

Peptide-Apatite hybrid nanoparticles for the treatment of complex wounds.

Period: 6 months from January/February to June/July 2023

Internship tutors: Pr. Gilles Subra IBMM, Dr. Christophe Drouet CIRIMAT

Contacts : gilles.subra@umontpellier.fr, christophe.drouet@toulouse-inp.fr

Internship locations: IBMM, Pole Chimie Balard, Montpellier, Peptides www.ibmmpeptide.com and CIRIMAT team, Toulouse, PPB team

The work will take place mainly at the IBMM in Montpellier, with one or more short stays (5 days) in Toulouse at CIRIMAT for the synthesis and characterization of particles.

Summary

This Master's research project at the interface of inorganic chemistry, organic chemistry and biology, aims to synthesize, characterize and evaluate **bioorganic-inorganic peptide-apatite hybrid colloidal nanoparticles** from a bioactive peptide regulating inflammation and promoting wound healing. This internship is part of a larger project, conducted in collaboration between IBMM and CIRIMAT and Regentis Pharma for the **development of a new generation of bioactive dressings** to treat complex wounds with high infectious potential. In 2022, IBMM and CIRIMAT developed an original synthesis to obtain new submicron bio-inspired materials, which combine an apatite core, a natural constituent of bone, and a crown of bioactive peptides (e.g. proangiogenic or antibacterial). It will be necessary to adapt this synthesis to new bioactive peptides, to characterize and biologically evaluate the objects obtained.

Depending on the achievements of the project, CIFRE thesis funding may be proposed at the end of the Master's internship.

Student work

The Master student will carry out the synthesis, analysis and purification of peptide precursors of interest (e.g. sequence patented by Regentis Pharma) and pseudopeptide (e.g. phosphorylated and phosphonated peptides) using support synthesis methods.

He or she will characterize the biomolecules by LC/MS and NMR (H and P). He or she will perform the one-step synthesis of colloidal apatite-peptide hybrid particles and characterize them by TEM, DLS, DRX and FTIR, or even ATG. He or she will perform ligand quantification by multinucleus NMR (H, F and P). He or she will study the stability of particles under conditions close to physiological conditions, and the possible release of bioactive peptides.

Finally, depending on the progress of the project, he or she will be able to study the toxicity of these particles and their pro-healing effect on an *in vitro* cell model.

Competencies required:

1. Project management with several laboratories, work at the interfaces of disciplines.
2. Synthesis of peptides, synthesis on support, synthesis of phosphocalcic derivatives, characterization of nanoparticles (TEM, DRX, FTIR), characterization of biomolecules (LC/MS, NMR).

Required skills and soft skills

1. Scientific English, Organic Chemistry and Analytical Chemistry Master's level.
2. Knowledge of biology and biochemistry will be appreciated
3. Autonomy, scientific curiosity
4. Rigor, capacity for work
5. Good interpersonal skills, ability to report