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## Effect of FOS and skim milk on survival rate of freeze-dried cells of Lactobacillus during storage

Estefania F Garcia, Jessica Guedes, Ingrid C D Goncalves, Noadia P Rodrigues, Evandro L de Souza and Marciane Magnani Federal University of Paraiba, Brazil

**Statement of the Problem:** This study assessed the survival of freeze-dried *Lactobacillus plantarum* 49, *Lactobacillus acidophilus* LA-5 and *Lactobacillus paracasei* 108, when different lyoprotectants were used.

**Methodology & Theoretical Orientation:** *Lactobacillus* strains were inoculated in MRS broth, incubated at 37°C/24 h to reach the early stationary growth phase. The cells were harvested, re-suspended in PBS containing Fructo-Oligo-Saccharides(FOS - 20%) or Skim Milk (SM) or saline solution 0.85% (control) and stored at -80°C. The frozen suspensions were freeze-dried for 40 h. The freeze-dried samples were stored for 30 days at 4°C and 28°C. After days 1, 3, 7, 14 and 30 viable cells were enumerated and the results were expressed as survival rates (log N/log N0).

**Findings:** Among the lyoprotectants tested, freeze-dried cells of *Lactobacillus* with FOS ( $0.90\pm0.02$ ) presented the highest survival rate after 30 days of storage. The survival rate of cells with SM and control was  $0.88\pm0.03$  and  $0.73\pm0.03$ , after 30 days respectively. However, during storage at 28°C the survival rate of freeze-dried cells of *Lactobacillus* with FOS and control was  $0.22\pm0.04$  after 30 days, while with SM the survival rate was  $0.76\pm0.12$ . The protective effect of FOS may be associated with the capacity of sugars to form glassy matrices and for a successful storage. Possibly at 28°C the samples with FOS were above the vitreous transition temperature, not sufficient condition for a good protection. The protective effect of SM on the freeze-dried cells of *Lactobacillus* may be associated to lactose or whey protein components also been suggested as the main cause for the protective effects of SM. Investigations over a longer storage period need to be performed and other lyoprotectants can also be evaluated for their impact on the survival of lyophilized cells.

## **Recent Publications:**

- 1. Garcia E F, D E Oliveira Araújo A, Luciano W A, De Albuquerque T M R, De Oliveira Arcanjo N M, Madruga M S, Dos Santos Lima M, Magnani M, Saarela M and de Souza E L (2018) The performance of five fruit-derived and freeze-dried potentially probiotic *Lactobacillus* strains in apple, orange and grape juices. Journal of the Science of Food and Agriculture 98(13):5000-5010.
- 2. Da Costa W K A, De Souza G T, Brandão L R, De Lima R C, Garcia E F, Dos Santos Lima M, De Souza E L, Saarela M and Magnani M (2018). Exploiting antagonistic activity of fruit-derived *Lactobacillus* to control pathogenic bacteria in fresh cheese and chicken meat. Food Research International DOI:10.1016/j.foodres.2018.03.045.
- Luciano W A, Matte T C, Portela I A, Medeiros L L, Dos Santos Lima M, Maciel J F, De Souza E L, Garcia E F and Magnani M (2018) Effects of *Lactobacillus acidophilus* LA-3 on physicochemical and sensory parameters of açaí and mango based smoothies and its survival following simulated gastrointestinal conditions. Food Research International 114:159–168.
- 4. Albuquerque T M R, Garcia E F, Araújo A O, Magnani M, Saarela M and De Souza E L (2017) *In vitro* characterization of *Lactobacillus* strains isolated from fruit processing byproducts as potential probiotics. Probiotics and Antimicrobial Proteins 1:1-13.
- 5. Garcia E F, Luciano W A, Xavier D E, Da Costa W C A, De Sousa Oliveira K, Franco O L, De Morais Júnior M A, Lucena B T L, Picão R C, Magnani M, Saarela M and De Souza E L (2016) Identification of lactic acid bacteria in fruit pulp processing byproducts and potential probiotic properties of selected *Lactobacillus* strains. Frontiers in Microbiology 7:1371.

## Biography

Estefania F Garcia has experience in the development of fermented foods and isolation of lactic bacteria to study probiotic potential and application in fermented foods. She has developed studies with isolation of bacteria from fruits and by-products of fruits and insertion in juices, smoothies, breads and cheese, beside evaluation of the quality these products. She recently initiated the study of freeze-dry of lactic bacteria for commercial insertion in foods.

estefaniafgarcia@yahoo.com.br