

Analysis by Mass Spectrometry of the Polar Lipids from the Cellular Membrane of Thermophilic Lactic Acid Bacteria

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Abstract: Fast atom bombardment (FAB) technique was employed to determine the structure of polar lipids from the cellular membrane of *Lactobacillus delbruekii ssp. bulgaricus* and *Streptococcus salivarius ssp. thermophilus*. Analysis of spectra provided useful information about the molecular species and aminoacids constituents of the samples.

Introduction

Lactobacillus delbruekii ssp. bulgaricus and *Streptococcus salivarius ssp. thermophilus*, thermophilic lactic acid bacteria, are used as starter cultures for the manufacture of yogurt and different types of cheeses on a worldwide scale. However, the high sensitivity of these microorganisms to cryogenic treatments results in structural and physiological injury that makes their preservation difficult. Both the bacterial cell wall and membrane are damaged after freezing-thawing processes [1].

Membrane destabilization is the result of cell dehydration occurring in response to the osmotic stress and membrane phase transitions, changes that are related to the membrane lipid composition [2]. As lipids are important in maintaining cell membrane structure of Gram-positive microorganisms it would be of interest to know whether the different types of lipids and the fatty acids distribution on them are involved in the cell membrane integrity during freezing.

Fast Atom Bombardment (FAB) techniques were recognized early as being a useful analytical techniques for the analysis of polar lipids [3, 4]. In large part, this was due to the unique chemical behavior of these compounds, having a highly lipophilic region, which enable the molecule to orient on the surface of FAB-matrices as well as polar functionalities, which readily accept either positive or negative charge sites in the gas phase [3].

Results and Discussion

The polar lipids of thermophilic acid lactic bacteria were characterized by their characteristic mi-

grations on thin-layer chromatographic (TLC) plates. The preliminary characterization of the lipids was done by spraying plates with specific reagents. The extracts of *S. thermophilus* and *L. bulgaricus* gave positive reactions for glycolipids, phospholipids, and one species of aminophospholipid. These results were confirmed by Fast Atom Bombardment-mass spectrometry (FAB-MS). This technique showed information on the different molecular species present in the samples.

The presence of cardiolipin (CL) and diacylphosphatidylglycerol (PG) was established by negative-FAB MS. Glycolipids and aminophospholipids fractions were analyzed by positive-FAB MS. The results indicated, on the basis of the molecular weights, the presence of diglycosyldiglycerides and hydroxylysyl-phospholipids.

The aminoacid OH-lysine is not a common constituent of phospholipids molecules in bacteria membranes. Serine and ethanolamine are most frequently aminoacid found in the aminophospholipids of bacteria. This study was completed by traditional techniques of hydrolysis and fatty acids and aminoacid analysis.

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References and Notes

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