Starch-Polycaprolactone Nano Scaffolds for Tissue Engineering

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Introduction

Starch based polymers have been widely studied for several different applications within the biomaterials field, including as scaffolds for tissue engineering. Recently electrospinning has been gaining interest as a promising method to manufacture highly porous 3D structures which provide high surface area for cell attachment and proliferation, being adequate for several uses in tissue engineering.

Aim

The aim of this work is to develop nanofiber-based constructs from starch-polycaprolactone (SPCL 30/70 wt%) blends using electrospinning and study the effect of different solvents.

Materials and Methods

5-15 wt% solutions either in acetic acid or chloroform were electrospun to aluminium foil. The voltage used was 30 kV. Counter-electrode distance was 25 cm. The microstructure of the obtained constructs was characterized by using scanning electron microscopy (SEM).

Results

It was possible to obtain highly porous 3D scaffolds with a typical nanofiber-mesh structure by using electrospinning as a method from different SPCL-solvent solutions. Electrospinning was the most successful with higher concentrations (15 wt%). The process was not very feasible with the solutions which had 10 wt% concentration, although it was possible to produce nanofibers. With solutions which had lower concentrations (5 wt%) the process was rather electrospraying than electrospinning, and it was not possible to obtain fibers. The diameter of the fibers was 130-180 nm. SEM analysis revealed the presence of particles which can be assumed to be starch. The particles were interconnected by the nanofibres.

Conclusions

It is possible to produce highly porous nano-fibre based constructs from SPCL by using electrospinning. Such constructs may have applications in tissue engineering of different tissues, such as bone, skin and cartilage.