Abstracts

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Fats and oils

CHROMATOGRAPHIC ANALYSIS OF MYRTUS COMMUNIS FIXED OIL. M. Asif et al. *Fette, Seifen, Anstrichm. 81*(12), 473-4 (1979). The fixed oil derived from the berries of Myrtus communis L. (family Myrtaceae) was analyzed chromatographically.

CHANGES IN LIPIDS OF BENGALGRAM (*CICER ARIETINUM*) ON HEAT PROCESSING. K.S. Murthy and M. Kantharaj Urs (Central Food Technological Research Institute, Mysore-570 013) *J. Food Sci. Technol.16,* 87 (1979). Heat treatment of Bengalgram during roasting and puffing resulted in a decrease of free lipids by 15 to 18 percent and an increase in bound lipids. In the five varieties of Bengalgram, the bound lipids constituted 31-44 percent of the total lipids. Both roasting and puffing retarded development of free fatty acids during storage over a period of 48 weeks. Puffing resulted in the retardation of the oxidation of unsaturated fatty acids, but roasting had no such beneficial effect.

EXTRACTION AND ANALYSIS OF LIPIDS FROM IMMATURE SOYBEANS. F.C. Phillips and O.S. Privett (The Hormel Inst., Univ. of Minnesota, Austin, MN 55912) *Lipids 14*(11), 949-52 (1979). A procecdure is described for the extraction of lipids from immature soybeans that eliminates artifact formation and provides complete recovery of the lipid, including highly polar glycolipids free of nonlipid substances. The method involves pretreatment and extraction of the beans with hot dilute (0.25%) acetic acid, followed by chloroform-methanol extraction. Pretreatment and extraction of the tissue with hot dilute acetic acid destroys hydrolytic enzymes and removes organic-soluble, nonlipid substances that contaminate extracts obtained by chloroform-methanol extraction. Application of the method to immature soybeans confirmed that phosphatidic acid was largely an artifact of freezing and thawing of the beans, and phosphatidylmethanol was produced via transphosphatidylation of phosphatidylcholine and phosphatidylethanolamine upon extraction with chloroform-methanol.

CHARACTERIZIATION OF OLEFINIC DOUBLE BONDS IN LINEAR UNSATURATED FATTY ACIDS USING FLUORINE MAGNETIC RESONANCE SPECTROMETRY. M.V. Buchanan and J.W. Taylor (Dept. of Chem., Univ. of Wisconsin, Madison, WI 53706) *Anal. Chem. 52*(2), 252-4 (1980). ^{19}F NMR can be employed generally on stereospecific hexafluoroacetone derivatives of linear unsaturated fatty acid esters to yield the position and geometry of the original carbon-carbon double bond. Complications arise in derivative formation when the double bond is in the number two position, and NMR alone is not sufficient for positional characterization when the double bond is near the center of an acid with a chain length greater than 16 carbons.

STUDY OF THE FRACTIONATION OF PALM OIL. OBTAINMENT OF A FLUID OIL WITH AN IODINE VALUE ABOVE 75, AND CHARACTERISTICS OF THE RESULTING PRODUCTS. J.M. Klein, Oléagineux, 34, 531-6 (1979). The advantage of fractionating palm oil to extract its fluid fraction is underlined. To enable this fluid fraction to be used in temperate climates without a deposit forming at 15 C, it is essential that the maximum content in trisaturated triglycerides and disaturated-monounsaturated triglycerides should not be exceeded. The different criteria to be respected in order to obtain a fluid fraction comparable to groundnut oil as regards stability when cold are reviewed. The triglyceridic composition of the fractions recovered is also examined.

VARIETY IMPROVEMENT OF SUNFLOWER IN FRANCE. M. Arnoux, Rev. Fr. Corps Gras, *26*(12), 497-500 (1979). The selection and research work on sunflower has different aims: to improve the agronomical quality of the existing plant; to create a new starting material with a greater genetic flexibility; to study the variability of the physiological features of Helianthus genus; to look for new plant architectures; to discover new remedies for mean diseases.

SOFT MARGARINE IN THE U.S.A. A. Moustafa, Rev. Fr. Corps Gras, *26*(12), 485-91 (1979). In this article, a review of the present situation of the soft margarine in the U.S. is given. The paper describes the history of the soft margarine, its main components and composition, the U.S. production (total versus soft), the employed additives, as well as the processing and marketing for the main types and forms. Some details related to its distribution are given too.

CHEMICAL COMPOSITION OF BRASSICA JUNCEA SEEDS USED TO PREPARE THE MUSTARD OF DIJON. G. Vangheesdaele and N. Fournier, Rev. Fr. Corps Gras, *27*,(1), 15-22 (1980). The sum of lipids, proteins and mineral matters represents about 70% of the whole seed, the balance being essentially carbohydrates and fibers. The kernels constitute about 80% of the seed and contain almost all the lipids and a large amount of proteins and soluble carbohydrates. The seed coats which represent 15 to 20% of the seed are highly hygroscopic and contain 2 to 3 times more water than the kernel. They mainly consist of fibers and hemicelluloses. A type of Brassica Juncea has a yellow coat. The fatty acid and aminoacid composition is described.

PRODUCT SPECIFICITY OF RICE GERM LIPOXYGENASE. A. Yamamoto, Y. Fujii, K. Yasumoto and H. Mitsuda (Dept. of Food Sci. and Technology, Faculty of Agri., Kyoto Univ., Sakyo-ku, Kyoto, 606 Japan) *Lipids 15*(1), 1-5 (1980). Incubation of linoleic acid with partially purified lipoxygenase from rice germ yielded a ratio of 9- to 13-hydroperoxides of linoleic acid of 97:3 as measured by high performance liquid chromatography. Under similar conditions, hematin gave the 9- to 13-hydroperoxides at a ratio of 51:49, and soybean lipoxygenase-a at 9:91. Infrared spectral analysis revealed *cis-trans* configuration to predominate in the reaction products with the rice germ enzyme as was with the soybean enzyme.

IMPROVED SEPARATION OF PHOSPHOLIPIDS IN THIN LAYER CHROMATOGRAPHY. J.C. Touchstone, J.C. Chen and K.M. Beaver (School of Med., Univ. of Pennsylvania, Philadelphia, PA) *Lipids 15*(1), 61-2 (1980). The mobile phases described permit separation of the six major phospholipids of amniotic fluid in one dimension with either conventional or high performance thin layer chromatography. An example of this separation with an extract of amniotic fluid is given.

IDENTIFICATION OF LIPOXYGENASE-LINOLEATE DECOMPOSITION PRODUCTS BY DIRECT GAS CHROMATOGRAPHY-MASS SPECTROMETRY. A.J. St. Angelo, M.G. Legendre and H.P. Dupuy (Southern Regional Res. Center, New Orleans, Louisiana 70179) *Lipids 15*(1), 45-9 (1980). Lipoxygenase, prepared from Virginia-type peanuts, was used to catalyze the oxidation of linoleic acid and methyl linoleate to form the C-9 and C-13 hydroperoxides. These reactions were monitored by rapid unconventional direct gas chromatography-mass spectroscopy. An aliquot of the enzymatic reaction mixture, without prior extraction or chemical modification, was secured directly into the heated (40-70 C) or nonheated (room temperature) injection system. When the reaction mixture was analyzed at room temperature, only hexanal was found. At elevated temperatures, five major and several minor components were identified. The predominant compounds identified were pentane, hexanal, 2-pentylfuran, *trans*-2,*cis*-4-decadienal, and *trans*-2, *trans*-4-decadienal. These products originate from decomposition of either the C-9 or C-13 hydroperoxides generated by peanut lipoxygenase.

OCCURRENCE OF 24(*E*)-ETHYLIDENE STEROLS IN TWO SOLANACEAE SEED OILS AND RICE BRAN OIL. T. Itoh, S. Sakurai, T. Tamura and T. Matsumoto (Coll. of Sci. & Technology, Nihon Univ., 1-8, Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan) *Lipids 15*(1), 22-5 (1980). The occurrence of two 24(*E*)-ethylidene sterols, fucosterol and 28-isocitrostadienol, in the unsaponifiable matters of two Solanaceae seed oils from *Datura Stramonium* and *Capsicum annuum*, and rice bran oil from the seeds of *Oryza sativa* (Gramineae) was demonstrated by their isolation or

by gas liquid chromatography. Although *Z*-isomers of the above two 24-ethylidene sterols, 28-isofucosterol and citrostadienol, are a frequent occurrence in higher plant materials including some Solanaceae seed oils and rice bran oil, this report might be the second instance of the unambiguous demonstration of the occurrence of the 24(*E*)-ethylidene sterols in higher plants.

COMPARISON OF LIPID COMPOSITION OF *CANDIDA GUILLIERMONDII* GROWN ON GLUCOSE, ETHANOL AND METHANOL AS THE SOLE CARBON SOURCE. Y. Jigami, O. Suzuki, and S. Nakasato (Bioorganic Chem. Div., National Chem. Lab. for Industry, Agency of Industrial Sci. and Tech., 1-1 Higashi, Yatabecho, Tsukuba-gun, Ibaraki 300-21, Japan) *Lipids 14*(11), 937-42 (1979). The carbon and energy source for aerobically grown cultures of *Candida guilliermondii* profoundly influenced the neutral lipid content and the fatty acid composition of the individual lipid components. Methanol (0.80%, w/v) grown cells cultivated at 30 C in presence of 0.025% ammonium sulfate contained 12% total lipids, 67% of which was neutral lipids. Glucose (0.74%, w/v) or ethanol (0.53%, w/v) grown cells contained 21-22% total lipids, 80% of which was neutral lipids, under the same conditions. Methanol-grown cells contained a decreased 18:1 acid (52-54% of total fatty acids) and an increased 18:2 acid (23-25%), as compared with glucose- or ethanol-grown cells which contained 57-66% 18:1 acid and 8-14% 18:2 acid, in both neutral and polar lipid fractions. The relationship between methanol metabolism and desaturation of fatty acid in yeast was discussed.

A SIMPLE METHOD FOR THE DETERMINATION OF CHOLESTEROL AND SOME PLANT STEROLS IN FISHERY-BASED FOOD PRODUCTS. M.I.P. Kovacs, W.E. Anderson and R.G. Ackman. (Technology Branch, Fisheries and Environment Canada, 1707 Lower Water St., Halifax, Nova Scotia B3J 1S7 Canada) *J. Food Sci. 44*(5), 1299-301 (1979). An efficient method has been developed for the microdetermination of cholesterol and some plant sterols such as brassicasterol, campesterol, stigmasterol, and β-sitosterol. The method is a greatly simplified analytical procedure in which samples are directly saponified, the unsaponifiable substances extracted, and the sterols estimated by gas liquid chromatography without further processing. The sterol contents from the new method are at least as high, and generally higher, than those from the official method, indicating superior recovery. The analysis has been found to be simple, sensitive, economical of time and particularly of solvents. It is probably adaptable to a wide variety of food ingredients or products.

