Determination of fat quality

Two assay methods for quality determination of fats used in large-scale processing were examined. One method involved interesterification of fats with p-nitrophenol laurate using immobilized lipase from *Thermomyces lanuginosus* that in a blind study of 29 fats allowed a rapid and reliable assignment of bad fats and an acceptable differentiation between fats of moderate and good quality. The method was judged to be superior to the second assay in which pH indicators were added to fat samples containing the lipase.

Fish oil stability in homogenized milk

The effects of different homogenization temperatures and pressures on the incorporation of fish oil into milk were examined. Increasing homogenization temperature (50 to 72°C) caused slight decrease in droplet size; pressure increase (5 to 22.5 MPa) significantly decreased droplet size. Emulsions with smaller droplets have larger interfacial areas and were found to show greater oxidative stabilities. In general, homogenization at 72°C compared with 50°C appeared to increase droplet size. Emulsions with smaller droplets have larger interfacial areas and were found to show greater oxidative stabilities. In general, homogenization at 72°C compared with 50°C appeared to increase droplet size.

EPR analysis of unsaturated liposomes

Small unilamellar liposomes composed of dipalmitoyl-phosphatidylcholine and dioleoyl-phosphatidylcholine were photosensitized by a symmetrically or an asymmetrically substituted glycosylated tetraphenyl-porphyrin derivative. These derivatives were found by differential scanning calorimetry and electron paramagnetic resonance spectroscopy (EPR) to be localized at different depths within the lipid bilayer, and to cause structural modifications of the membrane. Lipid bilayers were labeled with 5-, 12-, or 16-doxyl stearic acid, and the efficiency of photo-induced reaction was followed by the decay of their EPR signal amplitude. Light dose-dependent destruction of the nitroxide radical proved to be related to the position of the spin label and proximity of the porphyrin to the double bond of unsaturated fatty acid. The EPR signal decay was also dependent on the unsaturated fatty acid content of the liposomes.

Dietary effect on n-3 PUFA on apolipoprotein B

Three meals—high monounsaturated fatty acid (MUFA); MUFA + α-linolenic acid (MUFAL); and MUFA + eicosapentaenoic acid + docosahexaenoic acid (MUFAL)—were administered in a randomized, double-blind, crossover design to adults with type 2 diabetes. The three treatments significantly increased apolipoprotein B (apo B) and apolipoprotein C (LpB:C) postprandially, but with no significant differences between the treatments. The postprandial change in LpB:C was lower with the MUFAED treatment than after the MUFA treatment. The MUFA treatment attenuated the increase in LpA-II:B:C:D:E in subjects with high triacylglycerol levels. Findings suggest that unsaturated fatty acids differentially affect concentrations of apo B-containing lipoprotein subclasses. An increase in LpB:C adversely affects endothelial function. MUFAED attenuated the postprandial rise in LpB:C and the impairment of endothelial function.

Molecular imaging of tissue lipids

Imaging mass spectrometry (TOF-SIMS; time-of-flight secondary ion mass spectrometry) showed the distribution in rat brain of galactosylceramide-sulfate (sulfatide) with varying hydrocarbon chain lengths and palmitate and oleate. Sulfatides were seen localized in regions of cerebellar white matter and the granular layer, and highest concentrations were at the borders of the white matter. Different distribution patterns for oleate and palmitate in the cerebellum apparently originated with phosphatidylcholine. The technique also revealed a significant increase in cholesterol concentration in the brush border of intestinal villi enterocytes following exposure to cholera toxin. TOF-SIMS is regarded as a powerful tool for studies of lipid distributions in cells and tissues, enabling the elucidation of their role in cell function and biology.

n-1 desaturase in sorghum root

Identification and cloning were made of three putative fatty acid desaturases, designated *ShDES1*, *ShDES2*, and *ShDES3*. Quantitative real-time PCR analyses showed that these genes were preferentially expressed in sorghum root hairs. Heterologous expression of the cDNAs in yeast showed that recombinant *ShDES2* converted palmitoleic acid (16:1Δ9) to hexadecadienoic acid (16:2Δ9,12) and recombinant *ShDES3* converted hexadecadienoic acid into hexadecatrienoic acid (16:3Δ9,12,15), functioning as a n-1 de-
saturase. These fatty acid desaturases represent key enzymes involved in the biosynthesis of sorgoleone, a recognized plant growth inhibitor against broadleaf and grass weeds.

