Title : Preparation, Characterization, and Drug Release Study of Bacterial Cellulose-Based Composite Membrane

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ABSTRACT

A membrane derived from bacterial cellulose (BC) prepared from nata de coco was developed for use in drug delivery and fluid absorption in wound dressing applications. The BC membrane offers a sustainable and environmentally friendly alternative for wound healing. To enhance its mechanical properties, liquid absorption capacity, and drug release performance, the BC membrane was reinforced with cellulose fibers (CFs) and layered material (LM). The resulting BC composite membrane exhibited improved tensile strength while maintaining flexibility compared to neat BC membrane. Drug release study revealed that the BC composite membrane loaded with model drug A provided sustained release for up to 240 hours, with a cumulative release of 25%, whereas the BC composite membrane loaded with model drug B released only 6% within 2 hours. Additionally, the BC composite membrane demonstrated excellent biocompatibility, with cell viability reaching 99%. The drug A-loaded membrane further exhibited strong antibacterial activity against *Escherichia coli*. In terms of liquid absorption, the BC composite membrane absorbed up to 370% of its weight, while the drug A-loaded membrane absorbed up to 190%. Thermal analysis confirmed the membrane's stability up to 350 °C. These findings suggest the potential of the developed BC-based composite membrane for use in advanced wound dressings, contributing to both improved biomedical applications and sustainable material development.