

# Extracts & Distillates

## SCE for palm kernel oil

Zaidul, I.S.M., N.A. Nik Norulaini, A.K. Mohd Omar, and R.L. Smith, Jr., Supercritical Carbon Dioxide (SC-CO<sub>2</sub>) Extraction of Palm Kernel Oil from Palm Kernel, *J. Food Eng.* 79:1007–1014, 2007.

Conditions for the supercritical carbon dioxide extraction (SCE) of oil from dehulled ground palm kernel at 313.2 and 353.2 K and at pressures from 20.7 to 48.3 MPa were studied. The yield of palm kernel oil increased with pressure from 34.5 to 48.3 MPa at 353.2 K giving a maximum yield of 49 g oil/100 g palm kernel. Lower amounts of shorter-chain triglycerides component (fatty acid C<sub>8</sub>–C<sub>14</sub>) were extracted at pressures of 20.7–27.6 MPa; higher amounts of longer-chain fatty acid constituents (C<sub>16</sub>–C<sub>18:2</sub>) were extracted at pressures from 34.5 to 48.3 MPa. A simple correlation was developed based on a kinetic mass transfer model. The minimum amount of CO<sub>2</sub> usage could be estimated.

## Interesterified oil blend properties

Siew, W.L., K.Y. Cheah, and W.L. Tang, Physical Properties of Lipase-Catalyzed Interesterification of Palm Stearin with Canola Oil Blends, *Eur. J Lipid Sci. Technol.* 109:97–106, 2007.

Several interesterified blends (IBs) of hard palm stearin and canola oil were prepared using immobilized lipase and resulted in significant differences in physical properties. Interesterification replaced the higher- and lower-melting triacylglycerols (TAG) by middle-melting TAG, yielding mixtures of lower slip melting points (SMP) and solid fat content (SFC) compared with the original palm stearin. All IBs showed lower SMP and SFC than their unreacted blends. Certain IBs were determined to be potentially useful for stick margarine and shortening applications; one particular IB had similar SFC properties to vanaspati; and other IBs were suggested to be useful for margarine and puff pastry applications. X-ray diffraction analysis indicated the appearance of  $\beta'$  crystals in all IBs from predominantly  $\beta$ -type oils.

## One-step isolation of tissue PC

Vassar, V., C. Hagen, J. Ludwig, R. Thomas, and J. Zhou, One-Step Method of Phosphatidylcholine Extraction and Separation, *BioTechniques* 42:442–444, 2007.

A simple, rapid (30 min) extraction and separation method for the preparation of phosphatidylcholine (PC) from cells has been developed. Several recognized and developed solvent systems were examined with a system of hexanes/isopropanol (9:1, vol/vol) allowing separation of radioactive PC from its choline precursor. More than 88% of PC was recovered in a single extraction. The system extracts and separates PC directly from cultured cells in a single step and is markedly quicker than existing conventional methods, including applications of thin-layer chromatography and high-performance liquid chromatography. The presence of residual buffer or media affects the efficacy of the method, which is relatively insensitive to time and temperature of exposure.

## HPLC analysis of interesterified oil

Lee, J.H., K.C. Jones, T.A. Foglia, A. Nuñez, J.H. Lee, Y.M. Kim, P.-L. Vu, and K.-T. Lee, Separation of Triacylglycerol Species from Interesterified Oils by High-Performance Liquid Chromatography, *J. Am. Oil Chem. Soc.* 84:211–217, 2007.

Structured triacylglycerols (SL-TAG) were prepared from the interesterification of soybean oil and olive oil with short-chain TAG tributyrin using a 1,3-regioselective lipase as catalyst. The SL-TAG were purified by column chromatography and analyzed by both normal-phase and reversed-phase high-performance liquid chromatography (HPLC). Individual SL-TAG molecular species were detected by evaporative light scattering and characterized by mass spectrometry. HPLC separation yielded two fractions, one containing one butyryl group and two long-chain fatty acyl groups (from soybean oil and olive oil); the other comprised two butyryl groups and one long-chain fatty acyl

group. Further characterization of the two fractions was made by reversed-phase HPLC analysis of the TAG species.

## PUFA-enriched MAG preparation

Pawongrat, R., X. Xu, and A. H-Kittikun, Synthesis of Monoacylglycerol Rich in Polyunsaturated Fatty Acids from Tuna Oil with Immobilized Lipase AK, *Food Chem.* 104:251–258, 2007.

Monoacylglycerols (MAG) enriched in eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) were prepared by glycerolysis of tuna oil using immobilized lipase AK (*Pseudomonas fluorescens*) and *tert*-butyl methyl ether (MTBE) as the most effective solvent. Optimal reaction conditions were determined to include 10% wt/vol tuna oil in MTBE, 3% immobilized lipase, and 4% water, with reaction at 45°C for 24 h. Enzyme reaction parameters ( $K_m$  and  $v_{max}$ ) for the system were established. Enzymatic activity was retained at a level of 80% at the end of the reaction. Yield of MAG was 24.6% with a (EPA + DHA) content of 56.0%.

## n-3 PUFA CVD risk

Murphy, K.J., B.J. Meyer, T.A. Mori, V. Burke, J. Mansour, C.S. Patch, L.C. Tapsell, M. Noakes, P.A. Clifton, A. Barden, I.B. Puddey, L.J. Bellin, and P.R.C. Howe, Impact of Foods Enriched with n-3 Long-Chain Polyunsaturated Fatty Acids on Erythrocyte n-3 Levels and Cardiovascular Risk Factors, *Brit. J. Nutr.* 97:749–757, 2007.

