

Sustainable Strategies to Modulate Food Allergenicity: From Polyphenols to Nano-Biointerfaces

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Talk Abstract

Food allergies are an increasing health concern, particularly in developed countries and among children, due to the complex interplay of genetic, epigenetic, and environmental factors, which complicate both prevention and treatment [1]. In this context, recent research has focused on modifying the structure of allergenic proteins to reduce their ability to trigger immune responses, especially through safe, food-compatible approaches [2]. Among these, the use of polyphenols derived from plant waste, such as citrus peels, stands out for their antioxidant and anti-inflammatory properties, as well as their capacity to interact with proteins from egg and milk, altering their structure and decreasing IgE binding, albeit with some inter-individual variability [3,4]. In parallel, innovative strategies such as the use of biopolymer nanocrystals (cellulose and chitin) have been developed to reorganize epitope presentation without denaturing proteins, thereby reducing allergenicity in a more controlled manner. Altogether, these approaches point toward the development of hypoallergenic edible matrices and safer oral therapies, while also incorporating sustainability principles through the valorization of agro-food by-products and the use of renewable materials.

Keywords: food allergy, chemically-modified proteins, IgE-mediated anaphylaxis, oral immunotherapy, polyphenols, cellulose nanocrystals, chitin nanocrystals.

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