**Structured phospholipids synthesis**


Acyl modification of the sn-2 position in phospholipids was made by acidolysis using immobilized phospholipase A2 as the catalyst. A non-ionic weakly polar macroreticular resin was selected for enzyme immobilization. Response surface methodology was applied to evaluate the influence of substrate ratio, reaction temperature, and water addition during reaction between caprylic acid and soybean phosphatidylcholine (PC). Reaction temperature and water addition had significant effects on the acidolysis reaction. A general inverse relationship existed between caprylic acid incorporation and PC recovery. Optimized reaction conditions gave 36% incorporation within 48 h, Lysophosphatidylcholine was the major by-product formed. Acyl migration was found to be only a minor problem. Conjugated linoleic and docosahexaenoic acid incorporation into PC was 30 and 20%, respectively.

**Novel TAG synthase**


The catalytic properties of acyl-coenzyme A:monoacyltransferase 3 (MGAT3) have been compared with those of MGAT family members MGAT1 and MGAT2, using both monoacylglycerol (MAG) and diacylglycerol (DAG) as substrates. Re-combinant MGAT3 enzyme expressed in Sf-9 insect cells displayed a strong DGAT activity relative to that of MGAT1 and MGAT2. None of the MGAT enzymes recognized MAG as a substrate. MGAT3 possesses full acyl-coenzyme:diacylglycerol acyltransferase (DGAT) activity, but differs from DGAT1 in both catalytic properties and subcellular localization. Findings suggested that MGAT3 functions as a novel triacylglycerol (TAG) synthase that catalyzes efficiently the two consecutive acylation steps in TAG synthesis.

**GM sunflower oil stability**


The oxidative and thermal stabilities of genetically modified high-oleic sunflower oil (HOSO: 87% oleic acid; 5.5% linoleic acid), regular sunflower oil (17% oleic acid; 71.6% linoleic acid), and soybean, corn and peanut oils during storage at 55°C and simulated deep fat frying at 185°C were compared. Oxidative stability was determined by measuring the headspace oxygen content and volatile compounds as well as peroxide value. The oxidative stability of HOSO was greater than that of regular sunflower and soybean oils, and similar to that of corn and peanut oils. The thermal stabilities of the oils during deep-frying conditions were determined using infrared absorption at 2.9 μm and conjugated diene content. HOSO showed greater thermal stability than the other oils examined.

### New Certified Reference Materials Available

New CRM materials can be found [here](http://www.aocs.org/tech/crm). New CRMs (ground): AOCS 0406-A (Conventional Corn); AOCS 0406-B (MON 863 x NK603 Corn); AOCS 0406-C (MON 863 x NK603 x MON 810 Corn); AOCS 0406-D (MON 88017 Corn)

New CRM (DNA): AOCS 0306-A (Conventional Cotton); AOCS 0306-B (Conventional Canola); AOCS 0306-C (Conventional Corn); AOCS 0306-D (Conventional Rice); AOCS 0306-E (LLCotton25 Cotton); AOCS 0306-F (MS8 Canola); AOCS 0306-G (R13 Canola); AOCS 0306-H (T25 Corn); AOCS 0306-I (LLRICE62 Rice)

Certified Reference Materials (CRMs) are a useful tool for identifying new traits that arise from plant biotechnology. They are created from leaf, seed, or grain, expressing the new trait as well as from the conventionally bred matrix. The European Commission (EC) has mandated that as of 18 April 2004, a method for detecting a new biotech event and CRM must be available before the EC will consider authorizing acceptance of a new genetically modified crop. AOCS has been contracted to manufacture CRMs according to ISO Guides 30-35 and in accordance with EC No 1829/2003.

Please visit the [www.aocs.org/tech/crm](http://www.aocs.org/tech/crm) for a complete listing of available materials.

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