

Formation and Occurrence of Short-chain Fatty Acids and Oxidized Monomeric Triglycerides during Deep-frying

M.Carmen Dobarganes

Instituto de la Grasa (CSIC), Avda Padre García Tejero, 4. 41012-Sevilla (Spain)

Abstract

Heating fats and oils at high temperature in the presence of air, a common procedure in culinary practices as frying, results in a complex mixture of new oxidation compounds which may impair the nutritional value of the food. Among them, there is a growing interest in the group of oxidized triacylglycerol monomers because of their high absorbability. The main structures in this group include triacylglycerols (TAG) containing short chain acyl groups formed by homolytic β -scission of the alkoxy radicals coming from allylic hydroperoxides, as well as TAG containing oxidized fatty acyl groups of molecular weight similar to that of their parent TAG, i.e., epoxy, keto and hydroxy fatty acyl groups.

In this lecture, the main routes of formation of this group of compounds are detailed. Also, the interesting information available so far on the analysis of intact TAG molecules by high-performance liquid chromatography coupled with mass spectrometry is commented.

Special attention is paid to the present analytical possibilities for accurate quantitation of the most important oxidized compounds formed at high temperature. Both the need of converting fats and oils into simpler derivatives, thus concentrating the compounds bearing the oxidized structure, and the methylation procedure selected to avoid artefact formation are justified. Formation and evolution of short chain fatty acids, short chain aldehydic acids, short chain diacids, and monoepoxy fatty acids, ketoacids and hydroxyacids in olive and sunflower oils heated at frying temperatures for different period of times are discussed, establishing their dependence on the level of degradation and on the fatty acid composition. Finally, quantitative data of oxidized compounds in fats and oils from restaurants and fried food outlets are presented.