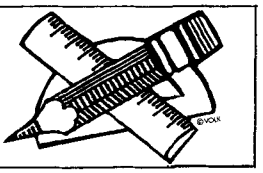
Abstracts



• Drying Oils and Paints

ALKYDS FROM ORANGE SEED OIL. S.M. Khandelwal and B.B. Gogte. *Paintindia* 26(9), 15–8 (1976). Short, medium and long oil alkyds were prepared by fusion methods from orange seed oil. A kinetic study was made on the short and medium oil formulations and the film properties were compared with those of standard linseed oil alkyds. The films were found to similar to the linseed oil derivs. and could be improved by replacing 10% of the phthalic anhydride with maleic anhydride. (World Surface Coatings Abs. No. 421)

MODIFICATION OF EPOXIDISED OILS WITH AMINES. II. MODIFICATION OF EPOXIDISED LINSEED OIL WITH AROMATIC AMINES. B.M. Badran, A.A. Yehia and E.M. Abdel-Bary. *Europ. Polym. J.* 13, 155–7 (1977). To assist in the elucidation of the mechanism of curing of epoxy polymers with amines, the reactions of epoxidised linseed oil with aniline, p-chloroaniline and p-toluidine have been followed. The reaction rate was found to increase with the basicity of the amine. (World Surface Coatings Abs. No. 421)

STUDIES ON FILMS OF JAPANESE LACQUER. VI. INFLUENCE OF ADDITIONS OF SOYBEAN, LINSEED AND JAPANESE TUNG OILS. T. Kenjo and K. Mihara. *J. Jap. Soc. Col. Mat.* 49, 600–4, (1976). The hardening process of films of Japanese lacquer mixed with soyabean oil, linseed oil and tung oil was investigated and changes in properties of the films during hardening were evaluated by comparison with those of Japanese lacquer films mixed with methyl oleate, methyl linoleate and methyl linolenate. The results obtained showed that: hydrogen bonding existed between the catecholic hydroxyl group of urushiol and the carbonyl group of the oil; the IR absorption band of the oil at 1160 reciprocal cm. shifted to 1185 reciprocal cm. when mixed with Japanese lacquer; of the three oils used, admixture of linseed oil with Japanese lacquer improved gloss without affecting hardening and other properties of the film. (World Surface Coatings Abs. No. 422)

STUDIES ON FILMS OF JAPANESE LACQUER. VII. INFLUENCE OF OIL-MODIFIED RESINS ON HARDENING OF LACQUER FILMS. T. Kenjo and K. Mihara *J. Jap Soc. Col. Mat.* 49, 605–11 (1976). Films obtained from Japanese lacquer mixed with alkyd resin modified with castor oil, coconut oil, soyabean oil, dehydrated castor oil, safflower oil and linseed oil were studied and it was found that, although the addition of alkyd resins in general markedly retarded drying of Japanese lacquer, when the lacquer was mixed with nondrying oil- or semi-drying oil-modified alkyds drying was faster than when the lacquer was mixed with drying oil-modified alkyd resin.

STUDIES ON FILMS OF JAPANESE LACQUER. VIII. HARDENING PROCESS OF JAPANESE, THAI, BURMESE AND FORMOSAN LACQUER AND SOME PROPERTIES OF THE HARDENED FILMS. T. Kenjo and K. Mihara. *J. Jap. Soc. Col. Mat.* 49, 639–42 (1976). Japanese, Thai, Burmese and Formosan lacquer samples were investigated for their hardening and for some properties of the hardened films. It was found that the change in IR spectra in the course of hardening of each of the four films differed in accordance with the type of substituted catechol contained in the samples (urushiol, thitsiol or laccol). The values for tack-free time, based on IR spectra, were 0.3 day for Japanese lacquer, 2 days for Formosan lacquer, 13 days for Burmese lacquer and 15 days for Thai lacquer. Japanese lacquer exhibited the greatest heat resistance, the thermal properties of the other lacquers being analogous to those of Japanese lacquer containing 20–40% oil-modified alkyd resin.

A METHOD TO ELUCIDATE THE STRUCTURE OF MALEINIZED LINSEED OIL. J.T.K. Woo and J.M. Evans (Glidden-Durkee, Div. SCM Corp.), *J. Coatings Technol.* 49(630), 42–50 (1977). An attempt to elucidate the structure of maleinized linseed oil using infrared, ultraviolet, proton nuclear magnetic resonance (^{1}H NMR) and carbon-13 nuclear magnetic resonance (^{13}C NMR) spectroscopy has been made. While ^{1}H NMR spectroscopy gave only qualitative data for maleinized linseed oil, ^{13}C NMR spectroscopy proved to be an exceptionally good tool for studying this complex structure. The data obtained agrees with the generally accepted mechanisms of linseed oil maleinization. Maleinization experimentation and spectral analyses are included.

USE OF SORBITOL AND XYLITOL FOR THE SYNTHESIS OF ALKYD RESINS. K. Hajek. *Farbe + Lack* 83(9), 798–804 (1977). As a polyol for the manufacture of alkyd resins mostly glycerol or pentaerythritol is used, in a lesser degree trimethylol propane or trimethylol ethane. In this work information is given about the use of the polyols sorbitol and xylitol.

• Fats and Oils

MASS SPECTROMETRY IN STRUCTURAL AND STEREOCHEMICAL PROBLEMS. CHARACTERISTIC FRAGMENTATIONS OF CHOLESTEROL ACETATE. L.G. Partridge and C. Djerassi (Dept. of Chem., Stanford Univ., Stanford, CA). *J. Org. Chem.* 42, 2799–805 (1977). Through the use of extensive deuterium labeling, the structure and origin of the diagnostic fragments of cholesterol acetate have been clarified. Deuterium labels at carbon atoms 9, 11, 12, 14 and 19 which have not previously been reported for cholesterol itself provide information on the genesis of the characteristic M^+-168(*m/e* 260) and M^+-181(*m/e* 247) fragments of the acetate as well as on the more common loss of acetic acid (*m/e* 368), ring D fragmentation (*m/e* 213), and the proposed retro-Diels-Adler fragment (*m/e* 120). The mass spectra of cholesterol acetate and the free sterol are compared, and further information is provided on the fragments of mass 247, 231, and 213 in cholesterol.

COMPOSITION OF HYDROXY ACIDS FROM TALL OIL. H. Berbalk, G. Pieh, K. Eichinger and R. Esmail-Nad. *Holzforsch. Holzverwert.* 28(3), 66–8 (1976). The crude acids were separated into four fractions based on solubility in ether and in 4N sodium hydroxide. Two further fractions were obtained by methylating the alkalisoluble fraction and extracting the methylation mixture with alkali. It was found, by the use of GLC and TLC, that the hydroxy acids contained 21% oleic or linoleic acids, 10% abietic acid, and traces of acetovanillone. Pimaric acid was not found but the substance classes sterols, higher phenols, and carbonyl compounds were detected. (World Surface Coatings Abs. No. 421)

ERUCIC ACID IN EDIBLE FATS AND OILS: A COLLABORATIVE STUDY ON DETERMINATION BY OPEN-TUBULAR (CAPILLARY) GAS-LIQUID CHROMATOGRAPHY. R.G. ACKMAN, S.M. BARLOW and I.F. Duthie (Fisheries and Environment Canada, Technology Branch, Halifax Laboratory, 1707 Lower Water Street, Halifax, Nova Scotia, B3J 2R3, Canada). *J. Chromatogr. Sci.* 15, 290, (1977). An open-tubular (capillary) column gas-liquid chromatographic method for the determination of the specific isomer of docosenoic acid known as erucic acid (*cis*-docos-13-enoic) in the presence of other docosenoic acid isomers present in partially hydrogenated marine oils has been evaluated collaboratively. With wall-coated columns and the liquid phase SILAR-5CP, nine laboratories successfully analysed mixtures of partially hydrogenated marine oils, corn oil and rapeseed oil with a nominal content of 10% erucic acid, compatible with the regulations of the European Economic Community.

