



Master in Photonics – “PHOTONICS BCN” Master ERASMUS Mundus “EuroPhotonics”

MASTER THESIS PROPOSAL

Laboratory: The Super-resolution Light microscopy and Nanoscopy Lab

Institution: Institute of Photonic Sciences (ICFO)

City, Country: Castelldefels, Barcelona, Spain

Title of the master thesis: Advanced and Super-resolution microscopy characterisation of the cellular and molecular alterations caused by Collagen VI mutations.

Name of the master thesis supervisor and co-supervisor:

Supervisor: Enrico Castroflorio

Co-supervisor: Pablo Loza-Alvarez

(for external proposals a co-supervisor from the Master program is needed)

Email address:

Phone number:

Mail address:

Keywords: super-resolution, microscopy, biology, photonic, muscular dystrophy, image analysis, human cells

Summary of the subject (maximum 1 page):

Congenital Muscular Dystrophies (CMD) are a group of rare neuromuscular diseases, highly disabling and with a reduced life expectancy. In particular, common CMD related to collagen VI deficiency (COL6-RD) vary in severity and have no curative treatment.

Collagen type VI is a microfibrillar macromolecule assembled through a finely regulated process. It is expressed in different tissues like muscle, tendon, cartilage, blood vessels, and brain, and it is mainly produced by **fibroblasts**. Once secreted, it has a **pivotal role** in maintaining skeletal muscle integrity and function allowing a proper link between muscle cells and extracellular matrix (ECM).

In this project, the student will learn and use **super-resolution microscopy** and **image analysis** techniques to reveal the subcellular modifications and the molecular architecture of collagen VI in human cells, and in different connective healthy and mutant tissues.

The main objective is to characterise the molecular and subcellular alterations induced by collagen VI mutation in human cells and mouse tissues, to further develop a **new tool** able to monitor the efficacy of **novel therapies** in patients with CMDs.



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The student will learn different advanced microscopy techniques, such as Stimulated Emission Depletion (STED) microscopy, Stochastic Optical Reconstruction Microscopy (STORM), and Light Sheet Fluorescence Microscopy (LSFM) on both human cells and mouse tissues. The student will learn to perform immunofluorescence, immunohistochemistry, tissue clearing, and immunoconjugation techniques, as well as biochemical techniques (Western Blot and Immunoprecipitation).

The candidate will learn and work in a **friendly**, attractive and competitive environment within the Institute of Photonic Sciences (Castelldefels) and the Sant Joan de Deu Hospital (Barcelona).

Additional information (if needed):

- * Required skills : eager to learn, curious.
- * Miscellaneous : will work with biological samples.