DEVELOPMENT OF BIOACTIVE & BIODEGRADABLE NANOFIBROUS SCAFFOLDS FOR TISSUE REGENERATION

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Introduction

Cartilage regeneration is a complex process that requires a tissue engineering strategy at nanoscale [Oseni, 2011]. In an attempt to replicate the natural cartilage related environment, polymeric nanofibrous scaffolds were developed and their effect on fibroblasts and chondrocytes adhesion and growth was investigated. The correlation between the development parameters, the physical and biological properties of these nanoscaffolds was performed and analyzed in detail.

Methods

The biodegradable polymeric nanofibrous (chitosan, gelatin and polycaprolactone) scaffolds were developed by the Electrospray Deposition system, as shown in Figure 1 and Figure 2. MTT assay, a known cytotoxicity assay, was used to determine their cytocompatibility behaviour in direct contact with cells under static conditions, while SEM and fluorescence microscopy were applied to observe the proliferated cells on the nanoscaffolds. The wetting behavior, morphology and mechanical properties of the nanoscaffolds were assessed by Contact Angle and Atomic Force Microscopy (see Figure 2), respectively, while the optical properties by Spectroscopic Ellipsometry.

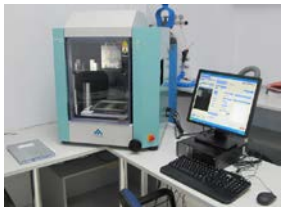

Figure 1: Electrospray Deposition system (ESD).

Results

Different concentrations of the polymeric scaffolds produced variable nanofibrous structures with different fibres diameters that affected cell proliferation in agreement with previous studies on similar natural polymers with the conventional electrospinning process [Zheng 2010, Prabhakaran 2012]. The surface roughness of the nanoscaffolds influenced the cell proliferation. The physical properties of the nanoscaffolds accompanied the above findings.

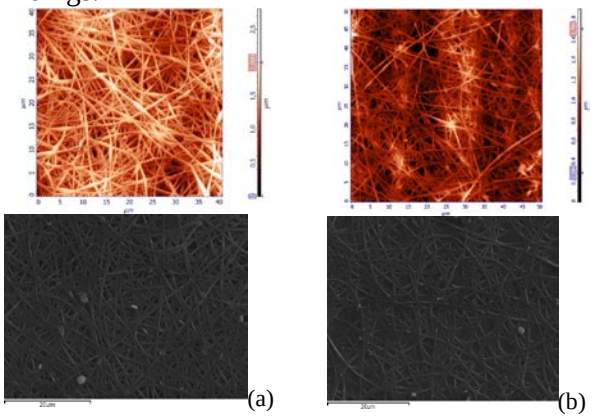

Figure 2 AFM and SEM images of nanofibrous scaffolds (a) Chi:Gel:PVA (50:50:30) concentration and (b) Chi:PVA (60:40) concentration.

Discussion

The optimization of the ESD process in combination with the polymer's properties is the main factors for tissue regeneration applications such as cartilage.

Acknowledgment

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