P666 Biomimetically surface modified fibres for cartilage regeneration

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Electrospinning technique let to form fibres with nanometric diameter, thanks to which they are highly similar to the net of polymeric fibres occurring in extracellular matrix (ECM). Selection of appropriate materials for their forming or surface modification can additionally improve their biomedical properties [1]. Polyelectrolytes, occuring naturally in cartilage ECM, help to maintain appropriate amount of water for chondrocytes proliferation and activity [1]. Chitosan is an example of a semi-crystalline polysaccharide, which is commonly used in biomedical applications. The protonated amino groups are responsible for the formation of polycations, which subsequently form compounds with natural and synthetic anions [1, 2]. In this study polycaprolactone/ chitosan (PCL/CHT) fibres were formed. Thanks to appropriate selection of high voltage polarity on the spinning nozzle we influenced the electrospinning efficiency of PCL/CHT blends and additionally the fibres' surface chemistry [3, 4]. Further, chondroitin sulphate (CS), the second polysaccharide, was attached to the fibre surface by layer-by-layer technique (LbL). The aim of this research was to study the effect of surface modification of fibres on their properties and cell response.

SEM analysis indicates the effect of the polarity applied during electrospinning on PCL/CHT fibre diameter distribution and morphology. At the same time surface modification did not affect on this properties. XPS data revealed increasing amount of nitrogen and sulphur on the fibres surface after LbL procedure. The atomic concentration of these elements on the fibre surface increased with repeating of LbL process. Contact angle data indicated the correlation of applied polarity with surface composition of PCL/CHT fibres. For all blends prepared with negative charge on the spinning nozzle, significant increase of wettability is observed as compared to fibres formed with positive polarity. Surface modification in all cases decrease the contact angle. Mechanical tests of fibre mats also indicate significant effect of polarity on the properties of PCL/CHT nonwovens, as well as surface modification. In order to study the effect of polarity applied during electrospinning on surface modification of PCL/CHT fibres on cell proliferation *in vitro* conditions, MTT assays were conducted. Data revealed that charge polarity during electrospinning may significantly influence cells' proliferation on PCL/CHT fibres. An increase or decrease of cells' proliferation, depending on PCL to CHT ratio in the fibres, was observed. The LbL modification as well had various effect on cell proliferation on each PCL/CHT fibres depend on fibres composition. All described changes in cell proliferation occurred in the range of high biocompatibility of the materials. The effect of LbL modification on cell morphology was analysed by EM imaging and cytoskeleton staining.

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