Using oxy-lipidomics to study lipid oxidation in emulsified foods

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Lipid oxidation in foods is a crucial problem. The deterioration of polyunsaturated lipids causes undesirable changes in flavour, texture, appearance, nutritional value and consequently reduces the shelf life of the food products. Even though lipid oxidation has been examined extensively, the processes behind it in more complex systems like emulsified foods (e.g. mayonnaise and infant formulas) are not fully understood. Moreover, in recent years consumers demand all natural products with fewer additives and prolonged shelf life at ambient conditions. These demands intensify the need for a better understanding of the mechanisms behind lipid oxidation, in order to establish natural antioxidant strategies.

The lipid phase of food emulsions mainly consists of triacylglycerols, but also contains low levels of di- and monoacylglycerols, free fatty acids and phospholipids. Triacylglycerols are mostly located at the inner part of the oil droplet whereas phospholipids are mainly present at the oil/water interface. In oil–in-water emulsions, lipid oxidation generally proceeds from the exterior of the oil droplet (interface) to the interior, making it important to understand the interfacial composition and its impact on the oxidation kinetics.

The purpose of this research is to quantitatively characterize the oxidative fate of the different lipid classes in emulsions. To achieve that, a two-dimensional liquid chromatography-mass spectrometry (2D-LC-MS) method will be developed that will firstly separate the different classes of lipids and subsequently the various primary and secondary products occurring during oxidation of the different groups of lipids.