Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

Monsieur Bruno AOR

Master of Science in Cellular and Molecular Biotechnology

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et technologie

« Engineering microchannels for vascularization in bone tissue engineering»

qui se déroulera

le lundi 17 décembre 2018 à 14h

B7 (salle 7) Allée Geoffroy Saint Hilaire

33600 Pessac - France

Membres du jury :

Prof. Sophie Demoustier (UCLouvain), supervisor & secretary
Prof. Marie-Christine Durrieu (UBX, France), supervisor
Prof. Alain Jonas (UCLouvain), chairperson
Prof. Emmanuel Pauthe (U-Cergy-Pontoise, France)
Prof. Laurence Bordenave (UBX, France)
Prof. Jessem Landoulsi (LRS, France)
Prof. Véronique Migonney (CSPBAT, France)
Prof. Gaetan Laroche (ULaval, Canada)

UCLouvain

In vitro, tubular-like structures formation with human umbilical vein endothelial cells (HUVECs) was investigated by combining material chemistry functionalization and three-dimensional geometry development. Polycarbonate (PC) was used as a template for the development of the scaffold. Natural polysaccharide's film based on alternate layer-by-layer (LbL) deposition of hyaluronic acid (HA) and chitosan (CHI), was first applied to PC surface and characterized in terms of thickness growth both, in dry conditions using ellipsometry, and confocal lascar scanning microscopy (CLSM). This first functionalization results in a complete coating of the PC layer. Further biofunctionalization with one adhesive peptide (RGD) and two angiogenetic peptides (SVV and QK) was investigated, immobilizing those peptides on the carboxylic group of HA previously deposited, using the well-known carbodiimide chemistry. The labeled version of each peptide was used to characterize the peptides' immobilization and penetration into the polyelectrolytes layers, resulting in a successful grafting with complete penetration through the entire thickness of the LbL. In vitro tests were performed using HUVECs to assess their adhesion efficiency and their metabolic activity on the LbL with and without peptide immobilization, resulting in a preliminary improved activity when peptide-combinations is used. Finally, PC micro-channels (µCh) were first developed and characterized, and the rest of the experiments were performed on µCh of 25µm width, functionalized with $(HA/CHI)_{12.5}$ architecture (PC-LbL) with RGD and QK peptides (PC-RGD+QK) or with RGD and SVV peptides (PC-RGD+SVV). Our first tubulogenesis experiment surprisingly showed the formation of tubular-like structures already after 2h of incubation using the double-peptides combination but only using PC-RGD+QK the tubes were present also after 3 and 4 hours of culture. The co-culture experiment with human pericytes derived from placenta (hPC-PL) demonstrates how the stabilization of the tubes was improved after 3 and 4 hours also for the PC-RGD+SVV sample. Globally our bio-functional material with PC-RGD+QK and PC-RGD+SVV peptides allow the formation of tubular-like structure in both mono and co-culture experiment.