THE STUDY OF DIFFERENTIATED DENTAL PULP STEM CELLS ON ELECTROSPUN PCL-GELATIN NANOFIBER MATRICES

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Abstract: Regeneration of damaged cartilage tissue can be slow due to its avascular nature and challenging due to the complexity of the cartilage tissue structure. Dental Pulp Stem Cells (DPSCs) have been used to differentiate into a variety of cell types such as chondrocytes. DPSCs are an attractive source of stem cells due to their similarity in differentiation abilities to Mesenchymal Stem Cells (MSCs) and can be ethically sourced from canine baby teeth or extractions of adult molars. Nanofibers have been used in supporting cells as scaffolding in addition to being used in drug delivery and wound dressings. Determining the ability of DPSCs to differentiate into chondrogenic cells on nanofibers can assist in enhancing the recovery of damaged cartilage tissue. Using the co-axial method on an electrospinning machine, core-sheath nanofibers were spun from a PCL core and gelatin sheath dissolved from separate solutions of 50:50 (v/v) acetic acid and acetonitrile. DPSCs were cultured on top of nanofibers in a well plate. The cells were maintained for two weeks before imaging was conducted using an actin filament and DAPI staining technique. SEM was performed in addition to the visualization of cell surfaces on scaffolding. A separate combined solution of PCL and gelatin was dissolved in a 50:50 (v/v) of acetonitrile/acetic acid and spun at various speeds on a collecting drum. An SEM was conducted on samples for visualization of fiber patterns. Imaging of DPSCs revealed successful proliferation and cell differentiation on fibers. Collection of nanofiber scaffolding appeared more random at slower speeds and more aligned at faster speeds. Nanofiber technology can be used in enhancing differentiation of DPSCs into chondrogenic cells to aid in tissue repair.

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