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Polymer based nanostructured membranes obtained via electrospinning

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Introduction: In this work electrospinning (ELS) was used for the production of polymer based nanostructured membranes for biomedical applications. Present work reports the the characterization of polycaprolactone (PCL) based membranes, implemented with a bioactive chitosan derivative (CTL) and antibacterial silver nanoparticles (nAg). Methods: PCL 12%w/V solved in DCM:DMF 7:3 was electrospun for 1h with a custom made ELS device. Parameters: 17kV of potential, flow rate of 0.6mL/h, 27G needle, 15cm of distance. Nanofibers were characterized by means of Scanning Electron Microscopy (SEM) and micro-Computed Tomography. Air-plasma treatment was used to increase the hydrophilicity of the membrane surface and to adsorb CTL and CTL-nAg. Ag was quantified with Inductively Coupled Plasma Mass Spectrometry ICP-MS. Wettability and biocompatibility of membranes were tested.

Results: PCL nanostructured membranes produced with this technique exhibited an average thickness of 215µm and an average fibre diameter of 600nm. CTL adsorption was assessed by means of confocal microscopy using FITC labelled CTL. Contact angle measurements showed limited wettability of PCL membrane (as prepared), and increased hydrophilicity of air-plasma and CTL coated membranes. Biocompatibility test were performed using MG63 cells cultured on membrane surface. CTL-coated membranes were able to support cell adhesion and proliferation. In contrast, both as-prepared membranes and air-plasma treated membranes exhibited limited cell adhesion and proliferation.

Discussion and Conclusions: This work highlighted the hydrophilicity and biocompatibility of ELS nanostructured membranes made of PLC and coated with CTL- nAg. These results are promising for applications in the field of tissue engineering.

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