DEUTERIUM NUCLEAR MAGNETIC RESONANCE INVESTIGATION OF DIMYRISTOYLLECITHIN-DIPALMITOYLLECITHIN AND DIMYRISTOYLLECITHIN-CHOLESTEROL MIXTURES. R. Jacobs and E. Oldfield (Dept. of Chem., Univ. of Il. at Urbana-Champaign, Urbana, Il) *Biochemistry 18*(15), 3280-5 (1979). Deuterium nuclear magnetic resonance (NMR) spectra of 1,2-dimyristoyl-3-*sn*-phosphatidylcholines (DMPCs) specifically deuterated in the 2-chain at one of positions 2', 3', 6', or 14' have been obtained by the quadrupole-echo Fourier transform method at 34.1 MHz (corresponding to a magnetic field strength of 5.2 T) or the pure material as a function of temperature, and in the presence of either 1,2-dipalmitoyl-3-*sn*-phosphatidylcholine (DPPC) or cholesterol as a function of temperature and composition. The results with pure DMPC and DMPC-DPPC mixtures indicate that a sharp, intense deuterium resonance is characteristic of fluid-phase lipids, whereas a broad resonance is characteristic of solid-phase lipids.

ROLE OF PHOSPHOLIPIDS AND TRIGLYCERIDES IN WARMED-OVER FLAVOR DEVELOPMENT IN MEAT MODEL SYSTEMS. J.O. Igene and A.M. Pearson (Dept. of Food Science and Human Nutrition, Michigan State Univ., East Lansing, MI 48824) *J. Food Sci. 44*(5), 1285-90 (1979). The effects of triglycerides and phospholipids on development of warmed-over flavor (WOF) in cooked meat was studied using model systems from beef and from chicken dark and light meat. Triglycerides, total lipids, total phospholipids, phosphatidyl choline (PC) and phosphatidyl ethanolamine (PE) were added back to the lipid extracted muscle fibers in each system and WOF development was followed by the TBA test and taste panel scores after heating to 70°C and holding at 4°C for 48 hrs. Total phospholipids, especially PE, were shown to be the major contributors to development of WOF in cooked meat. The triglycerides enhanced development of WOF only when combined with the phospholipids (as total lipids). Phosphatidyl choline (PC) did not influence WOF in the model system. Changes in the PUFAs of the phospholipids were shown to be related to development of WOF in cooked meat. Addition of 156 ppm of nitrite significantly ($P<0.01$) reduced TBA numbers and prevented development of WOF.

DETERMINATION OF FREE AND BOUND FATTY ACIDS IN RIVER WATER BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY. D.A. Hullett and S.J. Eisenreich (Environmental Engineering Program, Department of Civil and Mineral Engineering, University of Minnesota, Minneapolis, MN 55455) *Anal. Chem. 51*(12), 1953-60 (1979). A technique is described for the isolation and quantitation of free and bound fatty acids (FA) in river water. The method involves sequential liquid-liquid extraction of the water sample by 0.1 N HCl, benzene/methanol (7:3) and hexane/ether (1:1). The resultant extract was concentrated and the fatty acids were separated as a class on Florisil using an ether/methanol (1:1) and (1:3) elution. Final determination of individual fatty acids was accomplished by forming the phenacyl ester and separating by HPLC. Results are given for the distribution of FA in Mississippi River water and show the general applicability of the technique to complex environmental samples.

THE MECHANISM OF THE REARRANGEMENT OF LINOLEATE HYDROPEROXIDES. H.W.-S. Chan, G. Levett and J.A. Matthew (Agricultural Research Council Food Research Inst., Colney Lane, Norwich NR4 7UA, UK) *Chem. Phys. Lipids 24*(3), 245-56 (1979). Linoleate hydroperoxides undergo rearrangement leading to their isomerisation in which the OOH group is relocated or the stereochemistry of a double bond changed, or both. The reaction was studied mainly with pure isomers of methyl hydroperoxylinoleates since conditions could be found in which rearrangement occurred with little accompanying decomposition. The rearrangement was found to be non-stereoselective and took place by a free-radical chain mechanism. Using ^{18}O-labelled hydroperoxide on $^{18}O_2$, it was shown that the oxygen atoms of the OOH group of the hydroperoxides exchanged with surrounding molecular oxygen during the rearrangement. A mechanism for the rearrangement is proposed.

FREE CERAMIDE, SPHINGOMYELIN, AND GLUCOSYLCERAMIDE OF ISOLATED RAT INTESTINAL CELLS. J.-F. Bouhours and H. Guignard (Unité de Recherche de Physiopathologie Digestive, INSERM U 45, Pavillon H, Hôpital E. Herriot, 69374 Lyon Cedex 2, France) *J. Lipid Res. 20*(7), 897-907 (1979). Free ceramide, glucosylceramide, and sphingomyelin were isolated from mature cells of adult rat small intestine. Free ceramide and ceramide cleaved from sphingomyelin by enzymatic hydrolysis were fractionated by thin-layer chromatography on borate-impregnated silica gel plates. Sphingoid bases were characterized by gas-liquid chromatography of aldehydes formed upon periodate oxidation. Fatty acids were quantified as methyl esters. Ceramide structures were confirmed by direct-inlet mass spectrometry. Free ceramide was found to contain two major long-chain bases in nearly equal quantity: sphingosine, mainly linked to palmitic acid, and 4*D*-hydroxysphinganine associated with C_{20} to C_{24} fatty acids, 22% being hydroxylated. Sphinganine occurred as a minor component linked to nonhydroxy fatty acids. Sphingomyelin contained the three long-chain bases and 63% of its ceramide was *N*-palmitoylsphingosine. Mass spectrometry of glucosylceramide confirmed 4*D*-hydroxysphinganine as the major sphingoid base associated preferentially with longer chain hydroxy fatty acids.

SEPARATION OF FLAVOR COMPOUNDS FROM LIPIDS IN A MODEL SYSTEM BY MEANS OF MEMBRANE DIALYSIS. K.F. Benkler and G.A. Reineccius (Dept. of Food Science and Nutr., Univ. of Minnesota, 1334 Eckles Ave., St. Paul, MN 55108) *J. Food Sci. 44*(5), 1525-9 (1979). The separation of flavor compounds from lipids by membrane dialysis was studied using a model system consisting of 11 flavor compounds and corn oil dissolved in solvent. Several solvent systems and three perfluorosulfonic acid membranes were studied. The most effective solvent system was a mixture of 70% acetone and 30% pentane while the more effective membranes were ones with equivalent weights of 1200 and 1100g and thicknesses of 5 and 10 mils, respectively. Diffusion of the corn oil was less than 0.12% of the oil added. Calculation of permeances showed that diffusion decreased with increased molecular size. The diffusion of 2-methoxypyrazine was hindered by either adsorption on to or reaction with the dialysis membrane. Reaction of the membrane with acetone (solvent) resulted in the formation of two artifacts.

LIPID CHANGES DURING PROCESSING AND STORAGE OF SWEET POTATO FLAKES. N. Alexandridis and A. Lopez (Dept. of Food Science & Tech., Virginia Polytechnic Inst. & State Univ., Blacksburg, VA 24061) *J. Food Sci. 44*(4), 1186-90 (1979). Changes in fatty acids, lipid classes, and total lipids, during processing and storage of sweet potato flakes were identified and quantified. The extracted and purified lipids were separated by column chromatography into three major classes: neutral lipids, glycolipids and phospholipids. The fatty acids of each class were determined. During processing and storage, the percent of the total lipids decreased significantly. The percent of the unsaturated fatty acids, linolenic and palmitoleic, decreased significantly while the percent of the saturated fatty acids, palmitic and stearic, increased slightly. The decrease in the unsaturation ratio following the 6- and 12-

months storage for sweet potato flakes, suggests the existence of a link between the decrease in unsaturates and the development of off-flavor and odor.

SHELF-LIFE OF SUNFLOWER OIL AND GROUNDNUT OIL. R.Y.A. Khan, T. Lakshminarayana, G. Azeemoddin, D.A. Ramayya and S.D. Thirumala Rao (Oil Technological Research Institute, Anantapur, India) *J. Food Sci. Technol. 16* 90 (1979). Raw sunflower and groundnut oils and refined groundnut oils produced in India and also imported were stored at ambient room temperature in mild steel and tin containers respectively. Raw sunflower oil and raw groundnut oil were stable hydrolytically and oxidatively for 1080 and 660 days respectively. Refined groundnut oils did not register increase in free fatty acid contents whereas peroxide values widely differed from each other. Refined groundnut oil even without added antioxidants stored in closed container without access to air showed low peroxide value at the end. Acceptability tests showed that the raw sunflower and groundnut oils were acceptable till they attained a peroxide value of about 25 and beyond this limit, there was rapid deterioration in the palatability of the preparations.

VITAMIN E CONTENT OF FOODS. P.J. McLaughlin and J.L. Weihrauch (Consumer and Food Economics Institute, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Maryland) *J. Am. Diet. Assoc. 75*, 647 (1979). Tables showing representative values for the vitamin E content of human foods have been developed from all the available reliable information. These tables cover animal products, plant products, fats and oils, baked products, infant foods, and mixed dishes. The effects on vitamin E content are discussed for heating and storage of dairy products, grains, vegetables, and plant oils; for the refining of plant oils; and for the processing and baking of grain products.

Biochemistry and nutrition

QUANTITATIVE EFFECT OF AN ISOENERGETIC EXCHANGE OF FAT FOR CARBOHYDRATE ON DIETARY PROTEIN UTILIZATION IN HEALTHY YOUNG MEN. D.P. Richardson, A.H. Wayler, N.S. Scrimshaw, and V.R. Young (Dept. of Nutr. and Food Sci., and the Clin. Res. Center, Mass. Inst. of Tech., Cambridge, MA 02139) *Amer. J. Clin. Nutr. 32*(11), 2217-26 (1979). The quantitative effect on protein utilization of an isoenergetic exchange of dietary fat for carbohydrate was studied in 10 healthy young men. Milk protein was given for two 21-day experimental periods with two ratios of carbohydrate to fat calories: diet A, a ratio supplying an equal proportion of energy from carbohydrate and from fat, generally representative of the usual Western diet, and diet B, a ratio supplying twice as much energy from carbohydrate as from fat, chosen in view of recommendations to reduce the amount of fat in the diet. Nitrogen (N) balance and dietary protein utilization were significantly ($P < 0.05$) improved on diet B. The protein-sparing effect was greatest in those subjects who were on marginal energy and protein intakes and who were losing weight. The additional carbohydrate in diet B resulted in significant reductions in fasting serum urea N ($P < 0.001$), total urinary N ($P < 0.01$), and urinary urea N ($P < 0.001$); fasting plasma insulin values were unchanged. Whether or not the longer-term effects of the change in dietary carbohydrate:fat ratio on N metabolism are mediated solely by the action of insulin remains to be determined.

