Enhanced biological properties of collagen/chitosan-coated poly(ε-caprolactone) scaffold by surface modification with GHK-Cu peptide and 58S bioglass

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Abstract

Bioactive glasses and peptides have shown promising results in improving wound healing and skin repair. The present study explores the effectiveness of surface modification of collagen/chitosan-coated electrospun poly(ε-caprolactone) scaffold with 58S bioactive glass or GHK-Cu peptide. To coat scaffolds with the bioactive glass, we prepared suspensions of silanized bioactive glass powder with three different concentrations and the scaffolds were pipetted with suspensions. Similarly, GHK-Cu-coated scaffolds were prepared by pipetting adequate amount of 1-mM solution of peptide (in milli-Q) on the surface of scaffolds. ATR–FTIR spectroscopy indicated the successful modification of collagen/chitosan-coated electrospun poly(ε-caprolactone) scaffold with bioactive glass and GHK-Cu. Microstructural investigations and in vitro studies such as cell adhesion, cell viability and antibacterial assay were performed. All samples demonstrated desirable cell attachment. Compared to poly(ε-caprolactone)/collagen/chitosan, the cell proliferation of GHK-Cu and bioactive glass-coated (concentrations of 0.01 and 0.1) scaffolds increased significantly at days 3 and 7, respectively. Poly(ε-caprolactone)/collagen/chitosan-uncoated scaffold and scaffolds coated with GHK-Cu and bioactive glass revealed desirable antibacterial properties but the antibacterial activity of GHK-Cu-coated sample turned out to be superior. These findings indicated that biological properties of collagen/chitosan-coated synthetic polymer could be improved by GHK-Cu and bioactive glass.