Determination of cytocompatibility and osteogenesis properties of in situ forming collagen-based scaffolds loaded with bone synthesizing drug for bone tissue engineering.

Azza Ahmed ,Nermeen Adel Elkasabgy, Rehab Nabil Shamma

Abstract

Bone tissue engineering using in situ forming 3D scaffolds can be an alternative to surgically treated scaffolds. This work aimed to develop in situ forming scaffolds using poly (lactic-co-glycolic acid) and a bone synthesizing drug (risedronate) with or without the porogenic agent (collagen). Hybrid scaffolds were formed through solvent-induced phase inversion technique and were morphologically evaluated using scanning electron microscopy (SEM). The effect of scaffolds on Saos-2 cell line viability using 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide test besides their effect on cell growth using fluorescence microscope was assessed. Furthermore, alkaline phosphatase (ALP) activity as well as Ca2+ deposition on the scaffolds was evaluated. SEM images revealed the porous structure for collagen-based scaffolds. Saos-2 cell proliferation was significantly enhanced with risedronate-loaded scaffolds compared to those lacking the drug. Porous collagen-based scaffolds were more favorable for both the cell growth and the promotion of ALP activity. Furthermore, collagen-based scaffolds promoted the Ca2+ deposition compared to their counterparts without collagen. Such results suggest that collagen-based scaffolds offer excellent biocompatibility for bone regeneration, where this biocompatible nature of scaffold leads to the proliferation of cells that lead to the deposition of mineral on the scaffold. Such in situ forming 3D scaffolds provide a promising noninvasive approach for bone tissue engineering.

International Journal of Polymeric Materials and Polymeric Biomaterials 2017, May