ON THE CONTROL OF LONG-CHAIN-FATTY ACID SYNTHESIS IN ISOLATED INTACT SPINACH *(SPINACIA OLERACEA)* CHLOROPLASTS. P.G. Roughan, R. Holland and C.R. Slack (Plant Physiology Div., D.S.I.R., Private Bag, Palmerston North, New Zealand) *Biochem. J. 184*(2), 193-202 (1979). Chloroplasts isolated from spinach leaves by using the low-ionic-strength buffers of Nakatani & Barber (1977) had higher rates of HCO_3^--dependent oxygen evolution (up to 369 μmol/h per mg of chlorophyll) and higher rates of [1-^{14}C] acetate incorporation into long-chain fatty acids than chloroplasts isolated by using alternative procedures. Acetate appeared to be the preferred substrate for fatty acid synthesis by isolated chloroplasts, although high rates of synthesis were also measured from $H^{14}CO_3^-$ in assays permitting high rates of photosynthesis. Rates of long-chain-fatty acid synthesis from [1-^{14}C] acetate in the highly active chloroplast preparations, compared with those used previously, were less dependent on added cofactors, but showed a greater response to light. Endogenous [^{14}C] acyl-(acyl-carrier protein) concentrations increased with increasing HCO_3^- concentration and higher rates of fatty acid synthesis, but were slightly lower in the presence of Triton X-100. It is proposed that rates of long-chain-fatty acid synthesis in isolated chloroplasts at saturating [1-^{14}C] acetate concentrations and optimal HCO_3^- concentrations may be primarily controlled by rates of removal of the products of the fatty acid synthetase.

THE ROLE OF GASTRIC LIPOLYSIS ON FAT ABSORPTION AND BILE ACID METABOLISM IN THE RAT. C.C. Roy, M. Roulet, D. Lefebvre, L. Chartrand, G. Lepage, and L.A. Fournier (Dept. of Pediatrics, Hopital Ste-Justine, Univ. of Montreal, Montreal, Canada) *Lipids 14*(9), 811-15 (1979). *In vivo* studies were carried out in young Sprague-Dawley rats to examine the role of gastric lipolysis on fat absorption and bile acid metabolism. When fed by gastric perfusion 5 times (corn oil, 4 g/day) their usual dietary intake of fat, rats deprived of lingual lipase by the creation of an esophageal fistula had a significant degree of fat and bile acid malabsorption as well as a shortened bile acid half-life when compared to animals with a gastrostomy. The % fat absorption, bile acid loss and bile acid pool were normal in 2 groups of esophageal fistula rats fed the same quantity of corn oil or twice (8 g/day) that amount as a fine emulsion. In view of a negligible gastric lipase activity in animals with an esophageal fistula and of decreased hydrolysis of a triglyceride test meal, these data suggest that gastric lipolysis is of physiological importance in situations where lipolytic mechanisms are stressed by a large fat intake. Its principal role is to potentiate intestinal lipolysis by facilitating the emulsification of dietary lipids through its formed products and, therefore, the contact of pancreatic lipase with its substrates.

CHARACTERIZATION OF A CALCIUM-MEDIATED ACTIVATION OF ARACHIDONIC ACID TURNOVER IN ADRENAL PHOSPHOLIPIDS BY CORTICOTROPIN. M.P. Schrey and R.P. Rubin (Dept. of Pharmacology, Med. College of Virginia, Virginia Commonwealth Univ., Richmond, VA 23298) *J. Biol. Chem. 254*(22), 11234-41 (1979). The present investigation utilized isolated cat adrenocortical cells to study synthetic adrenocorticotropin (β1-24) (ACTH)-stimulated turnover of endogenously labeled phospholipid. Agents known to suppress phospholipase A_2 activity were effective as inhibitors of ACTH-induced incorporation of labeled arachidonate into phosphatidylinositol. The response to A23187 was also markedly inhibited by *p*-bromophenacylbromide. ACTH and A23187 also caused a significant loss of arachidonate from prelabeled phospholipids, including phosphatidylinositol. It is concluded that an early action of ACTH is a Ca^{2+}-dependent turnover of arachidonyl-phosphatidylinositol, which is initiated by phospholipase A_2 and appears to be followed by a rapid, selective reacylation of lysophosphatidylinositol.

REGULATION OF ETHER LIPIDS AND THEIR PRECURSORS IN RELATION TO GLYCOLYSIS IN CULTURED NEOPLASTIC CELLS. C.C. Scott, C.A. Heckman and F. Snyder (Med. and Health Sci. Div., Oak Ridge Associated Univ., Oak Ridge, TN 37830) *Biochim. Biophys. Acta 575*(2), 215-24 (1979). Tumors typically show high rates of glycolysis and elevated levels of ether lipids, particularly the alkyldiacylglycerols; thus, we investigated the relationship between ether lipid accumulation and glucose metabolism in a neoplastic cell line (B2-1). The B2-1 cells grown in 5.5 mM galactose in the absence of glucose produced very low levels of alkyldiacylglycerols, triacylglycerols, lactic acid, and dihydroxyacetone-*P*. Increasing concentrations of glucose caused a progressive increase in lactic acid, dihydroxyacetone-*P*, and up to a ten-fold increase in alkyldiacylglycerols and triacylglycerols. Glucose supplements also caused an increased incorporation of [9,10-^{3}H] palmitic acid into alkyldiacylglycerols and triacylglycerols. These metabolic changes appeared to be independent of altered growth rates of the cells. The addition of hexadecanol along with glucose to the cultures resulted in a shorter lag and a more rapid rate of accumulation of alkyldiacylglycerols; hexadecanol supplements alone had no effect. The extent of uptake and oxidation of hexadecanol was similar in both the glucose and galactose-grown cells. These results indicate that the levels of alkyldiacylglycerols in neoplastic cells can be regulated by the extent their precursors are formed from glucose.

EVIDENCE FOR AN IMPORTANT ROLE OF PROSTAGLANDINS E_1 AND F_2 IN THE REGULATION OF ZINC TRANSPORT IN THE RAT. M.K. Song and N.F. Adham (Dept. of Med., Veterans Admin. Hospital, Sepulveda, CA 91343, and Univ. of Calif., San Fernando Valley Program, Los Angeles, CA 90024) *J. Nutr. 109*(12), 2152-9 (1979). The current studies were undertaken to examine the effects of the various prostaglandins (PG) on zinc transport across the rat small intestine. In *in vitro* studies using everted jejunal sacs, the addition of PGE_2 to the mucosal media increased the transport of ^{65}Zn from the mucosal surface to the serosal surface by 54%, whereas the addition of PGF_2 decreased it by 40%. In contrast, addition of PGE_2 to the serosal media decreased ^{65}Zn transport from serosa to mucosa by 37% while the addition of PGF_2 increased it by 36%. Our *in vivo* studies showed that oral administration of PGE_2 caused a 2-fold increase in the ^{65}Zn content of rat internal organs whereas PGF_2 decreased it slightly but insignificantly.

Pretreatment of rats with indomethacin resulted in a significant decrease in organ ^{65}Zn content when compared to control, when the rats were administered ^{65}Zn by the oral route. The decrease in organ ^{65}Zn content was overcome by the administration of PGE_2. Furthermore, the administration of PGF_2 to indomethacin pretreated rats caused a further and significant decrease in the ^{65}Zn content of liver and pancreas—the two organs that have a high zinc uptake. The fact that PG had no effect on the active transport of L-[3-^{3}H]histidine and that PGE_2 and PGF_2 had opposing effects on zinc transport strongly suggest that PGE_2 and PGF_2 act as physiological regulators of zinc transport by the intestinal mucosa, and that their effects are specific.

THE ROLE OF LYSOPHOSPHATIDYLCHOLINE AND APOLIPOPROTEIN A_1 IN THE CHOLESTEROL-REMOVING CAPACITY OF LIPOPROTEIN-DEFICIENT SERUM IN TISSUE CULTURE. O. Stein, M. Fainaru and Y. Stein (Dept. of Experimental Med. and Cancer Res., Hebrew Univ.-Hadassah Med. Schl. and Lipid Res. Lab., Dept. of Med. B, Hadassah Univ. Hospital, Jerusalem Isreal) *Biochim. Biophys. Acta 574*(3), 495-504 (1979). Lipoprotein-deficient serum ($d > 1.21$ or 1.25 g/ml fraction) is commonly used to deplete cellular cholesterol from cultured cells and presently we have studied some of the potential promoters of this process. Although serum albumin is the main protein component of the fraction, its cholesterol-removing capacity was quite limited, even in the presence of lysophosphatidyl-choline, which is the major phospholipid of the $d > 1.25$ g/ml infranatant of serum. On the other hand, apolipoprotein A_1, especially when complexed with lysophosphatidylcholine promoted considerable release of cellular cholesterol. It is proposed that in human serum there are low molecular weight protein-phospholipid complexes (less than 100,000), which can cross the capillary endothelial barrier, in preference to lipoproteins, and promote cholesterol removal from peripheral cells.

TRIAGLYCEROL METABOLISM IN *SACCHAROMYCES CEREVISIAE* RELATION TO PHOSPHOLIPID SYNTHESIS. F.R. Taylor and L.W. Parks (Dept. of Microbio., Oregon State Univ., Corvallis, OR 97331) *Biochim. Biophys. Acta 575*(2), 204-14 (1979). The acylglycerol content of *Saccharomyces cerevisiae* has been examined during cellular growth. The cells maintained a constant amount of phospholipid and diacylglycerol throughout growth. Triacylglycerol content fell in the early exponential phase of growth and then increased sharply upon entry of the culture into the stationary growth phase. Pulse-chase experiments with [1-^{14}C]-oleic acid and [2-^{3}H]- and [1-^{14}C]glycerol indicated that the triacylglycerol molecule was utilized for phospholipid synthesis in early exponential phase, probably through a diacylglycerol intermediate. A substantial turnover of phospholipid during growth was also apparent. No role for the triacylglycerol could be found in regulating the fatty acid species of the phospholipid nor in the storage of fatty acid for energy metabolism.

RECEPTOR-MEDIATED LOW DENSITY LIPOPROTEIN CATABOLISM IN MAN. J. Shepherd, S. Bicker, A.R. Lorimer, and C.J. Packard (Univ. Depts. of Biochem. and Med. Cardiology, Royal Infirmary, Glasgow G4 OSF, United Kingdom) *J. Lipid Res. 20*(8), 999-1006 (1979). Binding of human low density lipoproteins (LDL) to their specific receptor on cultured cells can be inhibited by treatment with 1,2-cyclohexanedione which blocks a number of functionally significant arginyl residues on the apolipoprotein. We have used this observation to examine the role of the receptor pathway in LDL catabolism in man. Because the mean apoLDL pool size in the group was increased 3-fold over normal, this gave absolute clearance rates for the apoprotein of 2.5 mg/kg per day via the receptors and 12.8 mg/kg per day by the nonreceptor pathway. We conclude that the specific LDL receptor mechanism operates *in vivo* and probably accounts for 33% and 16% of overall LDL catabolism in normal and heterozygous familial hypercholesterolemic subjects, respectively.

