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8.38 Immobilization of gelatin on electrospun polyesters nanofibers to enhance biological response

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Polyester nanofiber scaffolds are attractive from the perspective of tissue regeneration due to appropriate morphology mimicking the fibrous structure of extracellular matrix, as well as suitable porosity and mechanical performance. However, undesirable hydrophobicity and the lack of biological cues limit their effective interaction with cells. Surface modification of electrospun polymer nanofibers is essential method to enhance biological response.

In this research, poly(caprolactone), poly(lactide) and poly(lactide-co-caprolactone) nanofibers were obtained via electrospinning process and subjected to the surface modification. First step was aminolysis with usage of 6 % w/v ethylenediamine in isopropanol solution at different conditions. Then, aminolyzed samples were chemically activated with 1% w/v solution of glutaraldehyde in water for 2.5 h at room temperature, which was necessary for further immobilization of gelatin via covalent bonding. Morphology, amount of amino groups, wettability, mechanical properties and cell response were characterized for all modified polyester nanofibers.

Chosen conditions of surface modification allowed to maintain original morphology of all types of polyester nanofibers. Ninhydrin test confirmed effectiveness of aminolysis conditions for poly(lactide) and poly(lactide-co-caprolactone) nanofibers. Additionally, differences in impact on mechanical properties were observed. All samples were completely hydrophilic after gelatin immobilization and improvement of cell response was observed.

This study shows that this type of surface modification is relatively effective way to improve cell adhesion and growth on the fibers surface and there is perspective of further optimization of process in the aspect of cell response and scaffold properties.

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