

## Second-year master internship – 2020/2021

The Regenerative Medicine and Skeleton laboratory (RMeS, INSERM U1229, Dir.: J.Guicheux; <https://rmes.univ-nantes.fr/>) in Nantes is recruiting a highly motivated second-year master student in the framework of the SELF'HY (Self-Healing Hydrogels for Osteoarthritis) project led by Vianney Delplace under the supervision of Catherine Le Visage. Joining a pluridisciplinary team at the interface of chemistry, biomaterials design & development, biology and bioprinting, her/his work will focus on the development and in vitro biological characterization of mini-joint models for the discovery of novel osteoarthritis (OA) treatments.

### Research program:

OA is the most common debilitating joint disease, resulting from the inflammation of the synovium and destruction of cartilage. Crippling and painful, the causes of OA are still poorly understood and current therapies are mainly symptomatic. There is, therefore, a tremendous need for innovative joint disease models enabling to better study OA underlying mechanisms and screen new therapeutic compounds. Tridimensional (3D) bioprinting is a promising technology, as it allows the versatile creation of biomimetic structures using cell-laden hydrogels as bioinks. Yet, bioinks and bioprinting processes that would enable to create 3D bioprinted constructs with high shape-fidelity, long-term stability and full tunability in terms of composition and physicochemical properties remain to be invented.

To create stable 3D bioprinted constructs, shear-thinning and self-healing hyaluronic acid-based hydrogels are being developed, with dynamic-covalent crosslinked networks. Using a novel generation of bioprinter, we are currently developing multi-material-based bioprinting of mini-joint models by combining gradients of several bioinks with distinct polymers, endogenous cartilage components and cells.

During the internship, the student will design bioprinted mini-joints, and evaluate their biological relevance as in vitro OA models. Closely working with Dr Pierre Tournier (post-doctoral fellow), the student's work will include the characterization (e.g., viability, proliferation) of human multipotent stromal cells (hMSCs) cultured in association with diverse injectable hydrogels, the 3D printing of mini-joints using multi-material bioinks, and the verification of the hMSCs chondrogenic commitment in the printed constructs via real-time PCR and histological analyses of extracellular matrix production. Screening bioprinting conditions (e.g., materials, printed architectures) will allow us to determine the best candidates for future in vitro drug testing of OA treatment.

### Main objectives of the master internship:

- hMSCs adhesion, viability and proliferation in bioinks
- hMSCs chondrogenic and osteogenic differentiation in 3D bioprinted constructs
- 3D Bioprinting of in vitro mini-joints models

**Keywords:** joint regenerative medicine, osteoarthritis, bioprinting, chondrogenic differentiation

If you are interested in this internship, please send a curriculum vitae and a motivation letter to: [vianney.delplace@univ-nantes.fr](mailto:vianney.delplace@univ-nantes.fr); [pierre.tournier@univ-nantes.fr](mailto:pierre.tournier@univ-nantes.fr)