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Introduction

Various types of biopolymers have been explored and proposed as alternatives to interact with biological systems, contributing to the development of new approaches in several areas of research; however, there are still attempts to develop functional biomaterials that meet the growing demands for practical and safe options for clinical uses (1).

Skin health, for example, is a primary concern for many people, as changes in the skin can be caused by a variety of circumstances, including external influences such as UV radiation, stress, and inadequate skincare practices, as well as internal elements such as fibroblast activation and reduced collagen production (2).

These factors can lead to various skin problems, such as aging and the appearance of expression lines, and for this reason, maintaining a balanced hydrolipidic layer is essential for skin preservation. To achieve this goal, it is crucial to reduce water loss from the skin, which can be accomplished through the incorporation of treatments with moisturizing and antioxidant properties, such as creams and facial masks, which work to delay signs of aging, such as fine lines, wrinkles, and to keep the skin hydrated (3)(4).

Due to its natural composition, bacterial cellulose (BC) has become the focus of innovative cosmetic research, as it is a linear and extracellular homopolymer of glucose that possesses very interesting properties, such as excellent biocompatibility, water retention capacity, flexibility, and mechanical properties. Furthermore, it has great versatility, finding practical applications in various domains, such as artificial skin, blood vessels, and dressings. BC emerges as a promising possibility for biological applications due to its high performance and unique properties; however, it is crucial to enhance its properties through the evaluation of various techniques, including chemical methods, where a more natural approach, for example, involves the incorporation of essential oil properties into BC (5)(6).

The incorporation of these essential oils into a composite or scaffold structure enhances its characteristics; some studies highlight the properties of

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Copaiba essential oil, rich in volatile sesquiterpenes, especially β-caryophyllene, confers anti-inflammatory properties, in addition to being widely used in the cosmetic and pharmaceutical sectors due to its aromatic properties and health benefits, including its antioxidant capacity and potential contribution to tissue regeneration (7).

Some research has already explored incorporations into these matrices for the development of materials with functional properties, particularly in the cosmetic sector. One study highlighted the creation of a polymeric matrix of CB enhanced with grape skin extract, obtained through in situ and ex situ methods. The extract imparts significant antioxidant properties to cellulose, where the study identified that the sample exhibited 35.6% antioxidant activity, a value close to that of the pure extract (38.5%). Furthermore, these materials demonstrated high water retention (around 98%) and porosity (approximately 85%), important characteristics for cosmetic applications, such as hydration and incorporation of active compounds. Another study directly reports the use of CB incorporated with essential oils in facial masks, which was conducted using peppermint oil, highlighting that menthol, the main component of this oil (35.31%), is efficiently retained in the cellulose matrix, ensuring its therapeutic properties during dermal application. Moreover, the three-dimensional fibrous structure of cellulose increases the porosity and strength of the masks, while mechanical and enzymatic treatments of the fibers optimize the incorporation of the essential oil, maintaining the integrity of the material (8)(9).

This study explored new possibilities for the application of CB by creating membranes and incorporating them with copaiba oil nanoemulsions, conferring differentiated properties. In order to test its biomedical potential, cell viability assays were performed with murine fibroblasts (L929), seeking to understand the cellular impact of the produced material. This paves the way for the produced membranes to gain traction in biomedical use, offering an approach that combines materials science and biomedical engineering.