INTERNSHIP PROPOSAL

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Thesis possibility after internship: YES/~~NO~~

Forces in muscular tissues

Cell-generated forces in tissues allow to contract, to stretch the whole tissue and to align or to organize individual cells. All these mechanisms are implied in fundamental tissues processes such as homeostasis, transcription or cell differentiation. While most existing mechanobiological techniques focus on tissue embedded in a matrix, we develop a new approach based on magnetic cells (through the insertion of magnetic nanoparticles) to create a substrate-free 3D tissue. This tissue is handled by two micro-magnets and can be stretched at will.

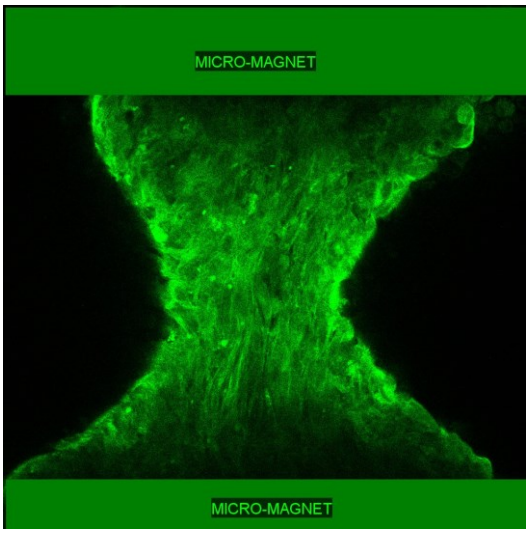

Figure 1 : Multicellular aggregates of muscle cells stretched between two micromagnets. Actin is labelled. The two magnets are separated by 500µm

Our aim is to couple this technology with the insertion of force nanosensors (through the insertion of an elastic segment into cadherins) to visualize forces inside the tissue and study their propagation in response to a macroscopic stimulation. As stimulations can be easily modulated we will be able to access force and deformation patterns inside the tissue to understand cell mechanical properties.
Speaking about forces in tissues, one can't help thinking about muscles. This approach will thus be tested on pre-muscle cells first in the context of muscular differentiation.
The project is multidisciplinary and will be done in close collaborations with biologists. It will use both cell culture protocols and develop new approaches using two-photons microscopy, magnetic techniques.

F. Mazuel et al. 10.1103/PhysRevLett.114.098105
V. Du et al. 10.1038/s41467-017-00543-2
G. Mary et al. 10.21203/rs.3.rs-130138/v1