Lipid Oxidation and Quality Interest Area
Technical Program Abstracts

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LOQ 2a: Metabolic Fate of Lipid Oxidation Products and Antioxidants in Foods or Biological Systems

Chairs: K. Miyashita, Hokkaido University, Japan; and S. Witeof, Cargill Inc., USA

Antioxidant Potential of an Olive Leaf Extract Component, Oleuropein, and Its Preventive Effect on Type 2 Diabetes.
A. Umeno, K. Murotomi, Y. Nakajima, and Y. Yoshida, Advanced Industrial Science & Technology, Japan.

Olive leaf has great potential as a natural antioxidant, since it contains oleuropein and hydroxytyrosol as the major phenolic components. We studied the radical-scavenging activity of antioxidants by investigating the probe decay by peroxyl radicals and oxidative stress markers derived from linoleates. We evaluated the antioxidative effects of oleuropein and hydroxytyrosol in comparison with those of homovanillic alcohol by using fluorescein and pyrogallol red. It was found that the stoichiometric number of oleuropein and hydroxytyrosol was twice of that of vitamin E, mimicking Trolox and leading to the marked suppression of the oxidation of methyl linoleate micelles compared with Trolox. Therefore, we investigated the preventive effect of oleuropein against Type 2 diabetes (T2D) in Tsumura Suzuki Obese Diabetes (TSOD) mice, by measuring the plasma levels of hydroxyoctadecadienoic acids (HODEs). It was found that young TSOD mice were exposed to oxidative stress before the development of diabetic phenotypes, and fed an oleuropein-rich diet, which suppressed oxidative stress and T2D development. The results of human studies suggested that singlet oxygen participated in the development of T2D. These studies investigated 10and12(Z,E)HODE, which are specific biomarkers of singlet oxygen. In conclusion, oleuropein possesses antioxidative properties and prevents T2D.

In Search of Natural Phenolics or Derivatives with Potential Mitochondria Targeting Activity. C. Bayrasy[1], J. Lecomte[1], R. Upasani[2], B. Chabi[3], B. Baréa[1], E. Durand[1], C. Bourlieu[1], M. Clarke[2], D. Moore[2], C. Wrutniak-Cabello[3], and P. Villeneuve*[1], [1]CIRAD, UMR IATE, France, [2]GlaxoSmithKline, USA, [3]INRA, UMR DMEM, France.

The number of antioxidants that have been claimed to be potentially used in pharmaceutical or cosmetic sectors is very large. For example, thousands of phenolic molecules have already been structurally characterized and many of them have been evaluated in vitro for their radical scavenging or metal chelating properties. In front of this multitude of compounds, there is a need in evaluating their activity in cells and also a great interest in identifying specific molecules with mitochondria targeting activity to combat oxidative stress situations. In that context, we have screened several natural phenolic compounds or synthesized derivatives for their ability to scavenge ROS in fibroblast cells. For this, ROS inhibiting action was evaluated at short and long times. Our results showed that some molecules were active rapidly but lose their activity for longer term, while others tend to be more active at longer period. These results suggest that more detailed kinetics of ROS inhibiting action are needed for the most active compounds and that combination of fast and slow acting molecules are promising strategies to identify synergistic antioxidant combinations. Finally, the most promising candidates were evaluated for their mitochondria targeting activity, and among them, sinapine extracted from canola meal.

Oxidative Deterioration of Fish Oils and Its Prevention.
M. Uemura, A. Shibata, and K. Miyashita*, Hokkaido University, Japan.

Fish oil rich in eicosapentaenoic acid (EPA; 20:5n-3) and docosahexaenoic acid (DHA; 22:6n-3) are very easily oxidized to form undesirable flavors. We have found the higher quantities of acrolein (2-propenal) at the early stages of oxidation of fish oil triacylglycerol (TAG). The acrolein quickly increased, but afterward, it either did not change or slightly decreased. On the other hand, in the oxidation of linseed and soybean oil TAGs, propanal, pentane, and hexanal were detected as major volatiles, but a little acrolein was formed. Thus, acrolein may act as a key compound having a strong impact on flavor deterioration of fish oil, especially at early stage of the oxidation. We have also found that the acrolein formation in the fish oil could be effectively inhibited by the addition of sphingoid bases such as sphingosine and sphinganine with α-tocopherol. The study showed that antioxidant compounds would be formed by the reaction between the amine group of sphingoid bases and the carbonyl groups of acrolein in the early stage of fish oil oxidation.

The Presence and Type of Flavor Present in Fish Oil Supplements Interferes with *p*-anisidine Testing. J.C. Sullivan Ritter[1], S.M. Budge[2], and M. Reid[1], [1]Nature's Way Canada, Canada, [2]Dalhousie University, Canada.

Fish oil dietary supplements because of the many health benefits they provide. The high levels of EPA and DHA in these oils mean that they are prone to rapid oxidation. The main measures of oxidation in fish oil are peroxide value and *p*-anisdine value (AV). Unfortunately, AV cannot be used on flavoured oils because flavours interfere with the chemical reaction, resulting in inflated AV values. In this study we analyzed AV on fish oils with different flavours to see what effects they have. We found that different flavours cause different increases on AV.