Preparation and evaluation of Polycaprolactone/Chitosan/pr-NPs biocompatible nanofibers as skin tissue engineering scaffolds

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Tissue engineering is an emerging method for replacing damaged tissues. Recently, the use of nanofibers (NFs) for tissue engineering has been more developed. In this study in order to increase bioavailability and biosolubility the row propolis (as a natural antibacterial agent) convert to nanoparticles (pr-NPs). Pr-NPs was characterized physiochemical by Dynamic light scattering (DLS), scanning electron microscope (SEM), UV-Visible spectroscopy and Fourier-transform infrared spectroscopy (FTIR) spectral analysis, The results indicated the pr-NPs had narrow size and size distribution index in the spherical shape with the zeta potential value of +34±2±2. The UV-Visible spectroscopy and FTIR analysis proved that there was no significant changes in in structure of propolis after nanomization. The Polycaprolactone (PCL) in addition to chitosan (CH) and pr-NPs by application of electrospinning method prepared the skin nanofiber scaffold. A combination of Polycaprolactone (PCL), chitosan (CH), and pr-NPs was used to incorporate mechanical properties of synthetic polymers, biological properties of natural polymers, antibacterial and wound healing accelerating properties of pr-NPs. Physical and morphological characteristics of synthetized scaffolds were investigated using (SEM), mechanical analysis, swelling ratio, and contact angle. Moreover, chemical and biological properties were evaluated by (FTIR), DAPI staining, MTT assay, and trypan blue exclusion assay. Obtained results demonstrated that the fabricated scaffolds have good mechanical properties. Moreover, addition of chitosan and pr-NPs to the PCL scaffolds improved their water absorption capacity as well as surface hydrophilicity. MTT results showed the fabricated nanofibrous scaffolds have adequate cell viability which accelerated the fibroblast cells proliferation. Furthermore, SEM images of cultured scaffolds, trypan blue exclusion assay, and DAPI staining confirmed that fibroblast cells could well-attached and multiply on the PCL/CH/pr-NPs scaffolds. Results have proven that this novel bioactive scaffold has promising mechanical properties, suitable biocompatibility in vitro, and in vivo. Consequently, it could be a promising candidate for skin tissue engineering applications.

Biography

Dr. Seyedeh-Sara Hashemi has completed her PhD at the age of 34 years from Shiraz University and postdoctoral studies from Tehran University School of Medicine. She is the director of Tissue Engnearing and cell therapy lab of Amir-Al-Moemenin Hospital, a premier and most advanced burn care and treatment service organization. She has published more than 46 papers in reputed journals and has been serving as Assistant Professor and Academic Member of Shiraz University of Medical Sciences and editorial board member of some Journal.

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