OC17 – 25012 - CO-MILLING AS INNOVATIVE ENCAPSULATION OF BIOACTIVES IN GLASSY MATRICES

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Abstract

Encapsulation at micro- or nano-scale is an innovative strategy to enhance the functionality of bioactive and liable compounds by both increasing their stability under stressing conditions, and controlling their delivery and release in food matrices. Various conventional (freeze-drying, spray-drying) and novel (e.g. liposome encapsulation, spray drying, spray chilling) technologies, also in combination, allow to produce low moisture-to-dry encapsulates with enhanced functionalities (e.g. solubility) and shelf-life longer than the corresponding native or in aqueous systems. The achievement of powders in a glassy/ amorphous state has been recognized as a critical factor for both stability and technological functionality of encapsulated bioactives, generally obtained by the use of high molecular weight carbohydrates (starch, maltodextrins, cyclodextrins) as coating or dispersing materials.

Milling is a largely used process in the pharmaceutical drug formulation aimed at reducing drug particle size and performances at usage. However, starting from a stable crystalline state, the mechanical stresses during processing may also induce structural changes and the formation of metastable polymorphic forms or amorphous materials. Co-milling, where two compounds are subjected together to the same milling process, is also used in the development of pharmaceutical ingredients with physical and physico-chemical properties different from those of the individual compounds, alloys or nano- or micro-dispersions, scarcely used in the food sector.

In this presentation the application of co-milling as solid-state technology to obtain micro- and nano-encapsulates of bioactive compounds of different nature and functionality (limonene, phycocyanin and olive leaves extracts) will be presented. Physical and structural properties of the obtained powders will be presented and related to the encapsulation efficiency and stability. Results will be also compared with those of encapsulates obtained by conventional technologies (spray-drying, freeze-drying).