THE INFLUENCE OF THE QUALITY OF THE SEEDS ON THE ACID VALUE OF THE SUNFLOWERSEED OIL. V.G. Svetov. *Maslo-zhir. Promst.* 1976(9), 15–7. Immediately after harvest, the quality of sunflower is determined by the presence of healthy seeds, seeds affected by fungous agents, and seeds deteriorated by the bugs, and by the ratio between these. The increase of the acid value is influenced by the seeds affected by the pathogenic fungous agents. Having in mind that the seeds were affected in the field long before the harvest, it is im-

portant to do all possible to reduce the time of harvest of the sunflower. (Rev. Fr. Corps Gras)

SYNTHESIS OF THE ESTER OF CETYL ALCOHOL AND OF MALIC ACID. A.P. Netchaev et al. *Maslo-zhir. Promst.* **1976**(9), 19–21. The authors synthesized cetyl malate under different conditions: without solvent and in the medium of 1,4-dioxane. In the absence of solvent, the synthesis is done at 130C, with intensive mixing in a stream of nitrogen. In the medium of 1,4-dioxane, the reaction is carried out at 100C, in the presence of a 36% solution of hydrochloric acid. The reaction product consists of monocetylmalate, dicetylmalate, and unreacted cetyl alcohol. The elimination of water as an azeotrope with dioxane offers the possibility of increasing the total yields of esters with a relatively high content of monoester. The synthetic products exert a favorable action on the quality of the margarine and of the bread. (Rev. Fr. Corps Gras)

PURIFICATION OF GLYCERINE SOLUTIONS WITH THE USE OF SEMIPERMEABLE CELLULOSE ACETATE MEMBRANES. V.M. Makhigna et al. *Maslo-zhir. Promst.* **1976**(9), 21–5. The possibility of the use of ultrafiltration on semipermeable cellulose acetate membranes for elimination of some organic compounds from glycerine solutions has been studied. These examinations have been done with glycerine solutions obtained in the production of toilet soap from neutral fatty materials. The best purification was realized with the membranes having pores whose dimensions were 5.7 nm. The influence of the degree of purification of glycerine solutions and the penetrability of the glycerine into the membrane on yield of the installation was also studied. (Rev. Fr. Corps Gras)

DECOLORIZATION OF THE POLYOXYETHYLENIC DERIVATIVES OF MONOETHANOLAMINES OF FATTY ACIDS. J. Plucinski et al. TSPK-Pollena **20**, 233–40 (1976). The colorization of these derivatives is a function, not only of the kind of raw material submitted to ethoxylation, but also of the process of neutralization of the product of ethoxylation, i.e. of the final pH and of the type of acid used. The lower the pH value, the darker the color of the product is. Among the six acids, the best results were obtained with the use of oxalic and phosphoric acids. The lasting effect of decolorization is obtained with the use of bleaching agents having reduction properties, such as the sodium pyrosulfite and the sulphuric anhydride. (Rev. Fr. Corps Gras)

THE SCISSION OF THE FATTY MATERIALS REGARDING THE YIELD OF GLYCERINE. H. Sikorski et al. *TSPK-Pollena* **20**, 241–6 (1976). On the basis of the probability calculation, there exists a possibility of estimating the composition of the product after scission of the fatty materials and the yield of glycerine. In the product of scission, beside the glycerine and the free fatty acids, an important quantity of glycerides and in particular monoglycerides appears. Some important losses of glycerine can equally result from its solubility in the organic phase. It is impossible to exceed a yield of glycerine of 73% with a degree of scission of 90% and a yield of 86% with a degree of scission of 95%. (Rev. Fr. Corps Gras)

DYNAMICS OF ACCUMULATION OF OXIDATION PRODUCTS IN PRIME STEAM LARD. M.S. Kastornikh et al. *Pishch. Promst.* **1976**(2), 25–8. The butylhydroxyanisol impedes noticeably the development of the oxidation process and of the radical formation in lard and, at the same time, it reduces the speed of accumulation of secondary oxidation products responsible for the modification of taste and odor of the fat. The oxidation of lard rendered at 90C, coincidentally corresponds to the time necessary to obtain a peroxide value of 0.1% I_2, a maximum of the specter of flouroscence of the fat F^{370}_{310}, and a moment of the appearance of flouroscence F^{436}_{370}. (Rev. Fr. Corps Gras)

THE POLYMORPH MODIFICATIONS WITHIN THE EDIBLE HYDROGENATED FATS IN FUNCTION WITH TEMPERATURE. V.V. Sitnikov. *Pishch. Tehnol.* **1976**(3), 145–7. It was observed that the polymorph transformation β' to β in the fatty phase of margarine has an unfavorable influence on its structure, consistency, and melting tendency. The correlation between the speed of the polymorph conversions to the stable from β and the temperature was not found. This work tries to establish the correlation between the speed of the transition of fatty phase and the temperature of thermoregulation of the solidified edible hydrogenated fat. (Rev. Fr. Corps Gras)

POSSIBILITY OF INCREASING THE YIELD OF EXTRACTION LINE: ND—1250. N.S. Aroutunyane et al. *Maslo-zhir. Promst.* **1976** (10), 4–8. The modernized extractor ND—1250 can work in a stable manner with a daily capacity of up to 500 t of sunflower seeds; with a hydromodule of at least 0.7, the oil content in the extraction meal can represent 1.0 to 1.2%. The modernized evaporator assures the elimination of solvent from the extraction meal. The system of distillation in three stages assures the elimination of solvent from miscella and the production of an oil conforming to the clarity norms. (Rev. Fr. Corps Gras)

SYNTHESIS OF THE LACTOGLYCERIDES. A.A. Shmidt et al. *Maslo-zhir. Promst.* **1976**(10), 19–20. With the aid of the method of factorial experiment, the optimal conditions for production of lactoglycerides, which are alimentary surface-active substances, were established: ratio between monoglycerides and lactic acid 1:2.2 (in moles), quantity of n-toluensulfonic acid 0.7%. It was shown that the maximal quantity of lactic acid is connected with the case of the use of monoglycerides at a high concentration. (Rev. Fr. Corps Gras)

DEGREE OF NEUTRALIZATION OF FATTY ACIDS WITH A WATER SOLUTION OF SODIUM BICARBONATE. A.N. Morgounov et al. *Maslo-zhir. Promst.* **1976**(10), 20–2. The degree of neutralization of [pelargonic, lauric, palmitic, and arachidonic acids, and liquid and solid oxidized paraffins] by a water solution of $NaHCO_3$ at 20–70C was studied. A functional dependence of the equilibrium constant in function of temperature was found and for each case an analytical expression was proposed. It was demonstrated that with the increase of temperature, the degree of neutralization of the acids increases and represents at 100C for the pelargonic acid 99%, lauric 92%, palmitic 88%, arachidonic 85%, liquid oxide 95%, and solid oxide 93%. (Rev. Fr. Corps Gras)

DETERMINATION OF THE GLYCERINE IN THE RESIDUAL WATERS BY GAS-LIQUID CHROMATOGRAPHY. R.I. Adamiane et al. *Maslo-zhir. Promst.* **1976**(10), 26–8. A method for glycerine determination in the residual waters from oil factories was described. For elimination of organic components from the residual waters, whose presence can hinder the chromatographic analysis, the sample was treated with a solution of a basic salt of lead acetate. For the determination of the composition of mixtures, 1,2-propylene glycol was used as the internal standard. A statistic evaluation of the precision of the method was done. The relative standard deviation represents 7.8%. (Rev. Fr. Corps Gras)

PERFECTING THE HYDROGENATION IN THE PRODUCTION OF LAURIC ALCOHOLS FROM COCONUT OIL. T.P. Porubleva et al. *Maslo-zhir. Promst.* **1976**(11), 19–20. A more efficient catalyst than the one used up to now for the hydrogenolysis of coconut oil was found and a scheme for hydrogenation in two stages was chosen: in the first stage, the catalyst is based on aluminum-zinc-chromium and in the second, on nickel on kieselguhr. From the product of the second stage of hydrogenation, the technical lauric alcohols C_6–C_{18} and C_{12}–C_{18} conforming to norms TU 38-10744-74 and TU 38-10745-74, are separated. (Rev. Fr. Corps Gras)

