Radiation fabrication of Xanthan-based wound dressing hydrogels embedded ZnO nanoparticles: In vitro evaluation

Amany I. Raafat, Naeem M. El-Sawy, Nagwa A. Badawy, Eglal A. Mousa, Asmaa M. Mohmed

PII: S0141-8130(18)32036-1
DOI: doi:10.1016/j.ijbiomac.2018.07.031
Reference: BIOMAC 10075

To appear in: *International Journal of Biological Macromolecules*

Received date: 4 May 2018
Revised date: 9 July 2018
Accepted date: 10 July 2018

Please cite this article as: Amany I. Raafat, Naeem M. El-Sawy, Nagwa A. Badawy, Eglal A. Mousa, Asmaa M. Mohmed , Radiation fabrication of Xanthan-based wound dressing hydrogels embedded ZnO nanoparticles: In vitro evaluation. Biomac (2018), doi:10.1016/j.ijbiomac.2018.07.031

Radiation Fabrication of Xanthan - based Wound dressing hydrogels embedded ZnO nanoparticles: *In vitro* Evaluation

Amany I. Raafat[a], Naeem M. El-Sawy[a] , Nagwa A. Badawy[b], Eglal A. Mousa [b], Asmaa M. Mohmed[a]

[a]*Polymer Chemistry Department ,National Center for Radiation Research and Technology, Atomic Energy Authority, P.O. Box 29, Nasr City, Cairo, Egypt*
[b]*Chemistry Department, Faculty of Science, Al-Azhar University, Nasr City, Cairo, Egypt.*

*Corresponding author; A. I. Raafat
e-mail:ismaelraafat_a@hotmail.com,
Tel/Fax: 002022979298

Abstract

Depending on the biocompatibility of Xanthan, polyvinyl alcohol and the antibacterial efficiency of zinc oxide nanoparticles (ZnO), a series of (Xanthan-polyvinyl alcohol)/ZnO nanocomposite hydrogels were prepared as wound dressing using eco-friendliness ^{60}Co γ-ray irradiation facility. ZnO nanoparticles were characterized using X-ray diffraction, UV–vis spectroscopy, transmission electron microscopy and energy dispersive X-ray analysis. The size of ZnO nanoparticles was ranged betwen15–25 nm. The presence of ZnO nanoparticles reconstructed the internal structure of the hydrogel network which aid in a homogenous porous structure as indicated by scanning electron micrographs. Such adequate porosity along with the presence of ZnO nanoparticles controls the fluid uptake ability, water retention and water vapor transmission rate. The fluid uptake ability in pseudo-extracellular fluid and water ranged between (554-664%) and (1281-1603%), respectively. After exposure to air for 6 hours, ZnO dressings kept about 50-65% of their water content which makes them more suitable for moderate exudating wounds. Water vapor transmission rate ranged between (167-184) (g/(m^{2}h) which is sufficient to keep wound's surface moist. ZnO dressings show an efficient microbial barrier potency and profound antimicrobial activity against *Staphylococcus aureus, Escherichia coli* and *Candida albicans*. *In vitro* cytotoxicity and haemolytic potency evaluation showed their biocompatibility.

Key words: Gamma irradiation; Xanthan; ZnO nanocomposites; wound dressing; Biocompatibility