PHOTOSENSITIVE GELATINE-METHACRYLAMIDE IN 3D CELL CULTURE

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Natural cell environment, the extra-cellular matrix (ECM), is a complex three-dimensional (3D) structure with characteristic features at multiple dimensions. Conventional 2D cell culture systems used in biology do not accurately reproduce the structure, function, or physiology of living tissue. As a result there are substantial discrepancies in behaviour and responses of cells compared to the *in vivo* situation. Primary human articular chondrocytes (hAC) are often used in cartilage repair and tissue engineering. In order to gain a sufficient number of cells for a therapeutic treatment or an experimental study, the cells are expanded in conventional 2D monolayer culture after enzymatic isolation. During expansion in 2D monolayer culture and repetitive passaging of cells, they lose their chondrocyte phenotype as they de-differentiate. We aim to develop a 3D cell culture system, which is suitable for the cells to re-differentiate after 2D monolayer expansion, without using any additional stimuli. Therefore, we encapsulate cells in methacrylamide-modified gelatin (gelMOD) [1], which is an enzymatically degradable hydrogel derived from collagen. Due to the introduced methacrylamide groups it becomes photocrosslinkable with tunable mechanical properties. In the current study his material and the used photoinitiator have been proven to be suitable for cell encapsulation and cell culture for up to 3 weeks. Therefore, it is a suitable material for chondrocyte cultivation and to study the influence of substrate properties on cells. Due to the tunability of material parameters, this approach could also be used for 3D culture of other cell types, such as mesenchymal stem cells, where different tissues can be formed for therapeutic use or pharmaceutical testing.

[1] A. Ovsianikov, A. Deiwick, S. Van Vlierberghe, M. Pflaum, M. Wilhelmi, P. Dubruel and B. Chichkov (2011). Materials 4 (1): pp 288-299