

Invitation à la soutenance publique de thèse

Pour l'obtention du grade de Docteur en
Sciences agronomiques et ingénierie biologique

Madame Sara MAUQUOY
Master bioingénieur: chimie et bioindustries

Fibronectin and collagen-based biomimetic surfaces to improve cell-material interactions for biomedical applications

The lack of donors for tissue or organ grafts has led to the development of several strategies in the last decades, based first on the use of biomaterials, then on tissue engineering. For both approaches, a key challenge is the control of cell-material interactions, which can be addressed by modifying the physical and/or chemical properties of material surfaces. A biomimetic way to modify interfaces is the adsorption of molecules from the extracellular matrix. In this work, two proteins, collagen and fibronectin, were chosen as building blocks to create well-organized biointerfaces to improve interactions with stem cells.

To design biomimetic surfaces, layer-by-layer (LbL) deposition was compared to simultaneous adsorption of both proteins. The influence of the buffer composition, of a polyethyleneimine (PEI) anchoring layer and of collagen denaturation on LbL assembly was examined.

The results showed that true LbL building was not obtained by assembly of collagen and fibronectin. However, multilayers were built and results showed that a PEI anchoring layer allowed thicker films to be obtained, and that HEPES buffer allowed obtaining the most regular assembly. Moreover, comparison with simultaneous adsorption revealed interesting features. Films obtained by simultaneous adsorption were of the same thickness, or even thicker than those prepared by LbL, and they presented a different morphology, with more collagen fibrils, a lower contact angle and lower water content. Adipose derived mesenchymal stem cells were cultured on films obtained by both deposition methods, in HEPES, with or without PEI anchoring layer. All the protein films supported cell adhesion and proliferation better than pure polystyrene. The main influence observed on cells was the one of the PEI anchoring layer, which decreased proliferation rate but improved cell osteogenic differentiation.

Biointerfaces were thus designed based on collagen and fibronectin, two major proteins of the extracellular matrices. Mesenchymal stem cell behavior was influenced by the organization and nature of biomolecules present in these biointerfaces, which may open the way to new strategies for tissue engineering applications.

**Mercredi 23 novembre 2016 à
15h00**

Auditoire LAVO 51
Place Louis Pasteur, 1
1348 Louvain-la-Neuve



Membres du jury :

Prof. Dupont Christine (UCL), promoteur
Prof. Eric Gagneaux (UCL), président
Prof. Bernard Knoops (UCL), secrétaire
Prof. Sophie Demoustier (UCL)
Prof. Jessem Landoulsi (UPMC, France)
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