LOW DENSITY LIPOPROTEIN RECEPTORS AND CATABOLISM IN PRIMARY CULTURES OF RABBIT HEPATOCYTES. P.A. Soltys and O.W. Portman (Dept. of Nutr. and Metabolic Diseases, Oregon Regional Primate Res. Center, Beaverton, OR 97005) *Biochim. Biophys. Acta 574*(3), 505-20 (1979). Rabbit ^{125}I-labelled low density lipoproteins (LDL) were incubated with primary monolayer cultures of rabbit hepatocytes in studies designed to assess the role of liver in LDL catabolism at the cellular level. After hepatocytes were preincubated for 20 h in lipoprotein-free medium, they exhibited time- and concentration-dependent interaction with ^{125}I-labelled LDL at concentrations to 1 mg LDL protein/ml and times to 24 h. The amounts of LDL bound to hepatocytes after 3 h (37 C) were similar to amounts for fibroblasts, but LDL internalization and degradation were considerably less. Induction of specific high affinity receptors for binding LDL was shown to occur by preincubation of hepatocytes for increasing periods in lipoprotein-free medium and then measuring ^{125}I-labelled LDL binding at 4 C in the presence and absence of excess unlabelled LDL. Finally, hepatocytes took up 40 times more LDL than sucrose or dextran over a 24-h period, an indication that the uptake of LDL occurs via some mechanism other than simple bulk fluid endocytosis.

MAMMARY TRANSFER OF VITAMIN E IN COWS TREATED WITH VITAMIN A OR LINOLEIC ACID. M.R. Yeargan, S. Oshidari, G.E. Mitchell, Jr., R.E. Tucker, G.T. Schelling, and R.W. Hemken (Dept. of Animal Sci., Univ. of Kentucky, Lexington 40546) *J. Dairy Sci. 62*(11), 1734-8 (1979). The effect of an intravenous injection of vitamin A alcohol and subcutaneous injections of linoleic acid on the mammary transfer of an intravenous injection of vitamin E acetate was studied with 15 Holstein cows. The cows received either an intravenous injection of 3 g vitamin E acetate (controls), intravenous injections of 3 g vitamin E acetate and 1 million IU vitamin A alcohol, or an intravenous injection of 3 g vitamin E acetate and subcutaneous injections totaling 40 g of linoleic acid. Milk samples were at 12-h intervals, two prior to and six following treatment. The main influence of vitamin A alcohol and linoleic acid on mammary transfer of vitamin E was to delay secretion of vitamin E in milk. However, total secretion of vitamin E was not reduced by injection of either vitamin A alcohol or linoleic acid. Vitamin E injection produced substantial increases in vitamin E in milk, but less than 1% of the dose could be accounted for in the milk.

CHANGES IN CONTENT AND COMPOSITION OF BRAIN PHOSPHOLIPIDS IN MALNOURISHED CHILDREN. H.K.M. Yusuf, J.W.T. Dickerson and J.C. Waterlow (Dept. of Biochem., Univ. of Surrey, and the Dept. of Human Nutr., London School of Hygiene and Tropical Medicine, England) *Am. J. Clin. Nutr. 32*(11), 2227-32 (1979). The content and composition of phospholipids were studied in the brain of children who died from severe malnutrition within the first 2 years of life, and compared with those obtained from well-nourished children who died of accidents, or of illnesses not known to affect the central nervous system. The phospholipid:DNA ratio in the forebrain and cerebellum of most of the malnourished children under 1 year of age was higher than normal. The brain stem of only a few malnourished children aged around 1 year also had higher phospholipid:DNA ratio than normal. Among the different phospholipids, sphingomyelin was found to be selectively decreased in each brain part of the malnourished children aged 1 year or more.

RELATIONSHIP OF RAISED ATHEROSCLEROTIC LESIONS TO FATTY STREAKS IN CORONARY HEART DISEASE AND HYPERTENSION. R.E. Tracy, J.P. Strong and V. Toca (Dept. of Pathology, Louisiana State Univ. Med. Center, New Orleans, LA 70112) *Atherosclerosis 33*(1), 125-40 (1979). The abdominal aortas and right coronary arteries removed during autopsies were gathered from over 18,000 subjects in 19 location-race groups. Sudan-stained intimal surfaces were graded for the percent as raised lesions (R) and fatty streaks (F). The proportions of all types of lesions (ATL=F+R) that were raised (raL=R÷ATL) were examined. We concluded that hypertension is almost, if not entirely, a Class A type of atherogenic agent, and that CHD is promoted by exceptionally strong effects of both A and B_2 types of causation. This conclusion exposes a biological principle that, if the assumptions of the model are true, is of considerable importance: Some of the more important causes of atherosclerosis (Class B causes) begin to act only *after* the fatty streaks have formed.

REGULATION OF BILIARY CHOLESTEROL OUTPUT IN THE RAT: DISSOCIATION FROM THE RATE OF HEPATIC CHOLESTEROL SYNTHESIS, THE SIZE OF THE HEPATIC CHOLESTERYL ESTER POOL, AND THE HEPATIC UPTAKE OF CHYLOMICRON CHOLESTEROL. S.D. Turley and J.M. Dietschy (Dept. of Internal Med., Univ. of Texas Health Sci. Ctr. at Dallas, TX 75235) *J. Lipid Res. 20*(8), 923-34 (1979). These studies were designed to determine the importance of the rate of hepatic cholesterol synthesis, the size of the hepatic cholesteryl ester pool, the amount of chylomicron cholesterol reaching the liver, and the rate of bile acid transport into bile as determinants of the rate of biliary cholesterol output. Female rats that had been subjected to diurnal light cycling, fasting for 48 hr, intravenous administration of chylomicrons, and diets containing either cholestyramine, cholesterol, or bile acid underwent total biliary diversion for 2 hr. The animals were then killed and the rates of hepatic choleserol synthesis and levels of hepatic esterified cholesterol were measured along with biliary lipid concentrations. Cholesterol and phospholipid output remained tightly coupled to bile acid output over almost a 40-fold range. In other experiments it was shown that biliary cholesterol output could be driven by bile acid infusion to a similar extent in rats in which the rate of hepatic cholesterogenesis had been varied over a 26-fold range. It was concluded that the rate of hepatic

cholesteryl esters, and the amount of cholesterol absorbed from the diet play no role in determining the rate of biliary cholesterol secretion, at least in this species.

CHANGES IN THE FATTY ACID COMPOSITION OF THE PLASMA LIPID ESTERS DURING LIPID-LOWERING TREATMENT WITH DIET, CLOFIBRATE AND NICERITROL. REDUCTION OF THE PROPORTION OF LINOLEATE BY CLOFIBRATE BUT NOT BY NICERITROL. B. Vessby, H. Lithell, I-B. Gustafsson and J. Boberg (Dept. of Geriatrics, Univ. of Uppsala, Uppsala, Sweden) *Atherosclerosis 35*(1), 51-65 (1980). The fatty acid composition of the plasma lipid esters has been studied during lipid-lowering treatment of 95 patients with atherosclerotic disease. During the first two months of the trial only a diet was prescribed. During the ensuing two months either clofibrate or niceritrol, a nicotinic acid ester, was added in a randomized order. During the last two months the second drug was added. The combined treatment with diet, clofibrate, and niceritrol caused highly significant serum lipid reductions. The fatty acid composition in the plasma lipid esters was determined in samples from each trial period to measure the degree of dietary adherence. It is concluded that addition of clofibrate treatment to patients who are on a diet enriched with polyunsaturated fats is associated with a change from polyunsaturated to monounsaturated fatty acids in the plasma lipid esters but does not significantly affect the ratio between polyunsaturated and saturated fatty acids. The fatty acid changes caused by clofibrate treatment are counteracted by an increased amount of polyunsaturated fat in the diet.

REDUCTION OF HIGH DENSITY LIPOPROTEIN CHOLESTEROL AND APOLIPOPROTEIN A-I CONCENTRATIONS BY A LIPID-LOWERING DIET. B. Vessby, J. Boberg, I. Gustafsson, B. Karlström, H. Lithell and A. Östlund-Lindqvist (Dept. of Geriatrics, Univ. of Uppsala, Uppsala, Sweden) *Atherosclerosis 35*(1), 21-7 (1980). Nine hyperlipoproteinaemic patients were treated with a serum lipid-lowering diet during 4 weeks in a metabolic ward. The diet contained 35% energy from fat and the ratio between polyunsaturated and saturated fats (the P/S ratio) was 2.0. This treatment caused a reduction of the serum concentrations of the low density lipoprotein cholesterol (Chol) by 17% ($P < 0.01$), of the apolipoprotein (apo) B by 27% ($P < 0.01$), of high density lipoprotein (HDL) Chol by 15% ($P < 0.05$) and of the apo A-I by 9% ($P < 0.02$). The apo B/apo A-I ratio decreased by 19% ($P < 0.01$). It is suggested that the reduced HDL Chol and apo A-I concentrations may be due to both the qualitative change to more polyunsaturated fats in the diet and to the reduction of the total dietary fat intake.

ISOLATION AND CHARACTERIZATION OF PHOSPHOLIPASE D FROM FABABEANS. A.S. Atwal, N.A.M. Eskin and H.M. Henderson (Dept. of Foods and Nutr. and Dept. of Food Sci., Univ. of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2) *Lipids 14*(11), 913-7 (1979). An enzyme activity in crude extract of fababeans hydrolyzed phosphatidylcholine-U-^{14}C to produce choline and phosphatidic acid. This enzyme, phospholipase D, was stable at 50 C in the presence of 5 mM DTT but was inactivated at 55 C. The enzyme was precipitated with cold acetone, concentrated between 30% saturation to 40% saturation with ammonium sulphate, absorbed on calcium phosphate gel and eluted with 0.2 M phosphate buffer. This procedure resulted in a 20-fold increase in specific activity. The activity of fababean phospholipase D was much higher when assayed at 38 C than that at room temperature. There was an obligatory requirement for calcium, and for maximal activity 40 mM calcium was required. A narrow pH optimum of about pH 5.7 was observed. The enzyme activity was extremely dependent on substrate dispersion. When 5 mM phosphatidylcholine (PC) was sonicated with increasing levels of sodium dodecyl sulphate (1 mM to 4 mM), the enzyme activity kept increasing. By using equimolar concentrations of PC and sodium dodecyl sulphate (1 mM to 5 mM), the Michaelis constant (Km) was estimated to be 1.74 mM. Addition of choline and serine at 10 mM concentration reduced phospholipase D activity by 31% and 22%, respectively.

