

Abstract No:594

Electrosprayed whey protein Isolate-based nanocapsules for bioactive compounds encapsulation

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Background & Objectives: Electrospray is a methodology able to create nanocapsules, as well as to encapsulate and dry in only one-step process. In this work the electrospray was used to produce nanocapsules based on whey protein isolate (WPI) loaded with beta-carotene as lipophilic model compound.

Method(s) and Results:

WPI solutions of 18% (w/v) were prepared in aqueous solutions with 5, 10 and 15% (v/v) of ethanol, which was used for beta-carotene solubilization (0.02 mg/mL). The optimized electrospray conditions were: 20 kV, 0.5 mL/h and using a needle with an inner diameter of 1.422 mm.

The morphology and molecular organization of the nanocapsules were studied in dried and hydrated state. The size of the dried nanocapsules (determined by SEM) ranged between 227 and 283 nm. After hydration, the nanocapsules (determined by DLS and TEM) showed an average size higher than the dried ones, which increased for nanocapsules produced using higher ethanol concentrations. Results, obtained from the reactivity of free sulfhydryl groups and fluorescence analysis, showed that the increase of ethanol concentration had an effect on the protein unfolding, while for samples with the presence of beta-carotene is observed a decrease in sulfhydryl groups, which is explained by the interaction of beta-carotene with protein hydrophobic region.

Conclusions: The results showed that WPI-based capsules can be obtained by electrospray and used for the encapsulation of beta-carotene.

Significance and Impact of the Study: It responds to the industrial demand for novel encapsulation technologies that protect sensitive bioactive compounds.

Conflict of interest disclosure: The authors declare no conflict of interest, in terms of scientific, financial and personal.

Keywords: [nanotechnology, encapsulation, electrohydrodynamic process]

Acknowledgments: This work was supported by the project ARMAdilhas seletivas para eliminação da VESPA velutina. Medida 6 – Investigação e Desenvolvimento (nº 5894057). Instituto de Financiamento de Agricultura e Pescas, I.P.