RMeS lab from Nantes University is recruiting
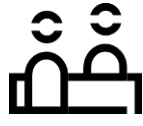
Regenerative Medicine and Skeleton, UMR 1229

Post-doctoral/Engineer position
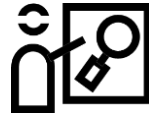
43 000
students, including more than 5,000 internationals

4600
administrative and technical staff

3257
teachers, teacher-researchers

1500
nearly 1,500 doctoral students

42
Laboratories and research structures

Nantes University is a public higher education and research establishment that offers **a university model unique** in France bringing together a university, a university hospital (Nantes University Hospital), a technological research institute (IRT Jules Verne), a national organization research (Inserm) and major schools (Centrale Nantes, Nantes Saint-Nazaire School of Fine Arts, Nantes School of Architecture).

These players concentrate their strengths on **developing the excellence of Nantes research** and offering **new training opportunities** in all areas of knowledge.

Sustainable and open to the world, Nantes University ensures the quality of the study and working conditions offered to its students and staff, to promote their development on all its campuses in Nantes, Saint-Nazaire, and La Roche-sur-Yon.

Work environment and context

• *Localization : Nantes*

The RMeS laboratory is composed of 119 people in 2023 (75 full-time equivalent). It is armed with 8 permanent senior scientists from Inserm and CNRS (4 DR and 4 CRCN), 11 University/ONIRIS researchers (1 PR, 10 MC), 35 University/Hospital researchers (23 PU-PH, 12 MCU-PH), 11 University/Hospital associated clinicians (10 PH, 1 CCA), 26 technical and administrative staffs, 10 postdocs, 18 PhD candidates and about 20 trainees (Master students, engineers, residents). RMeS is structured around 2 independent research teams: REJOINT (formerly STEP) and REGOS (**see organizational chart**). These 2 teams still benefit from our 4 open technological platforms: SC3M (electron microscopy, micro-characterization and functional morphohistology- imaging), BIO3 (biomaterials, biohydrogels and biomechanics), INOA facility (OsteoArticular INflammation), HiMolA (Molecular Histology) and 2 in-house core facilities for cell culture and molecular biology.

Our RMeS laboratory aims to reinforce his international positioning as a center of excellence and a leader in skeleton aging and regenerative medicine. Our research goals range from deciphering the mechanisms that govern development, growth and aging of bone and cartilaginous tissues to promote the advance of innovative 4R medicine strategies for the skeleton. Four "R" medicine relies on concepts we recently developed.

The promising field of regenerative medicine aims to restore the function of damaged tissues including those constituting the skeleton. It also intends to conceive biomaterial- and cell-assisted

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therapeutic solutions for tissues that become ineluctably degrade with aging. Considering the large number of diseases for which clinicians can only manage patients' symptoms using drugs or devices, regenerative medicine has for long been contemplated as a game-changer in medicine. Interestingly, recent advances in biomaterial sciences (biomimicry, hydrogels, 3D bioprinting...), skeletal physiopathology (developmental diseases, osteoarthritis, age-associated diseases...), developmental biology (cell fate and tissue modeling), and stem cell biology (reprogramming and differentiation) are paving the way to new concepts that will undoubtedly improve skeletal regenerative strategies.

Our strong and recognized expertise that encompass a broad range of disciplines from material sciences and physico-chemistry to cell and molecular biology and clinical sciences within the same research laboratory constitutes an exciting and unique opportunity in France. This complementary workforce has greatly contributed to make RMeS laboratory a pioneer center in skeleton aging and regenerative medicine.

Missions

The candidate will participate in implementing a scientific approach to produce, exploit, and disseminate knowledge to certify some and produce new ones. The position is part of the REJOINT team in the PEPR CARN.

