

**Studies on lipid peroxidation in human disease:
its modulation from the view point of food chemistry**

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【Outline of survey】

Lipid hydroperoxide (LOOH) formation is well known in oxidative deterioration of edible food oils during storage and cooking. Miyazawa has considered that membrane lipid peroxidation in human body may be involved in cellular damage and senescence, life-style related disease, as well as in age-related disorders, and has carried out a series of fundamental investigations collaborating with clinical research groups.

Up to now Miyazawa et al have developed the CL-HPLC method and LC-MS/MS method for the selective and sensitive determination of LOOH present in human plasma and organ tissues, together with establishment of the synthesis method for pure LOOHs standard with high stability as to designed by protection of hydroperoxide group by the adduct formation with methoxypropene. Using these methodologies, Miyazawa et al have confirmed the membrane lipid peroxidation is closely association with several human diseases, and the evidence has been accumulated by cell culture studies, animal model researches and studies of patients with hyperlipidemia, diabetes, dementia, and skin-related diseases. To promote health benefit and disease prevention, the application of food constituents and their functionalities to modulate LOOH formation in human body is very important. We recently discovered that glycation of aminophospholipid occurs in human hyperglycemic plasma and red blood cells, and the glycated aminophospholipid causes membranous phospholipid peroxidation. We explained that the lipid glycation reaction is effectively inhibited by the presence of vitamin B6 (pyridoxal 5'-phosphate).

Considering our researches and findings, it is highly encouraged to further understand the “essential contribution of LOOH in human disease” and “prevention by food and food components of LOOH-mediated cytotoxicity and organ tissue injury”. This study is aimed 1) to develop comprehensive analytical methods of LOOH in human body, 2) to create the universal LOOH determination method by antibody with high selectivity for LOOH, 3) to clarify the molecular mechanism of LOOH-mediated cytotoxicity, organ tissue injury and disorders in atherosclerosis, diabetes, cancer, and dementia, and 4) to understand the functionality of food and food constituents which can control LOOH formation in human body.

【Expected result】

Applying our original techniques for the determination of LOOH and for the preparation of LOOH standards as well as our on-going research for anti-LOOH antibody, we will try to demonstrate the dream “real determination and visualization of LOOH in human body” in the world. The results have to contribute to understand the biological significance of LOOH formation in vivo, which will serve the discovery of new functions of food and food constituents and the prevention of human disease.

【References by the principal researcher】

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【Term of project】 FY2008—2012

【Budget allocation】

155,900,000 yen (direct cost)

【Homepage address】 <http://www.agri.tohoku.ac.jp/kinoubunshi/index-j.html>