

Opening of a Blood Brain Barrier on-a-chip

The Biophysics team of the Institute of Light and Matter (iLM, UMR 5306, CNRS-UCBL, Lyon, France, <http://ilm.univ-lyon1.fr/biophysique>) is opening a postdoctoral research position in cellular biomechanics and organ-on-a-chip for 12 months starting by January 2018.

Brain is a notoriously difficult organ for therapeutic agents to reach due to the presence of the blood brain barrier (BBB), a specialized structure in the blood vessels and capillaries of central nervous system (CNS). The CNS-blood permeability can be significantly enhanced using ultrasound techniques, through the temporal opening of the BBB, providing a promising strategy to increase delivery of therapeutic agent into the brain.

The CARIBBBOU project funded by an International ANR in 2016 associates the Laboratory of Therapeutic Applications of Ultrasound (LabTAU, Lyon, <http://labtau.univ-lyon1.fr/> coordinator Claude INSERRA), the Biophysics team of iLM (Jean-Paul RIEU), and two Taiwanese laboratories. The aim of this project is to design and implement a real-time signal feedback for cavitation control to facilitate ultrasound-based gene therapy or drug delivery, with a particular focus on the BBB opening on both in vivo (mouse, Taiwan labs) and in vitro models (organ-on-chip, iLM-LabTAU). Control of cavitation was already implemented and we now try to understand the mechanisms of BBB opening in vitro. We will focus on the BBB opening using MDCK cell monolayers standing on a porous membrane separating two channels. Stabilized air bubbles will be inserted on one side together with fluorescent agents mimicking therapeutic genes or drugs and we will observe by fluorescence microscopy the BBB opening after insonification. A transfer of the methodology toward the Taiwanese laboratories is expected at the end of this one year focused project to work with human vascular endothelial cell lines.

Organ-on-a-chip will be adapted from commercial ones at iLM using if necessary the NanoLyon facilities. Cell culture, microscopy (epifluo and confocal microscopy) and image analysis will be performed with Hélène Delanoë-Ayari (iLM). Adaptation of the ultrasonic methods to the organ-on-a-chip geometry and insonification experiments under the microscope will be performed in close collaboration with LabTAU.

Qualified candidates should have a PhD in Biophysics, Physics of complex systems or Biomechanics with a background in cell culture and microscopy. Experiences in microfluidics, image analysis or acoustic will be appreciated.

Please send by Email your CV with cover letter, and the names of referees familiar with your work by November 30th to: Jean-Paul, RIEU (jean-paul.rieu@univ-lyon1.fr) and Claude INSERRA (claud.inserra@inserm.fr)