ESPCI PARIS CBI CHIMIE BIOLOGIE INNOVATION Agence Nationale de la Recherche ANR

Laboratoire Colloïdes et Matériaux Divisés

Postdoc/ Engineer:
Encapsulation process for host-pathogens studies

Possible artifactual behaviors of individual cells in 2D, as compared to 3D, stimulate the creation of 3D artificial environments that mimic the physiological environment experienced by cells in any multicellular organisms. LCMD has recently developed a novel protocol of liquid core capsule formation well suited for cell culture since the fabrication procedure involves a minimal number of steps and is only based on aqueous solutions and biocompatible compounds [1]. The basic principle is to gel a liquid core-shell structure template formed by a co-extrusion technique. Capsule creation is thus based on a two-step procedure: the formation of a compound drop in air followed by the gelling of the coating layer once the compound drop enters a gelling bath (Fig. 1). The so-formed capsules possess a thin hydrogel membrane made of alginate whose permeability and mechanical properties are known [2]. Such compartments allowed to create multicellular spheroids [3] in a high throughput way [4]. This encapsulation strategy then opens the way to screening applications of micro-tissues.

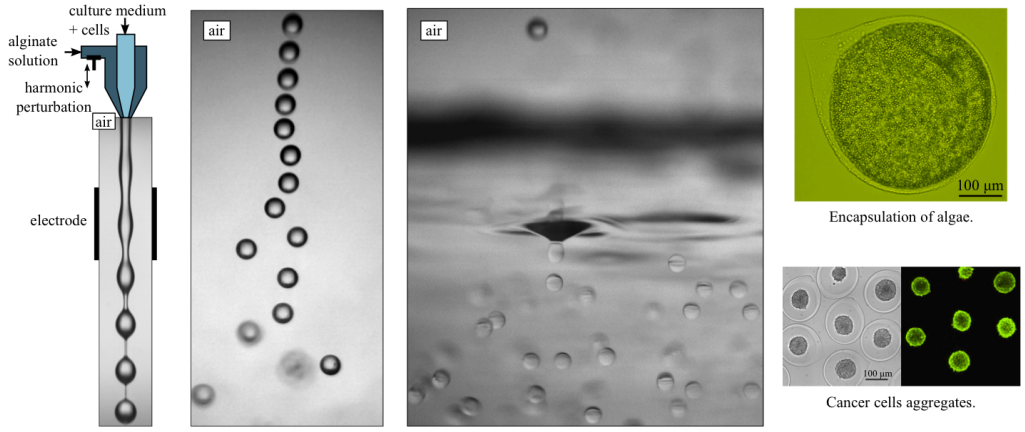

Figure 1: Principle of liquid core hydrogel capsule formation and examples of cell encapsulation.

The present project is funded by ANR in collaboration with Valérie Soulard from Centre d'Immunologie et des Maladies Infectieuses (CIMI-Paris). The goal of the project is to take advantage of the encapsulation method for making a new bioreactor that would enable to study host pathogen interactions. More specifically, we intend to dissect human malaria liver infection. The postdoc/engineer will have the mission to optimize the current encapsulation process an to build up a co-encapsulation set-up where micro-tissues of liver cells can be entrapped in liquid core capsules in presence of parasites. The development will be performed with model biological systems, along with cell viability assays, and then transferred to CIMI-Paris for real case studies.

We look for a candidate having accomplished a PhD or having an engineer degree in applied physics or in mechanical/chemical engineering. Strong skills in fluid mechanics, computer aided design, instrumentation and experimental work are desired. Knowledges in micro-fabrication, physico-chemistry of soft matter or cell culture are welcomed. High motivation, flexibility, autonomy, the ability to work in a highly multidisciplinary team and good interpersonal and communication skills are essential.

Start date: beginning of 2018
Duration: 12 months
Net salary: depends on profile and experience, from 2 000 € to 2 400 € per month

Contact :
A motivation letter and a CV, including referent persons or letters of reference, should be sent to Nicolas Bremond (nicolas.bremond@espci.fr). For more information: 01 40 79 52 34.

References

[1] Bremond, N., Santanach-Carreras, E., Chu, L. Y., and Bibette, J. Formation of liquid-core capsules having a thin hydrogel membrane: liquid pearls. *Soft Matter* **6**(11), 2484–2488 (2010).

[2] Rolland, L., Santanach-Carreras, E., Delmas, T., Bibette, J., and Bremond, N. Physicochemical properties of aqueous core hydrogel capsules. *Soft Matter* **10**(48), 9668–9674 (2014).

[3] Alessandri, K., Sarangi, B. R., Gurchenkov, V. V., Sinha, B., Kiessling, T. R., Fetler, L., Rico, F., Scheuring, S., Lamaze, C., Simon, A., Geraldo, S., Vignjevic, D., Domejean, H., Rolland, L., Funfak, A., Bibette, J., Bremond, N., and Nassoy, P. Cellular capsules as a tool for multicellular spheroid production and for investigating the mechanics of tumor progression in vitro. *Proc. Natl. Acad. Sci. USA* **110**(37), 14843–14848, September (2013).

[4] Domejean, H., de la Motte Saint Pierre, M., Funfak, A., Atrux-Tallau, N., Alessandri, K., Nassoy, P., Bibette, J., and Bremond, N. Controlled production of sub-millimeter liquid core hydrogel capsules for parallelized 3d cell culture. *Lab on a Chip* **17**(1), 110–119 (2017).