

Synthesis and characterization of cellulose nanofibers/chitosan/cinnamon extract wound dressing with significant antibacterial and wound healing properties

Summary: Recently, bacterial cellulose-based wound dressings have gained lots of attention, and many studies have tried to improve the efficacy of these membranes with incorporation of different natural materials to fabricate an all-natural wound dressing with significant antibacterial and wound healing properties.

Methods-Results: In the present study, bacterial cellulose (BC) is produced from *Gluconacetobacter xylinus* to fabricate BC-based membranes. Then, chitosan (CS) and cinnamon extract (CE) are incorporated into the BC membranes to prepare an all-natural wound dressing. The obtained composite membrane (BC/CS/CE) is characterized according to chemical properties, surface morphology, mechanical properties, water absorptivity, water retention, CE release, antibacterial activity, biocompatibility, in vivo wound healing activity, and compared with BC and BC/CS membranes. The BC/CS/CE membrane is able to maintain appropriate moisture content for an acceptable period of time. Although the tensile strength and elongation at break values of the BC/CS/CE are slightly lower than the BC membrane, they are still in ideal ranges.

Conclusions: The BC/CS/CE membrane exhibits significantly more antibacterial effects against *Staphylococcus aureus* and *Escherichia coli* in comparison with the BC and BC/CS which can be related to the sustained released profile of CE. In addition, BC/CS/CE is more biocompatible with L929 normal skin fibroblast cells in comparison with the BC and BC/CS membranes. Also, the BC/CS/CE membrane can meaningfully promote the wound healing progress compared with other membranes at the Wistar rats full-thickness skin wound model. The BC/CS/CE membrane-treated wounds have more developed dermis layer in comparison with other groups according to histopathological analyses. Taking together, the CS and CE enriched BC membranes can be a promising wound dressing with desirable properties.