global health challenge closely linked to metabolic disorders such as type 2 diabetes (T2D). Alterations in circulating proteins reflect systemic metabolic and inflammatory changes and may provide insight into disease mechanisms and biomarker discovery. However, the plasma proteomic landscape across different metabolic states remains incompletely characterized.

Hypothesis: We hypothesize that distinct plasma proteomic profiles are associated with obesity and T2D, reflecting progressive metabolic dysfunction from normoglycemic to diabetic states.

Objectives and Methods: This study aims to characterize the plasma proteome in 90 human subjects stratified into three groups: 30 individuals with normal weight and normoglycemia, 30 individuals with obesity and normoglycemia, and 30 individuals with obesity and T2D. Fasting blood samples have already been collected and are available for analysis. We will ensure a balanced representation of sexes and aim to distribute participants across three age groups (<44, 44–59, and ≥60 years), based on evidence of age-related molecular transitions (Shen et al. Nat Aging 2024;4:1619-1634). Plasma proteomic profiling will be performed using a high-throughput platform (Olink™ Reveal, ~1,000 proteins). Differential protein expression, pathway enrichment, and network analyses will be conducted, incorporating age and sex as covariates.

Expected Results: We anticipate identifying specific protein signatures linked to inflammation, extracellular matrix remodeling, insulin resistance, and metabolic dysregulation. Comparative analyses are expected to reveal early proteomic alterations associated with obesity prior to the onset of T2D, as well as markers distinguishing normoglycemic and diabetic obesity, while accounting for age- and sex-related effects. This study will provide a comprehensive characterization of circulating proteomic changes across metabolic states, contributing to the identification of novel biomarkers and potential therapeutic targets in obesity and T2D.

The following techniques will be used:

Proteomic analysis from human blood samples.

ELISAs.

Gene expression analysis from human samples.

- RNA extraction from tissue.
- Nucleic acid quantitation and quality assessment.
- Real Time RT-PCR.

Protein expression analysis.

- Protein extraction from tissue.
- Protein amount quantitation (Bradford).
- Western blot.

Statistical analysis.

This TFM will allow the student to become familiar with the handling of biological samples, learn techniques frequently used in biomedical research laboratories, as well as carry out the statistical analysis of the data obtained.

yes	
no	X

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