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Industrial Applications of Microbial Bacteriocins

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DESCRIPTION

Bacteriocins are ribosomally generated antimicrobial peptides produced by bacteria. They can kill or inhibit microorganisms that are closely related or unrelated to the bacterium that produced them but do not damage the bacteria themselves. Bacteriocins have become one of the most effective weapons against bacteria due to their diverse structure and function, natural resource, and thermal stability. Bacteriocins have recently been isolated and identified for use in food technology, to extend food preservation time, treat bacterial disease and cancer therapy, and maintaining human health. Bacteriocins can become a possible pharmacological alternative for treating multiple drug resistance bacteria in the future, potentially replacing antibiotics. Animals, plants, insects, and bacteria create antibacterial chemicals such as hydrogen peroxide, fatty acids, organic acids, ethanol, antibiotics, and bacteriocins. Bacteria develop a variety of bacteriocins to compete for space and resources in the absence of nutrients in the environment. The promise of bacteriocin as a natural food preservative and therapeutic antibiotic has caught researchers' curiosity in the recent decade. LAB bacteriocins are known for their activity throughout a wide pH range and are inherently resistant to extreme heat stress. The odourless, colourless, and tasteless nature of these antimicrobial peptides adds to their potential utility. Despite the long history of bacteriocin use, there have been no reports of microorganisms developing resistant.

Bacteriocins have a variety of uses in the food, pharmaceutical, and agricultural industries. Bacteriocins have long been employed in the food preservation industry. Bacteriocins have been extensively studied in the food business, particularly in dairy products, eggs, vegetables, and meat products. Nisin is approved by the FDA and is utilized in over 48 countries, whereas NisaplinTM is promoted as a natural food protectant. Peptic ulcers are generated by a conflict between the gastroduodenal mucosa's defensive mechanisms and the harmful forces of stomach acid and pepsin, as well as overlapping lesions induced by environmental or immunological factors. In patients with gastric and duodenal ulcers, anaerobic Helicobacter pylori levels are high. Bacteriocin inhibits H. pylori, the bacteria that causes peptic ulcer disease. Bacteriocins can influence sperm motility, making them potential spermicidal agents. Fermenticin HV6b, a class IIa antimicrobial peptide discovered in the human vaginal ecosystem, is produced by *Lactobacillus fermentum* HV6b MTCC 10770. Gardnerella vaginalis, Mobiluncus, Staphylococci, and Streptococci, which cause vaginal infections in humans, can be inhibited by it. Fermenticin HV6b possesses a sperm immobilisation and spermicidal action that is unique. A new formulation including *Lactobacillus fermentum* HV6b or fermenticin HV6b can be used alone or in combination with the creation of vaginal creams to protect the human vagina against microbial infections while simultaneously serving as contraception. Bacteriocins have the potential to be utilized in cancer treatment because they prevent tumour cells from synthesising DNA and membrane proteins. This causes apoptosis or cytotoxicity. When compared to primary keratinocytes, the bacteriocin nisin produces selective apoptosis, cell cycle pauses, and inhibits cell proliferation in HNSCC cells, suggesting that it could be a new potential therapeutic for the treatment of head and neck squamous cell carcinoma (HNSCC). Certain probiotics may contribute to modifying the skin's microbiota, lipid barrier, and immune system, resulting in the preservation of skin homeostasis, according to scientific and fact-based research. In a patient with inflammatory acne lesions caused by Propionibacterium acnes, ESL5, a bacteriocin generated by Enterococcus faecalis SL-5, was used as a lotion, which drastically reduced the inflammatory lesions and pimples when compared to a placebo lotion.

CONCLUSION

Bacteriocins from the Generally Recognized as Safe (GRAS) LAB have piqued the interest of a growing number of research organizations, owing to their enormous application potential in both the food and pharmaceutical industries. Bacteriocins have long been advocated as a solution to problems of food deterioration and food-borne diseases in the food sector. Despite the discovery of a large number of bacteriocins in the last two decades, nisin remains the sole commercially available and industrially used bacteriocin. The under-utilization of bacteriocin in the food industry has been attributed to a combination of a lack of awareness of what bacteriocins may do in food systems and a lack of enthusiasm to shift away from conventional food-preservation techniques.

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