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TAL 797 – Seminário

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POLYELECTROLYTE COMPLEXES BASED ON BIOPOLYMERS: From Physicochemical Interactions to Nanoparticle-Based Topical Delivery Systems

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Polyelectrolyte complexes (PECs) have attracted considerable attention due to their potential applications in the development of innovative delivery systems for bioactive compounds. These supramolecular structures are formed through interactions between oppositely charged biopolymers, particularly polysaccharides, whose physicochemical properties contribute to the stability, structural organization, and functionality of the resulting complexes. Among these biopolymers, chitosan, carboxymethylcellulose, and alginate have demonstrated considerable technological potential owing to their biocompatibility, biodegradability, and ability to establish electrostatic interactions. The formation and characteristics of PECs depend on several factors, including pH, temperature, polymer mixing ratio, and molecular structure, which directly influence particle formation, morphology, and stability (FERREIRA et al., 2022). In this context, polyelectrolyte complexation has emerged as a promising strategy for the development of polymeric nanoparticles capable of encapsulating bioactive compounds, improving their stability, and modulating their release. Recent studies have demonstrated the potential of chitosan–alginate nanoparticles for topical applications, particularly in enhancing the stability and skin retention of encapsulated protein hydrolysates, thereby expanding their potential use in dermatological and cosmeceutical formulations (YEERONG et al., 2024). Despite these advances, further investigations are required to understand the relationship between polymer interactions, nanoparticle characteristics, and their behavior in biological environments, especially regarding skin delivery, safety, and clinical effectiveness. Therefore, this seminar aims to present

concisely i) the fundamental principles and physicochemical interactions involved in the formation of polyelectrolyte complexes, with particular emphasis on chitosan and carboxymethylcellulose; ii) the influence of formulation parameters on the formation, morphology, and stability of macro- and micro-polyelectrolyte complexes; and iii) the application of polyelectrolyte complexation in the development of chitosan–alginate nanoparticles for the encapsulation, protection, and controlled release of bioactive compounds, highlighting their potential applications in topical dermatological and cosmeceutical products.

REFERÊNCIAS BIBLIOGRÁFICAS

FERREIRA, D. C. M. et al. Polyelectrolyte complexes (PECs) obtained from chitosan and carboxymethylcellulose: A physicochemical and microstructural study. *Carbohydrate Polymer Technologies and Applications*, v. 3, 100197, 2022. DOI: 10.1016/j.carpta.2022.100197.

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