



## Food Processing: Role of Hydrolysis on Food Allergenicity

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### DESCRIPTION

The prevalence of food allergies has been rising, particularly in developed countries, posing challenges for food safety and public health. One of the key strategies employed to manage and potentially reduce the allergenicity of food is hydrolysis. Hydrolysis, a chemical process that involves the breakdown of compounds by water, plays a significant role in food processing. This article explores the mechanism of hydrolysis, its applications in food processing, and its impact on the allergenicity of food.

### Understanding hydrolysis

Hydrolysis is a reaction that involves the cleavage of chemical bonds by the addition of water. In the context of food processing, hydrolysis can occur under the action of enzymes, acids, or bases. The most common type of hydrolysis in food processing involves enzymes, which are biological catalysts that facilitate the breakdown of complex molecules into simpler ones.

**Enzymatic hydrolysis:** This involves the use of enzymes such as proteases, lipases, and carbohydrases to break down proteins, fats, and carbohydrates, respectively. Enzymatic hydrolysis is widely used due to its specificity and efficiency.

**Acid hydrolysis:** In this process, acids like hydrochloric acid are used to hydrolyze proteins and carbohydrates. Acid hydrolysis is less specific than enzymatic hydrolysis and can result in the formation of undesirable by-products.

**Alkaline hydrolysis:** Alkaline hydrolysis uses bases such as sodium hydroxide to break down proteins and other macromolecules. It is often used in the processing of plant-based foods.

### Hydrolysis in food processing

Hydrolysis is employed in various food processing techniques to modify the texture, flavor, and nutritional profile of foods. Some common applications include:

**Production of hydrolyzed protein products:** Hydrolyzed proteins are widely utilized in infant formulas, sports nutrition products, and medical nutrition products. The hydrolysis process involves breaking down proteins into peptides and amino acids, which enhances digestibility and reduces the risk of allergic reactions.

**Flavor enhancement:** The hydrolysis of proteins releases amino acids and peptides, which enhance the umami flavor. This process is frequently utilized in making soy sauce, fish sauce, and various other fermented products.

**Texturizing agents:** Hydrolyzed proteins and carbohydrates can serve as texturizing agents in food products. They enhance the mouthfeel and stability of items such as soups, sauces, and desserts.

**Reduction of anti-nutritional factor:** Hydrolysis can decrease or remove anti-nutritional factors like phytic acid and protease inhibitors in plant-based foods, enhancing their nutritional quality.

### Impact on allergenicity

One of the most significant impacts of hydrolysis in food processing is its potential to reduce the allergenicity of food. Allergens are typically proteins or glycoproteins that can trigger immune responses in susceptible individuals. Hydrolysis can alter the structure of these proteins, potentially reducing their ability to bind to immunoglobulin E (IgE) antibodies and trigger allergic reactions.

**Reduction of IGE binding:** Hydrolysis can break down allergenic proteins into smaller peptides and amino acids, reducing their ability to bind to IgE antibodies. This is particularly important in the production of hypoallergenic infant formulas, where cow's milk proteins are hydrolyzed to reduce allergenicity.

**Alteration of epitope structure:** Allergens contain specific regions called epitopes that are recognized by the immune system. Hydrolysis can modify the structure of these epitopes,

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potentially rendering them less recognizable to the immune system and reducing the likelihood of an allergic response.

**Degradation of allergenic proteins:** In some cases, hydrolysis can completely degrade allergenic proteins, effectively eliminating their allergenic potential. This is particularly relevant for food products derived from highly allergenic sources like peanuts, soy, and shellfish.

### Challenges and considerations

While hydrolysis ability for reducing the allergenicity of food, there are several challenges and considerations:

**Incomplete hydrolysis:** Incomplete hydrolysis can result in the formation of intermediate peptides that may still retain allergenic potential.

**Unintended reactions:** Acid and alkaline hydrolysis can lead to unintended reactions and the formation of undesirable by-products. Enzymatic hydrolysis is preferred for its specificity, but it requires careful control of conditions to achieve the desired outcomes.

**Variability in allergenic proteins:** The effectiveness of hydrolysis in reducing allergenicity can vary depending on the specific allergenic proteins and their structures. Customized hydrolysis protocols may be necessary for different food sources.

**Regulatory and safety concerns:** Regulatory agencies require rigorous testing and validation of hydrolyzed products to ensure their safety and efficacy in reducing allergenicity. Clear labeling and communication to consumers are also important to avoid confusion and ensure the safe use of hydrolyzed products.

Hydrolysis is an important tool in food processing that offers numerous benefits, including the potential to reduce the allergenicity of food. By breaking down allergenic proteins into smaller, less allergenic fragments, hydrolysis can help make food products safer for individuals with food allergies. However, the process requires careful control and validation to ensure its effectiveness and safety. As research and technology continue to advance, hydrolysis is likely to play an increasingly important role in developing hypoallergenic food products and improving food safety for allergic consumers.