INFLUENCE OF SUBSTANCES ACCOMPANYING THE VEGETABLE OIL ON THE ELECTRICAL CONDUCTIBILITY OF MISCELLA. O.F. Efenediev et al. *Maslo-zhir. Promst.* **1976**(12), 9–12. The conductivity of the miscella is essentially determined by the phosphatides and depends on their quantity. Humidity affects the conductivity of miscella in the presence of phosphatides, but this influence is insignificant in comparison with the conductivity of the phosphatides. The electrical activity of the phosphatides allows one to suppose the possibility of their chemical modification in the case of evolution of electrochemical reactions under the action of an electrostatic field. The wax material, the primary and secondary oxidation products, the unsaponifiable matters, the free fatty acids, and the mechanical impurities exert hardly any influence on the conductivity of the miscellas. (Rev. Fr. Corps Gras)

INFLUENCE OF THE SYNTHETIC FATTY ACIDS OF THE C_{10}–C_{16} FRACTION ON THE COMPOSITION OF ORGANIC COMPONENTS OF THE SALTED LYE. L.V. Simonova et al. *Maslo-zhir. Promst.* **1976** (12), 15–9. The replacement of coconut oil by synthetic fatty acids of the C_{10}–C_{16} fraction leads to an increase of the

content of fatty acids in the salted lye by 3.5 times. This is a result of the high solubility of the lower acids, in salt solution, bicarboxylic and iso, as well as of the presence in the synthetic fatty acids of normal carboxylic acids with an odd number of carbon atoms. The content of non-volatile organic residue in the salted lye increases close to 3 times. The improvement of the commercial synthetic fatty acids by light saponification with a solution of 2% of KOH is more efficient than blowing of steam. (Rev. Fr. Corps Gras)

DECREASE OF THE GLYCERINE LOSSES IN THE PRODUCTION PROCESS. M.V. Irodov et al. *Maslo-zhir. Promst.* **1976**(12), 19–21. A review of the essential sectors of the production of glycerine with a stress on the losses of glycerine is done. It was shown that in function with the nature of the fatty materials at the start, the losses vary between 13 and 47% (regarding the quantity of glycerine contained in these lipids). Recommendations for their reduction are given. It was noted that the losses of glycerine in the distillation process are determined by the quality of the crude glycerine. A reduction of the losses by 2.0–2.5% in the production of crude glycerine and by 1.0–1.5% in the distillation allows a decrease of the total losses of glycerine of about 200 t per year. (Rev. Fr. Corps Gras)

COMPREHENSIVE EVALUATION OF FATTY ACIDS IN FOODS. J. Exler, R.M. Avena, and J.L. Weihrauch *(Consumer and Food Economics Institute, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Maryland) J. Am. Diet. Assoc.* **71**, 412, (1977). This paper presents data on nine legumes consumed in the United States and on products made from two of them—peanuts and soybeans. The data are given as grams fatty acid per 100 gm. food or per 100 gm. oil, depending on the product. Some of the effects on composition due to growing area and seed maturity are discussed.

STUDY OF CUCUMIS MELO MOMORDICA SEED OIL. S.P. Tandon, (Chemistry Department, University of Allahabad, India, and S.Q. Hasan, Chemistry Department, Pt. J.N. College, Banda) *J. Indian Chem. Soc.* **53**, 1161 (1976). Cucumis melo momordica, known as "Phut" in the northern part of India, is a common fruit belonging to the "cucurbitaceae" family. The seeds of the fruit are popular and are eaten for their "cooling" effect on the metabolism. The seeds are rich and contain about 35.6% of oil light yellow in color. The major fatty acid components of the oil are oleic acid (47.77%) and linoleic acid (25.40%). Palmitic and stearic acids are present to the extent of 13.24% and 7.90% respectively. The other acids present are lauric (3.26%), capric (1.20%), and myristic (0.74%). Hexadecenoic acid is present to the extent of 0.45%. Comparison of the fatty acid composition of this oil with others shows that high percentage of unsaturated fatty acids in the oil may be responsible for the so-called "cooling" effect of the seeds.

WHEAT FLOUR LIPIDS, SHORTENING AND SURFACTANTS: A THREE WAY CONTRIBUTION TO BREADMAKING. O.K. Chung and Y. Pomeranz, (U.S. Department of Agriculture, U.S. Grain Marketing Research Center, Manhattan, KS) *Bakers Dig.* **51**, 32, (1977). Wheat flour lipids and their role in breadmaking have been the subject of several comprehensive reviews. That role is modified by the addition of shortening and/or surfactants. This is a review of recent studies on the contribution of flour lipids, shortening, and surfactants, alone or in combination, in the production of bread; illustrations are mainly from data obtained in the authors' laboratories.

POLYMORPHISME DE L'OLEATE DE SODIUM ANHYDRE. J.L. Curat and R. Perron (CNRS, 2, rue Henry Dunant. 94320 Thiais. France) *Chem. Phys. Lipids* **19**, 301–11 (1977). By careful experiments with a DTA apparatus equipped with a closed sample-holder for operations at elevated temperatures and pressures, it was found that pure sodium oleate shows 8 phases: I crystalline, II and III not well defined, IV and V face centered cubic structures, VI ribbons phase, VII and VIII labile lamellar structures. These results are discussed and compared with the other literature data.

FATTY ACIDS, PART 12. THE SYNTHESIS OF FURANOID, α,β-UNSATURATED OXOCYCLOPENTENYL AND OXOCYCLOHEXENYL ESTERS FROM METHYL OCTADECADIYNOATES. M.S.F. Lie Ken Jie and C.H. Lam (Dept. of Chem., Univ. of Hong Hong, Hong Kong) *Chem. Phys. Lipids* **19**, 275–87 (1977). Hydration of methyl 7,11-octadecadiynoate gives the 1,4-dioxo-(methyl 8,11-dioxostearate) and 1,5-dioxo(methyl 7,11- and 8,12-dioxostearate) derivatives, while methyl 8,13-octadecadiynoate furnishes only the corresponding 1,5- and 1.6-dioxo derivatives when the diacetylenic esters are treated with mercuric acetate in aqueous tetrahydrofuran. Acid catalysed condensation reactions of 1,4-, and 1,5- and 1.6-dioxo derivatives of methyl stearate give furanoid, α,β-unsaturated oxocyclohexenyl and pentenyl derivatives respectively, while reaction of the dioxo esters with alcoholic KOH provides α,β-unsaturated oxocyclohexenyl and pentenyl derivatives of methyl stearate.

PROTON CONDUCTION IN PHOSPHATIDYLETHANOLAMINE. N. Murase, K. Gonda, I. Kagami and S. Koga (The Inst. of Applied Microbiol., Univ. of Tokyo, Bunkyo-ku, Tokyo 113, Japan) *Chem. Phys. Lipids* **19**, 339–46 (1977). The dc conductivity of polycrystalline phosphatidylethanolamine (PE) was measured in the temperature range 60–120°C. Since no conclusive evidence had so far been obtained for the presence of proton conduction in this phospholipid, hydrogen gas was shown in the present experiment to evolve during the electrolysis in its premelted state between 91 and 124°C. In this temperature range molecules assume rotation around the molecular axes and proton conduction of the Grotthus type takes place possibly along two chains of intermolecular hydrogen bonds running in parallel. Zwitter-ions behave cooperately as proton donors and acceptors in transferring proton from molecule to molecule via the hydrogen bond networks. This efficient push-pull way of proton transferring seems to account for the fact that no polarization was observed in the dc conduction experiments. The amount of evolved gas appears to be not exactly in accordance with Faraday's law and discussions are made on possible causes for this slight deviation.

STEREOSPECIFIC SYNTHESIS OF CIS AND TRANS FATTY ESTERS. H. Rakoff and E.A. Emken (Northern Reg. Res. Ctr., ARS, USDA, Peoria, IL) *Lipids* **12**, 760–1 (1977). The *erythro* and *threo* isomers of methyl 9,10-dihydroxyoctadecanoate and the *threo* isomer of methyl 12,13-dihydroxy-*cis*-9-*octadecenoate* were converted into methyl *cis*- and *trans*-9-octadecenoate and methyl *cis*-9,*trans*-12-octadecadienoate, respectively, by reaction of the dihydroxy ester with triethyl orthoformate to give the 2-ethoxy-1,3-dioxolane which was thermally decomposed to the unsaturated ester.

