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## **Cellular Response on Polycaprolactone/Chitosan Crystallinity Tailored by Solvent System in Electrospinning Process**

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Nanofibers formed by electrospinning method are excellent material for cell scaffolds used in tissue engineering. One of the most promising and flexible techniques of scaffolds formation is electrospinning, allowing formation of structures resembling morphology of a native extra cellular matrix (ECM). Chitosan is a linear, semi-crystalline polysaccharide, which in accordance with accepted standards contain at least 60 % deacetylated D - glucosamine groups. The reason for high potential of chitosan in tissue engineering is high to glycosaminoglycans, which are a natural component of the extracellular matrix. The positive charge of D – glucosamine residues in chitosan amino groups helps to explain the majority of the material properties, such as interaction with negatively charged compounds from the cell membrane, what affect on analgesic activity and inhibition of RNA synthesis of microorganisms. Positive charge of the material is also responsible for some problems in electrospinning of chitosan solution. Moreover, the additional problem for electrospinning of this material is relatively poor solubility in acidic medium. Chitosan nanofibers were also formed with additions of various synthetic polymers like PEO, PLA or PCL. Polycaprolactone (PCL) is a semi-crystalline, aliphatic polyester. It is biocompatible and biodegradable material, which is characterized by good mechanical properties. Synthetic polymers and their composites with chitosan are of wide interest as a materials for use in cartilage or nerve tissue regeneration. Blends of chitosan with is characterized by a higher structural stability in aqueous media and higher mechanical strength, while maintaining a suitable wettability. Chitosan improves the wettability, increasing cells and protein adhesiveness while PCL is responsible for adequate mechanical properties and degradation time. Biodegradation rate of PCL/Chit nonwovens strongly depends on crystallinity. Until now, electrospinning of chitosan and chitosan blends was conducted mainly from such solvents as: solutions of formic acid and / or acetic acid and 1, 1, 1, 3, 3, 3 hexafluoro-2-propanol (HFIP). Up to date experimental results show that both homogeneity and crystallinity of PCL/Chit fibers depend on solvent used. Creating a cell scaffold without optimizing the internal structure leads to belittle several important issues, such as crystallinity effect on cell activity and proliferation. Few research teams showed that the degree of crystallinity of the material has influence on cells development. They prove that manufacturing method affects the material properties and cellular response. It was also shown that depending on the crystallinity of the substrate on which cells develop, they may form various morphological forms.

The aim of the study is to determine the cellular response to changes in the supermolecular structure, morphology and properties of tested materials caused from various solvent systems used for nanofibers formation. The additional aim of this study is to determine the effect of chitosan content on the properties of nonwovens, particularly optimization of a polycaprolactone / chitosan ratio from the perspective of cellular response in vitro conditions. To characterize the crystallinity of tested samples DSC and WAXS analysis was carried out. Morphology of samples was imaged by SEM and fluorescent microscopy. To characterize additional properties of materials wettability measurements was done. The effect of crystallinity on a cell response was estimated from proliferation tests.