DESATURATION OF ISOMERIC *CIS* 18:1 ACIDS. M. Mahfouz and R.T. Holman (Hormel Inst., Univ. of Minnesota, Austin, Minnesota 55912) *Lipids 15*(1), 63-5 (1980). The desaturation of positional *cis* 18:1 isomers (Δ4 through Δ11) was studied, using essential fatty acid deficient rat liver microsomes. The *cis* Δ4, Δ5, Δ6 and Δ7 isomers were not desaturated. The *cis* Δ10 and Δ11 isomers were desaturated at a very low rate. The maximum desaturation was obtained for Δ8 and Δ9 isomers. The *cis* Δ8 and Δ11 isomers were desaturated by Δ5 desaturase; the *cis* Δ9 isomer was desaturated by Δ6 desaturase; and the *cis* Δ10 isomer was desaturated to Δ7, 10 and Δ5, 10-18:2 acids.

A PROCEDURE FOR THE QUANTITATIVE ISOLATION OF BRAIN GANGLIOSIDES. L. Svennerholm and P. Fredman (Dept. of Neurochem., Psychiatric Res. Centre, Univ. of Göteborg, St. Jörgen Hosp., S-422 03 Hisings Backa, Sweden) *Biochim. Biophys. Acta 617*(1), 97-109 (1980). In a systematic study of the optimal conditions for the quantitiative isolation of gangliosides from brain tissue and their further purification the yield of gangliosides obtained by extraction of the tissue twice with twenty volumes of chloroform/methanol/water (4:8:3, v/v) was larger than that obtained with all other solvents tested, including tetrahydrofuran/phosphate buffer. The gangliosides were separated from other lipids by phase partition, water was added to the total lipid extract to give a final chloroform/methanol/water volume ratio of 4:8:5.6. Isolation of gangliosides from the total lipid extract with the aid of anion-exchange resins was not practical as a routine procedure on a large scale. The crude gangliosides extract was freed from low molecular weight contaminants by dialysis against water. This method was superior to the purification on gel filtration media or on anion-exchange resins, which required large columns with selective losses of gangliosides as a result. The present method has been applied to human brain, and the concentration and distribution of gangliosides in the human forebrain in infancy and old age are given.

THE EFFECT OF CHOLESTEROL FEEDING ON BILE ACID KINETICS AND BILIARY LIPIDS IN NORMOLIPIDEMIC AND HYPERTRIGLYCERIDEMIC SUBJECTS. E. Andersen and K. Hellström (Dept. of Medicine, St. Erik's Hospital, Stockholm, Sweden) *J. Lipid Res. 20*(8), 1020-7 (1979). Six normolipidemic and six hypertriglyceridemic subjects were studied. The investigations were conducted before and after the basal diet (cholesterol intake about 0.8 mmol/day) was replaced by a cholesterol-rich diet (cholesterol intake about 4 mmol/day). Irrespective of the type of diet, the combined formation of cholic acid (C) and chenodeoxycholic acid (CD) was about two times higher in the hyperlipoproteinemic (mostly type IV) than the normolipidemic subjects. The pool size of CD increased in all but one normolipidemic subject. This group also displayed a decrease in the C/CD ratio of the bile acids produced and in the C/CD ratio of the bile acids in duodenal bile. The latter finding was also encountered in the hyperlipoproteinemic patients. On the basis of these and other data, it is suggested that the pattern of the bile acids synthesized may roughly reflect the degree of hepatic cholesterogenesis. Cholesterol feeding had no consistent effects on the molar cholesterol concentration in duodenal bile.

EFFECT OF SERUM LIPOPROTEINS OF BILE OBSTRUCTED RATS ON 3-HYDROXY-3-METHYLGLUTARYL COENZYME A REDUCTASE ACTIVITY IN PERFUSED RAT LIVER. A.J. Barak, M.F. Sorrell and D.J. Tuma (Liver Study Unit, Veterans Admin. Med. Center, Univ. of Nebraska Med. Center, Omaha, NE 68105) *Lipids 14*(11), 883-7 (1979). Total lipoproteins as well as fractionated VLDL + LDL and HDL from fasted control rats and bile-ligated rats were tested in liver perfusion for their effect on 3-hydroxy-3-methylglytaryl CoA reductase activity in normal rat livers. The total lipoproteins of bile-obstructed rats had 3 times greater capacity to increase 3-hydroxy-3-methylglutaryl CoA reductase activity than that of the control total lipoproteins. When the fractionated lipoproteins were tested from fasted control rats, it was found that the major stimulating activity was in the HDL fraction with minor activity in the VLDL + LDL fraction. When these plasma components isolated from fasted bile-ligated rats were tested, it was found that the major activity had shifted to the VLDL + LDL fraction with the HDL having only a minor stimulatory role. The possible mechanism of action of the abnormal lipoproteins associated with bile obstruction in regulating 3-hydroxy-3-methylglutaryl CoA reductase activity is discussed.

ROLE OF LIPOPROTEIN LIPASE IN PLASMA TRIGLYCERIDE REMOVAL. A. Bensadoun and I.P. Kompiang (Div. of Nutr. Sci., Cornell Univ., Ithaca, NY) *Fed. Proc. 38*(12), 2622-6 (1979). Intravenous injections of anti-lipoprotein lipase serum quantitatively block the catabolism of very low density lipoprotein (VLDL) and portomicron triglyceride and specifically inhibit triglyceride transport into ovarian follicles. The immunological studies presented provide information on the site of action triglyceride accumulation occurs at the time of antiserum injection. This instantaneous inhibition of triglyceride removal provides direct evidence that the functional LPL responsible for VLDL and portomicron triglyceride hydrolysis is located in sites within the plasma compartment readily accessible to immunoglobulins. In vitro immunological studies show that the adipose, heart, ovarian, and liver LPL share common immunological determinants. Biochemical studies on highly purified heart and adipose LPL suggest that these enzymes have identical protein moieties.

INTERACTION OF ZINC AND POLYUNSATURATED FATTY ACIDS IN THE CHICK. W.J. Bettger, P.G. Reeves, E.A. Moscatelli, J.E. Savage and B.L. O'Dell (Biochem. Dept., College of Agric. and School of Med., Univ. of Missouri, Columbia, MO 65211)

J. Nutr. 110(1), 50-8 (1980). Three experiments were performed to investigate the physiological relationships between zinc and polyunsaturated fatty acids (PUFA) in the chick. Chicks were fed diets low in zinc, PUFA or both; the growth rates and tissue fatty acid profiles were determined and correlated with the severity of skin lesions and leg abnormalities. When the diets were zinc-deficient, low PUFA supported a significantly higher growth rate and decreased the dermatitis. With adequate zinc, HCO and soybean oil were equivalent in support of growth. The foot skin of zinc-deficient chicks had a fatty acid profile different from that of the ad-libitum-fed controls, but the percentages of linoleic acid and arachidonic acid were similar to those of weight controls. In the physiological interaction between zinc and PUFA in the chick, PUFA aggravates the signs of zinc deficiency. This effect is opposite to the effect previously observed in the rat, but in both species a higher than normal proportion of arachidonate was found in the fatty acids of zinc-deficient skin.

BETA- AND PRE-BETA-LIPOPROTEINS IN CORONARY DISEASE AND HYPERLIPOPROTEINAEMIA. J.D. Billimoria, J. Makin and J.M. Meerloo (Biochem. Res. Lab., Westminster Schl. of Med., Udall St., London, SW1P Great Britain) *Atherosclerosis 33*(1), 141-4 (1979). A very high percentage of male patients with proven coronary disease and/or raised lipid levels had a pre-β-hyperlipoproteinaemia (calss P (6) or Fredrickson (3) type IV) and relatively few had a β-hyperlipoproteinaemia (class B or Fredrickson type IIA). Mixed hyperlipoproteinaemia was found in a large number of male patients over 40 years and few had β-hyperlipoproteinaemia. Our retrospective study shows that raised triglyceride levels are more often found in patients with coronary disease than raised cholesterol levels.

SYNTHESIS OF PHOSPHATIDYLCHOLINE AND PHOSPHATIDYLETHANOLAMINE AT DIFFERENT AGES IN THE RAT BRAIN IN VITRO. M. Brunetti, A. Gaiti and G. Porcellati, (Dept. of Biochem., Univ. of Perugia, 06100 Perugia, Italy) *Lipids 14*(11), 925-31 (1979). The de novo synthesis of choline and ethanolamine phosphoglycerides in brain microsomes from 18 month-old male rats was investigated in vitro by using labeled cytidine-5′-diphosphate choline and cytidine-5′-diphosphate ethanolamine as lipid precursors. The rate of synthesis of the two phospholipid classes was found to be noticeably decreased, as compared to that of adult animals. The addition of exogenous diacyl glycerols to microsomes from ageing rat brain brings the rate of synthesis nearly to the adult levels. The synthesis of choline and ethanolamine phosphoglycerides is not affected in the liver microsomes of ageing rats. The molar distribution of fatty acids in brain microsomal diacyl glycerols of ageing rats is noticeably different from that of adult animals. The content of monoenoic and dienoic species is increased, whereas that of the tetraenoic species is decreased. Base exchange reaction for choline and ethanolamine incorporation into respective phospholipids is not affected in the brain microsomes of the aged rats.

HEPATIC CHOLESTEROL AND BILE ACID METABOLISM IN SUBJECTS WITH GALLSTONES; COMPARATIVE EFFECTS OF SHORT TERM FEEDING OF CHENODEOXYCHOLIC AND URSODEOXYCHOLIC ACID. N. Carulli, M. Ponz De Leon, F. Zironi, A. Pinetti, A. Smerieri, R. Iori and P. Loria (Istituti di Clinica Medica, Clinica Chirurgica e Chimica Organica, Universita di Modena, Italy) *J. Lipid Res. 21*(1), 35-43 (1980). The activity of 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase and 7α-hydroxylase, the enzymes controlling the rate of hepatic synthesis, respectively, of cholesterol and bile acids, and the microsomal cholesterol content were evaluated in 25 patients with cholesterol gallstones and 17 subjects without gallstones. The same quantities were estimated in 16 additional patients with gallstones given chenodeoxycholic (CDCA) or ursodeoxycholic acid (UDCA) at a dose of 15 mg/kg per day in order to investigate the comparative effect of a short term (7 days) administration of the two bile acids on the hepatic sterol metabolism. Altogether the results would suggest that in the liver of patients with gallstones the conversion of cholesterol to bile acids is somewhat reduced, and that changing the bile acid pool composition, by exogenous bile acid feeding, has disparate effects on hepatic cholesterol synthesis. The findings could represent the acute changes produced by bile acid feeding, however they could imply that the effects of two bile acids in dissolving cholesterol gallstones might not be related only to the changes in hepatic sterol metabolism.