POLYGALA VIRGATA SEED OIL—A NEW SOURCE OF ACETOTRIGLYCERIDES. C.R. Smith Jr., R.V. Madrigal, D. Weisleder and R.D. Plattner (Northern Reg. Res. Ctr., ARS, USDA, Peoria, IL) *Lipids* **12**, 736–40 (1977). The seed oil of *Polygala virgata* (family Polygalaceae) contains 74% of monoacetotriglycerides, the first found in nature with the acetate group in position 2 of *sn*-glycerol. Naturally occurring triglycerides characterized previously all have the acetate at position 3. The configuration of the acetoglyceride from *P. virgata* was established by a combination of thin layer chromatography, optical rotatory dispersion, and nuclear magnetic resonance.

DECA-2,4,6—TRIENOIC ACID, A NEW CONJUGATED FATTY ACID, ISOLATED FROM THE LATEX OF EUPHORBIA PULCHERRIMA WILLD. F. Warnaar (Botanical Lab., State Univ. of Utrecht, Lange Nieuwstraat 106, Utrecht, The Netherlands) *Lipids* **12**, 707–10 (1977). From the latex of *Euphorbia pulcherrima*, a new conjugated trienoic fatty acid was isolated and identified as deca-*trans*-2,*trans*-4,*cis*-6-trienoic acid. Four other isomers of this acid were also present as minor components. The acids were esterified with triterpenols.

• Biochemistry and Nutrition

PHOSPHOLIPID-PROTEIN INTERACTIONS IN HUMAN LOW DENSITY LIPOPROTEIN DETECTED BY ^{31}P NUCLEAR MAGNETIC RESONANCE. P.L. Yeagle, R.G. Langdon and R.B. Martin (Dept. of Chem., Univ. of Virginia, Charlottesville, Virginia). *Biochemistry* **16**, 3487–91 (1977). ^{31}P nuclear magnetic resonance (NMR) spectra of human low density lipoprotein (LDL) have been obtained and the major phospholipid components identified. Analysis of the spectra revealed two phospholipid environments: one occupied by ⅘ of the phospholipid with high resolution resonances possessing properties similar to phospholipids in vesicles, and a second occupied by ⅕ of the phospholipid with broad lines indicative of immobilization. Limited trypsin treatment of the particle cleaved all of the B peptide into smaller molecular weight peptides which remained with the particle. Trypsin-treated LDL eluted from

a Sephrose CL-6B column similarly to native LDL so that the modified particle remained intact. ^{31}P NMR spectra of trypsin-treated LDL showed little or no immobilized phospholipid. The immobilization in the native LDL particle is attributed to lipid-protein interactions between ⅕ of the phospholipid and the B peptide.

STRUCTURE AND THERMODYNAMIC PROPERTIES OF HIGH DENSITY LIPOPROTEIN RECOMBINANTS. A.R. Tall, D.M. Small, R.J. Deckelbaum and G.G. Shipley (Biophysics Div., Boston Univ., Schl. of Med., Boston, Massachusetts). *J. Biol. Chem.* **252**, 4701–11 (1977). Recombinants of saturated lecithins with the apoproteins of human plasma high density lipoproteins (HDL) were prepared by incubation of dimyristoyl lecithin (DML) or (DPL) dipalmitoyl multilamellar liposomes with either the total apoprotein (apoHDL) or the purified principle apoprotein (apo-A-1) of HDL. Examination of the equilibrated mixtures containing different ratios of lipid to protein by differential scanning calorimetry (DSC), negative stain electron microscopy, and the centrifugation techniques revealed three-zones of lipid-protein interaction, typified by DML/apoHDL. The linear decrease in diameter in the discoidal complexes with the diminishing lipid/protein ratio is consistent with a predominant localization of apoprotein in an annulus around the perimeter of the disc. The changes in enthalpy of the phospholipid main transition may be due to the presence of the boundary layer, 1 to 2 molecules thick, in which the phospholipid hydrocarbon chains are prevented from melting by the interaction with apoprotein.

AN IMPROVED METHOD FOR THE PREPARATION OF UNSATURATED PHOSPHATIDYLCHOLINES: ACYLATION OF SN-GLYCERO-3-PHOSPHORYLCHOLINE IN THE PRESENCE OF SODIUM METHYLSULFINYL METHIDE. T.G. Warner and A.A. Benson (Marine Biology Res. Div., Scripps Institution of Oceanography, La Jolla, California 92093). *J. Lipid Res.* **18**, 548–51 (1977). An improved method for the partial chemical synthesis of unsaturated and radioactively labeled phosphatidylcholines is described. This procedure offers advantages over the conventional methods of acylation in that it can be carried out on a micromole or millemole scale under mild conditions and it does not require a large excess of fatty acid acylating reagent. In this procedure sn-glycero-3-phosphorylcholine is reacted with twice the theoretical amount of fatty acid imidazolide and sodium methylsulfinylmethide in dimethylsulfoxide for several minutes at 17°C. Phosphatidylcholine, which was purified by gradient-elution chromatography on silicic acid, was isolated in 60% yield and was estimated to be about 99% pure. The preparations of 1,2-dioleoyl-, 1,2-dilinoleoyl-, and 1,2-dilinolenoyl-sn-glycero-3-phosphorylcholine are described. The reaction was also carried out on a small scale for the preparation of high specific activity 1,2-di-[1-^{14}C] oleoyl-sn-glycero-3-phosphorylcholine in 38% yield with a specific activity of about 9.7 μCi/μmol.

THE MOLECULAR ORGANISATION OF BIMOLECULAR LIPID MEMBRANES. THE EFFECT OF BENZYL ALCOHOL ON THE STRUCTURE. R.G. Asheroft, H.G.L. Coster and J.R. Smith (Biophys. Lab., Schl. of Phys., Univ. of New South Wales, Sydney, N.S.W. 2033, Australia). *Biochim. Biophys. Acta.* **469**, 13–22 (1977). The separate effects of benzyl alcohol on the hydrocarbon and polar-head region capacitances and conductances of phosphatidylcholine bimolecular lipid membranes were obtained from measurements of the very low frequency impedance dispersion. It was found that the conductance of the hydrocarbon region (and, to a lesser extent, the polar-head region) increased progressively with increasing concentrations of benzyl alcohol in the external solution. The polar-head capacitance did not show a systematic dependence on the concentration of benzyl alcohol. At low concentrations of benzyl alcohol (7.5 μM) the capacitance of the hydrocarbon region was not significantly affected by the alcohol. At high concentrations ($\geqslant$ 7.5 mM) of benzyl alcohol, however, the capacitance of this region was reduced by $\sim$ 25% This is interpreted in terms of an increase in the thickness of this region caused by a straightening of the otherwise kinked, folded (across neighbouring molecules) and perhaps even partially interdigitated hydrocarbon tails of the phosphatidylcholine molecules. This effect of benzyl alcohol is probably closely related also to the apparent increase in the fluidity of the membrane. The effect of benzyl alcohol on the thickness of the hydrocarbon region of the membrane provides a ready insight into its mode of action as a local anaesthetic.

THE OCCURRENCE OF 13,14-DIHYDRO AND 13,14-CIS-UNSATURATED PROSTAGLANDINS IN THE CORAL, PLEXAURA HOMOMALLA. SYNTHESIS OF 13,14-CIS-PROSTAGLANDIN E_2, 15-ACETATE METHYL ESTER, AND THE 13,14-CIS ANALOGUES OF PROSTAGLANDIN $F_{2\alpha}$ AND PROSTAGLANDIN $F_{2\beta}$. W.P. Schneider, R.A. Morge, and B.E. Henson (The Upjohn Co., Kalamazoo, Mich.). *J. Am. Chem. Soc.* **99**, 6062–6 (1977). Extracts from the coral, *Plexaura homomalla*, have been shown to contain derivatives of 13,14-dihydro- and 13,14-*cis*-PGA_2, and from the latter, 13,14-*cis*-$PGF_{2\alpha}$, 13,14-*cis*-$PGF_{2\beta}$, and 13,14-*cis*-PGE_2, 15-acetate methyl ester have been synthesized. The 13,14-dihydro-PGA_2 undergoes internal Michael addition of the 15-hydroxyl to the enone system as does 13,14-dihydro-PGA_1. In the latter case, the two epimeric (at C-11) Michael products were separated, and structures assigned by CD and NMR spectra and compared with the corresponding data from the 5,6-dehydro compound 4 isolated from coral extracts.

