Use of Glycosylated milk proteins for the Microencapsulation of Lipophilic food ingredients

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Milk proteins in combination with low molecular weight carbohydrates are generally regarded as suitable wall material for microencapsulation purposes. Thermal treatment of this wall material results in non-enzymatic glycation of the proteins, which leads to an improved stability of the encapsulated lipophilic core material. Aim of the present study was to investigate the characteristics of glycosylated milk proteins responsible for the stabilization of microencapsulated lipophilic food ingredients prepared by spray-drying.

Glycosylation of caseinate upon heating improved the emulsifying activity of the protein as reflected by a decrease in the oil droplet size. Heating also resulted in a loss of available amino groups amounting to 38 % after 24 h. The antioxidative capacity of the heated wall materials initially decreased (2h) and subsequently increased upon prolonged heating. Lipid oxidation (development of hydroperoxides and propanal) upon storage was retarded in the microcapsules prepared with the glycoconjugates heated for 10 or 24 h. The decrease in the antioxidative capacity after heating the wall material for 2h and the low oxidative stability of this sample is possibly attributed to highly reactive radicals formed prior to the Amadori rearrangement in the early stage of the Maillard reaction. The role of the oil droplet size on oxidative stability is still up for discussion, but there is limited (but not conclusive) evidence that a decrease in oil droplet size reduces lipid oxidation in microencapsulated oils. The increased stability towards oxidation for fish oil encapsulated in a matrix heated for more than 10h is caused by the formation of melanoidins with antioxidative capacity.

In summary, non-enzymatic glycosylation of milk proteins offers a promising potential for additional stabilization of micro-encapsulated oils. Results from the present study suggest that the stabilizing mechanism is attributed to an improved emulsifying capacity of the glycosylated proteins and the formation of antioxidative compounds during pre-heating of the dissolved wall materials.