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Molecular aspects of chitosan: a versatile polysaccharide in technological applications.

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Abstract

Polysaccharides are among the most important class of biopolymers with technological applications, especially in the food industry. Food polysaccharides are commonly used to modify rheological properties and to improve sensorial attributes of foods. The specific applications of such biopolymers are dependent on their physicochemical properties, which reflects on their techno-functional properties as thickening, gelling, or emulsifying agents. They may be obtained from different sources such as microorganisms (xanthan, gellan, pullulan gums), animals (chitin and chitosan), plants, including seeds (guar, LBG, tara gums), tree exudates (gum acacia), fruits (pectin, cashew gum), and seaweeds (carrageenan, agar, alginate, etc.). Among them, chitosan, which is a biocompatible, biodegradable, and non-toxic material and the only cationic polysaccharide in nature, has been widely used in several biotechnological applications, but with limited use so far as food ingredient and/or additive. The presence of amino groups ($–NH_2$), that become protonated in acid aqueous media ($pH \leq 6,4$), facilitates chitosan dispersion depending on the acid type and concentration. Indeed, in order to explore techno-functionalities of macromolecules in food formulations, they must be firstly solubilized/dispersed in the desired medium, which in the case of chitosan needs to be an acidic one. Because of its growing relevance in technological applications, chitosan has been one of the most studied polysaccharides in the scientific and industrial field. Therefore, the aim of this seminar is to highlight aspects related to the obtainment, molecular structure, dispersibility, and regulatory affairs of chitosan, as well as the contribution of our team to the development of high impact research, on scientific and technological levels. Finally, some future perspectives are brought up to enlighten what can be done to predict and provide explanations of experimentally observed macromolecular structure, dynamics, and microscopic and macroscopic material properties.

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