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**IN VITRO CHARACTERIZATION OF PROBIOTIC SURVIVAL, ADHERENCE AND ANTIMICROBIAL RESISTANCE: CANDIDATE SELECTION FOR ENCAPSULATION IN A PEA PROTEIN ISOLATE-ALGINATE DELIVERY SYSTEM**

B. Lakshmi Kotikalapudi, N. H. Low, M. T. Nickerson and D. R. Korber

**ABSTRACT:** *A panel of commercially available probiotic strains, including Lactobacillus acidophilus ATCC 11975, Bifidobacterium longum subsp. infantis ATCC 15697D, Bifidobacterium catenulatum ATCC 27675 and Bifidobacterium adolescentis ATCC 15703, were screened for different traits. Under simulated gastric conditions (pH 2.0), L. acidophilus was the most acid-tolerant strain (D-value  $10.2 \pm 0.8$  min), and was able to survive for 30 min; whereas, the other probiotics tested underwent a rapid (within the first 5 min at pH 2.0) 4-5 log cfu/mL loss in viability. All probiotics tested were able to survive 5 h of exposure to 0.3% (w/v) Oxgall bile at pH 5.8. The relative ranking of probiotic adherence to Caco-2 cells was determined to be: L. acidophilus > B. catenulatum > B. adolescentis > B. infantis, which correlated with  $4.5 \times 10^4$ ,  $3.1 \times 10^3$ ,  $2.6 \times 10^1$ , and  $1.5 \times 10^1$  cfu/mL associated with Caco-2 cell monolayers, respectively. The probiotics also revealed varying degrees of resistance for the antimicrobial agents: ciprofloxacin, naladixic acid, kanamycin and sulfisoxazone. Determination of carbon source utilization patterns indicated that all strains grew to the highest culture optical densities on D-xylose. As a best overall in vitro performer, L. acidophilus was selected for encapsulation within a pea protein-alginate matrix and following exposure of encapsulated L. acidophilus to simulated gastric conditions (pH 2.0) there was only a  $\sim 1$  log cfu/mL loss of cell viability observed over a 2 h period; whereas, unprotected L. acidophilus cells experienced a reduction in cell viability of greater than 6 log cfu/mL over the same period. The present study indicates that the encapsulated delivery of probiotics is a feasible means for enhancing probiotic survival during passage through the upper gastrointestinal tract.*

**International Journal of Probiotics & Prebiotics 5(1): 13-20**

13-20

**PROBIOTIC CHALLENGE OF ORAL EPITHELIAL CELLS IN VITRO**

Iva Stamatova, Kirsti Kari and Jukka H. Meurman

**ABSTRACT:** *The aim of the present study was to evaluate cytokine response of oral epithelial cells after probiotic challenge. Probiotic lactobacilli and dairy starter Lactobacillus bulgaricus strains were incubated with oral epithelial cells and levels of IL-8 and TNF- $\alpha$  were measured. The effect of Porphyromonas gingivalis on cytokine secretion after probiotic pretreatment was also assessed. IL-8 concentrations were significantly higher when  $10^9$  CFU ml $^{-1}$  live bacteria were added. Heat killed bacterial samples at  $10^6$  CFU ml $^{-1}$  induced greater IL-8 secretion. L. reuteri SD2112 produced 3-fold higher levels of IL-8 than the positive control. Generally, levels of TNF- $\alpha$  were low and only a L. bulgaricus strain and L. reuteri SD2112 stimulated TNF- $\alpha$  secretion approximating the positive control. Results of this study demonstrate that probiotic and putative probiotic species can interact with oral epithelial cells inducing various cytokine levels. Further studies are called for to define relevant probiotic concentration for oral cavity applications.*

## International Journal of Probiotics & Prebiotics 5(1): 21-26

21-26

### MODELING THE SURVIVAL OF THE PROBIOTIC BACTERIA *LACTOBACILLUS ACIDOPHILUS* AND *BIFIDOBACTERIUM BIFIDUM* IN STORED ICE CREAM

Tamer Turgut and Yakup Ermurat

**ABSTRACT:** *The survival of the probiotic bacteria, Lactobacillus acidophilus and Bifidobacterium bifidum, in stored ice cream was modeled with a microbial decay equation to determine the survival of mono and mixed bacterial cultures. The ice cream was formulated with 5% or 10% cream and the probiotic bacteria fermented milk that was incubated with either Lactobacillus acidophilus, Bifidobacterium bifidum or both (Lactobacillus acidophilus + Bifidobacterium bifidum). The probiotic ice cream samples were stored at -20°C for 90 days. The viability of the probiotic bacteria was measured at 15-day intervals during storage. Scatter plots were used to outline the survival parameters and to make predictions. The bacteria viability data were analyzed with a linear model to obtain the  $N_0$ ,  $r$  and  $R^2$  values. Using a linear model, scatter plots of the observed versus predicted viability values were compared each other. Lactobacillus acidophilus with 10% cream was found more resistant to decay conditions.*

## International Journal of Probiotics & Prebiotics 5(1): 27-32

27-32

### ADEQUACY OF PROBIOTIC AND PREBIOTIC DAIRY FOODS LABELING

Estevão G. B. Silva, Thomás M. Parisotto, Adriano G. Cruz, José A. F. Faria, Helena M.A. Bolini and Anderson S. Sant'Ana

**ABSTRACT:** *This research sought to evaluate the labels of Probiotic and Prebiotic Dairy Foods, checking their degree of conformity with regulatory requirements. 150 samples of prebiotic and probiotic dairy foods- yogurts and fermented milks of different commercial brands and batches - were submitted to label analysis in the light of Brazilian legislation requirements. Overall, at least one fault was noted on every label irrespective of the dairy product analyzed. The results indicated the need for continuous surveillance by the Health Agencies to guarantee the correct labeling of prebiotic and/or probiotic dairy foods thereby ensuring the availability to consumers of complete information on those products.*

