

Multilayered Assembly of Gelatin on Nanofibrous Matrix for 3-D Cell Cultivation

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Abstract : Electrospinning is a versatile tool for fabricating nano-structured polymeric materials. Gelatin hydrogels are considered to be a good material for cell cultivation because of high water swellability as well as good biocompatibility. Three-dimensional (3-D) cell cultivation is a desirable method of cell cultivation for preparing tissues and organs because cell-to-cell interactions or cell-to-matrix interactions can be much enhanced through this approach. For this reason, hydrogels were widely employed as tissue scaffolds because they can support cultivating cells and tissue in multi-dimensions. Major disadvantages of hydrogel-based cell cultivation include low mechanical properties, lack of topography, which should be enhanced for successful tissue engineering. Herein we surface-immobilized gelatin on the surface of nanofibrous matrix for 3-D cell cultivation in topographical cues added environments. Electrospun nanofibers were electrospun with injection of poly(caprolactone) through a single nozzle syringe. Electrospun meshes were then chopped up with a high speed grinder to fine powders. This was hydrolyzed in optimized concentration of sodium hydroxide solution from 1 to 6 hours and harvested by centrifugation. The freeze-dried powders were examined by scanning electron microscopy (SEM) for revealing the morphology and fibrillar shaped with a length of ca. 20um was observed. This was subsequently immersed in gelatin solution for surface-coating of gelatin, where the process repeated up to 10 times for obtaining desirable coating of gelatin on the surface. Gelatin-coated nanofibrils showed high waterswellability in comparison to the unmodified nanofibrils, and this enabled good dispersion properties of the modified nanofibrils in aqueous phase. The degree of water-swellability was increased as the coating numbers of gelatin increased, however, it did not any meaning result after 10 times of gelatin coating process. Thus, by adjusting the gelatin coating times, we could successfully control the degree of hydrophilicity and water-swellability of nanofibrils.

Keywords : nano, fiber, cell, tissue

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