

Chromatographic and Detection Techniques for the Characterization of the Molecular Species in Polar Lipids

Emanuele Boselli, Deborah Pacetti, Natale G. Frega

Dipartimento di Scienze degli Alimenti

Università Politecnica delle Marche

Ancona, Italy

Polar lipids, such as phospholipids and glycolipids and their breakdown products play a variety of roles in animals and plants, since they are fundamental components of the bilayer membrane present in cells and organelles and thus affect the cell metabolism and its transmembrane processes.

The characterization of polar lipids with high resolution techniques may be useful not only in the field of lipidomics (a discipline dealing with the specific roles played by lipids in physiological and pathological states), but also for the identification of specific technology (oxidation) or sensory (rancidity, texture) markers in the food processing industry. Moreover, the commercial use of polar lipids as ingredients in novel foods, cosmetics, pharmaceuticals and other personal care products is increasing and requires specific analytical methods for their quality control.

It is evident that each phospholipid class has a peculiar physiochemical and technological role. Probably for this reason, the fatty acid composition of polar lipids can vary significantly according to the different polar lipid classes: each phospholipid class is formed by different molecular species according to the fatty acid combination. Thus, from the analytical point of view, a simple indication of the total fatty acid composition of one polar lipid class may not be sufficient for an effective characterization.

High performance liquid chromatography (HPLC) is the most powerful and less time-consuming tool for the separation of polar lipids. Detailed information can be obtained when the chromatographic system can be simultaneously coupled on-line with evaporative light scattering detection (ELSD) and mass spectrometry of first and second order (tandem MS); this apparatus allows to achieve both the accurate quantification of the phospholipid classes and the characterization of the different molecular species within a class.

The operative conditions for the analysis of polar lipids in biological samples and food of animal and non-animal origin are discussed.