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Studies on protein metabolism of lactic acid bacteria

Lactic acid bacteria (LAB) are known as fastidious microorganisms that require a wide variety of exogenous free amino acids or peptides as nitrogen sources for growth. Most of Food stuffs such as milk generally contain proteins but very low amount of free amino acids and peptides. Therefore, LAB first hydrolyze the proteins to get nutritious oligopeptides using their own cell-envelope proteinases (CEP). The oligopeptides released are subsequently taken up by the LAB cells via specific transport systems for further degradation into shorter peptides and free amino acids using various intracellular peptidases. The CEP, transporters and peptidases are species- or strain-specific, and their functional and enzymatic differences are an important factor to produce the diversity on taste, flavor and health-promoting effect of fermented food products. In our laboratory, we are studying the protein metabolism of LAB; particularly focusing on characterization of CEP and function of the oligopeptides released by CEP on fermented foods.

Studies on antimicrobial substances produced by lactic acid bacteria

Lactic acid bacteria (LAB) are known as safe producers of antimicrobial substances such as lactic acid and bacteriocins. Bacteriocins, ribosomally biosynthesized antibacterial peptides, have strong activity with a very small quantity and are easily degraded by digestive enzymes in the animal gut. Food-derived antimicrobial peptides are also produced by LAB. Food proteins such as milk caseins are good origins of functional peptides, including with antimicrobial activity, released by hydrolysis using cell-envelope proteinases (CEP) of LAB. These antimicrobial peptides are expected to be used as a safe natural preservative (biopreservative) for foods and feeds. In our laboratory, we isolated some LAB strains with bacteriocin productivity and high CEP activity for production of food-derived antimicrobial peptides, and characterized the bacteriocins and the food-derived antimicrobial peptides for application to foods and feeds.