Supervisor(s):
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Host laboratory:
BioSanté biosante-lab.fr/

Host group/team:
IMAC

Title of the M2 research internship:
Study of the metastasic process using 3D cancer cell models in a microfluidic chip.

Project summary:
The metastatic spread of cancer cells, a major cause of cancer-associated morbidity, is a complex process that involves several stages (metastatic cascade). We propose a reductionist model system that provides the opportunity to control the first steps of this complexity with a focus on examining the dissemination of cancer cells and their crossing of the endothelial barrier of tumor-coalescing blood vessels. This device reproduces the characteristics of two key stages of the metastatic cascade: 1) the acquisition of the invasive behavior of cancer cells into nearby environment.
2) The ability to penetrate the vessel wall and enter the blood or lymph systems (intravasation).
Goals:
In this project, we aim to adapt a microfluidic device capable of evaluating the metastatic potential of several cancer cell models like spheroids from kidney cancer cell lines and tumoroids derived from patients, thanks to a preclinical study (NCT03571438) with the Urology Service at Grenoble Hospital (CHUGA).
If successful, this device could be used in the future as a medical device to: 1) discriminate the aggressiveness of metastatic cancers; 2) test the patient's sensitivity to specific anti-metastatic drugs.
The student will perform 3-dimensional cell culture (spheroids and tumoroids) imbedded in hydrogels and inserted in a microfluidic device. The invasive capacity of cancer cells through the stiff structure of the hydrogel will be monitored by videomicroscopy and studied by analysis of recorded immunofluorescence images. Co-cultures of cancer and endothelial cells will make it possible to study the mechanism of intravasation.
The student will be co-supervised by a 3rd year doctoral student to continue this follow-up project.

Keywords:
metastatic process, tumoroid, precision medicine

Relevant publications of the team:
- A new scaffold-free tumoroid model provides a robust preclinical tool to investigate invasion and drug response in Renal Cell Carcinoma.

Séraudie I, Pillet C, Cesana B, Bazelle P, Jeanneret F, Evrard B, Chalmel F, Bouzit A, Battail C, Long JA, Descotes JL, Cochet C, Filhol O.

Cell Death Dis. 2023 Sep 22;14(9):622. doi: 10.1038/s41419-023-06133-z.

- COL7A1 Expression Improves Prognosis Prediction for Patients with Clear Cell Renal Cell Carcinoma Atop of Stage.

Koca, D.; Séraudie, I.; Jardillier, R.; Cochet, C.; Filhol, O.; Guyon, L.

Cancers 2023, 15, 2701doi: 10.3390/cancers15102701

- Cooperative Blockade of CK2 and ATM Kinases Drives Apoptosis in VHL-Deficient Renal Carcinoma Cells through ROS Overproduction.

Giacosa S, Pillet C, Séraudie I, Guyon L, Wallez Y, Roelants C, Battail C, Evrard B, Chalmel F, Barette C, Soleilhac E, Fauvarque MO, Franquet Q, Sarrazin C, Peilleron N, Fiard G, Long JA, Descotes JL, Cochet C, Filhol O.

Cancers (Basel). 2021 Feb 2;13(3):576. doi: 10.3390/cancers13030576.

- Ex-Vivo Treatment of Tumor Tissue Slices as a Predictive Preclinical Method to Evaluate Targeted Therapies for Patients with Renal Carcinoma.

Roelants C, Pillet C, Franquet Q, Sarrazin C, Peilleron N, Giacosa S, Guyon L, Fontanell A, Fiard G, Long JA, Descotes JL, Cochet C, Filhol O.Cancers (Basel). 2020 Jan 17;12(1):232. doi: 10.3390/cancers12010232.