MÁSTER DE FÍSICA BIOMÉDICA. CURSO 2021/22

PROPUESTA DE TRABAJO FIN DE MÁSTER

Título: Estudio de la Mecano-biología del núcleo celular en condiciones patológicas mediante pinzas ópticas

Title: **Mechano-biology study of cell nucleus in pathological states using optical tweezers**

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Resumen**

It is well-known that mechanical properties of the cell nucleus frequently determine the global cell behavior in many physiological processes, such as cell migration occurring during the immune response or cancer. The structure of the cell nucleus can be described as formed by two different regions: a rigid layer (nuclear cortex), composed by the envelope and the fibrillary lamin network; and the smoother nucleoplasm constituted by the chromatin and other components.

In this project, our purpose is to address the development of a physico-chemical characterization of the cell nuclear state by using the water permeation and the elastic response to micro-indentation assays using optical tweezers with direct force measurements on isolated cell nuclei.

This characterization will help to extend the understanding of how the internal organization of the cell nucleus under different chemical or pathological conditions affects its mechanical properties, and gain knowledge about the relationship between the nuclear mechanics and the cell behavior in the context of diverse diseases.

The student will have the opportunity to gain expertise in: cell culture and manipulation (cell nucleus isolation, drug perturbations…), optical microscopy, optical tweezers with direct force measurements, Matlab programation for data analysis, theoretical analysis using soft condensed matter tools.

Observaciones***

Este trabajo se desarrollará principalmente en el laboratorio del Dr. Francisco Monroy (Dpto. de Química Física, Fac. de Ciencias Químicas, UCM), en estrecha colaboración con los laboratorios del Dr. Pedro Roda-Navarro (Dpto. de Inmunología, Facultad de Medicina, UCM) y del Dr. Javier Redondo-Muñoz (grupo de Biomecánica Nuclear y Epigenética durante la Migración Celular, CIB, CSIC).

*Solo en el caso de dos co-tutores.

**Breve resumen de los objetivos.

***Optativo. Por ejemplo si se recomienda tener algun conocimiento o experiencia previa.