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New conductive nanocomposite scaffold coated with fibrin glue for myocardial tissue engineering

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Heart disease is the number one cause of death in industrialized nations. Myocardial infarction (MI) and heart failure resemble the most prevalent pathologies. Lost cardiomyocytes are replaced by scar tissue resulting in reduced cardiac function causing high morbidity and mortality. One possible solution to this problem is cardiac tissue engineering. Cardiac tissue engineering aims at providing advanced *in vitro* models and disease modeling as well as heart muscle tissue for myocardial regeneration. Here, we present nanocomposite scaffolds composed of Polycaprolactone (PCL)/Multi Wall Carbon Nanotubes (MWCNTs) with fibrin glue coating (FG) prepared via solvent casting and freeze drying (SC/FD) technique. Characterization techniques such as Fourier transform infrared microscopy (FT-IR), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and X-ray diffraction (XRD) were performed. Furthermore, mechanical properties and electrical conductivity of the PCL and nanocomposite scaffolds with and without FG coating were determined. The results revealed that the scaffolds contained sufficient porosity with highly interconnected pore morphology. Addition of multi wall carbon nanotubes in the PCL matrix improved conductivity and also elastic modulus of the prepared scaffolds. Multi Wall carbon nanotubes were used as doping material to develop highly conductive nanocomposite scaffolds. Desired distribution of MWCNT with a few agglomerates was observed in the nanocomposite scaffolds by SEM. The FG coating was homogenous across the entire substrate and allowed the pore structure remain open in the constructs. In conclusion, the electrically conductive and nanofibrous network formed by 1% MWCNTs within a porous PCL scaffold and coated with FG could be used as an appropriate construct for myocardium regeneration.

Biography

Sharareh Ghaziof has completed his PhD in Biomaterials from Isfahan University of Technology, Iran. He is an Academic Member at the Department of Biomedical Engineering, Faculty of Engineering, University of Isfahan, Iran. He has published several papers in reputed journals.

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