

| | |
|--------------|---|
| Paper ID: | 1571067997 |
| Paper Title: | The development of wound healing patch containing silk sericin and cinnamon extract for the treatment of infected wound |
| Authors: | Siriporn Piyapan (Chulalongkorn University & Biomedical Engineering Program, Thailand); Pornanong Aramwit (Bioactive Resource for Innovative Clinical Applications Research Unit, Thailand) |
| Email: | 6470093421@student.chula.ac.th |

Abstract

Sericin is a natural protein from silkworm cocoons. It is used in many biomedical applications as scaffolds, films, hydrogels, and micro/nanoparticles. This study was interested in fabricating a scaffold from sericin as a wound healing patch. The scaffold was fabricated, but sericin had poor properties, so it needed to be solved using another polymer. PVA was chosen to improve their properties in conjunction with chemical (adding glutaraldehyde) and physical (freezing-thawing) crosslink. The cross-section of SEM showed high porous and good interconnectivity all around the sheet of both scaffolds. The chemical crosslink scaffold was smaller porous than the physical crosslink scaffold. The result of FT-IR showed that the specific absorption peaks of sericin were amide I at 1618-1640 cm^{-1} (C=O stretching), amide II at 1518-1638 cm^{-1} (N-H bending and C-N stretching) and amide III at 123 cm^{-1} (C-N and C=O stretching). Adding glutaraldehyde gave the two small peaks at 2830-3000 cm^{-1} , indicating the C-H bond of the aldehyde and alkyl functional group. The mechanical testing, crosslinking can resist deformation observed from Young's modulus. Young's modulus of non-crosslink, physical and chemical crosslink scaffolds were 1.4 ± 0.001 , 34.4 ± 0.004 and 7.5 ± 0.004 kPa, respectively. Elongation at break of all were 116.4 ± 11.1 , 140.3 ± 13.2 and 22.7 ± 17 , respectively. These results suggested that the addition of glutaraldehyde had an impact on the brittleness of the scaffold. The swelling property indicated the wound healing patch's efficiency in absorbing liquids or exudate. There were two folds of swelling of the chemical crosslink scaffold compared with the physical crosslink scaffold at intervals time after immersion. At the same time, sericin released more than 450.0 $\mu\text{g/mL}$ from both scaffolds after 48 h. MTT assay showed that they were non-toxic at 24 and 48 h. Cell viability has been measured more than 70%. Moreover, our study wants to develop an antibacterial scaffold, so cinnamon essential oil was used as an active agent. Cinnamon essential oil (CEO) exhibits a broad spectrum of antimicrobial activity. CEO was loaded into the scaffold, and antibacterial activity was tested in *Acinetobacter baumannii*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. The diameter of the inhibition zone was observed, and the result showed that the CEO loaded physical and chemical crosslink scaffolds were excellent against all of them. From all of the testing, we can assume that physical and chemical crosslinking significantly affects their physical property, and CEO is suitable as an antibacterial agent on wound healing patch.