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Bacterial Cellulose/Chitosan Hydrogels Synthesized *In situ* for Biomedical Application

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ABSTRACT

Objective: Bacterial cellulose (BC) is a biopolymer whose application has been limited due to the difficulty to introduce modifiable functional groups onto its network. The present study introduces new functional groups from chitosan (Chs) by *in-situ* method and further modified by crosslinking with genipin (Gp), a non-toxic agent.

Methodology and Results: Bacterial cellulose-chitosan (BC-Chs) hydrogels were synthesized *in-situ*, dried, immersed in genipin (Gp) solution to yield BC-Chs crosslinked hydrogel (BC-Chs-Gp) and characterized. The presence of amide 1 and II and crosslinking with genipin was revealed by FT-IR and SEM showed BC-Chs-Gp had a compact fibril network. Low tensile strength, less swelling ratio and moisture were exhibited by BC-Chs-Gp due to crosslinking. Hydrogels were active against *E. coli* and *S. aureus. In vitro* drug release studies of hydrogels using quetiapine fumarate followed the Higuchi model with a super case II transport mechanism and non-Fickian for BC-Chs-Gp.

Conclusion and Application of findings. The present study utilized non-pathogenic bacteria, *G. Xylinus* and a natural resource (coconut) to obtain non-toxic and biocompatible hydrogels. BC-Chs hydrogels were prepared by simple and direct *in-situ* method by the introduction of Chs onto the growing network of BC and subsequently crosslinked using genipin by *ex-situ* modification method. The properties of the hydrogels in term of swelling ratio, moisture content, tensile strength, antibacterial activity, and their controlled drug release ability make them suitable for potential application in biomedicine, especially in transdermal patches as wound dressing and wound healing agents.

Keywords: Bacterial cellulose; Chitosan; Genipin; Biocompatibility; mechanical properties.