Food hygiene-related microorganisms' degradation of histamine.

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Introduction

Histamine is a biogenic amine commonly found in various foods, particularly in fermented and aged products such as cheese, wine, and certain types of fish. While histamine plays crucial roles in physiological processes within the human body, excessive consumption of histamine-rich foods can lead to histamine toxicity or "scombroid poisoning." This condition is primarily characterized by symptoms such as headaches, flushing, sweating, nausea, vomiting, and palpitations. Understanding the mechanisms involved in histamine degradation is vital for food safety and public health. In this article, we delve into the role of food hygiene-related microorganisms in the degradation of histamine [1, 2].

Histamine degradation in foods primarily occurs through two main pathways: oxidative deamination and oxidative deamination coupled with oxidative deamination. In the first pathway, histamine is oxidatively deaminated by diamine oxidase (DAO) enzymes, yielding imidazole acetaldehyde and ammonia. In the second pathway, oxidative deamination is followed by oxidative deamination coupled with oxidative deamination, leading to the formation of imidazole acetaldehyde, which is further oxidized to imidazole acetic acid. Both pathways contribute to the detoxification of histamine in foods [3, 4].

Food hygiene-related microorganisms, including bacteria and yeasts, play a crucial role in histamine degradation. Certain strains of bacteria possess histamine-degrading enzymes, such as histidine decarboxylase (HDC), which catalyzes the decarboxylation of histidine to histamine. Conversely, other microorganisms possess diamine oxidase enzymes capable of oxidatively deaminating histamine. Lactic acid bacteria (LAB) and some species of marine bacteria have been identified as important histamine-degrading microorganisms [5, 6].

LAB are commonly associated with fermented foods and have been extensively studied for their histamine-degrading capabilities. Species such as Lactobacillus sakei, Lactobacillus plantarum, and Lactobacillus casei have demonstrated histamine-degrading activity. These bacteria produce histamine oxidase enzymes, which facilitate the conversion of histamine to imidazole acetaldehyde, thus reducing histamine levels in fermented products. In seafood, histamine formation is often associated with certain spoilage bacteria such as Morganella morganii, Photobacterium phosphoreum, and Enterobacter aerogenes. However, several marine bacteria have also been identified as histamine degraders [7, 8].

For instance, strains of Shewanella and Pseudomonas isolated from fish have shown histamine-degrading capabilities. These bacteria contribute to the natural detoxification of histamine in seafood, thereby enhancing food safety. The presence of histamine-degrading microorganisms in food matrices highlights their potential role in mitigating histamine toxicity. Understanding the microbial ecology of histamine degradation can aid in the development of strategies to control histamine levels in food products. For instance, selecting starter cultures with histamine-degrading capabilities for fermented foods or implementing proper hygiene practices during seafood processing can help minimize the risk of histamine-related foodborne illnesses [9, 10].

Conclusion

Histamine degradation in foods is a complex process influenced by various factors, including microbial activity. Food hygiene-related microorganisms, particularly certain strains of LAB and marine bacteria, play a significant role in histamine detoxification. Harnessing the capabilities of these microorganisms can contribute to the enhancement of food safety and the prevention of histamine-related foodborne illnesses. Further research into the mechanisms of histamine degradation and the identification of novel histamine-degrading microorganisms are essential for ensuring the safety and quality of histamine-containing foods.

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