

Muscle induced differentiation: interplay between mechanical and electrical effects

Internship director's surname: Sylvie HENON / Myriam REFFAY

E-mail: sylvie.henon@u-paris.fr myriam.reffay@u-paris.fr

Phone number: 01 57 27 70 29

Web page: <http://www.msc.univ-paris-diderot.fr/~henon/> <http://www.msc.univ-paris-diderot.fr/spip.php?rubrique274&lang=en>

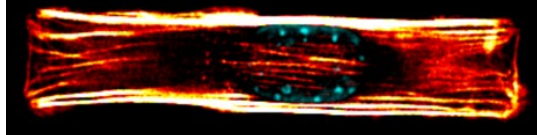
Laboratory name: Laboratoire Matière et Systèmes Complexes

Thesis possibility after internship: YES

Molecular and systems biology have provided unprecedented insights into the molecular and genetic basis of many cellular processes. However, the initiation of numerous metabolic, transcriptional or mechanical responses to environmental stimuli remain largely unexplained, pointing out the need to look at interplay between electrical coupling, mechanical stimuli and transcription factors.

Muscle cells are a reference model to look at the effects of electrical and mechanical stimuli at the scale of a single cell but also in the production of collective behaviour. Myoblasts, which are the precursor cells of muscles, reveal as being influenced by physical properties such as adhesive microenvironment⁽¹⁾⁽²⁾ and cell-generated forces transmission both in term of proliferation, migration, nuclear positioning. In parallel, physiological cues may also determine their fate. The project aims at considering mechanical and electrical stimuli on the differentiation process from myoblasts to myofibers.

myoblasts/myotubes on
adhesive patterns



The internship will focus on micro-patterning of adhesion proteins approaches to monitor cell environment through the 2D constraints of their adhesion. We will correlate various clues of cell differentiation starting from transcriptomics through RNA-FISH imaging⁽³⁾ (dynamics or statics) to electrical conduction by the imaging of membrane potential sensors. This internship will give the opportunity for the student to learn numerous and various techniques such as surface micro-patterning, fluorescence imaging on confocal or 2-photon microscope, immunolabelling, RNA-FISH measurements.

(1) *L. Montel, Sotiropoulos A., Hénon S. PLoS One, 2019, Vol. 14, e0214385.*

(2) *D. Pereira, et al. 2020 Sci. Rep. Vol. 10, 20598.*

(3) *M. Dos Santos, et al. 2020 Nat. Comm., Vol. 11, 5102.*