BUTYLATED HYDROXYTOLUENE PROTECTS CHICKENS EXPOSED TO NEWCASTLE DISEASE VIRUS. M. Brugh, Jr. (SE Poultry Res. Lab., Agr. Res. Service, Dept. of Agr., Athens, GA). *Science* **197**, 1291–2 (1977). Dietary butylated hydroxytoluene, an antioxidant widely used in food and feed processing, prevents mortality of chickens exposed to virulent Newcastle disease virus and prevents the serological response of chickens exposed to avirulent Newcastle disease virus. This chemoprophylactic effect is evident when chickens are fed diets containing concentrations of butylated hydroxytoluene normally used for antioxidant purposes (100 to 200 parts per million of total diet.)

COMPARISON OF THE LIPID-LOWERING EFFECT OF CLOFIBRATE AND OF CLOFIBRATE PLUS BETA-PYRIDYLCARBINOL. I. Graham, R. Mulcahy and N. Hickey (Cardiac Dept., St. Vincent's Hosp. and Depts. of Med. and Preventive Med., Univ. College, Dublin, Ireland). *Atherosclerosis* **27**, 487–92 (1977). Forty-eight patients under 65 years were included in a double blind study comparing the lipid-lowering effect of clofibrate with that of beta-pyridylcarbinol combined with clofibrate. Over 4 months there was no significant difference in the lipid-lowering effect of either regime. A mean reduction of triglyceride of approximately 30% and of cholesterol of 18% was observed. Both drugs caused significantly greater reductions than placebo. No serious side-effects were noted.

EFFECTS OF ASCORBIC ACID AND VITAMIN E ON SERUM LIPIDS OF COCKERELS FED WESSON OIL-CHOLESTEROL DIETS. C.F. Klopfenstein and R.E. Clegg (Dept. of Biochem., Kansas State Univ., Manhattan, Kansas). *Poult. Sci.* **56**, 1600–4 (1977). The major lipid changes caused by adding 5% Wesson Oil and 1% cholesterol to cockerel diets were large increases in serum cholesterol, cholesteryl esters, and triglycerides. Lecithin and cephalin were not affected. Ascorbic acid significantly increased serum triglycerides; vitamin E significantly lowered serum cholesterol. Percentages of the saturated acids (palmitic, stearic, and arachidic) of cockerels on the Wesson Oil-cholesterol diet decreased significantly; unsaturated linolenic and linoleic acids increased, and oleic acid remained the same. Dietary ascorbic acid seemed not to affect fatty acid distribution significantly, but when vitamin E was added to the diet, the stearic acid percentage rose and oleic acid percentage was lower. Acrylamide-gel electrophoresis showed that changes the vitamin E caused in the lipid and protein constituents of cockerel serum differed from changes the Wesson Oil-cholesterol diet caused.

EFFECT OF VEGETABLE OILS ON PREFERENCES FOR FRIED FOODSTUFFS. T.J.J.M. Theunissen, T. Kouwenhoven and Y.H. Blauw (Dept. of Human Nutr., Agr. Univ., Wageningen, Netherlands). *J. Food Sci.* **42**, 1380–2 (1977). The effects of five different vegetable oils with a high content of P.U.F.A. on the preferences of a consumer panel for five common fried foodstuffs were investigated. Prior to that, the possibility that a panel could distinguish between different brands of one kind of oil was investigated. It was found that the very large majority of people is unable to discriminate between different brands of one kind of oil. As regards the preference study: Only for beef and chicken were any statistically significant results found. The differences were so small however, that no practical consequences can be expected.

MECHANISM OF LIPID ACCUMULATION IN RATS FED WHEAT DIETS. S. Bahl and T.A. Venkitasubramanian (Dept. of Biochem., Vallabhbhai Patel Chest Inst., Univ. of Delhi, Delhi-110007, India). *J. Nutr.* **107**, 1385–93 (1977). Young, weanling rats fed wheat as a sole source of protein have been shown to

develop periportal liver lipid infiltration. An attempt has been made to study the mechanism by which these lipid changes are produced. Weanling, male albino rats were fed three diets containing 10% protein based on wheat, wheat fortified with 0.2% lysine or casein, as control. Plasma and liver lipids, incorporation of (1-^{14}C)acetate and (U-^{14}C)glucose into hepatic lipids and triglycerides were studied after 6 weeks of feeding. Results of radioactive incorporation studies indicated that hepatic lipogenesis was depressed in rats fed wheat diets. However, adrenal cortical function as well as increased mobilization of lipids from adipose tissue was observed in these rats. Impaired secretion of lipids from liver to plasma is another factor which may be responsible for hepatic lipid accumulation in rats fed the lysine-deficient diet. Rats fed the lysine fortified wheat diet represented a more normal metabolic state though some features of protein deficiency were evident in this group too.

SYNTHESIS OF PLASMA LIPOPROTEINS BY THE ISOLATED PERFUSED LIVER FROM THE FASTED AND FED PIG. N. Nakaya, B.H. Chung and O.D. Taunton (Div. of Athero. and Lipoprotein Res., Dept. of Med., Baylor Coll. of Med., and the Methodist Hospital, Houston, Texas). *J. Biol. Chem.* 252, 5258–61, (1977). Livers from fasted or fed pigs were perfused for 5 h with Krebs-Ringer bicarbonate buffer containing human erythrocytes, bovine serum albumin, glucose, and amino acids. Liver viability was estimated by color, consistency, portal pressure, bile flow, electrolyte changes, and glucose levels in the perfusate, urea synthesis, (1-^{14}C)leucine incorporation into protein, oxygen uptake, and histological examination. It was shown that the liver was maintained in good condition throughout the perfusions. The apolipoprotein B (apoB) and apolipoprotein A-I (apoA-I) in the perfusate were measured by solid phase radioimmunoassay. In the fasted state, the amount of apoB released was greatest in the low density lipoprotein (LDL) fraction and the amount was especially high during the first h. There was no increase of apoB in this fraction by feeding. The apoB in the very low density lipoprotein in (VLDL) fraction was less than that in the LDL fraction in the fasted state, and it increased more than 2-fold in the fed animals. The amount of apoA-I was greatest in the 1.21 bottom fraction and was relatively small in the high density lipoprotein (HDL) fraction. The HDL fraction contained approximately one-twentieth as much apoA-I as the 1.21 bottom fraction in the fasted condition. In the fed state, apoA-I in the HDL fraction increased markedly, although the amount was still less than in the 1.21 bottom fraction.

MECHANISM OF THE APPARENT REGULATION OF ESCHERICHIA COLI UNSATURATED FATTY ACID SYNTHESIS BY EXOGENOUS OLEIC ACID. M.L. Polacco and J.E. Cronan, Jr. (Dept. of Molecular Biophysics and Biochem., Yale Univ., New Haven, Conn.). *J. Biol. Chem.* 252, 5488–90 (1977). Starvation of strains of *Escherichia coli* which are glycerol auxotrophs and are also defective in β oxidation results in the accumulation of large amounts of free fatty acid. We now report that addition of exogenous oleic acid to these cultures results in no decrease in the synthesis of the unsaturated acids of the free fatty acid fraction although a 40 to 60% decrease of (^{14}C)acetate incorporation into phospholipid unsaturated acyl moieties occurs under these conditions. This result indicates that the decreased synthesis of phospholipid unsaturated acyl moieties observed by others during oleic acid supplementation can be attributed to competition between exogenous and endogenously synthesized unsaturated fatty acids rather than a curtailment of unsaturated fatty acid synthesis *per se*.

EGG AND YOLK PRODUCTION AS INFLUENCED BY LIVER WEIGHT, LIVER LIPID AND PLASMA LIPID IN THREE STRAINS OF SMALL BODIED CHICKENS. H.L. Shivaprasad and R.G. Jaap (Dept. of Poultry Sci., Ohio St. Univ., Columbus, Ohio). *Poult. Sci.* 56, 1384–90 (1977). Data on egg and yolk production were collected from three small-bodied strains, D6, D3 and D5, slaughtered between 44 and 56 weeks of age, and weighing 1.73, 1.01, and 0.69 kg., respectively. Rate of deposition of yolk in the ovarian follicles was estimated by the total weight of yolk in eggs laid during a 10-day period and by the postmortem total weight of all ovarian follicles rapidly accumulating yolk (above 200 mg. in weight). Liver weight, liver and plasma lipid were used to estimate the efficiency of lipid production of each strain. The strains differed significantly in all measurements except percent moisture in the liver and the amount of lipid per gram of dry liver weight which were similar only in strains D6 and D3. Also, the concentration of plasma lipid did not differ significantly between the three strains. Egg weight appeared to be more highly correlated with body weight (0.47 to 0.59) than the average (0.36) of published data from larger females. Liver weight was closely associated with body weight in all three strains. The regression of liver on body weight was highest (3.6 g./100 g.) in the smallest (D5) strain. Concentration of lipid in the blood plasma was not closely associated with yolk production. Rate of yolk production appeared to be dependent on liver weight and total liver lipid only in strain D3.

