Funded PhD scholarship

PhD advisor: Dr Guillaume Perry (UMR8507, GeePs)

This PhD proposal is based on an existing collaboration between CoRaKiD lab within Hospital Tenon, which has a recognized expertise in glomerulus physiology, LISE, which is expert in electrochemical impedance spectroscopy and GeePs, expertise of the PhD advisor in microfluidics, microsystems and tissue engineering. This proposal is in the framework of the AWACS project that has recently been funded by ANR JCJC (French national research agency grant for young researchers).

The prevalence increase of Chronic Kidney Diseases (CKD) is becoming a worldwide public health issue because the only treatments of end-stage kidney failure are not only costly but also rely on heavy treatment such as dialysis or kidney transplantation. Since the renal glomerulus is the first structure to perform the blood filtration, it is the main target in the case of kidney injury. In order to understand the physiology and physiopathology of the glomerulus, there is a need for a new generation of *in vitro* models. Indeed, current *in vitro* models do not reproduce accurately the *in vivo* physiology of the glomerulus and the animal models do not only reproduce poorly human physiology but also suffer of ethical issues. New *in vitro* systems, called MicroPhysiological Systems (MPS) or Organs-on-Chip have been introduced, 10 years ago. If MPS represent a very promising technology to enhance the physiological relevance of *in vitro* models thanks to the microfluidic technologies, they still lack of two majors *in vivo* physiological features: (i) mature cells expressing the specific markers of interest and (ii) basement membrane, an extracellular matrix membrane playing an important role in the glomerular filtration. Further enhancement of MPS should also allow getting real-time readouts, thanks to integrated sensors, in order to monitor the *in vitro* model and the dynamic effects. Up to now, MPS mimicking the glomerulus, do not implement all these three aspects or focus on the use of cells that express a better phenotype than glomerular cell lines . The development of a new glomerular filtration barrier-on-chip integrating these different aspects will not only help to perform permeability assays but also to model and understand glomerulopathies.

The main objective of this PhD thesis proposal is to develop a sensor-integrated microfluidic platform reproducing the glomerular filtration barrier by differentiating induced pluripotent stem cells into physiologically relevant glomerular cells as well as generating a basement membrane-mimicking hydrogel. This platform will be then used with clinical samples.

Collaboration:

CoRaKiD, UMRS 1155: Pr Pierre Ronco, Pr Emmanuelle Plaisier, Dr Hanna Debiec

LISE, UMR 8235: Dr Kieu Ngo

Candidate:

We are looking for a candidate with a Master degree in bioengineering, cellular biology, biochemistry or related fields. Able to work in an interdisciplinary environment. Experiences in microfabrication, microfluidics, cell culture with induced pluripotent stem cells, stem cell

differentiation, tissue engineering, hydrogel chemistry, FACS, RT-PCR and immunofluorescence appreciated. Good communication skills in French and/or English are required.

The work will be mainly based at CoRaKiD within Tenon Hospital located in the 20th district of Paris. Some experiments can take place time-to-time in Sorbonne Université main campus in the 5th district.

To apply, please send your CV, a cover letter and at least two reference letters before April 30th 2021 to Dr Guillaume Perry: guillaume.perry@sorbonne-universite.fr

Applicants will then be selected for interviews based on their profile. The interviews will be held in the beginning of May 2021.

The successful candidate is expected to start between June and September 2021.

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