



Propuesta de Trabajo Fin de Máster

Año académico 2025-2026

MÁSTER EN CIENCIA DE DATOS PARA CIENCIAS EXPERIMENTALES

Proyecto Nº 24

Título: Decoding Epigenetic Mechanisms Driving Cardiac Fibrosis

Departamento/ Laboratorio: Bioquímica y Genética

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Resumen:

Cardiac disease, primarily driven by adverse remodeling and fibrotic scar formation, remains the leading cause of mortality and morbidity worldwide. Despite significant progress in research, an effective anti-fibrotic treatment has yet to become clinically available. However, promising advances are emerging through the exploration of novel epigenetic therapies.

Our group has employed both bulk and single-cell CRISPR perturbation in primary cardiac fibroblasts (CFs), alongside ex vivo functional assays, to identify key chromatin factors involved in fibrotic processes. Subsequent ATAC-seq analyses have uncovered the roles of various transcription factors regulated by these chromatin factors, highlighting their crucial involvement in fibrosis.

Building upon these findings, we aim to further investigate the underlying molecular mechanisms by first conducting in silico analyses of the signaling pathways governed by these factors. This initial approach will leverage both public and our proprietary single-cell databases to gain insight into the regulatory networks at play.

Concurrently, we will examine the potential regulation and interactions of these factors experimentally, using both primary murine fibroblasts and established cell lines stimulated with fibrotic cues and treated with candidate regulatory drugs. Functional in vitro assays will be employed to elucidate the molecular mechanisms underlying the regulatory effects of these inhibitors.

Our major innovative outcome will be the identification and development of novel molecules with significant potential to reduce cardiac fibrosis, and possibly other forms of fibrosis, with future clinical application. The successful development of a new anti-fibrotic drug not only addresses critical global health challenges but also holds the promise of lowering healthcare costs, shortening hospital stays, and significantly improving patient outcomes.

OPTATIVAS RECOMENDADAS

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