THE TRUE METABOLIZABLE ENERGY VALUES FOR POULTRY OF RAPESEED AND OF THE MEAL AND OIL DERIVED THEREFROM. I.R. Sibbald (Animal Res. Inst., Agr. Canada, Central Experimental Farm, Ottawa, Ontario K1A 0C6). *Poult. Sci.* 56, 1652–6 (1977). Two experiments were made to measure the true metabolizable energy (T.M.E.) values of rapeseed and rapeseed products. In the first experiment full-fat Tower and LEAR seeds were assayed as were the crude oils, degummed oils and meals prepared therefrom in a commercial solvent extraction plant. In the second experiment Tower and HEAR seeds were assayed together with oils and meals prepared in a prepress solvent extraction plant. Within experiments there were no differences between the T.M.E. values of the full-fat seeds. In Exp. 1 Tower Oil contained more ($P < 0.01$) T.M.E. than LEAR Oil but in Exp. 2 there was no difference between Tower and HEAR oils ($P > 0.05$). Removal of gums had no effect on oil T.M.E. values. Tower meal contained more T.M.E. than either LEAR or HEAR meals. Processing appeared to affect the availability of the energy of Tower seed; the full-fat seed had a T.M.E. value of 4.96 kcal./g. while the yield in terms of oil and meal was calculated to be 5.45 kcal./g.

EFFECT OF DIETARY FACTORS ON SERUM AND EGG YOLK CHOLESTEROL LEVELS OF LAYING HENS. J.S. Sim and D.B. Bragg (Dept. of Animal Sci., Univ. of British Columbia, Vancouver, B.C. Canada V6T 1W5). *Poult. Sci.* 56, 1616–21 (1977). Effects of dietary lipid factors (saturated and unsaturated oil, cholesterol and plant sterols) on the serum and egg yolk cholesterol levels of the laying hen were investigated. Single Comb White Leghorn laying hens, at thirty weeks of age, were used in two trials by feeding two basal diets containing 8.0% hydrogenated coconut oil or safflower oil, with or without supplemental cholesterol (1.0%), soysterols (2.0%) or combinations of both. Safflower oil, *per se*, had a superior property to hydrogenated coconut oil in suppressing cholesterol levels, in both serum and egg yolk. Cholesterol supplementation to the safflower oil basal diet resulted in a significant ($P < 0.01$) elevation of serum and egg yolk cholesterol levels, whereas cholesterol in combination with hydrogenated coconut oil did not change the serum level. Cholesterol lowering effect of soysterols was clearly demonstrated in both serum and egg yolk by feeding soysterols alone as well as by feeding soysterols in combination with cholesterol.

PROTEIN AND CHOLESTEROL CONTENT OF ARAUCANA CHICKEN EGGS. R.G. Somes, Jr., P.V. Francis and J.J. Tlustohowicz (Nutr. Sci. Dept., Univ., of Connecticut, Storrs, Conn.). *Poult. Sci.* 56, 1636–40 (1977). Comparative data collected over two years are presented which refute the popular press claims that blue-shelled eggs of Araucana chickens have higher protein levels and lower cholesterol levels than market eggs. These comparisons were made between the eggs from three strains of Araucanas and those of White Leghorns and Sex-links. None of the differences found between test groups in % protein/g. albumen and % protein/g. yolk were shown to be consistently related to any one test group type. However, all Araucana test groups were significantly ($P < .01$) lower in their total egg protein content than either control groups by from 2.8–6.5%. This lower total protein content was the result of a consistent increase in the yolk/albumen ratio of the Araucana eggs over the market eggs. The Araucana eggs were consistently higher in their cholesterol levels on a mg./g. yolk basis than either of the market eggs. These increased concentrations ranged from 2.0–6.9%.

EFFECT OF HIGH LEVELS OF DIETARY VITAMIN E ON LIVER AND PLASMA LIPIDS AND FAT SOLUBLE VITAMINS IN RATS. N.Y.J. Yang and I.D. Desai (Div. of Human Nutr., Schl. of Home Econ., Univ. of British Columbia, Vancouver, B.C., Canada). *J. Nutr.* 107, 1418–26 (1977). The effect of low, moderate and high dietary vitamin E (ranging from 0 to 25,000 IU/kg diet) on the levels of α-tocopherol, total lipids, cholesterol and vitamin A in liver and plasma of rats fed for 8 and 16 months was studied. A logarithmic relationship was observed between dietary levels of vitamin E and the concentrations

of this vitamin in liver and plasma. The total α-tocopherol, in whole liver of rats fed different levels of dietary vitamin E for 16 months was approximately double in comparison to rats fed for 8 months. Total lipids in liver were significantly increased by excess vitamin E supplementation in rats fed for 8 months, but not in rats fed for 16 months. There was no significant change observed in liver cholesterol level at 16 months. Plasma total lipids and cholesterol were lowered by vitamin E deficiency and also by dietary levels higher than 2,500 IU vitamin E/kg diet in rats fed for 16 months. Liver vitamin A storage was 4.5 times higher in rats supplemented with vitamin E than in rats without any supplement, but the effect of excess dietary vitamin E was no different from that of normal level (25 IU/kg diet). The findings of our long-term study are compared with the results of other short-term studies and the implications are discussed.

EXTENSIVE EXCHANGE OF RAT LIVER MICROSOMAL PHOSPHOLIPIDS. D.B. Zilversmit and M.E. Hughes (Div. of Nutr. Sci. and Sec. of Biochem., Molecular and Cell Biol., Div. of Biol. Sci., Cornell Univ., Ithaca, N.Y.). *Biochim. Biophys. Acta.* **469**, 99–110 (1977). Liver microsomal fractions were prepared from rats injected with a single dose of choline [^{14}C]methylchloride or with single or multiple doses of $^{32}P_i$. Exchangeability of microsomal phospholipids was determined by incubation with an excess of mitochondria and phospholipid exchange proteins derived from beef heart, beef liver or rat liver. Labeled phosphatidylcholine, phosphatidylethanolamine, phosphatidylserine and phosphatidylinositol were found to act as a single pool and were 85–95% exchangeable in 1–2 h. High latencies of mannose-6-phosphate phosphohydrolase activities and impermeability of microsomes to EDTA proved that phospholipid exchange proteins did not have access to the intracisternal space. If microsomal membranes are largely composed of phospholipid bilayers, the experiments suggest that one or more of the phospholipid classes in microsomal membranes undergo rapid translocation between the inner and outer portions of the bilayer.