THE EFFECTS OF VITAMIN E DEPLETION AND REPLETION ON PROSTAGLANDIN DEHYDROGENASE ACTIVITY IN TISSUES OF YOUNG RABBITS. A.C. Chan, P.V.J. Hegarty and C.E. Allen (Dept. of Food Sci. and Nutr. and Dept. of Animal Sci., Univ. of Minnesota, St. Paul, MN 55108) *J. Nutr. 110*(1), 74-81 (1980). The key enzyme controlling prostaglandin (PG) catabolism, 15-hydroxyprostaglandin dehydrogenase (PGDH), was characterized in rabbit tissues. The apparent Michaelis constant (K_m) using PGE_2 as substrate was found to be 5.3, 4.0, 4.0 and 7.1 μM for semitendinosus and soleus muscles, heart and kidney, respectively. The effect of dietary vitamin E depletion and repletion on the PGDH activity in these tissues was studied. Vitamin E deficiency caused an elevation of PGDH activity in rabbit skeletal muscles but not in the heart and kidney. Oral supplementation of tocopherol acetate to the deficient animals did not affect the skeletal muscle PGDH activity. A long period of refeeding (30 days) was required to suppress the elevated PGDH level to the control values. The data indicates a higher turnover of the PGs in the vitamin E-deficient rabbit skeletal muscles. The significance of such a change in connection to prostaglandin metabolism is discussed.

STABILITY OF PLASMA LOW DENSITY LIPOPROTEIN WITH ABNORMAL GLYCOLIPID COMPOSITION FROM PATIENTS WITH FABRY'S DISEASE. J.T.R. Clarke, J.M. Stoltz and J.B. Garner (Dept. of Pediatrics, Biochem., and Preventive Med.; and The Atlantic Res. Center for Mental Retardation, Dalhousie Univ., Halifax, Nova Scotia B3H 4H7, Canada) *Atherosclerosis 35*(2), 155-63 (1980). Fabry's disease is a glycosphingolipid storage disease associated with premature generalized arteriosclerosis. Plasma low density lipoprotein (d 1.019-1.055 g/ml; LDL) was isolated from 4 healthy male volunteers (LDL-N) and from 4 patients with Fabry's disease (LDL-F), in whom plasma globotriaosylceramide ($GbOse_3$) levels were 2-4 times above normal. LDL-N was labeled with ^{131}I and LDL-F with ^{125}I by the iodine monochloride method; both were then injected together intravenously into 4 mongrel dogs. The results indicate that significant abnormalities of the neutral glycosphingolipid composition of LDL, such as occur in Fabry's disease, do not affect the metabolism of the lipoprotein apoprotein in dogs. The arteriosclerosis in patients with the disease is probably due to damage to vessel walls occurring as a result of defective $GbOse_3$ metabolism and accumulation of glycosphingolipid in the tissue, rather than to abnormal LDL metabolism.

DISTRIBUTION OF PHOSPHOINOSITIDES AMONG SUBFRACTIONS OF RAT BRAIN MYELIN. D.S. Deshmukh, S. Kuizon, W.D. Bear and H. Brockerhoff (Inst. for Basic Res. in Mental Retardation, 1050 Forest Hill Rd., Staten Island,NY 10314) *Lipids 15*(1), 14-8 (1980). Rat brain myelin was separated into three subfractions, heavy, medium, and light, and the concentrations of phosphatidic acids (PA), phosphatidylinositol (PI), di- (DPI), and triphosphoinositide (TPI) in these fractions were determined. PI was evenly distributed among the fractions, and PA, DPI, and TPI occurred in highest concentrations in the "light" myelin. This result indicates that these fast metabolizing lipids play an important role in the tightly packed central lamellae of the myelin sheath.

EFFECT OF DIETARY FAT AND VITAMIN E ON MOUSE LUNG LIPIDS. D.H. Donovan and D.B. Menzel (Depts. of Pharmacology and Medicine, Duke Univ. Medical Center, Durham, NC 27710) *J. Nutr. 109*(11), 1856-64 (1979). To examine the effect of dietary fat on lung lipids, male weanling mice (CD-1 strain) were fed purified diets containing 5% stripped lard or corn oil and kept in chambers supplied with air filtered free of airborne bacteria. Vitamin E was fed at 0, 10.5 or 105 mg dl-α-tocopheryl acetate/kg diet. Dietary fat and vitamin E (0 or 10.5 mg/kg) had no significant effects on the lung levels of triacylglycerol (TG) or phospholipid (PL) molecular species through 4 weeks of intake. Alterations in lung fatty acid composition were followed through 6 weeks of intake at 0, 10.5 and 105 mg vitamin E/kg diet. Vitamin E, at all levels of supplementation, had no significant effect on mouse lung fatty acid composition. Saturated fatty acids on the lung also showed little alteration by diet, but feeding the lard diet significantly elevated oleic and palmitoleic acids. In mice fed the corn oil diet the levels of linoleic acid (18:2) were twice those of lard-fed mice, and arachidonic acid (20:4) was elevated by 15.8%. The diet elevated the mean peroxidizability index (PI) of lung tissue in corn oil-fed mice.

ISOMERIZATION OF THE DOUBLE BONDS OF A CONJUGATED FATTY ACID DURING β-OXIDATION. L.M. Du Plessis and N. Grobbelaar (Natl. Food Res. Inst., Council for Sci. and Industrial Res., P.O. Box 395 an dDept. of Botany, Univ. of Pretoria, Pretoria 0001, Republic of South Africa) *Lipids 14*(11), 943-8 (1979). The β-oxidation of an unsaturated fatty acid containing conjugated double bonds at odd-numbered carbon atoms has not previously been studied. It is, therefore, not clear whether, during the β-oxidation of such an acid, the double bonds will be isomerized by enoyl-CoA isomerase (Δ^3-Δ^2-enoyl-CoA isomerase) with the loss or retention of its conjugated nature. To investigate the problem, (E,E)-3,5-octadienoyl-CoA was synthesized for use as a model substrate, and enoyl-CoA isomerase was partially purified from bovine liver. The isomerization was followed by spectrophotometric and gas liquid chromatographic methods, and the results suggested

that the isomerization of the model substrate proceeded with retention of a conjugated double bond system. It is, therefore, proposed that the β-oxidation intermediate of α-eleostearic acid ($\Delta^{9,11,13}$ fatty acid) will also isomerize with retention of the conjugated double bond system.

EFFECTS OF FEEDING CHOLIC ACID AND CHENODEOXYCHOLIC ACID ON CHOLESTEROL ABSORPTION AND HEPATIC SECRETION OF BILIARY LIPIDS IN MAN. K. Einarsson and S.M. Grundy (Dept. of Med., Veterans Admin. Med. Center, and Univ. of Calif., Sandiego, CA 92161) *J. Lipid Res. 21*(1), 23-34 (1980). Chenodeoxycholic acid (CDCA), in contrast to cholic acid (CA), reduces cholesterol saturation of bile. The mechanisms for these differences were the object of this study. Investigations were carried out in nine white men; three nonobese subjects and one obese subject were fed a weight-maintenance diet, and five obese patients had a reduced caloric intake for weight reduction. They were given a daily dose of 750-1000 mg CDCA or CA for one month after which they received the other bile acid for another month. The effects of both bile acids on bile acid pool size and hepatic secretion rates of biliary lipids were determined. Total bile acid pools were increased markedly by both CDCA and CA, but to about the same degree for each. We observed a linear relationship between the secretion rates of bile acids and cholesterol, cholesterol and phospholipids, and bile acids during both treatment periods. However, cholesterol:phospholipid ratios were higher during CA therapy than with CDCA, and they increased still more during fasting in most CA-treated subjects, but not with CDCA. This indicated that there is a marked difference between the two bile acids in the degree of coupling of cholesterol and phospholipids in fasting.

SKELETAL MUSCLE TRIACYLGLYCEROL IN THE RAT: METHODS FOR SAMPLING AND MEASUREMENT, AND STUDIES OF BIOLOGICAL VARIABILITY. K.N. Frayn and P.F. Maycock (Med. Res. Council Trauma Unit, Stopford Bldg., Univ. of Manchester, Oxford Road, Manchester M13 9PT U.K.) *J. Lipid Res. 21*(1), 139-44 (1980). Previously reported concentrations of triacylglycerol in skeletal muscle have shown high coefficients of variation, and there has been large differences between mean concentrations reported in a given muscle. Conditions for sampling and measurement were therefore investigated. Samples were best taken under anesthesia as breakdown of triacylglycerol was rapid after decapitation. Silicic acid was preferable to zeolite for removal of phospholipids although either agent could interfere with the estimation. Even with apparently reliable methods, a high variability was found in any one muscle and there were large differences between muscles. It is unlikely that the variability was due to contamination with adipose tissue. Concentrations of glycogen and phospholipid were much less variable. Although the store of triacylglycerol in skeletal muscle in caloric terms was found to be 2-18 times greater than that of glycogen, the variability found is likely to hamper studies of its metabolic role.

THE EFFECT OF ORAL CONTRACEPTIVES ON MONONUCLEAR CELL CHOLESTERYL ESTER HYDROLASE ACTIVITY. F.C. Hagemenas, F.M. Yatsu and L.C. Manaugh (Univ. of Oregon Health Sci. Center, Dept. of Neurology, 3181 S.W. Sam Jackson Park Rd., Portland, OR 97201) *Lipids 15*(1), 39-44 (1980). The influence of sex steroids on mononuclear cell cholesteryl ester hydrolase (CEH) activity in premenopausal women and women on combined estrogen-progestin oral contraceptives has been studied. In addition, plasma and mononuclear cell cholesterol and esters were measured along with plasma estrogen and progesterone levels. Mononuclear cell CEH activity in control women is highest on Day 20 of their menstrual cycle. The control women had significantly higher CEH activities than women on oral contraceptives. Plasma esters were higher in the oral contraceptive group. However, in mononuclear cells, free cholesterol but not cholesteryl esters were higher in women on oral contraceptives.

LIPOPROTEIN-CHOLESTEROL DISTRIBUTIONS IN SELECTED NORTH AMERICAN POPULATIONS: THE LIPID RESEARCH CLINICS PROGRAM PREVALENCE STUDY. G. Heiss, I. Tamir, C.E. Davis, H.A. Tyroler, B.M. Rifkind, G. Schonfeld, D. Jacobs and I.D. Frantz (Depts. of Biostatistics and Epidemiology, School of Public Health, Univ. of N. Carolina, Chapel Hill, NC) *Circulation 61*(2), 302-15 (1980). Total plasma lipid and lipoprotein-cholesterol distributions of 4756 white men and women ages 20-59 years are presented. Measurements were obtained during the visit-2 survey of the Lipid Research Clinics Program Prevalence Study and correspond to a 15% random sample of 35,748 white adults screened during the LRC visit-1 survey. Standardized examinations were carried out by 10 North American clinics using a common protocol, on diverse target populations chosen to include a range of sociodemographic characteristics. Age-specific means, medians and selected percentiles are given by sex, with stratification on exogenous sex hormone use in women. Women taking sex hormone preparations have higher total cholesterol than women not on hormones between ages 20-50 years, and higher LDL cholesterol between ages 20-40 years. From the third age decade onward, HDL cholesterol levels are progressively higher in women taking hormones than in women not taking sex hormones. Compared with women not taking exogenous sex hormones, women taking hormones have higher total plasma triglyceride values at all ages from 20-59 years. VLDL cholesterol values are higher in women on hormones compared with nonusers of hormones younger than 55 years.

