The Impact of Encapsulation Matrix on Physicochemical Properties and Oxidative Stability of Fish Oil Microencapsulated by Spray-drying

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Physicochemical properties and subsequently oxidative stability of microencapsulated lipophilic food ingredients heavily depend on the type of wall material selected for encapsulation, the ratio of the individual constituents and the processing conditions during microencapsulation. Comparability of results from currently available studies on microencapsulation of fish oil is hampered by differences in stabilization of the oil, processing and storage conditions as well as the use of different analytical methods to follow lipid oxidation. In the present study, for the first time different wall materials (gum Arabic, n-octenylsuccinate-derivatized starch, sugar beet pectin, sodium caseinate, and combinations thereof) were compared under standardized conditions. In depth characterization of the physicochemical properties was performed (e.g. scanning electron microscopy, porosity, particle surface, true density, non-encapsulated oil, oil droplet size), lipid oxidation was monitored during storage at 20 °C and 33 % relative humidity following the development of conjugated dienes, hydroperoxide content and propanal.

Generally, microencapsulation efficiency varied in wide range of 75 to 98 % of the total oil content. Based on the development of the hydroperoxide content and the development of the secondary lipid oxidation products, fish oil encapsulated with sodium caseinate and n-octenylsuccinate-derivatized starch showed the highest stability against autoxidation. The content of non-encapsulated oil could only partially explain the differences in oxidative stability observed. Other factors like the molecular weight profile of the wall material and the presence of prooxidative compounds also influenced lipid oxidation.