Université Lille Nord de France
Pôle de Recherche et d'Enseignement Supérieur

Ecole doctorale régionale Sciences Pour l'Ingénieur
Lille Nord-de-France - 072

Titre Thèse	Systèmes microfluidiques (BioMEMs) d'étude de l'influence de l'environnement matriciel et crible de nouvelles molécules actives sur la barrière endothéliale et l'angiogenèse	
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	Contrat Doctoral Etablissement	Lille 1 ☒ UVHC ☐ ECL ☐ ISEN ☐
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Résumé du sujet :

Blood vessels are a barrier to the efficient crossing of therapies from the blood circulation into solid tumors. Blood vessels are also able to produce new blood vessels through sprouting angiogenesis, a process which is necessary to tumor development and which is the target of several anti-cancer therapies actually used in clinics. The tumor microenvironment plays a critical role in the regulation of angiogenesis. In particular, the composition and the physical properties of the extracellular matrix strongly orient endothelial cell physiology and the process of angiogenesis.

The LIMMS/SMMiL-E laboratory has recently created a microfluidic device (BioMEMS) to reproduce an initial blood vessel implanted within a hydrogel in vitro and which can be induced to produce new vessel sprouting as in the process of angiogenesis (ref. below). HCS Pharma is a private company dedicated to high-throughput screening of biomolecules which holds a proprietary technology to produce specific extracellular matrix hydrogels based on the use of hyaluronic acid and which can be functionalized with various other components of the matrix while finely controlling the chemical composition and the physical properties of the gel.

The project consists in:

1) optimizing the existing BioMEMS device in order to reformat it in multi-well plates, design a perfusion system to allow the feeding of medium and biomolecules within the blood vessel lumen, implant an electrical impedance sensor in order to study vessel permeability,
2) optimizing the hydrogel composition in order to form a more stable, less permeable initial blood vessel and to allow the controlled emergence of new vascular angiogenic sprouts,
3) performing high-throughput screenings of biomolecules libraries to test their effects on blood vessel permeability and angiogenesis.

The PhD student will be under the supervision of a biologist specialized in angiogenesis and an engineering scientist within the SMMiL-E team of LIMMS/UMI2820 hosted by IRCL on the CHRU campus in Lille. HCS Pharma is in close proximity to the SMMiL-E lab, at Eurasanté, Loos. The project involves strong collaborative interactions with the laboratory of Dr Y Matsunaga, Institute for Industrial Sciences, Univ. Tokyo, Japan.

J. Pauty, R. Usuba, I. Gayi Cheng, L. Hespel, H. Takahashi, K. Kato, M. Kobayashi, H. Nakajima, E. Lee, F. Yger, F. Soncin, Y. T. Matsunaga. *EBioMedicine*, January 2018, Volume 27, Pages 225–236 https://doi.org/10.1016/j.ebiom.2017.12.014

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