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	Development of a 3D microfluidic culture model to study the mechanisms regulating the behaviour of Schistosome parasites in blood vessels and their reproduction.	
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Equipe	BioMEMS Chemical Biology of Flatworms	Web : http://chemicalbiologyflatworms.org
	Contrat Doctoral Etablissement	Lille 1 ☒ UVHC ☐ ECL ☐ ISEN-YNCREA ☐
Financement prévu	Président-Région ☐	Région – Autre ☐ Préciser :
Acquis ☐	Président- Autre ☐ Préciser	DGA – Autre ☐ Préciser
	Contrat de recherche ☐ Type	Autre ☐

Abstract :

Schistosomiasis is the second most important parasitic disease after malaria. It affects 230 million people and is responsible for about 200 000 deaths per year and has unexpectedly emerged in Corsica in 2013. In absence of vaccine, Praziquantel is the only drug used to cure schistosomiasis but the emergence of resistant parasite strains raises serious concerns. Schistosomes are blood-dwelling flatworms with a remarkable capacity to reproduce and to escape immune responses. The pathology is mainly due to the high fecundity of female worms allowing the accumulation of eggs in host tissues, causing severe disorders and particularly hepatosplenomegaly and hepatic fibrosis.

Therefore, identifying biophysical and biochemical parameters underlying the molecular processes regulating parasite behavior, sexual reproduction and development are essential to develop new therapeutics in order to control schistosomiasis transmission and pathology.

BioMEMS (Biological MicroElectroMechanical Systems) allow the design of “organs on the chip” and help to recapitulate physiological processes close to those of natural organs.

The main challenge of this project is to design a BioMEMS mimicking host vasculature, bloodstream and liver environment in order to generate *in vitro* fertile eggs. This innovative-engineered microfluidic device made of PDMS (poly-dimethylsiloxane) and glass will help the maintenance of physiological metabolic and reproductive functions of *Schistosoma mansoni* couples for a long period. We now made the proof-of-concept that the BioMEMS technology is a powerful approach to mimic favourable *in vivo* environment allowing worm pairing, motility together with massive egg production. Such a device is thus an unprecedented tool to understand blood-dwelling parasite biology but also to evaluate efficacy of toxic compounds in a human-like environment.

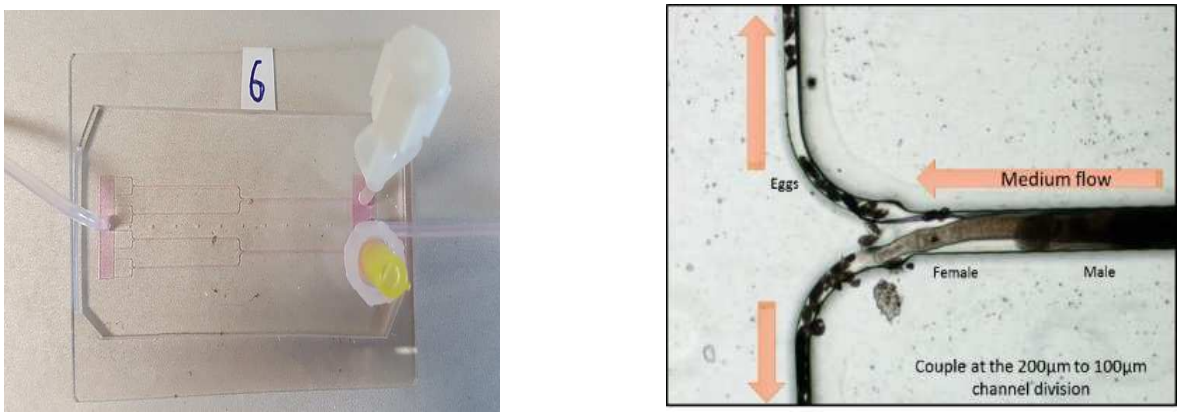

Figure 1: (left) PDMS device mimicking the blood vasculature, (right) zoom on the microchannel with the flat worm and production of eggs.