Monosodium Glutamate as Lyoprotector: Effectiveness during Freeze-drying and Storage of Lactobacillus delbrueckii subsp. bulgaricus

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Abstract:

Lactobacillus delbrueckii subsp. *bulgaricus* (*L. bulgaricus* from now) plays an important role in the dairy industry together with *Streptococcus thermophillus* as starter culture for the manufacture of yoghurt and cheeses. Lyophilization is often chosen as preservation method of microorganisms because of its multiple advantages; however, cells are damaged during the process resulting in viability and metabolic activity loss. Optimization of the survival rate during drying and subsequence storage is of outmost importance from technological and economic standpoint. The aim of this study was to evaluate the damage occured during lyophilization and the role of monosodium glutamate as lyoprotector in preserving the cell viability and metabolic activity. *L. bulgaricus* CRL 494 (CERELA Culture Collection) was used as model lactobacilli. The marker for cell injury were: a) Selective compounds: NaCl (0.8%, w/v), chloramphenicol (0.3 µg/mL), rifampicin (0.1µg/mL) and lysozyme (10 µg/mL) [CFU/mL of untreated, freeze dried, and stored bacteria grown with and without each selective compound]; b) Changes in fatty acid profile by gas liquid chromatography; c) Increase permeability to orthonitrophenol ß-galactoside in the supernatant; d) Loss of 260- and 280-nm absorbing materials from cells e) Changes in the cell envelopes by Transmission Electron Microscopy (TEM). Monosodium glutamate (Gl) was evaluated as lyoprotector by measuring the cell viability (CFU/ml in MRS agar) and the metabolic activity (conductimetric assay) before and after lyophilization and storage. *L. bulgaricus* CRL 494 displayed sensitivity to lysozyme and an increased permeability of the cell envelopes possibly related to the membranous forms and retraction of the cytoplasm observed by TEM and the changes in the lipid profile indicating peroxidation. The deleterious effect of freeze-drying upon viability and metabolic activity was overcome with monosodium glutamate. Conclusions. 1) The major target of freeze drying damage was the cell envelope, mainly the plasma membrane; 2) Sodium glutamate reduced the deleterious effects of freeze-drying enhancing cell viability and the recovery of metabolic activity of the culture.

Key words: Glutamate, L. bulgaricus, freeze-drying, cell damage, viability