
Peptide based hydrogels for tissue engineering

DIRECTEURS DE THESE : PIERRE SCHAAF

UMR INSERM 1121, 11 RUE HUMANN, 67085 STRASBOURG CEDEX

TEL : 03 68 85 33 87 ; E-MAIL : SCHAAF@UNISTRA.FR

Hydrogels are used for decades as substrates for cell growth and tissue engineering. Historically, they are based on cross-linked polymer networks (named chemical gels) or polymer chains interacting through ionic or hydrogen bonds (named physical gels).¹ More recently, hydrogels were developed based on low molecular weight gelators (LMWG) able to self-assemble into entangled fibrils through H bonding, Van der Waals forces, π - π interactions or metal-ligand bonds.² Over the last years, it has become increasingly apparent that fine tuning of the mechanical and biochemical properties of the substrate is of paramount importance to guide cell fate. In this PhD project, we aimed at developing new peptides and polymers (synthetic or natural) based hydrogels. We will develop hydrogels where the peptides are grafted to the polymers leading to supramolecular interactions between the polymers. These hydrogels will be used as matrix for cell culture and applied in tissue engineering. Different peptides will be synthesized by the PhD student using a well known solid phase synthesis. Physico-chemical properties of these gels will be studied by diffusion light scattering, UV-Visible spectroscopy, transmission electron microscopy and optical fluorescence microscopy. Hydrogels based on polymer-peptides, obtained at high concentration, will be studied by rheology to determine their viscoelastic properties and by scanning electron microscopy to characterize their structure. Finally, the biocompatibility of the hydrogels will be studied by cultivating stem cells and follow their adhesion and proliferation.

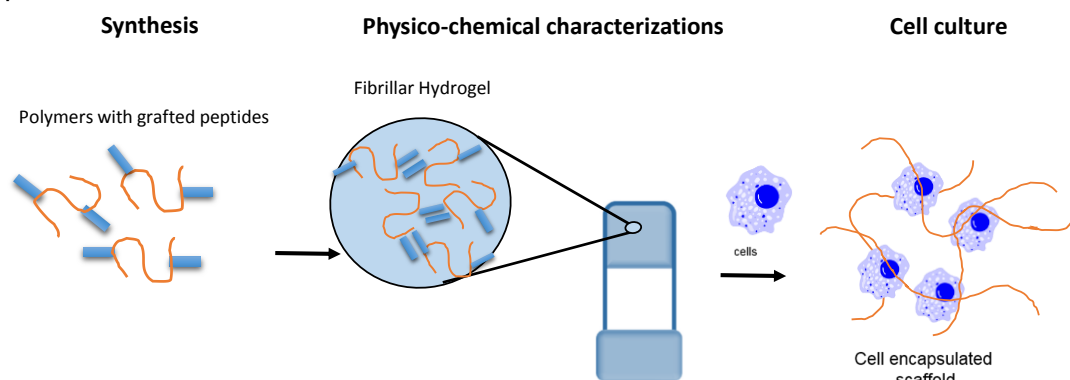


Figure 1: Schematic representation of the subject based on the synthesis of peptides and their grafting on polymers to form supramolecular hydrogels for cell culture.

We are looking for a motivated experimentalist with chemical synthesis skills who is interested in research at the interface of chemistry and biology. The candidate must have a good knowledge in chemistry and physico-chemistry with some knowledge of classical methods of purification and analysis of synthesized compounds. No biological knowledge is required. The candidate must demonstrate a rigorous and methodical mind with a sense of organization. He/she must be able to report on his/her activity in a synthetic way and work both independently and as part of a team.

References

- 1 N. A. Peppas, P. Bures, W. Leobandung and H. Ichikawa, *Eur. J. Pharm. Biopharm.*, 2000, **50**, 27-46.
- 2 N. M. Sangeetha and U. Maitra, *Chem. Soc. Rev.*, 2005, **34**, 821-836.