Dynamic Platform To Recreate An Osteoarthritic 3D In Vitro Model

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2016/12/1

TISSUE ENGINEERING PART A

Vol. 22

S67-S67

MARY ANN LIEBERT, INC

Osteoarthritis (OA), a prevalent chronic condition with a striking impact on life quality, represents an enormous societal burden that increases greatly as populations' age. Yet no approved pharmacological intervention, biologic therapy or procedure prevents the progressive destruction of the OA joint. Based on bilayered structures that have been previously suggested for osteochondral (OC) applications (Oliveira *et al* 2006) and on the potential of methacrylated gelatin (GelMA) and methacrylated gellan gum (MAGG) for different tissue engineering applications (Silva-Correia *et al* 2013, Tasoglu *et al* 2014), we set a dynamic platform for the in vitro recreation of an OA 3D in vitro model. Since OA is an inflammatory and degenerative disorder affecting cartilage and subchondral bone, we created 6 hybrid formulations recreating a 3D controlled subchondral bone and cartilage integrated microenvironment. Fat pad adipose derived stem cells (ASCs) were isolated from Hoffa's body obtained from healthy Patients, characterized by flow cytometry and their performance in the developed 3D structures assessed. GelMA formulation showed the best cell adhesion and proliferation, but the life-time of this one in culture is shorter due to the faster degradation *in vitro* comparing to MAGG based structures. According to this we proceeded with the best hybrid formulation, GelMA-MAGG 2:1, for OC co-differentiation using a dual-chamber bioreactor designed for the establishment of co-cultures in a single 3D structure (Canadas *et al* 2014). This approach solved challenges of 3D cell culture in interfaced tissues as OC and will ultimately be used for OA *in vitro* modeling.