Talk

Feasibility of lignin-based platforms for the development of healthcare applications

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ABSTRACT

Lignin, a naturally occurring aromatic biomacromolecule, which is available in large amounts as a byproduct from pulping industries and lignocellulosic biorefineries, has attracted growing interest in recent years. The rise of these modern biorefineries is dedicated to converting lignocellulosic biomass into biofuels or advanced bioproducts. This, coupled with a growing emphasis on environmental sustainability, has sparked great interest in the valorization of lignin in various fields, including chemicals or materials. Natural polymers obtained from biological systems have been widely employed for the development of biomedical applications in recent decades. The most used materials for this purpose include alginate, chitosan, collagen, gelatin, and cellulose, among others. Unfortunately, lignin remains relatively underexplored in the biomedical field. The heterogeneity of natural and technical lignin samples, arising from the various lignocellulosic resources and extraction methods used to obtain this biomacromolecule, may hinder its applicability in healthcare applications. Additionally, the lack of in vivo biocompatibility and biodegradability studies to fully understand how this biomacromolecule can be degraded by the human body remains the biggest limitation to the use of lignin in the biomedical field. Despite these drawbacks mentioned earlier, lignin possesses several distinctive properties, such as antioxidant and antimicrobial capabilities, UV-absorbing capabilities, and low cytotoxicity, which are not found in other natural polymers. Antioxidant materials have potential for biomedical applications as they contribute to reduce the concentration of reactive oxygen species and free radicals, which can preclude wound healing (Barapatre et al., 2015). Furthermore, the incorporation of materials with antimicrobial properties in the development of healthcare applications, such as wound dressings, may help prevent infections and enhance wound healing (Domínguez-Robles et al., 2020). Therefore, this biomacromolecule can be a promising good candidate to be incorporated in the development of healthcare applications (Domínguez-Robles et al., 2020; Sugiarto et al., 2022). This work discusses some recent advances in the valorization of lignin through the development of drug delivery platforms.

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