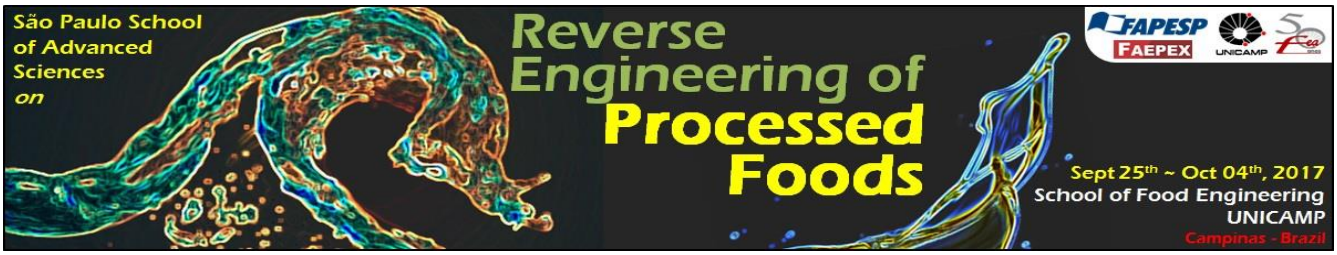

EVALUATING THE EFFECT OF CHITOSAN LAYER ON BIOACESSIBILITY OF BIOACTIVE MODEL COMPOUNDS IN PROTEIN NANOHYDROGELS

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One of the challenges of food enrichment with bioactive compounds is related with their loss of functional activity in food matrices and their instability during digestion, leading to a poor bioavailability. These challenges are promoting research efforts to find more effective delivery systems based on natural biopolymers. Protein nanohydrogels can be used as carriers of bioactive compounds in food products, however, during gastrointestinal (GI) digestion, proteins are denatured by environmental conditions and hydrolyzed by enzymes. One of the strategies to improve protein nanohydrogels' stability and the controlled release of active ingredients during GI digestion is the addition of a coating (e.g. polysaccharide layer). The behavior of lactoferrin (Lf) – glycomacropeptide (GMP) nanohydrogels with and without a chitosan coating was evaluated during gastrointestinal digestion. A dynamic gastrointestinal system, composed by stomach, duodenum, jejunum and ileum

compartments, was used as in vitro digestion model to evaluate the stability and bioaccessibility of Lf and GMP during the digestion process. The results showed that at the end of digestion, Lf and GMP were digested until levels of protein degradation of 76 % and 53 % were achieved, respectively, for the nanohydrogels with chitosan coating, whereas for nanohydrogels without coating the corresponding levels of protein degradation were around 86 % and 71 % for Lf and GMP, respectively. Protein bioaccessibility results showed that in nanohydrogels with chitosan coating 23 % of Lf and 40 % of GMP remained intact until absorption. Size distribution and transmission electron microscopy confirmed that nanohydrogels with chitosan coating were more stable during digestion than nanohydrogels without coating. Based on these results, the bioaccessibility of two different bioactive compounds encapsulated in Lf-GMP nanohydrogels with chitosan coating was evaluated during gastrointestinal digestion. Curcumin was used as lipophilic model compound and caffeine as hydrophilic model compound. Bioaccessibility of curcumin in coated nanohydrogels was 72 % while the corresponding value for curcumin in free form only reached 66 %. It was also observed that under simulated gastric and intestinal conditions, free curcumin lost around 68 % of its antioxidant activity while when incorporated into nanohydrogels only 30 % of this activity was lost. Results also showed that the bioaccessibility of caffeine encapsulated in coated nanohydrogels was 63 % while caffeine in free form only reached to 59 %. Overall results suggest that the use of chitosan layer to coat protein-based nanohydrogels could be a good alternative to improve proteins' stability during in vitro digestion and protect both lipophilic and hydrophilic compounds, improving their bioaccessibility.

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