Bioactive/natural polymeric scaffolds loaded with ciprofloxacin for treatment of osteomyelitis.

AZZA AHMED MOHAMED MAHMOUD ,Amany A. Mostafa , Mayyada M. H. El-Sayed, Amira M. Gamal-Eldeen

Abstract

Local delivery of antibiotic into injured bone is a demand. In this work, different scaffolds of chitosan (C) with or without bioactive glass (G) were prepared using the freeze-drying technique in 2:1, 1:1, and 1:2 weight ratios. Chitosan scaffolds and selected formulas of chitosan to bioglass were loaded with ciprofloxacin in 5%, 10%, and 20% w/w. Scaffold morphology showed an interconnected porous structure, where the glass particles were homogeneously dispersed in the chitosan matrix. The kinetic study confirmed that the scaffold containing 1:2 weight ratio of chitosan to glass (CG12) showed optimal bioactivity with good compromise between Ca and P uptake capacities and Si release rate. Chitosan/bioactive glass scaffolds showed larger t 50 values indicating less burst drug release followed by a sustained drug release profile compared to that of chitosan scaffolds. The cell growth, migration, adhesion, and invasion were enhanced onto CG12 scaffold surfaces. Samples of CG12 scaffolds with or without 5% drug induced vascular endothelial growth factor (VEGF), while those containing 10% drug diminished VEGF level. Only CG12 induced the cell differentiation (alkaline phosphatase activity). In conclusion, CG12 containing 5% drug can be considered a biocompatible carrier which would help in the localized osteomyelitis treatment.

AAPS PharmSciTech 2017, January