Use of Lactic Acid Bacteria and their metabolites as biopreservatives for meat products.

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Natural microflora and their antibacterial products. can be used as biopreservatives in order to extend food storage life. Lactic acid bacteria (LAB) and their metabolic products are commonly use in biopreservation because they are safe to consume (GRAS). Fermentation ensures not only increased shelf life and microbiological safety of a food but also may also make some foods more digestible. In raw meats and fish that are chill stored under vacuum or in an environment with elevated carbon dioxide concentration, the lactic acid bacteria become the dominant population and preserve the meat with a "hidden' fermentation. The same applies to processed meats provided that the lactic acid bacteria survive the heat treatment or they are inoculated onto the product after heat treatment (Stiles, ME. *Antonie Van Leeuwenhoek*.1996;70:331-45)

Lactic acid bacteria produce a variety of antagonistic factors that include metabolic end products, antibiotic-like substances and bactericidal proteins, termed bacteriocins. It is widely recognised that organic acids inhibit microbial growth. While acids can be added to food, LAB are able to produce lactic acid in situ. The controlled production of acids and other inhibitory metabolites (diacetyl, hydrogen peroxide) are important forms of biopreservation. This methodology is applied as a high concentration nitrite substitute in bacon manufacture.

Bacteriocins producing LAB are used in order to assure safety and to extend shelf life of fermented and non-fermented meat products. Among bacteriocins , nisin is used as adjunct to modified atmosphere in order to prevent *Listeria monocytogenes* growth and to delay toxin production by type E-botulinal strains The range of inhibitory activity by other bacteriocins of lactic acid bacteria can be either narrow, inhibiting only those strains that are closely related to the producer organism, or wide, inhibiting a diverse group of Gram-positive microorganisms. (Klaenhammer,TR. *Biochimie* 1988;70(3):337-49). Pediocins are more effective than nisin in meat for the inhibition of *L.monocytogenes* (Bartholomeu, D.- R. And C. I. Osuala. *J. Food Sci*. 1986, 51:1560-1562).

Bacteriocin-producing isolates from meat, fish and dairy products were *Lactobacillus* and *Leuconostoc* species typically found associated with these products. Most of these isolates gave only a narrow inhibitory spectrum although two showed activity against *Listeria monocytogenes*. The ease with which bacteriocin-producing strains could be isolated implies that they are already being safely consumed in food, and highlights the potential for using bacteriocin-producing cultures for biopreservation, especially in association with minimally processed products (Kelly WJ, Asmundson RV, Huang CM *Int J Food Microbiol* 1996;33:209-18). In fish products, contrary to other foods, the commercial use of starter cultures is relatively unexploited. However, some studies show that lightly preserved, chilled fish products contains LAB with antagonistic activity indicating their possible use as starter cultures (Jeppesen VF, Huss HH *Int J Food Microbiol* 1993 Jun 1;18(4):305-20)

Evidence show that bacteriocins produced by lactic acid bacteria act by the common mechanism of depleting proton motive force (Montville TJ, Bruno ME *Int J Food Microbiol* 1994 ;24(1-2):53-74).

The nature of strains of LAB producing biopreservative agents, environmental conditions for the in situ production, environmental condition for the effective action and host range, and target microorganisms will be discussed.