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A tunable and scalable biomaterial for 3D cell development: Applications in cartilage engineering and tumor engineering

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We designed an innovative biomaterial combining structural, mechanical and biological properties for tridimensional cell development. It consists of a tridimensional scaffold, made of biosourced and biocompatible polymers such as poly (lactic acid), whose surface is functionalized with a nanolayer of biomolecules naturally occurring in the extracellular matrix. Our biomaterial is highly tunable and scalable and thus, it may be used for a diversity of applications *in vitro* as well as *in vivo*. We focus here on cartilage engineering and tumor engineering. Surface scaffold was functionalized with hyaluronan (HA); an abundant glycosaminoglycan in both cartilage and tumors. We showed that mesenchymal stem cells' (MSC) behaviors greatly depended on the composition of the polymeric scaffold and that their ability to differentiate into chondrocytes strongly varied according to the shape, the porosity, the pore diameter and the HA surface functionalization of the scaffold. Very interestingly, in porous asymmetric films which display an interconnected network of macro- and micropores and whose surface was functionalized with HA, MSC differentiate into mature chondrocytes with deposition of a hyaline cartilaginous matrix. Using porous asymmetric films, we also showed that interactions between MSC and HT-29 colorectal cancer cells strongly depended on the chain size of HA. While there was no physical interaction between the two cell types with high molecular weight HA (HMW-HA), MSC came to surround HT-29 spheroids in the presence of low molecular weight HA (LMW-HA). Moreover, with HMW-HA the microenvironment was found to be proinflammatory, while an increased secretion of proangiogenic cytokines were observed with LMW-HA.

Biography

Brigitte Deschrevel got her PhD in Biophysicochemistry in 1993. Since, she is a Senior Lecturer in chemistry and biophysics at the Rouen University, France, where she carries out her research in the "Polymers, Biopolymers, Surfaces" laboratory (UMR 6270 CNRS). She is co-author of 24 papers and a patent, author of 2 book chapters and she presented her work in 25 international conferences. Her work has also led to collaborations with several companies. Since 2008, she is Director of the Chemistry Department of the Rouen University and, since 2015; she is member of the Academic Council of Normandy University.

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