Cytotoxicity and genotoxicity of lipid-oxidation products.

Esterbauer H.

Institute of Biochemistry, University of Graz, Austria.

The autoxidation of unsaturated lipids contained in oils, fats, and food and the endogenous oxidative degradation of membrane lipids by lipid peroxidation result in the formation of a very complex mixture of lipid hydroperoxides, chain-cleavage products, and polymeric material. Experimental animal studies and biochemical investigations lend support to the hypothesis that lipid-oxidation products, ingested with food or produced endogenously, represent a health risk. The oral toxicity of oxidized lipids is unexpectedly low. Chronic uptake of large amounts of such materials increases tumor frequency and incidence of atherosclerosis in animals. 4-Hydroxynonenal, a chain-cleavage product resulting from omega 6 fatty acids, disturbs gap-junction communications in cultured endothelial cells and induces several genotoxic effects in hepatocytes and lymphocytes. Although the concentrations of the aldehyde needed to produce these effects are in the range expected to occur in vivo, their pathological significance is far from clear. Recent findings strongly suggest that in vivo modification of low-density lipoprotein by certain lipid-peroxidation products (eg, 4-hydroxynonenal and malonaldehyde) renders this lipoprotein more atherogenic and causes foam-cell formation. Proteins modified by 4-hydroxynonenal and malonaldehyde were detected by immunological techniques in atherosclerotic lesions.