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Lipid oxidation in omega-3 emulsions prepared with milk proteins

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An increasing body of evidence supports the health beneficial effects of omega-3 polyunsaturated fatty acids. Therefore, incorporation of marine oils into foods has also gained an increasing interest. However, the highly unsaturated lipids present in marine oils are prone to lipid oxidation, and their addition to foods is therefore limited by the development of unpleasant off-flavors. Hence, efficient strategies are necessary to protect the lipids and thereby make fish oil-enriched food products successful in the marketplace.

In an attempt to increase the oxidative stability of fish oil-enriched food products several studies have been carried out where fish oil has been introduced to different foods through delivery emulsions instead of as neat oil. However, contradicting results have been obtained between individual foods on whether the neat oil or the delivery emulsion gave the most oxidatively stable product. Thus, a better understanding of factors influencing lipid oxidation in delivery emulsions themselves is therefore needed to understand the differences observed between food systems.

In oil-in-water emulsions, lipid oxidation is expected to be initiated at the oil-water interface. The properties of the emulsifier used and the structure at the interface are therefore expected to be of great importance for oxidation in emulsions.

This presentation will include results from mainly three different studies of lipid oxidation in omega-3 emulsions prepared with milk proteins and protein components. In these three studies different parameters that are expected to change the properties and structure of the proteins at the interface were investigated. The first study compares 70% emulsions with either sodium caseinate or whey protein isolate at two pH values with and without iron addition. The second study evaluates the effect of two different high pressure homogenizers on oxidation in 10% emulsions with the same emulsifiers as in the first study. Finally, the third study considers the effect of changing pH on oxidation in emulsions prepared with different whey protein components. Results on lipid oxidation as affected by the different parameters will be discussed and related to the differences between the proteins and their structure at the interfacial layer. Results will be complimented by micrographs of the emulsions.