P13: Antimicrobial activity of bacterial nanocellulose modified with chestnut extract

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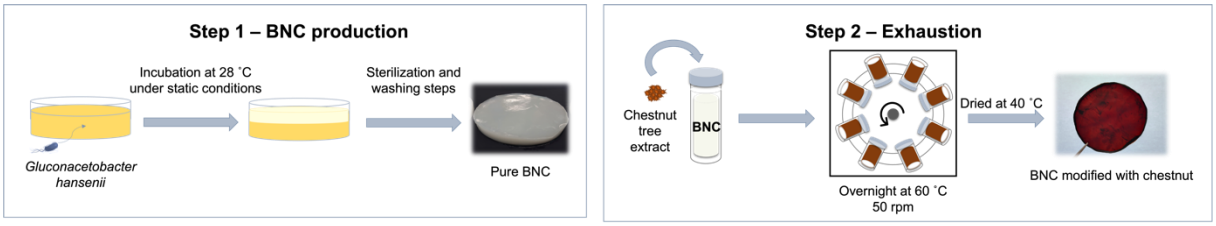
Abstract

Chestnut wood and bark extracts are rich in tannins. Hydrolysable tannins exhibit numerous health-promoting properties such as antioxidant, antimicrobial, anti-parasitic, anti-inflammatory, anti-carcinogenic, anti-ulcerative, antiangiogenic, phytoestrogenic, and P-glycoprotein inhibiting effects [1, 2]. The most abundant polyphenolic compounds in chestnut extract are hydrolysable tannins (gallotannins and ellagitannins), where vescalagin and castalagin are the most important constituents (nearly 10 %), contributing significantly to the chestnut's antimicrobial activity [2]. Therefore, chestnut extract has tremendous potential to be used in medical appliances. The incorporation of chestnut extract within the nanofibrous structure of bacterial nanocellulose (BNC) produced by *Gluconacetobacter hansenii* ATCC 53582 was obtained through exhaustion. The chestnut extract adsorbed tightly onto the surface of the nanofibers and across the entire depth of the membranes, resulting in functionalized BNC with similar properties to those of the chestnut extract. However, BNC became more brittle. Adding glycerol as a plasticizer circumvented this issue, resulting in a highly flexible and resistant material. The antimicrobial activity of the chestnut modified BNC was tested against common bacteria: *Escherichia coli* and *Staphylococcus aureus*, MS2 bacteriophage, and yeast *Candida parapsilosis*. Antioxidant properties, release profile and swelling behavior were evaluated. Morphology of the functionalized BNC was analyzed through scanning electron microscopy, and the chemical composition using Fourier transform infrared spectroscopy. In this study, the simple processing methodology resulted in a flexible, biodegradable, biocompatible nanocomposite for potential application in medical appliances, including skin injuries in particular for diabetes wounds.



References

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