

Master's thesis position: Separation of primary cell adipocytes by Deterministic Lateral Displacement

This master thesis project focuses on the development of a novel Deterministic Lateral Displacement (DLD) platform tailored for sorting primary adipocytes obtained from human tissue biopsies. While DLD systems have demonstrated great potential in sorting various blood cell types, their application to isolating primary cells from tissue digestion remains largely unexplored. The goal of this project is to build upon a DLD device previously developed in our laboratory and expand its utility toward the efficient isolation of bone marrow adipocytes.

The thesis will involve redesigning and optimizing the existing DLD platform to accommodate the unique characteristics of primary adipocyte samples. Key objectives include adjusting the critical sorting size, modifying microfluidic geometries to manage heterogeneous cell populations, and implementing strategies to prevent chip clogging. A significant part of the project will also focus on optimizing the biological pre-processing of the tissue biopsy. This includes refining the digestion protocol to preserve fragile adipocytes, removing lipid contamination, and achieving a monophasic cell suspension suitable for microfluidic sorting. The student will work closely with both the Laboratory of Life Sciences Electronics (CLSE-EPFL) and the Laboratory of Regenerative Hematopoiesis (Naveiras group-UNIL) to iteratively test and improve both the biological and engineering aspects of the workflow.

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: 6 months

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

Interested candidates are encouraged to contact us via email and include their CV. While a reference letter is not required, it would be considered an asset: micaela.cristofori@epfl.ch, fabien.bonini@unil.ch