STUDY OF THE DYNAMICS OF ACCUMULATION OF TRANS-ISOMERS OF UNSATURATED FATTY ACIDS IN THE ORGANS AND TISSUES OF ANIMALS AND THEIR UTILIZATION BY THE ORGANISM. B.I. Kadykov et al. *Vopr. Pit.* **1976**(2), 20–3. Two groups of white rats in growth were maintained on a diet containing hydrogenated fat with 62 or 26% of *trans*-isomers of unsaturated fatty acids. It was found that the *trans*-isomers are accumulated in the lipids of the animal organs and tissues, attaining their maximum level during the fourth week of the experiments. Putting the rats on a diet free of *trans*-isomers, their exponential fall in the lipids of the organs and tissues was registered. It follows that the *trans*-isomers of unsaturated fatty acids are involved in the metabolic processes and are used by the organism side by side with the other fatty acids. (Rev. Fr. Corps Gras)

INFLUENCE OF DIFFERENT LIPID PRODUCTS ON THE COMPOSITION OF THE BILE AND ON THE LEVEL OF BLOOD CHOLESTEROL. M.F. Nesterin et al. *Vopr. Pit.* **1976**(4), 9–13. In experiments with rats carried out during 60 days with an equilibrium diet, including either sunflowerseed oil, cottonseed oil, sheep fat, or margarine, a hypocholesterolic action of the diet with the sunflowerseed oil was noticed. There is also an increase of the secretion of biliary acids and of the cholesterol in bile. With the diets poor in proteins or rich in lipids, containing sunflowerseed oil (30 and 60% respectively), a marked modification in the ratio between the bile acids and the cholesterol in favor of this one was observed. (Rev. Fr. Corps Gras)

FATTY ACID COMPOSITION AT THE 2-POSITION OF ETHER-LINKED AND DIACYL ETHANOLAMINE AND CHOLINE PHOSPHOGLYCERIDES OF HUMAN BRAIN TUMORS. D.H. Albert and C.E. Anderson, (Dept. of Biochem. and Nutr., Schl. of Med., University of North Carolina, Chapel Hill, NC) *Lipids* **12**, 722–8 (1977). The acyl composition of ethanolamine and choline phosphoglycerides from a series of human brain tumors was determined and compared to that of normal human gray matter. Six glioblastomas, one astrocytoma, one oligodendroglioma, and one meningioma were analyzed. The total fatty acid composition of ethanolamine phosphoglycerides generally had a higher percentage of 18:1, 18:2ω6, and 22:5ω3 and a lower percentage of 22:6ω3 than that of normal gray matter. Choline phosphoglycerides from the tumors also contained a higher than normal percentage of 18:2ω6. These data demonstrate that the composition of the acyl moiety at the 2 position of diacyl and ether-linked phosphoglycerides of brain tumors differs from the corresponding component from normal gray matter and that the ether-linked ethanolamine phosphoglycerides provide an important pool of polyunsaturated fatty acids from brain tumor phospholipids.

LIPID METABOLISM IN CULTURED CELLS XVI. LIPOPROTEIN BINDING AND HMG CoA REDUCTASE LEVELS IN NORMAL AND TUMOR VIRUS-TRANSFORMED HUMAN FIBROBLASTS. J.M. Bailey and J.-D. Wu (Dept. of Biochem., The George Washington Univ. Schl. of Med., Washington, D.C.) *J. Lipid Res.* **18**, 512–6 (1977). The loss in feedback control of cholesterol biosynthesis in tumor cells was examined in tissue culture. Human fibroblasts from normal subjects, SV40 tumor virus-transformed cell lines, and homozygous familial hypercholesterolemic cells as reference, were grown in tissue culture. Experiments were conducted to relate the regulatory enzyme for cholesterol biosynthesis, HMG CoA reductase, and the membrane-located binding receptors for low density lipoproteins (LDL) that mediate feedback control in normal cells. These findings demonstrate that tumor cells growing in vitro contain a normal complement of the membrane-located binding receptors for low density lipoproteins and, although the basal levels are higher than normal, an effective feedback regulation of the enzyme HMG CoA reductase is retained.

LYSOPHOSPHOLIPASE-TRANSACYLASE FROM RAT LUNG:ISOLATION AND PARTIAL PURIFICATION. G. Brumley and H. van den Bosch (Lab. of Biochem., Padualaan 8, De Uithof, Utrecht, The Netherlands) *J. Lipid Res.* **18**, 523–32 (1977). Incubation of rat lung supernatant with 1-[1-^{14}C]palmitoyl-*sn*-glycero-3-phosphocholine in the absence of any co-factors resulted in the release of radioactive fatty acid and the formation of phosphatidylcholine. The production of fatty acids (lysophospholipase activity) exceeded phosphatidylcholine formation (transacylase activity) about threefold although the relative extent of phosphatidylcholine formation was considerably greater than previously reported by Abe *et al.* In agreement with these authors, evidence is presented suggesting that a single enzyme is responsible for both catalytic activities. The enzyme, provisionally denoted lysophospholipase-trans-acylase, was found primarily in the soluble fraction of rat lung and was purified approximately 250-fold. The enzyme had an estimated mol wt of 50,000. This enzyme was capable of synthesizing disaturated phosphatidylcholine, an important component of the pulmonary surfactant. Three lysophospholipases purified from other sources did not possess this transacylase activity.

EFFECTS OF FOOD ANTIOXIDANTS ON PROSTAGLANDIN BIOSYNTHESIS. M.A. Boehme and A.L. Branen (Dept. of Food Sci. & Tech., Washington State Univ., Pullman, WA) *J. Food Sci.* **42**, 1243–6 (1977). This study was designed to determine the influence of t-butylhydroquinone (TBHQ), butylated hydroxyanisole (BHA), butylated hydroxy-toluene (BHT) and ascorbic acid on the biosynthesis of prostaglandins. Prostaglandin biosynthesis was monitored by determining the conversion of ^{14}C-dihomogamma-linolenic acid and ^{3}H-arachidonic acid to prostaglandin E_1 (PGE_1), and prostaglandin E_2 (PGE_2), respectively, by the microsomal fraction of bovine seminal vesicles incubated under optimal conditions. These results confirm that extremely low concentrations of food antioxidants can interfere with prostaglandin biosynthesis.

FATTY ACID AND GLUCOSE METABOLISM IN SELENIUM DEFICIENT RATS AND LAMBS. W.C. Fischer and P.D. Whanger (Dept. of Agr. Chem., Oregon State Univ., Corvallis, OR) *J. Nutr.* **107**, 1493–501 (1977). Fatty acid analyses were done on tissues of lambs from ewes fed purified diets, and injected with selenium and/or vitamin E in a 2 × 2 factorial treatment. The concentrations of arachidonic acid averaged 9.3% of the total fatty acid content in semitendinousus muscle from lambs given vitamin E and selenium, but averaged 19.4% in this muscle from lambs given vitamin E without selenium. Arachidonic acid comprised 28.3% and 33.7%, respectively, of the total fatty acids in livers from selenium supplemented and deficient rats. This increased glucose metabolism is suggestive of a greater metabolic rate in selenium deficient animals, which may be responsible for the differences observed in tissue fatty acid composition.

FREE AND ESTERIFIED CHOLESTEROL IN DEVELOPING FELINE WHITE MATTER. C. Hildebrand and C.-H. Berthold (Dept. of Anatomy, Karolinska Institutet, S-104 01 Stockholm, Sweden) *Lipids* **12**, 711–6 (1977). The content of free and esterified cholesterol was examined in the cervical spinal cord lateral funiculus and in the corpus callosum of the cat during post-

natal development. The concentration of free cholesterol increased with development from 8 to 56 μg/mg in the lateral funiculus and from 4 to 37 μg/mg in the corpus callosum. The total content per specimen increased 130 and 70 times, respectively. The major part of the post-natal increase in the free cholesterol occurred late postnatally. The transient increase in concentration of esterified cholesterol in the early postnatal lateral funiculus coincides in time with a spontaneous myelin sheath disintegration. This supports the view that the ester peak may be primarily related to myelin breakdown rather than to myelin production. The significance of the high ester concentration in the neo-natal corpus callosum and the ester peak seen during initial myelination remains obscure and calls for further developmental morphological studies.

UPTAKE OF VERY LOW DENSITY LIPOPROTEIN TRIGLYCERIDE BY BOVINE AORTIC ENDOTHELIAL CELLS IN CULTURE. B.W. Howard (Dept. of Physiol. and Biochem., The Med. Col. of Pennsylvania, Philadelphia, Pa.) *J. Lipid Res.* **18**, 561–71 (1977). Primary monolayers of calf aortic endothelial cells were presented with isolated human very low density lipoproteins that had been labeled with radioactive triglyceride. The cells were observed to take up triglyceride over a 24 hr period; incorporation increased with exogenous lipoprotein concentrations, and up to 60% of the triglyceride taken up was converted to other cell lipids within 24 hr. When [2-^{3}H]glyceryl tri-[1-^{14}C]oleate-labeled very low density lipoprotein was used, the ^{3}H/^{14}C ratio in the cell triglyceride was always similar to that of the exogenous lipoprotein triglyceride. Moreover, no significant hydrolysis of the exogenous very low density lipoprotein triglyceride was observed during the time of exposure to the cells. Similar experiments using doubly-labeled triglyceride exposed to endothelial cells in triglyceride-phospholipid liposome preparations also resulted in incorporation of the exogenous triglyceride without evidence of extracellular hydrolysis. The results indicate that primary monolayers of endothelial cells in culture are able to incorporate and metabolize very low density lipoprotein triglyceride. However, triglyceride does not appear to be significantly hydrolyzed during uptake, suggesting an absence of lipoprotein lipase activity in these cells.

