Tubular Electrospun Composite Scaffolds for Potential Bone Tissue Engineering

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Electrospinning is an adaptable method in which polymer solutions or melts converted into micro or nano scale fibers. In this procedure, polymer solutions are loaded into 10 mL syringes that contained millimeter scale nozzles. High voltage (20-30 kV) was applied to polymer solutions at the tip of the nozzle to stabilize the surface tension by electrostatic force. The critical point where this stabilization occurred is called Taylor cone and it lets the droplets to turn into polymer sprays. The fibers were collected onto a tubular rotational collector, which was grounded. Different tubular scaffolds composed of pure polycaprolactone (PCL), small intestinal submucosa (SIS), hydroxyapatite (HA) and tricalciumphosphate (TCP) were prepared by using the electrospinning technique. 13 and 15 wt% pure PCL stock solutions were prepared by dissolution in 1,1,1,3,3,3-hexafluoro-2-propanol (HPF) and stirring at the room temperature until a viscous translucent liquid was acquired. Composite PCL/SIS and PCL/HA dopes were prepared from 10 wt% PCL stock by adding SIS or HA in an 8:1 (PCL:SIS, PCL:HA) dry weight ratio. Similarly, PCL/HA/TCP solutions were made from 13 wt% PCL stock by adding HA and TCP in a 8:1:1 dry weight ratio. Each individual scaffold will be scanned through electron microscope (ECM) to gather information about the % porosity and the diameter of the electrospun fibers. Mechanical testing will be conducted to measure the tensile strength of the fibers. Finally, implanting the tubular scaffolds into axolotls will test cell biocompatibility of the scaffolds.

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