

## Symbiotic microgels: the effect of the encapsulation process in the microorganisms viability.

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### Abstract

The structure of the encapsulating matrices as well as the environment in which these capsules are added are critical in the protection and release of the encapsulated compounds. This study investigated the effect of processing in stability and release of probiotics vehiculated in a gelatin-alginate microbeads with and without prebiotic during shelf life and simulated in vitro digestion when incorporated into butter.

### Key words:

Microgel, probiotic, simbiotic.

### Introduction

The encapsulation of microorganisms should balance the protection against drastic conditions of processing, storage and gastric digestion<sup>1</sup>. The external gelation method of encapsulation consists in the formation of hydrogels by the diffusion of a gelator agent through droplets formed by atomization<sup>2, 3</sup>. Microbeads prepared by emulsion gelation are produced by the dispersion of an aqueous phase, containing the bacterial cells and a polymer suspension, into an organic phase, as an oil, resulting in a water-in-oil emulsion, with posterior gelation of the aqueous droplets<sup>4</sup>. This study aimed to study the viability and release of probiotic and symbiotic microbeads produced by emulsion gelation and atomization technique followed by ionic gelation, during digestion (in vitro) and storage when incorporated into butter.

### Results and Discussion

This research evaluated microbeads produced with alginate and gelatin, containing or not frutoligosaccharide (FOS) during storage. The particles were produced by emulsion gelation and atomization technique followed by ionic gelation.

It is observed by microscopy (Image 1) that microbeads are present in the buttermilk and in the water phase of butter emulsion. Therefore, it has been defined that the addition of microbeads during the malaxing stage of butter processing is the best option for incorporating the particles in this product. In this case, higher availability is associated to the prevention of loss of microbeads in buttermilk.

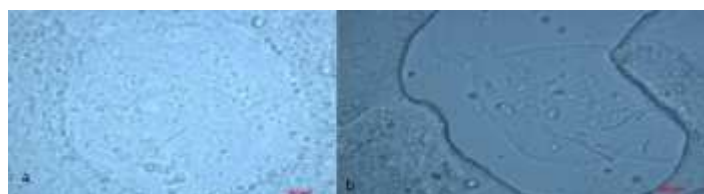


Image 1. a) Microscopy of buttermilk. b) Microscopy of butter.

The viability during storage of the incorporated probiotics in AGF (with FOS) and AG (with no FOS) microbeads were compared to free probiotics added in butter in the malaxing stage in an amount of 20% (m/m), determined by previous

rheological measurements. The viability of free and microencapsulated *L. acidophilus* added in butter during the 28-day storage (Image 2) shows lower viability of the free probiotic samples (PL). Such result was associated to the lack of protection of the bacteria by the microbeads. In addition, the microbeads produced by emulsion showed better viability for both samples. Besides that, the presence of frutoligosaccharide in the symbiotic microbeads (AGF) resulted, generally, in a higher viability of the probiotic when compared to the probiotic microbead (AG).

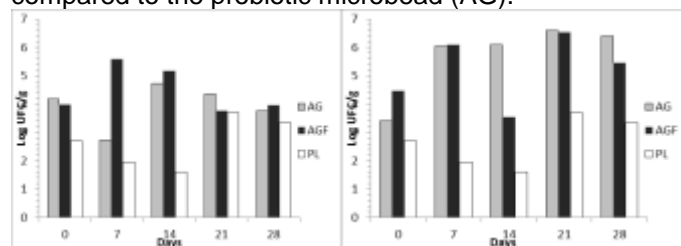


Image 2. Viability of microencapsulated and free probiotics during storage in microbeads produced by a) atomization. b) Emulsion gelation.

### Conclusions

It is concluded that the microbeads protect the probiotic against conditions of storage. Furthermore, the presence of FOS (symbiotic microgels) resulted, generally, in more viable microorganisms when compared to the ones produced without the prebiotic. As for the encapsulation method, the emulsion gelation technique resulted in greater viability of the probiotic during storage.

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