FREE-RADICAL AND BIOCHEMICAL REACTIONS IN POLAR PART OF GLYCEROPHOSPHOLIPIDS

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It is well known, that lipid peroxidation (LPO) is the most studied process, which can proceed by both biochemical and non-enzymatic mechanisms. LPO reactions realize in the lipophilic part of lipids involving residues of unsaturated carboxylic acids and oxygen. Regarding the polar component of lipids, the biochemistry of its hydrolytic cleavage, catalyzed by different phospholipases, has been explored by numerous studies. It is shown in our work that hydroxyl-containing glycerophospholipids, such as phosphatidylglycerol, cardiolipin, lyso-lipids and others can undergo ROS-induced fragmentation upon interaction with radical agents forming new lipid molecules.

One of the main products of the phospholipase A_2 hydrolysis is lyso-PC, the lipid with a variety of biological activity. Our studies have shown that the interaction of ROS with lyso-PC can cause its fragmentation leading to the accumulation of phosphocholine and 2-oxopropyl palmitate. Phospholipase D catalyzes hydrolysis of glycerophospholipids to phosphatidic acid (PA). ROS-induced fragmentation of cardiolipin leads also to the accumulation of PA and to the formation of a radical intermediate reduced to phosphatidylhydroxyacetone (PGA). Biological properties of PA and PHA have not been studied thus far. We have shown that the presence of PA and PHA in mitochondria changes functional characteristics of the latter.

This report is discussing the possible interrelations between biochemical and free-radical reactions of glycerophospholipids polar components. This is very important for finding universal and effective approaches to regulate these processes.