## International Journal of Probiotics & Prebiotics 5(1): 33-36

33-36

### BIFIDOBACTERIA PREVENTS PRETERM INFANTS FROM DEVELOPING INFECTION AND SEPSIS

Umezaki Hikaru, Shinohara Koichi, Satoh Yayoi, Shoji Hiromichi, Satoh Hiroaki, Ohtsuka Yoshikazu, Shiga Seigo, Nagata Satoru, Shimizu Toshiaki and Yamashiro Yuichiro

**ABSTRACT:** *To investigate whether daily supplementation of Bifidobacteria prevents preterm babies from developing infection and sepsis. A randomized control study was applied for the infection and sepsis study. 208 extremely low birth weight (ELBW) and very low birth weight (VLBW) infants were enrolled in the infection study during a 3-year period. The infants were randomly divided into a Bifidobacterium breve (Bifido b.) supplemented group (Bifido group) and controls. The Bifido and control groups consisted of 108 and 100 cases*

respectively. Infants in the Bifido group were supplemented daily with Bifido b. using a dose of  $1 \times 10^9$  CFU dissolved in own mother's milk or mixed with formula for premature infants, starting from several hours after birth and continuing until discharge from NICU. The control group was fed by the similar method without the supplementation. Diagnosis of infection was made when a patient showed serum CRP  $\geq 2.0$ mg/dl. Sepsis was diagnosed in the infected infants with positive blood culture. Statistical analysis was performed by Chi-square test. Development of infection and sepsis were significantly lower in the Bifido group than in controls. Daily administration of Bifido b. to ELBW and VLBW infants from several hours of life is an effective method to prevent these infants from developing infection and sepsis.

### **International Journal of Probiotics & Prebiotics 5(1): 37-44**

37-44      **INHIBITORY ACTIVITY OF METABOLITES PRODUCED BY STRAINS OF *LACTOBACILLUS PLANTARUM* ISOLATED FROM MALAYSIAN FERMENTED FOOD**  
Nguyen Tien Thanh, Loh Teck Chwen, Hooi Ling Foo, Mohd Hair-Bejo and Azhar Bin Kasim

**ABSTRACT:** Inhibitory activity of 63 combinations of metabolites produced by 6 strains of locally isolated *Lactobacillus plantarum* I-UL4, TL1, RS5, RI11, RG14 and RG11 against various pathogens was studied. Inhibitory activities based on the diameter of inhibitory zone were then tested against *Pediococcus acidilactici*, *Escherichia coli*, *Listeria monocytogenes*, *Salmonella typhimurium* and Vancomycin resistant enterococci (VRE). Four combinations with the highest inhibitory scores were identified. The combination of four strains RS5, RI11, RG14 and RG11 shared the highest score, followed by the combination of TL1, RG14 and RG11, combination of TL1, RI11 and RG11 and combination of TL1, RS5, RI11 and RG14. These results indicated that different combinations of metabolites had different antibacterial activity. For pathogen specificity, 63 combinations showed the highest average inhibitory activity against *S. typhimurium*, *E. coli* followed by *L. monocytogenes*. VRE was also inhibited by these combinations of metabolites; however, the inhibitory activity was lower than other pathogens.

### **International Journal of Probiotics & Prebiotics 5(1): 45-52**

45-52      **SELECTION OF LACTOBACILLUS STRAINS AS POTENTIAL PROBIOTICS ON BASIS OF IN VITRO ATTRIBUTES**  
T. Dhewa, V. Bajpai, R.K. Saxena, S. Pant and V. Mishra

**ABSTRACT:** Probiotics are often used as the active ingredient in health - related food products. Before considering an organism as a probiotic strain some desirable technical features and factors related to health promotion, serve as important criteria for their selection. The present study was undertaken to select a lactobacillus culture based on in vitro methods for development of freeze dried synbiotic product. All the tested cultures could survive well at pH 2.0, 2.5 and 3.0, but at pH 1.5, drastic reduction in the viable numbers was observed, though tolerance to pH 1.5 was exhibited by *L. plantarum* only. *L. plantarum* showed most stable characteristics as the strain tolerated the 1.0, 1.5 and 2.0% bile up to 12h of incubation with maintaining a consistent viable count more than 4 log cycles. Wide variations were observed in cell surface hydrophobicity ranging from 21 to 70% *L. plantarum* of indigenous origin showed maximum hydrophobicity in xylene at 70%, while *L. fermentum* showed 62% hydrophobicity in xylene. Other isolates viz. *L. casei* subsp. *casei* and *L. brevis* showed

*hydrophobicity in range of 21% to 38% towards different markers. The production of lectin like substances with Saccharomyces cerevisiae NCDC49 by L. plantarum and L. fermentum within 6 hrs of incubation showed a greater ability of lactobacilli to bind epithelial cells of the host to protect from the attachment of pathogenic bacteria. Antagonistic activity against most common enteric organisms indicated that inhibition of S. typhimurium NCDC113 was greater with diameter of zones of inhibition ranging from 12.40 to 14.86mm in comparison with inhibition zones for E. coli MTCC443, E. faecalis MTCC439, S. aureus MTCC87 and B. cereus NCDC240 whose values were found to be ranging from 11.10 to 14.22; 9.2 to 12.52; 10.62 to 11.88 and 10.16 to 12.10mm respectively. Among the lactobacilli cultures, L. plantarum produced maximum antibacterial activity against S. typhimurium NCDC113 with inhibition zones of 14.86mm in diameter. Based on these characteristics, L. plantarum was selected for further use as lyophilized synbiotic powder.*