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Protein Delivery through Enteric Nanoparticles: The Effect of the Matrix and the Surfactant

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Abstract – A modified Water/ Oil/ Water (W/O/W) technique has been used to obtained nanoparticles containing Bovine Serum Albumin, as a model protein. The nanoparticles obtained using Eudragit L100 showed the highest values of production yield while the highest values of encapsulation efficiency were achieved using Eudragit L100 55 as polymer matrix and more than 20 mg of Tween 80 as a surfactant. No chemical interaction was detected by Raman and FTIR spectroscopy. In all the cases, the release profile indicates that these systems are suitable to protect BSA from the gastric environment since its solubility continues to be sensitive to pH changes.

Nanoencapsulation of proteins represent one of the most important areas of science, which involves multidisciplinary scientific approach, contributing to human health care. Oral delivery of proteins has been showing great potential but also presenting problems in development[1,2,3]. In this regard, recent advances in nanoparticles systems have revealed new functions arising from nanosizing, such as improved solubility, targetability, and adhesion to tissues. In this study, a modified Water/ Oil/ Water (W/O/W) technique has been used to obtained nanoparticles containing Bovine Serum Albumin, as a model protein. As polymer matrixes were used two copolymers of methacrylic acid and and a mixture thereof with PEG, varying the amount of surfactant used in each sample. The nanoparticles obtained using Eudragit L100 showed the highest values of production yield while the highest values of encapsulation efficiency were achieved using Eudragit L100 55 as polymer matrix and more than 20 mg of Tween 80 as a surfactant. No chemical interaction was detected by Raman and FTIR spectroscopy. SEM micrographs revealed how the specific polymeric matrix influences the morphology and size of nanoparticles obtained under the very same experimental conditions when are re-dispersed in differents solvents. In the particular case of the copolymer with methyl methacrylate that posseses the highest Tg value, two different shapes were observed, one spherical that resembles a grenade and the other one cubic (Fig. 1). These morphologies are simultaneously produced under the same experiment. The dual character of these enteric materials (hydrophilic-hydrophobic) and their difference in physical properties seem to rule the complex behaviour observed (Fig.1 and 2). In all the cases, the release profile indicates that these systems are suitable to protect BSA from the gastric environment since its solubility continues to be sensitive to pH changes.

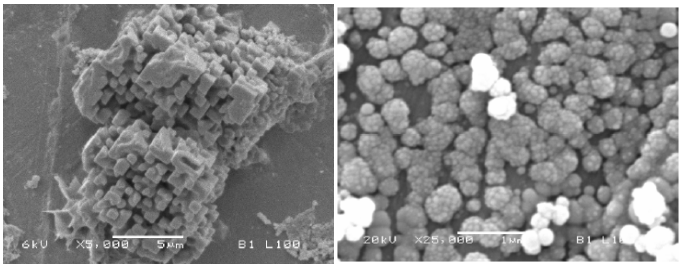

Figure 1: Scanning electron micrographs at different magnifications of sample containing enteric polymer.

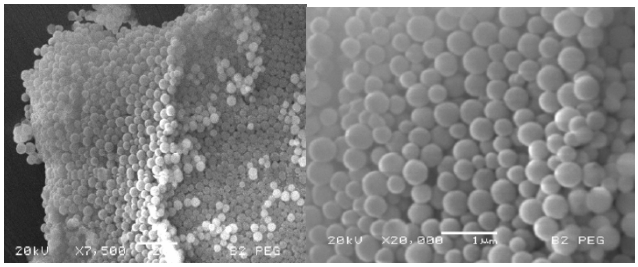

Figure 2: Scanning electron micrographs at different magnifications of sample containing enteric polymer.

References

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