

# **Lipoxygenase Catalyzed Enzymatic Lipid Peroxidation. From Mechanisms to Biological Implications.**

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In our aerobic world lipid peroxidation is a ubiquitous process, which converts polyenoic fatty acids to the corresponding hydroperoxides. For many years lipid peroxidation has been considered a deleterious event, which leads to structural and functional alterations of complex lipid-protein assemblies, such as biomembranes and lipoproteins. However, in recent years it became increasingly evident that this view is somewhat one-sided and that lipid peroxidation also exhibits beneficial activities, which have been overlooked for a long time. A crucial element within the two-sided functionality of lipid peroxidation is its regulation. If lipid peroxidation in living cells proceeds in a well-coordinated manner it contributes to the regulation of gene expression and thus, impacts the cellular phenotype. Moreover, it is involved in the biosynthesis of lipid mediators, which are essential for the regulation of a variety of physiological and pathological processes (beneficial character). On the other hand, if lipid peroxidation runs out of control it leads to destruction of biomembranes and consequently to cell death (deleterious character). During cell maturation and differentiation local destruction may be a beneficial process, when it proceeds according to a biological program. Non-enzymatic lipid peroxidation, which is usually catalyzed by transition metals, cannot be effectively regulated. Low molecular weight antioxidants and anti-oxidative enzymes interfere with non-enzymatic lipid peroxidation and prevent radical mediated secondary reactions. In contrast, lipoxygenase-catalyzed lipid peroxidation can quickly be up- or down-regulated according to the physiological requirements. If oxidative conditions are needed lipoxygenase expression can be up-regulated on transcriptional, translational and post-translational levels.

This talk is aimed at introducing lipoxygenases as family of lipid peroxidizing enzymes, which have been implicated in many biological processes. The enzymes will be characterized with respect to their protein-chemical and enzymatic properties and the structural basis for the catalytic mechanism will be discussed.