Internship subject

Impact of compressive stress on engineered cancerous tissues

Confidential subject: No **Subject open to M2:** Yes **to M1-RIT:** Yes **Subject adapted to LabTraining:** Yes

Abstract: Cancer tumors in vivo are mechanically constrained by their environments, which can impact their growth and/or invasiveness. This project aims at studying how compressive stress regulate the growth and contractility of cancerous tissues. To this end, this project combines cutting edge technologies in microfabrication with tissue engineering. Microfabrication techniques allow for generating soft force microsensors between which 3D cancerous microtissues are engineered. This challenging internship will provide a highly interdisciplinary training, as the student will learn praised skills in different aspects of bioengineering, from materials science to fundamental biology and biophysics.

Project description: A major focus of this project consists in investigating the influence of several parameters (cell density, extracellular matrix composition, level of compressive stress) that might impact the growth and contractility of cancerous tissue models. Our approach involves the in situ formation of 3D microtissues (Fig.1.A-C) by culturing murine colorectal carcinoma cells embedded within a tunable biopolymeric matrix in a microfabricated platform. Using this platform, we are uniquely able to measure both fine-scale cytoskeletal and extracellular architecture, as well as cell-generated forces. A biocompatible polymer, Dextran, will be added to the culture medium to exert an external mechanical stress (Fig. 1.D). The platforms will be microfabricated by soft lithography. The formation and tension of the microtissues will be assessed by time-lapse microscopy and the tissue architecture will be characterized by confocal imaging of immuno-stainings.

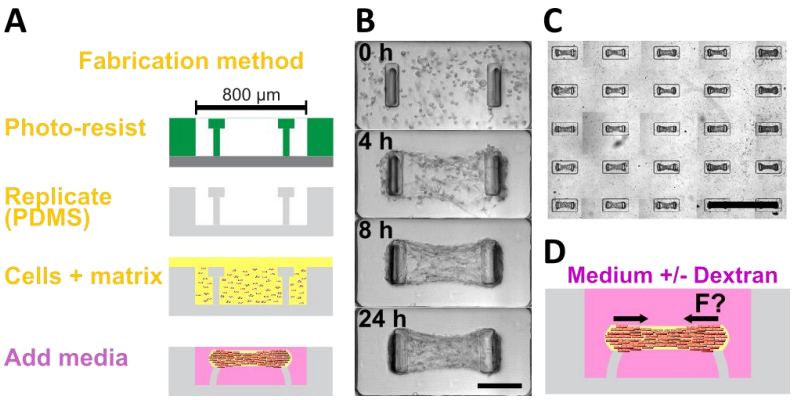

Fig. 1: Engineered 3D cancerous microtissues. (A) Description of the microfabricated platform. (B) Time course of a contracting microtissue. (C) Large arrays of microtissues simultaneously generated in the platform. (D) Illustration of the impact of the compressive stress on the tissue contractility.

Background and skills expected: 5th year engineering school student and / or Master student whose training focuses primarily on biophysics, tissue engineering, biology and biomaterials. We are looking for highly motivated scientists with an aptitude for teamwork and good communication skills in oral and written English.

Please send a CV + a cover letter (including names/contact email of 2 referees) + the record of your grades of the 2 past academic years (2018/2019 & 2019/2020)

Competences that will be acquired during the internship: Cell culture and manipulation, microfluidics, micropatterning, microscopy and data analysis.

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This Master internship could be followed into a PhD within the same research area: Yes