Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

Eleana SOMVILLE
Master ingénieur civil biomédical

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

« Polymer microcarriers with tunable properties for stem cell culture »

qui se déroulera
le jeudi 12 novembre 2020 à 9h
En visioconférence
1348 Louvain-la-Neuve

Jury members :

Prof. Karine Glinel (UCLouvain), supervisor
Prof. Alain Jonas (UCLouvain), supervisor
Prof. Arnaud Delcorte (UCLouvain), chairperson
Prof. Anne des Rieux (UCLouvain), secretary
Dr. Karine Anselme (Université Haute Alsace, France)
Prof. Jérôme Guicheux (Université de Nantes, France)
Prof. Sylvain Gabriele (Université de Mons, Belgium)

Cell-based therapies are promising for tissue engineering and for treating various diseases. However, their development is impaired by the large cell doses required per patient, since the common method to expand cells is not well-suited for large-scale production. Therefore, cell culture on microcarriers (MCs) emerges as an alternative, providing a larger surface-to-volume ratio. However, most commercially available MCs are not designed for stem cell expansion as they are frequently coated with animal-proteins and/or produced using toxic organic solvents. In this context, the aim of the thesis was to develop novel polymeric MCs produced by a green solvent-free process and free of animal protein. We also aim to obtain MC with tunable characteristics (size, porosity, etc.) in order to deal with the multiparameter nature of dynamic cell culture. The MC core is obtained thanks to a versatile and green fabrication process meeting the requirements described above. A polyelectrolyte film composed of poly(L-ornithine) and hyaluronic acid is deposited on MCs using the Layer-by-Layer technique, followed by a crosslinking step and the grafting of a bioadhesive peptide to ensure optimal cell adhesion. The ability of these new MCs to expand human adipose-derived mesenchymal stem cells in both static and dynamic conditions is demonstrated. More precisely, a range of parameters such as growth medium, cell seeding density, MC morphology and composition of coating are optimized in semi-static condition. We also show in semi-static condition that these new MCs offer similar performance in term of cell expansion compared to a widely used commercial MC while being superior in terms of detachment efficiency. Finally, the possibility of using these new MCs in dynamic condition as well as performing bead-to-bead transfer to improve cell yield is proven.