Project PEPR CARN

Therapeutic RNAs including **microRNAs** (miRNA, small, non-coding, regulatory but unstable nucleosides) and **messenger RNAs** (mRNAs) are part of the therapeutic arsenal for tissue regeneration. CARN proposes the development of bio-drugs using EVs and synthetic lipid vesicles as **RNAs delivery systems for skeleton regeneration**. EVs isolated from mesenchymal stromal cells (MSC) reproduce the therapeutic effect of their parental cells and are of real therapeutic interest in regenerative medicine. They contain proteins, lipids and also nucleic acids, in particular miRNAs which are responsible for their biological effect. EVs are also being developed as targeted delivery systems due to their abilities to deliver therapeutic cargo specifically into tissues and their exceptional endosomal escape and intracytosolic delivery of RNA. Besides natural EVs, **synthetic lipid vesicles** (eg, liposomes or lipid nanoparticles) are also used to transport therapeutic biomolecules, including RNAs (BioNtech and Moderna anticovid-19 vaccines). However, while these nanoformulations are particularly suitable for a vaccine strategy, in regards to their ability to induce an inflammatory environment, they need to be modified for other types of therapeutic strategies, in particular for regenerative medicine. In this context, their **association to EVs**, through hybrid formulation is a promising strategy. These **hybrid EVs** can further be **functionalized** at the surface by recognition elements to specifically target **cells from** cartilage and intervertebral discs.

By proposing **functionalized hybrid EVs decorated with recognition elements** and containing **disease-modifying therapeutic RNAs**, CARN will allow **hybrid EVs to open new therapeutic windows in the treatment of skeletal diseases**.

Main Activities

Within the framework of the PEPR CARN project, Inserm U1229-RMeS offers a 30-month postdoctoral position to work on the identification of therapeutic RNAs for the treatment of osteoarthritis and intervertebral disc degeneration and their delivery via their encapsulation in hybrid extracellular vesicles, starting in spring 2024. The goals of the project are as follows:

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- Identify RNA of interest with positive effects on at least either one cellular process in various cell types or various cellular processes in at least one cell type.
- Establish robust potency assays to study the effects of RNA of interest on the selected cell functions in the selected cell types.
- In vitro evaluation of hybrid EVs loaded with the therapeutic RNA of interest and selection of the most potent hybrid EVs.
- In vivo evaluation in OA rodent models of the selected hybrid EVs loaded with therapeutic RNAs.

Required Profile

• Education/qualification

- Ph.D. in Life science (cell biology, molecular biology, Biochemistry physiology)

The candidate is expected to have **a solid background and experimental skills in cell biology, and physiology with knowledge on bone, osteoarthritis and articular cartilage.** The candidate should be familiar with cell culture experimentation and extracellular vesicles. An in vivo animal experimentation level or experimental surgery accreditation will be greatly appreciated. Post-doctoral candidates must have a Ph.D. degree and at least one first-author publication in a relevant field. Excellent English writing and communication skills for communication of the results to the PEPR CARN collaborators, in international scientific meetings. Good teamwork skills are also essential.

Required skills and knowledge

General, theoretical or disciplinary knowledge:
- In-depth knowledge in the fields of biology, biochemistry, molecular biology, animal physiology
- In-depth knowledge of the project's bibliographic data;
- Knowledge of health and safety rules and ethics laws

Operational know-how:
- Determine the methods suitable for the project;
- Master the techniques of cellular and molecular biology and animal experiments;
- Master immunohistochemistry techniques;
- Writing detailed protocols and formatting and analyzing results;
- Master microscopy techniques.

Know-how:
- Sense of organization;
- Sense of teamwork;
- Responsiveness, rigor and critical thinking;
- Capacity for initiative and autonomy; •
- Communication of results internally and externally;
- Fluency in English (oral and written comprehension, writing).

To applied

Applicants are invited to send a CV, including a description of Technical skills, a complete list of publications, and 2-3 references (names and contact information), as well as a motivational letter to Claire Vinatier, claire.vinatier@univ-nantes.fr

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