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Association of riboflavin in whey protein hydrogels produced through application of moderate electric field and cold induced gelation

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Abstract

Protein hydrogels are one of the most convenient and widely used matrix in food applications. Recently, cold gelation ability of whey protein isolate (WPI) is taking interest in protection and delivery of value-added bioactive compounds through micro and nano-association techniques. This study aims to combine an electro-heating treatment at moderate electric fields (MEF) together with cold gelation ability of whey proteins in order to reduce size of protein aggregates at nano-scale and improve association efficiency of riboflavin. Divalent iron cation assisted cold gelation of electro-heated WPI and effects of MEF on the produced hydrogels were reported and encouraged during this experimental research. Particle size was characterized, through dynamic light scattering. While spectrofluorimetric analyses were performed in order to examine the effects of MEF and cold induced gelation on the association of riboflavin within WPI hydrogel network structure. Under MEF application smaller sized particles were produced and riboflavin association efficiencies ranged from 40 to 60%. Results also show that MEF treatment allowed producing WPI nano-hydrogels with associated riboflavin less susceptible to light oxidation. This novel approach that combines electro-heating treatment together with cold gelation can be used to design and develop entirely biodegradable whey protein-based gels as potential devices for controlled release of riboflavin. MEF can be used to improve or create novel applications not only in food and bioprocessing industries, but also in the pharmaceutical area.

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