END PRODUCT SPECIFICITY OF TRIACYLGLYCEROL LIPASES FROM INTESTINE, FATY BODY, MUSCLE AND HAEMOLYMPH OF THE AMERICAN COCKROACH, *PERIPLANETA AMERICANA* L. A.G.D. Hoffman and R.G.H. Downer (Dept. of Bio., Univ. of Waterloo, Waterloo, Ontario, Canada N2L 3G1) *Lipids 14*(11), 893-9 (1979). The triacylglycerol-hydrolyzing capacity of tissue homogenates has been investigated for midgut, fat body, thoracic musculature and haemolymph of the American cockroach, *Periplaneta americana*. The greatest lipolytic activity was demonstrated in midgut homogenates with decreasing levels of activity present in fat body, muscle and haemolymph. Comparison of the lipolytic products resulting from triacylglycerol hydrolysis indicates that midgut homogenates effect the production of *sn*-2-monoacylglycerols and free fatty acids, whereas the other tissues that were examined favor the accumulation of diacylglycerols. Stereospecific analysis of the diacylglycerol products of triacylglycerol hydrolysis demonstrated that the lipolytic activities of midgut and muscle homogenates result in the production of a racemic mixture of the *sn*-1, 2- and *sn*-2, 3-enantiomers, but the fat body and haemolymph show a preference for the accumulation of the *sn*-1, 2-isomer.

DIETARY REGULATION OF HEPATIC 3-HYDROXY-3-METHYLGLUTARYL-CoA REDUCTASE AND CHOLESTEROL SYNTHETIC ACTIVITIES IN FASTED-REFED RATS. T.Ide, Y. Gotoh and M. Sugano (Lab. of Nutr. Chem., Dept. of Food Science and Tech., Kyushu Univ. School of Agriculture, Fukuoka 812, Japan) *J. Nutr. 110*(1), 158-68 (1980). Effects of dietary cholesterol, β-sitosterol and cholestyramine on hepatic HMG-CoA reductase activity and sterogenesis were examined in male rats refed different types and amounts of fats for 3 days after fasting 2 days. Safflower oil (10%) decreased reductase and sterogenic activities more than saturated fat or low fat. Reductase activity and sterogenesis decreased as dietary cholesterol increased; this was not influenced by the type of dietary fat. Hepatic cholesterol and enterohepatically circulating cholesterol may not be critical factors in regulating HMG-CoA reductase in fasted-refed rats. Rather, the quantity of bile acids fluxed to the liver appears to influence the reductase activity in this situation. However, analyses of fecal acidic steroids provided no evidence for a relationship between HMG-CoA reductase activity, bile acid metabolism and dietary fat.

EFFECTS OF FAT CONTENT IN THE DIET ON HEPATIC PEROXISOMES OF THE RAT. H. Ishii, N. Fukumori, S. Horie and T. Suga (Dept. of Clin. Biochem., Tokyo College of Pharmacy, 1432-1 Horinouchi, Hachioji, Tokyo 192-03, Japan) *Biochim. Biophys. Acta 617*(1), 1-11 (1980). Effects of fat content in the diet on rat liver peroxisomes was examined. It appears that the high-fat diet-induced increase in the activity of carnitine palmitoyltransferase is a result of the raised activity of this enzyme in mitochondria only while the apparent high activity reflects stimulation of carnitine palmitoyltransferase is a result of the raised activity of this enzyme in mitochondria only while the apparent high activity reflects stimulation of carnitine acetyltransferase in all the subcellular fractions. Another notable effect of the high-fat diet was remarkable increase in the quantity of a peroxisome-associated polypeptide which was separable by sodium dodecyl sulfate polyacrylamide gel electrophoresis. It is noteworthy that this effect of the high-fat diet resemble that of clofibrate. If the diet was deprived of fat, however, this polypeptide species, with an estimated molecular weight of 80,000, decreased to a level slightly lower than normal. On the basis of the electron micrographic criteria, the high-fat diet provoked a marked proliferation of hepatic peroxisomes.

THE IN VIVO LABELING WITH ACETATE AND PALMITATE OF LUNG PHOSPHOLIPIDS FROM DEVELOPING AND ADULT RABBITS. A. Jobe, M. Ikegami and I. Sarton-Miller (Fetal-Maternal Res. Lab., Los Angeles County Harbor-UCLA Med. Center, 1000 W. Carson, Bldg. A-17, Torrance, CA 90509) *Biochim. Biophys. Acta 617*(1), 65-75 (1980). The labeling with radiolabeled acetate and palmitate of lung, microsomes isolated from lung, and surfactant phospholipids from adult, 3-day-old, and newborn rabbits was studied. The half-life of phosphatidylcholine from lung and microsomal fractions was shorter when labeled with acetate than when labeled with palmitate. Half-time values similarly measured for phosphatidylglycerol, phosphatidylinositol or phosphatidylethanolamine were not different for the two labels. Acetate and

palmitate-labeled phospholipids appeared in the surfactant fraction with similar accumulation curves. The relative specific activities of acetate-labeled phosphatidylcholine from adult, 3-day-old, and newborn rabbits, respectively, were 1.30, 1.86 and 1.77 times those measured for the palmitate label. Surfactant phosphatidylinositol and phosphatidylethanolamine from 3-day-old animals similarly were labeled preferentially with acetate. However, phosphatidylglycerol purified from the surfactant fraction contained equivalent relative amounts of the acetate and palmitate labels in 3-day-old and adult rabbits. These results suggest that the type II pneumocyte may use acetate preferentially for the synthesis of palmitic acid which then is incorporated into surfactant phospholipids.

EFFECT OF AGING AND CELLULARITY ON LIPOLYSIS IN ISOLATED MOUSE FAT CELLS. S.R. Jolly, Y.B. Lombardo, J.J. Lech and L.A. Menahan (Med. College of Wisconsin, Dept. of Pharmacology and Toxicology, Milwaukee, WI 53226) *J. Lipid Res. 21*(1), 44-52 (1980). The effects of age and cellularity on lipolysis have been investigated in isolated epididymal fat cells from both Swiss albino mice and Sprague-Dawley rats. No significant lipolytic response to glucagon could be demonstrated with adipocytes from either young or old mice, while glycerol output was increased by this hormone with fat cells from young rats. Larger adipocytes from older mice showed significantly greater isoproterenol-stimulated lipolysis than those from younger animals if the glycerol output was expressed on a per cell basis. However, the lipolytic response per cell appeared to be equivalent in young and old rat adipocytes with either isoproterenol or ACTH-(1-24). In a complete aging study, relationships between body weight, epididymal fat pad weight and cellularity were examined covering the life span of the mouse. ACTH-(1-24)- and dibutyryl cyclic AMP-stimulated lipolysis increased with age and cell size but fell at senescence when adipocyte size diminished. Although an effect of aging per se cannot be ruled out with the experimental techniques used in the present study, a dominant influence of adipocyte size on the lipolytic process was demonstrated.

SUPPRESSION OF SYNTHESIS AND ESTERIFICATION OF CHOLESTEROL AND STIMULATION OF LOW DENSITY LIPOPROTEIN RECEPTOR ACTIVITY BY POLYOXYETHYLATED CHOLESTEROL IN CULTURED HUMAN FIBROBLASTS. C.H. Fung and A.K. Khachadurian (Depts. of Med. and Biochem., Coll. of Med. and Dentistry of New Jersey—Rutgers Med. School, Piscataway, NJ 08854) *J. Biol. Chem. 255*(2), 676-80 (1980). In cultured skin fibroblasts from normal and homozygous familial hypercholesterolemic subjects, a water-soluble polyoxyethylated derivative of cholesterol suppresses the incorporation of [2-^{14}C] acetate into cholesterol and decreases the activity of 3-hydroxy-3-methylglutaryl coenzyme A reductase, the rate-limiting enzyme of cholesterol synthesis. The effect of this compound on low density lipoprotein (LDL) receptor-mediated activities (binding, internalization, and degradation of LDL) and on cholesterol ester formation was compared to that of LDL and 25-hydroxycholesterol. In normal fibroblasts preincubated in lipoprotein-dificient serum, LDL or 25-hydroxycholesterol decreased cholesterol synthesis and LDL receptor activity and increased cholesterol ester formation. In contrast, polyoxyethylated cholesterol stimulated LDL receptor activity, of acyl-CoA:cholesterol acyltransferase in cell extracts. Polyoxyethylated cholesterol had no effect on the low level of LDL receptor activity of homozygous hypercholesterolemic fibroblasts but stimulated the half-normal activity of heterozygous cells.

INHIBITION OF CHOLESTEROL SYNTHESIS IN MAMMARY TISSUE, LUNG, AND KIDNEY FOLLOWING CHOLESTEROL FEEDING IN THE LACTATING RAT. P.M. Kris-Etherton and I.D. Frantz, Jr. (Pennsylvania State Univ., College of Human Dev., Nutr. Program, Univ. Park, PA 16802) *Lipids 14*(11), 907-12 (1979). Pregnant rats were randomly allocated to one of 3 experimental dietary groups: Group 1 - 15.5% butter, 2% cholesterol, 0.78% sodium cholate purified diet; Group 2 - standard rat diet with the addition of 10% lard and 2% cholesterol, and Group 3 - standard rat diet. Plasma and milk cholesterol at 10 days postpartum were significantly elevated in dams fed exogenous cholesterol. Our data, for the first time, demonstrate that cholesterol synthesis in lactating rat mammary tissue is suppressed following cholesterol feeding. In a second experiment, the rate of incorporation of [1-^{14}C] acetate into digitonin-precipitable sterols in kidney and lung tissue of Group 1 rats was suppressed; however, this response was not as marked as that observed in lactating mammary tissue. The concentration of cholesterol in kidney and lung was greater than controls. These results suggest that extrahepatic inhibition of cholesterol synthesis exists in the rat with a concomitant increase in tissue cholesterol.

QUANTIFICATION OF LOW DENSITY LIPOPROTEIN BINDING AND CHOLESTEROL ACCUMULATION BY SINGLE HUMAN FIBROBLASTS USING FLUORESCENCE MICROSCOPY. H.S. Kruth and M. Vaughan (Lab. of Cellular Metabolism, Natl. Heart, Lung, and Blood Inst., Natl. Inst. of Health, Bethesda, MD 20205) *J. Lipid Res. 21*(1), 123-30 (1980). Using fluorescence microscopy, we have quantified low density lipoprotein (LDL) binding by indirect immunofluorescence and cellular cholesterol with the fluorescent sterol-binding polyene, fillipin, in individual cultured human fibroblasts from normal subjects and from patients with heterozygous and homozygous familial hypercholesterolemia. LDL binding by fibroblasts from heterozygous patients was about 40% of that of the normal cells, and cholesterol accumulation upon incubation with LDL was decreased to a similar degree. Most fibroblasts from homozygous patients bound no detectable LDL and only rare cells demonstrated any accumulation of cholesterol after incubation with LDL.

