The NEMESIS project: nanoparticle engineering for miRNA delivery in intervertebral disc regenerative strategies

Nature of the job: Post-doctoral position

Duration: 30 months

Salary: 4500 € / month

Workplace:
MINT laboratory in Angers (Pays de la Loire, France) for the first year, then RMeS laboratory in Nantes (Pays de la Loire, France) for 18 months.

Key words:
Disc degeneration, nanomedicines, cell penetrating peptide, miRNA

Starting date:
01/03/2023

Application deadline:
30/01/2023

Description of the subject

The degeneration of the intervertebral disc (IVD), at the origin of many cases of low back pain, is characterized by a degradation of the IVD extracellular matrix and a loss of IVD role in spine kinematic. There is currently no etiological treatment for these disorders. Our better understanding of the role of microRNAs (miR) in the physiopathology of IVDs allow to explore their use as therapeutics. miR are easily degraded and must be protected to reach their target. The NEMESIS project thus aims to develop peptide-functionalized lipid nanocapsules (fLNC) for the intradiscal delivery of miR155. The fLNC-miR155 will be successively produced, characterized and then tested *in vitro*, *ex vivo* and *in vivo* in a preclinical model of IVD degeneration in sheep. Finally, a clinical trial in dog with chronic discogenic low back pain will be conducted to provide clinical proof of this new concept. NEMESIS will associate 2 INSERM laboratories and the veterinary school of Nantes.

Funding

ANR PRC project obtained in July 2022 with RMeS laboratory and Prof J. Clouet as project leader, and MINT laboratory and Dr. E. Lepeltier as partner.

Presentation of the laboratories

The first 12 months of the post-doctoral fellowship will take place mainly at the MINT laboratory, in Angers, supervised by Dr. Elise Lepeltier, for the part concerning the formulation and characterization of Lipid Nanocapsules (LNC) loaded with a miRNA and decorated at the surface by a cell penetrating peptide. Then, concerning the *in vitro*, *ex vivo* and *in vivo* studies of these formulations (bio-functionality and proof of concept), the candidate will work mainly in the RMeS laboratory, and with the Nantes veterinary school (ONIRIS) for the last 18 months.

MINT INSERM 1066 CNRS 6021

The MINT laboratory is funded by the University of Angers, as well as the French National Institute of Health and Medical Research (INSERM) and The French National Center for Scientific Research (CNRS). Located within the Hospital Facility, the MINT laboratory consists in 40 researchers and PhD students with expertise in diverse fields including colloids and interfaces physical-chemistry, galenic, chemical engineering for pharmaceutical formulation, biological research, and imaging. All our research is focused on the design of nano- and micro-scaled vectors for the delivery of therapeutics (encompassing proteins, anti-cancer drugs, DNA, SiRNA, etc.) and/or imaging probes.

Website: https://mint.univ-angers.fr/en/index.html

RMES INSERM UMRS1229

The RMeS laboratory is a laboratory of excellence in the physiopathology of skeletal ageing and regenerative medicine. In the NEMESIS project, it will be particularly involved in the biocompatibility/biofunctionality aspects of the nanomedicines and, in collaboration with ONIRIS, in pre-clinical and clinical trials to demonstrate the proof of concept of the project.
Website: https://rmes.univ-nantes.fr/

Candidate profile

We are looking for a candidate who has performed a multidisciplinary PhD thesis, from organic chemistry to cell biology, and who has already worked with organic nanomedicines and their characterization. Ideally, the candidate should already have experience in cell culture, RT-qPCR and Western, and animal experimentation. On the other hand, we are looking for someone who is autonomous, motivated, and who speaks and writes English fluently.

Specific actions

Considering the both geographical locations (Angers and Nantes) for the NEMESIS project, the possibility of paying for travel by train or car could be considered.

Elements to be provided for the application

In order to apply for this post-doctoral position, a CV, a letter of motivation and a letter of recommendation are required. An interview will be requested if necessary.
Please send your applications to:

johann.clouet@univ-nantes.fr and elise.lepeltier@univ-angers.fr