A 6-mon dietary intervention study involving control and n-3-enriched foods was conducted on overweight hypertriglyceridemic subjects. The test diets were designed to provide an intake of (EPA + DHA) of 1 g/d. No significant differences were detected for blood pressure, glucose, insulin, lipids, and C-reactive protein (CRP) over 6 mon. The n-3 PUFA content of erythrocytes increased by 35 and 53% at 3 and 6 mon, respectively with consumption of n-3-enriched foods and was positively associated with measures of arterial compliance and negatively associated with serum CRP and urinary 11-dehydro-TXB<sub>2</sub> excretion. Regular consumption of n-3-enriched foods can cause sustainable increases in erythrocyte n-3 long-

chain PUFA levels that may be associated with reduced cardiovascular disease (CVD) risks.

## Antioxidant activity in fish oil dressing

Let, M.B., C. Jacobsen, and A.S. Meyer, Ascorbyl Palmitate,  $\gamma$ -Tocopherol, and EDTA Affect Lipid Oxidation in Fish Oil Enriched Salad Dressing Differently, *J. Agric. Food Chem.* 55:2369–2375, 2007.

The activity of three antioxidants in protecting against oxidative deterioration of fish oil enriched salad dressing during 6 wk of storage at room temperature was examined. EDTA was found to be the most efficient single oxidant by reducing overall peroxide values and volatiles by approximately 70 and 77–86%, respectively. Lipid-soluble  $\gamma$ -tocopherol reduced lipid oxidation during storage by partly retarding the formation of lipid hydroperoxides and by decreasing the concentration of individual volatile oxidation products by 34–39 and 42–66%, respectively. Ascorbyl palmitate at low concentration showed slight antioxidant activity, but at high concentrations exhibited prooxidant effects. Combination of all three antioxidants completely protected against oxidation during storage with EDTA and  $\gamma$ -tocopherol overcoming the prooxidant activity of ascorbyl palmitate.

## CRP interaction with oxidized LDL

Tabuchi, M., K. Inoue, H. Usui-Kataoka, K. Kobayashi, M. Teramoto, K. Takasugi, K. Shikata, M. Yamamura, K. Ando, K.

Nishida, J. Kasahara, N. Kume, L.R. Lopez, K. Mitsudo, M. Nobuyoshi, T. Yasuda, T. Kita, H. Makino, and E. Matsuura, The Association of C-Reactive Protein with an Oxidative Metabolite of LDL and Its Implication in Atherosclerosis, *J. Lipid Res.* 48:768–781, 2007.

C-reactive protein (CRP)/oxidized low-density lipoprotein (oxLDL) complexes with  $\beta$ 2-glycoprotein ( $\beta$ 2GPI) were found predominantly in sera of diabetes mellitus (DM) patients with atherosclerosis. Noncomplexed CRP isoforms were present in patients with acute/chronic inflammation, rheumatoid arthritis (RA) and DM. The occurrence of CRP and  $\beta$ 2GPI with oxLDL in carotid artery plaques in RA patients strongly suggested that complex formation occurs during development of atherosclerosis. The generation of CRP/oxLDL/ $\beta$ 2GPI appears to be associated with arterial inflammation, hyperglycemia, and hypercholesterolemia. These complexes can be distinguished from pyrogenic noncomplexed CRP isoforms and may represent a more specific and predictive marker for atherosclerosis.

## Liposomal lipid peroxidation


Schnitzer, E., I. Pinchuk, A. Bor, A. Leikin-Frenkel, and D. Lichtenberg, Oxidation of Liposomal Cholesterol and Its Effect on Phospholipid Peroxidation, *Chem. Phys. Lipids* 146:43–53, 2007.

2,2'-Azobis(2-amidinopropane) hydrochloride (AAPH) was used to induce peroxidation of liposomal lipid. AAPH-induced peroxidation of cholesterol was found to be slow and independent of the peroxidation of palmitoyllecithin phosphatidylcholine (PLPC), which, in turn, was not affected by the presence of cholesterol. Copper-induced oxidation did not affect cholesterol but caused a slow rate of oxidation of PLPC, which accelerated in the later stages of peroxidation. Urate was found to accelerate copper-induced peroxidation of PLPC in the absence of cholesterol, but the effect was inhibited by the presence of cholesterol. The observed complex kinetics was attributed to the known cholesterol-induced rigidization of liquid crystalline bilayers. The importance of the findings was considered as related to the pathogenesis of many diseases.

## Rapeseed protein for human nutrition

Bos, C., G. Airinei, F. Mariotti, R. Benamouzig, S. Bérot, J. Evrard, E. Fénart, D. Tomé, and C. Gaudichon, The Poor Digestibility of Rapeseed Protein Is Balanced by Its Very High Metabolic Utilization in Humans, *J. Nutr.* 137:594–600, 2007.


Volunteers equipped with either a jejunal or ileal intestinal tube were fed  $^{15}\text{N}$ -labeled rapeseed protein. Dietary N kinetics was quantified in intestinal fluid, urine and blood during the postprandial period. Real ileal digestibility (RID) was determined to be  $84.0 \pm 8.8\%$ , but dietary N was mainly undigested protein from both 12S and 2S rapeseed fractions. Dietary N was found 5.4% in urinary N, 8.2% in body urea, and 7.7% in plasma protein. The net postprandial protein utilization of rapeseed protein was 70.5%, and the postprandial biological value (PBV) was 83.8%. Rapeseed protein has a low RID in humans compared with other plant proteins but also shows a very low deamination rate. The PBV of rapeseed protein is excellent in humans, being comparable with that of milk protein. Rapeseed protein is regarded as having a high nutritional potential for human nutrition. ■

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