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Sugar uptake by *Lactobacillus rhamnosus* and its impact on shelf life

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To increase the survival of probiotics in a dried state, it is advised to expose the bacteria to protectants for a time prior to processing, to allow equilibration of solutes. However, the ideal temperature and exposure times remain unclear. This study examined solute uptake by a *Lactobacillus rhamnosus* strain at 4°C and 20°C over 0 to 240 min. The cells were subjected to hyperosmotic solutions of glucose and sucrose, both selected as model sugars, as they are metabolized by the organism and differ in size. During the period of exposure, the metabolism was stopped, and cells were centrifuged to analyse the cell extracts and supernatants for lactic acid and sugar content. The impact of these parameters on the cell viability was followed at 40°C for 3 months after freeze-drying. Finally, the effect of these sugars on cell biomolecule denaturation was examined using Nano-differential scanning calorimetry (Nano-DSC). HPLC analysis showed that the sugars were rapidly taken up by the cells, independent of exposure temperature. At 20°C, glucose was readily metabolized. However, the production of lactic acid was significantly reduced when cells were exposed to sucrose, or to glucose at 4°C. The storage study showed that sucrose was a better protectant than glucose for this bacterial strain. The survival was slightly better when cells were exposed at 20°C rather than 4°C. There was a clear reduction in bacterial viability when they were exposed to glucose at 20°C: the longer the exposure, the greater the reduction. The Nano-DSC study revealed the appearance of a cold stress response when cells were exposed to sucrose or phosphate buffer. This response could be due to the formation of a DNA coil structure. In conclusion, sugar type and exposure temperature were shown to exert a significant effect on the viability of the particular *Lactobacillus rhamnosus* strain studied.

Biography

Sarah Priour graduated with an MSc equivalent Engineering degree from the University of Technology of Compiegne, France in 2014. She then began her career working as an Engineering Specialist within the Application Group division of Nescafe, Nestle S.A. (Switzerland) where she was In Charge of developing coffee roasting recipes and monitoring powder homogeneity. In 2015, she changed roles within Nestle becoming a Junior R&D specialist in PTC Orbe (Product Technology Centre). Within this position her focus was on understanding the properties of cocoa powder and the impact of processing parameters, more specifically studying the roasting and alkalization steps. In late 2015, she commenced a PhD in Food Technology, at Massey University, New-Zealand. Her research focuses on the microencapsulation of probiotics, and specifically on how to protect them from elevated temperatures in the dried state.

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