

Lipid Oxidation in Homogeneous and Micro-heterogeneous Media in Presence of Prooxidants, Antioxidants and surfactants

Vessela D. Kancheva^a and Olga T. Kasaikina^b

^a Lipid Chemistry Department, Institute of Organic Chemistry with Centre of Phytochemistry, Bulgarian Academy of Sciences, "Acad. Georgi Bonchev" Str., Block 9, 1113 Sofia, Bulgaria, vedeka@abv.bg; ^b N.N. Semenov Institute of Chemical Physics, "Kosygina" Str. No 4; 119334 Moscow, Russia

Lipid oxidation by oxygen is one of the important reactions in food, cosmetics, and biology, which occur both in homogeneous and mainly in micro-heterogeneous media. The main features of lipid oxidation in the presence of free radical initiators, inhibitors, and surfactants and their pro-and antioxidant roles are considered. Kinetics and mechanism of oxidation for three model lipid substrates -methyl linoleate, limonene, egg phosphatidylcholine, and antioxidant properties of various natural and synthetic inhibitors: flavonoids (quercetin, luteolin, kaempferol, isorhamnetin, quercetin-3-O-glucoside, kaempferol-3O-glucoside, isorhamnetin-3O-glucoside, quercitrin, rutin, kaempferol-3O-rutinoside, isorhamnetin-3O-rutinoside, kaempferol-3O-pcoumaroyl-glucoside, isorhamnetin-3O-p-coumaroyl-glucoside, quercetin-7O-glucoside, luteolin7O-glucoside), benzoic acids (hydroxyl-benzoic acid, vanilic, syringic, 3,4-dihydroxy-benzoic acids), coumaric acids (p-coumaric, ferulic, sinapic, caffeic acids etc.), N-cinnamic acid amides, hydroxy-chalcones, simple coumarins, bis-coumarins, standard antioxidants (alpha-tocopherol, 2,2,5,7,8-pentamethyl-chroman-3-ol (Chroman C1), butylated hydroxytoluene, hydroquinone, tertbutylhydroquinone), xanthene-and neo-lignans are presented in quantitative level. Hydroperoxides are the primary products of the oxidation of many organic components with molecular oxygen and are spontaneously formed in materials, products, and in the course of biochemical processes in living organisms. The possibility of the accelerated formation of radicals in the reaction of hydroperoxides with cationic surfactants at a physiological temperature should be taken into account when construing the results of biochemical investigations with the consumption of surfactants and analyzing the mechanism of the bactericidal action of cationic surfactants. The catalytic decomposition of lipid peroxides in cellular membranes into radicals in the presence of cationic surfactants and the subsequent reactions of radicals with DNA, lipids, proteins, and other components of a cell, may be one of the probable mechanisms of the bactericidal action of cationic surfactants. Formation of mixed micelles {surfactant ...hydroperoxide} and the behavior of hydroperoxides in the mixed micelles, which determines the influence of the surfactants on oxidation, discussed in detail. The effects of the structuring of phospholipids in water and organic solutions on the kinetics of its oxidation are considered as well.

Acknowledgement

The financial support of Project № BG051PO001-3.3-05/0001 "Science and Business" Operative Program "Development of human resources" -Ministry of Education and Sciences, Bulgaria (published in: "Lipid Peroxidation", In Tech publ., 2012, on-line access) is gratefully acknowledged.