ELECTROSPUN SCAFFOLDS FOR TISSUE ENGINEERING

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ABSTRACT

Tissue engineering aims to produce medical devices that are biocompatible with the body and hence has numerous applications in regenerative medicine[1] for example in vascular or heart valve diseases. Electrospinning is one of the techniques used to fabricate scaffolds with micro or nanofibrous structures that mimic the natural extracellular matrix (ECM), cytocompatibility and the porous nature of native tissue that allows for cell ingrowth[2].

An adhesive peptide, GYG**RGD**GYG, was incorporated (0.1 & 0.2 wt%) into DegraPol® (a degradable polymer, M_w-70kDa) and Pellethane® (a non-degradable polymer, M_w-90kDa) by dissolution in 1:99 dimethylformamide/ chloroform and 1:1 dimethylformamide/tetrahydrofuran solvent systems, respectively. The polymer solutions were electrospun at 9kV and 13kV respectively and collected onto a 25mm cylindrical mandrel rotating at 1 000 RPM and positioned 25cm away from the needle tip. SEM analysis was used to analyse the electrospun scaffolds. Square samples (1cm x 1cm) were cut from the electrospun scaffolds, placed in glass vials with PBS and incubated at 37°C. The eluents were analysed for RGD via HPLC and UV spectroscopy at 280nm. The degradation of DegraPol® was investigated by incubating square samples (1cm x 1cm) in PBS at 37°C and weighing the dry samples over 4 months.

DegraPol® scaffolds had larger fibers than those of Pellethane® (5.62 ± 1.4 μm vs 3.8 ± 1.6 μm). The degradation study on DegraPol® showed that there was no significant mass lost over a 33day period (2.97 ± 1.7 %), however the degradation study extends over a period of 4 months. Both degradable and non-degradable scaffolds showed evidence of RGD release within the first 24h of incubation. The effect of RGD, as well as YIGSR and REDV (other adhesive peptides), on the adhesion of cells to both degradable and non-degradable scaffolds is will be quantified.

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References:

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