

Master thesis position: Label-free sorting of adipocytes at different stages of differentiation by DLD microfluidics

Despite being the most abundant stromal cell type within the bone marrow, the function of bone marrow adiposity (BMA) and its effect on blood formation remain unclear. Contradictory results could be explained by the difficulty in isolating bone marrow adipocytes (BMAd) at different stages of maturation, which exhibit different degrees of support to hematopoietic proliferation, as shown in Fig. 1a. BMA has been correlated with several pathologies, as cancer, osteoporosis, anorexia, or obesity, therefore a deeper understanding of its physiological role is crucial.

We propose tool for the separation of mature BMAds from stromal cells and their early stages of differentiation, based on their difference in size, as in Fig. 1b. This technology exploits Deterministic Lateral Displacement (DLD), a passive method based on a regular arrangement of pillars inside a microchannel, to sort cells with a label-free approach. The project is held in collaboration with the laboratory of regenerative hematopoiesis (Naveiras group) in CHUV, Lausanne.

The project aims at testing the DLD microfluidics and characterize its sorting performances with cells at different stages of maturation. The cell culture and induced differentiation will be carried out at CHUV laboratories. In order to optimize the sorting performances, the student will work on different chip layouts, and fabricate them by SU-8 photolithography and PDMS molding in the cleanroom facility of EPFL (Center of MicroNanotechnology). The sample will be characterized pre- and post-sorting by various biological assays as rt-qPCR and MALDI for lipidomics.

The project will give the students the opportunity to gain some expertise in :

- Cell sorting in microfluidics
- Microfabrication
- Cell culture
- Biological assays

Type of work: 10% literature study, 20% design and microfabrication, 25% cell culture and biological characterization, 25% microfluidic device testing, 20% data treatment and results reporting

Duration: 4 – 6 months

Prerequisites: Ideally someone with a background in microtechnology, bioengineering or biology, but physics or mechanics are also welcome. A strong motivation is required regardless your background.

Do not hesitate to contact us by email in case of interest: gloria.porro@epfl.ch, rita.sarkis@epfl.ch

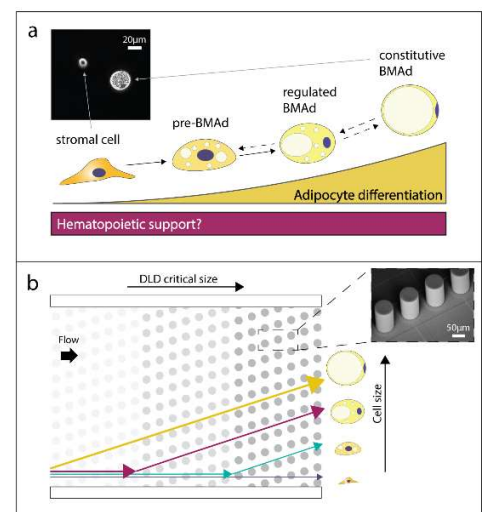


Figure 2 a) Stages of differentiation of stromal stem cells into bone marrow adipocytes; insight: OP9 stromal cell and mature adipocyte. b) Schematics of a cascaded DLD device to sort multiple cells fractions based on their size. Insight: arrayed pillars.