LIPOPROTEINS, FIBRINOLYTIC ACTIVITY AND FIBRINOGEN IN PATIENTS WITH OCCLUSIVE VASCULAR DISEASE AND IN HEALTHY SUBJECTS WITH A FAMILY HISTORY OF HEART ATTACKS. I. Lipinska, B. Lipinski and V. Gurewich (Vascular Lab., St. Elizabeth's Hosp., Dept. of Med. and Res., Tufts Univ. Schl. of Med. 736 Cambridge Street, Boston, MA 02135) *Artery 6*(3), 254-64 (1979). Plasma high density lipoprotein (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) were determined as a percent of the total lipoprotein by polyacrylamide gel (PAG) electrophoresis. The HDL fraction was highly significantly decreased and the VLDL fraction increased in patients with either peripheral vascular or coronary disease compared with age and sex matched controls. Healthy subjects with a positive family hisotry (+FH) of coronary disease showed identical abnormalities in their lipoproteins as the patients. No significant differences in LDL were found between the controls and any of the three test groups. The findings when compared with those published using precipitation techniques for measuring lipoprotein cholesterol suggest that PAG elctrophoresis may be a better discriminator between normal subjects and those with coronary or peripheral vascular disease. Fibrinolytic activity was significantly depressed in the patients and in the +FH subjects whereas an elevated fibrinogen was found only in the patients.

TRANSFER OF CHOLESTEROL ESTERS BETWEEN HUMAN HIGH DENSITY LIPOPROTEINS AND TRIGLYCERIDE-RICH LIPOPROTEINS CONTROLLED BY A PLASMA PROTEIN FACTOR. Y.L. Marcel, C. Vezina, B. Teng and A. Sniderman (Lab. of Lipoprotein Metabolism, Clin. Res. Inst. of Montreal, Montreal, Quebec, Canada) *Atherosclerosis 35*(2), 127-33 (1980). A protein factor from the d > 1.25 g/ml plasma fraction controls the transfer of cholesterol esters between high density lipoproteins and very low density lipoproteins. This transfer is time-dependent, and follows saturation kinetics relative to the concentration ratio of acceptor to donor lipoproteins. Although the process is reversible, the transfer rates are faster from high density to very low density lipoproteins and result in a net increase of cholesterol esters in the very low density lipoproteins. Under the same conditions, there is also a net mass transfer of cholesterol esters from high density lipoproteins to chylomicrons. This constitutes the first demonstration of cholesterol ester mass transfer between isolated lipoproteins and contrasts with the equilibrium of cholesterol esters between HDL and LDL which we previously demonstrated. It is concluded that cholesterol ester formation in high density lipoproteins and their transfer to triglyceride-rich lipoproteins may be closely coupled.

PHOSPHOLIPID COMPOSITION AND ULTRASTRUCTURE OF A549 CELLS AND OTHER CULTURED PULMONARY EPITHELIAL CELLS OF PRESUMED TYPE II CELL ORIGIN. R.J. Mason and M.C. Williams (Cardiovascular Res. Inst., Dept. of Med. and Anatomy, Univ. of California Schl. of Med., San Francisco, CA 94143) *Biochem. Biophys. Acta 617*(1), 36-50 (1980). In order to assess the usefulness of A549, L-2, and AK-D cell lines as model systems for alveolar type II cells, we compared their phospholipid composition to that of fibroblasts grown under similar conditions. The percentage of disaturated phosphatidylcholine and phosphatidylglycerol, key phospholipids of purified surface-active material, was the same in epithelial cells and fibroblasts. When A549 cells were maintained in serum-free media for two days, ultrastructural examination showed an increase in cytoplasmic lamellar inclusions but there was no change in the percentage of disaturated phosphatidylcholine or phosphatidylglycerol. Because the lipid content of these cultured cells was very different from that of freshly isolated rat type II cells, we conclude that their suitability as model cell systems for type II cells is questionable.

THE ROLE OF THE DE NOVO SYNTHETIC PATHWAY IN FORMING MOLECULAR SPECIES OF PHOSPHOLIPIDS IN RESTING LYMPHOCYTES FROM HUMAN TONSILS. K. Mori-

moto and H. Kanoh (Depts. of Otolaryngology and Biochem., Sapporo Med. Schl., West-17, South-1, Chuo-ku, Sapporo, 060 Japan) *Biochim. Biophys. Acta 617*(1), 51-64 (1980). The de novo synthesis of phospholipids occurring in lymphocytes was estimated to be physiologically important, in particular for supplying dipalmitoylglycerophosphocholine and highly unsaturated phosphatidylethanolamine. It was also suggested that diacylglycerol(s) not originating from glycerophosphate is (are) involved in the synthesis of tetraenoic phospholipids. From radioactive palmitic and oleic acids were actively synthesized dipalmitoyl, dioleoyl and 1-oleoyl, 2-palmitoyl species of diacylglycerol. The mode of diacylglycerol synthesis was reflected upon phosphatidylcholine formation. Radioactive linoleic and arachidonic acids were incorporated predominantly into the C-1 position of diacylglycerol, whereas the majority of the formed phospholipids was of 2-linoleoyl or 2-arachidonoyl species. These results indicated that the de novo synthetic pathway operating in lymphocytes is primarily responsible for forming 1-unsaturated type of phospholipids. The synthesis of 1-saturated, 2-unsaturated species appeared to be due to remodeling of the once-formed phospholipids.

REACTION BETWEEN PEROXIDIZED PHOSPHOLIPID AND PROTEIN: II. MOLECULAR WEIGHT AND PHOSPHORUS CONTENT OF ALBUMIN AFTER REACTION WITH PEROXIDIZED CARDIOLIPIN. H. Nielsen (Institute of Med. Biochem., Univ. of Aarhus, Aarhus, Denmark) *Lipids 14*(11), 900-6 (1979). Peroxidized cardiolipin (diphosphatidylglycerol) reacts covalently with albumin. Incubation of albumin with increasing amounts of peroxidized cardiolipin produces a gradual increase in molecular size. Incubation with a small amount of peroxidized cardiolipin (molar ratio of cardiolipin/albumin 21) produces a mixture of complexes that differs considerably with respect to the number of cardiolipin molecules bound per molecule of albumin. With larger amounts of peroxidized cardiolipin (molar ratios of cardiolipin/albumin 54 and 114), the complexes formed seem to be of a more uniform type since the numbers of cardiolipin molecules bound per molecule of albumin are similar. No polymerization occurs for reactions in which up to at least 15 moles of cardiolipin have become bound per mole of albumin, and 20-25 moles may be bound with only very little polymerization. Only when the ratio of peroxidized cardiolipin to albumin was increased to a high value of 314 did polymerization occur. The present findings show that extensive covalent binding of peroxidized cardiolipin to albumin can occur without intermolecular crosslinking of the protein.

RAPID REGULATION OF THE ACTIVITY OF THE LOW DENSITY LIPOPROTEIN RECEPTOR OF CULTURED HUMAN FIBROBLASTS. J.F. Oram, J.J. Albers and E.L. Bierman (Div. of Metabolism and Endocrinology and the Northwest Lipid Res. Clinic, Dept. of Med., Univ. of Washington School of Med., Seattle, Washington 98195) *J. Biol. Chem. 255*(2), 475-85 (1980). Regulation of low density lipoprotein (LDL) receptor activity of cultured human skin fibroblasts was studied by measuring 4 degrees C binding of ^{125}I-LDL after cells were incubated at 37 degrees C with medium containing varying lipoprotein and serum compositions. When cells grown on medium containing 10% human whole serum were exposed to medium containing 10% human lipoprotein-deficient serum, LDL receptor activity increased within 4 h and then decreased between 12 and 24 h. The direct addition of fresh lipoprotein-deficient serum to the medium partially reversed the secondary decrease in LDL receptor activity that followed the initial acute increase. Frequent medium changes enhanced the long term rate of activation of the receptor, depleted the cell of cholesterol, and increased the rate of sterol synthesis. These results suggest that regulation of the LDL receptor activity is a potentially

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rapid process that can respond acutely to changes in the rate of cholesterol flux into or out of the cell.

REDUCTION OF ESSENTIAL FATTY ACID DEFICIENCY IN RATS FED A LOW IRON FAT FREE DIET. G. Ananda Rao, M. Manix and E.C. Larkin (Hematology Res. Lab., Veterans Admin. Med. Center, Martinez, CA 94553) *Lipids 15*(1), 55-60 (1980). Young male rats were fed ad libitum for 8 weeks a low iron fat-free (FF-Fe) diet or a fat-free diet supplemented with iron (FF+Fe). The relative levels of 16:1 to 16:0 and 18:1 to 18:0 in the total fatty acids of liver and other tissues (plasma, erythrocytes and intestinal mucosa) were considerably decreased because of a lack of dietary iron. In rats fed the FF-Fe diet, the levels of essential fatty acids (18:2ω6 + 20:4ω6) in tissues were 2- to 3-fold greater than in the corresponding tissues of rats fed the FF+Fe diet. Eicosatrienoic acid (20:3ω9) levels in tissue lipids from rats fed the FF+Fe diet were high (8-16%), whereas they were low (2-5%) in the case of the animals fed the FF-Fe diet. The proportion of 20:4 in total fatty acids of tissues was 2- to 3-fold greater in rats fed the FF-Fe diet than when they were fed the FF+Fe diet. Therefore, the relative levels of 20:3ω9/20:4ω6 varied from 1-2.9 in tissue lipids of rats fed the FF+Fe diet, while it varied only from 0.2-0.3 in animals fed the FF-Fe diet. These results suggest that a lack of dietary iron may reduce the synthesis of 16:1, 18:1, 20:3 and 20:4 and the metabolism of 20:4.

SERUM LIPIDS IN SUCKLING AND POST-WEANLING IRON-DEFICIENT RATS. A.R. Sherman (Dept. of Foods and Nutr. Univ. of Ill., Urbana, IL 61801) *Lipids 14*(11), 888-92 (1979). Serum lipids were studied in iron-deficient and control rats during suckling and after weaning at 21, 30, and 60 days of age. Diets providing 5 or 307 ppm iron were fed to dams and their offspring during gestation, lactation, and after weaning. Rats on the deficient diet throughout the experimental period developed a hyperlipidemia characterized by elevated triglycerides, cholesterol, and phospholipids which was present at 21, 30, and 60 days. Control pups weaned to the deficient diet developed anemia at 30 days of age and hypertriglyceridemia at 60 days of age. Repletion of deficient rats with iron after weaning caused a rapid decline in serum lipid levels after only 9 days on the control diet. The hyperlipidemia of iron deficiency thus appears to be reversible with iron supplementation. The time required to develop hypertriglyceridemia in iron deficiency is longer postweaning than during suckling.

PUBLICATIONS ABSTRACTED

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