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The effect of alginate in the protection of probiotics from the harsh conditions of digestion

P. Ramos[1], P. Silva[1], M.M. Alario[2], L.M. Pastrana[3], J.A. Teixeira[1], M.A. Cerqueira[3], A.A. Vicente[1]

[1] *CEB – Centre of Biological Engineering, University of Minho, Centro de Engenharia Biológica, Universidade do Minho Campus de Gualtar, Braga, Portugal,* [2] *School of Industrial and Telecommunication Engineers, Department Chemical Engineering and Inorganic Chemistry, Universidad de Cantabria, 39005 Santander, Spain,* [3] *International Iberian Nanotechnology Laboratory, Av. Mestre José Veiga s/n, 4715-330 Braga, Portugal*

Probiotics are live microorganisms that when administered in adequate amounts confer a health benefit to the host. However, to accomplish this positive influence on Human health, probiotics should survive to the passage through the upper digestive tract in large numbers to unsure a desired beneficial effects in the host. Several encapsulation methods have been used to protect probiotics. Alginate is the most used biopolymer in the production of these systems, although its performance is totally dependent of its characteristics. In this work, alginates with different molecular weights and different M/G ratio were used in the encapsulation of *Lactococcus lactis* spp. *cremoris* (LLC) aiming the protection of this probiotic bacteria against the harsh conditions of digestion. Alginate-based be-

ads were produced using an external gelification process (extrusion technique) where variables regarding the processing conditions and alginate chemical characteristics were studied to assess their relevance in this process aiming the most efficient encapsulation system. The most important variables influencing the size of alginate beads were the alginate concentration, alginate type (M/G ratio and molecular weight) and the nozzle diameter. Beads with sizes between 1.8 to 3.6 mm were produced using low, medium and high molecular weight alginate. Fourier transform infrared (FTIR) spectroscopy showed relevant differences between beads produced proving the impact of different M/G ratios in the beads' chemical structure. In general, low molecular weight and low M/G ratio alginate (LFR5/60) proved to produce the most well organized (according to SEM analyses), less permeable (pore diameter of 2.52 mm) and stronger alginate beads, moreover molecular weight and M/G ratio proved to be an important variable on the protection of probiotics against the harsh conditions of digestion. Produced beads proved to be efficient in the protection of probiotics (i.e. high viability), with the best performance presented by the medium and low molecular weight alginates.