

## INTERNSHIP OFFER

### Biocompatibility and efficacy of therapeutic nanogels intended to osteoarthritic joints

Osteoarthritis (OA) is a complex degenerative disease of joints and one of the major causes of disability, without curative treatment to date. Indeed, the avascular nature of the cartilage is a major drawback, leading to the poor control of drug delivery in it.

Hydrogel nanoparticles, or nanogels (NG), combine the characteristics of hydrogels, i.e high water content, a biopolymeric matrix mimicking the extracellular environment of osteo-cartilage tissues, cellular adhesion and a high loading capacity, with the possibility to be nanoengineered. Nanosized materials are tunable carrier systems affording both controlled delivery and sustained release of active components to target tissues. However, despite the various nanosystems that are being developed, their safety and toxicity profiles must be investigated since they are destined to be administered for long-term periods to OA patients.

Moreover, the host laboratory has shown the effectiveness of a treatment based on the synergistic action of antagonist peptides of the endothelin receptor ETA and of bradykinin receptor BKB1, both involved in OA pathogenesis, in reducing disease progression and joint nociception in an animal model of OA. Therefore, our goal is to develop biocompatible and biodegradable biopolymeric nanogels (NG) for local administration of these peptides to increase their effectiveness for the treatment of OA.

The intern, under the supervision of Prof. Moldovan (CHU Sainte-Justine), will be involved in all fundamental research processes. This includes in particular bibliographical research related to the project, definition of the internship objectives as well as drafting of the research protocol. The intern will participate in the evaluation of the *in vitro* and / or *in vivo* biocompatibility of the synthesized nanoparticles, which mainly includes primary cell culture and biomolecular assays (viability, fluorescence microscopy, qPCR, etc).

This project will offer the chosen candidate an excellent view of fundamental academic research. The intern will be tutored daily by Seng Manivong, pharmacist and PhD candidate (2<sup>nd</sup> year).

#### Contact information:

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#### References :

1. Kaufman GN, Zaouter C, Valteau B, Sirois P, Moldovan F. Nociceptive tolerance is improved by bradykinin receptor B1 antagonism and joint morphology is protected by both endothelin type A and bradykinin receptor B1 antagonism in a surgical model of osteoarthritis. *Arthritis Res Ther.* 2011;13(3). doi:10.1186/ar3338
2. Callewaert M, Roullin VG, Cadiou C, et al. Tuning the composition of biocompatible Gd nanohydrogels to achieve hypersensitive dual T 1 / T 2 MRI contrast agents. *J Mater Chem B.* 2014;2(37):6397-6405. doi:10.1039/C4TB00783B