ERYTHROCYTE LIPIDS IN HETEROZYGOUS CARRIERS OF DUCHENNE MUSCULAR DYSTROPHY. J.L. Howland and S.L. Iyer (Committee on Biochem., Bowdoin Col., Brunswick, MN) *Science* **198**, 309–10 (1977). Erythrocyte membranes from heterozygous carriers of Duchenne muscular dystrophy exhibit a diminished amount of palmitoleic acid when compared to membranes from normal subjects. A similar, but more variable, diminution is observed in the case of patients with this disorder. The change in fatty acid composition appears related to a low membrane triglyceride content and may provide both a possible technique for carrier detection and a clue regarding pathogenesis.

A SODIUM-SPECIFIC MEMBRANE PERMEABILITY DEFECT INDUCED BY PHOSPHOLIPID VESICLE TREATMENT OF ERYTHROCYTES. W.H. Huestis (Dept. of Chem., Stanford Univ., Stanford, CA) *J. Biol. Chem.* **252**, 6764–8 (1977). Treatment of human erythrocytes with phospholipid vesicles induces a selective membrane permeability defect which leads to osmotic lysis. The defective cells exhibit a massive sodium ion leak while maintaining normal impermeability to other cations, anions, and neutral small molecules. The sodium ion influx and resulting hemolysis may be inhibited by increased pH, by tetrodotoxin, and by reintroduction of vesicle-extracted proteins into the cell. These characteristics suggest that phospholipid vesicle treatment destroys the cell by disrupting a membrane protein system involved in regulation of cation permeability.

MECHANISM OF LIPID-PROTEIN INTERACTION IN THE PLASMA LIPOPROTEINS: LIPID-BINDING PROPERTIES OF SYNTHETIC FRAGMENTS OF APOLIPOPROTEIN A-II. S.J.T. Mao, J.T. Sparrow, E.B. Gilliam, A.M. Gotto, Jr., and R.L. Jackson (Depts. of Cell Biol. and Med., Baylor Col. of Med. and The Methodist Hospital, Houston, Texas) *Biochemistry* **16**, 4150–6 (1977). To delineate the basic structural unit for the binding of phospholipids by the plasma apolipoproteins, we have synthesized peptides of human high-density apolipoprotein A-II (apoA-II) and tested them for their ability to interact with single bilayer vesicles of dimyristoylphosphatidylcholine (DMPC). The fragments corresponding to residues 65–77, 56–77, 47–77, and 40–77 in the apoprotein were prepared by solid-phase peptide synthesis. The binding of phospholipid by these synthetic fragments and by the native tryptic peptide 56–77 was studied by changes in conformation, as determined by circular dichroism and by fractionation of peptide-DMPC mixtures in density gradients of KBr. The results of these studies and examination of space-filling models of apoA-II suggest that an amphipathic α helix which contains a nonpolar face and a polar face with at least one juxtaposed acidic and basic group is required for phospholipid binding by apoA-II.

EFFECTS OF PHOSPHATIDYLCHOLINE LIPOSOMES ON THE FATTY ACID SYNTHETASE COMPLEX FROM MYCOBACTERIUM SMEGMATIS. J.M. Odriozola and K. Bloch (James Bryant Conant Labs., Harvard Univ., Cambridge, MA) *Biochim. Biophys. Acta* **488**, 198–206 (1977). Phosphatidylcholine liposomes stimulate fatty acid synthesis catalyzed by the multienzyme complex from *Mycobacterium smegmatis* up to 3-fold and raise the proportion of shorter chain fatty acids (C_{14}, C_{16}, C_{18}) from 15 to 72%. Palmitoyl-CoA in a concentration of 10 μM inhibits the synthetase completely. This inhibition is fully relieved by liposomes. Increasing the incubation temperature from 19 to 45°C, raises the rate of synthesis (2-fold) and the proportion of long chain fatty acids (C_{24} and C_{26}). Liposomes (250 μM) potentiate the effect of temperature on rate by another factor of 2 and have a chain-shortening effect in parallel with increasing temperature. It is concluded that liposomes affect the de novo synthesis rate by alleviating feedback inhibition of the synthetase caused by C_{16}- and C_{18}-CoA. By sequestering these products, liposomes minimize the further elongation of C_{16} chains. The possible role of membrane phospholipids in controlling the rate of synthesis and the length of fatty acid chains is discussed.

FATTY ACID SYNTHETASE ACTIVITY IN MYCOBACTERIUM SMEGMATIS. CHARACTERIZATION OF THE ACYL CARRIER PROTEIN-DEPENDENT ELONGATING SYSTEM. J.M. Odriozola, J.A. Ramos, and K. Bloch (James Bryant Conant Labs., Harvard Univ., Cambridge, Mass.) *Biochim. Biophys. Acta* **488**, 207–17 (1977). *Mycobacterium smegmatis* extracts contain two fatty acyl synthetase systems. One is the extensively studied multienzyme complex, (molecular weight $1.39 \cdot 10^{6}$) which produces shorter (C_{16} and C_{18}) and longer (C_{24} and higher) fatty acids in a bimodal pattern. The second synthetase is acyl carrier-protein (ACP) dependent and elongates the CoA derivatives of C_{12} and longer chains. In contrast to the type I synthetase which also extends long fatty acyl chains, the ACP-dependent system produces homologous fatty acids up to 30 carbon atoms long in approximately equal proportions. Other properties which distinguish the ACP-dependent system from the multienzyme complex include the resistance to high concentrations of palmitoyl-CoA and to low ionic strength and the lack of stimulation by mycobacterial polysaccharides. The possibility that the two fatty acid synthetases are complimentary in their function is discussed.

GLYCOSPHINGOLIPIDS FROM CULTURED ASTROBLASTS. J. Robert, G. Rebel and P. Mandel (Centre de Neurochimie de C.N.R.S. and Institut de Chimie Biologique de la Faculte de Medecine, 11, Rue Humann, 67085 Strasbourge Cedex, France) *J. Lipid Res.* **18**, 517–22 (1977). The glycolipids of two clonal lines of astroblasts, NN clone and C6 clone, were studied. Glucosylceramide and lactosylceramide were present at very low levels in both clones, but the most common myelin glycolipids, galactosylceramide and sulfatide, were not detected. The ganglioside pattern of these cells was rather simple, with G_{M3} as the main component, accompanied in one clone by G_{D3}. These results are quite different from those observed on astroglia-enriched fractions isolated from the brain. The fatty acid composition of these glycolipids was studied. Long chain fatty acids, up to lignoceric acid, were found in appreciable amounts, even in gangliosides. It is difficult to conclude if these glycolipid patterns are due to the properties of normal astroblasts, to transformation, or to a tumoral character of our cell lines.

LIPID AND MYELIN ABNORMALITIES OF BRAIN IN THE CRINKLED MOUSE. L.L. Theriault, D.D. Dungan, S. Simons, C.L. Keen and L.S. Hurley (Dept. of Nutr., Univ. of California, Davis, CA) *Proc. Soc. Exp. Biol. Med.* **155**, 549–53 (1977). Lipid composition and histology of brain samples from crinkled and noncrinkled mice fed a normal diet were studied. Sulfatides in young and cerebrosides in adults were found to be increased in brains from crinkled mice when compared to their noncrinkled controls. Cholesterol esters, not present at all in the controls, were found in all crinkled brains analyzed. Histological examination of brain showed abnormalities in myelin structures of varying degrees of severity in all brains from

crinkled mice. The observation of cholesterol esters in the brains of crinkled mutants supports the view that the myelin disruption found in these mice is secondary to axonal degeneration.

KINETICS OF PHOSPHOLIPID EXCHANGE BETWEEN BILAYER MEMBRANES. L. Thilo (Max-Planck-Inst. fur Biol., Corrensstr. 38, D74 Tubingen, G.F.R.) *Biochim. Biophys. Acta* **469**, 326–34 (1977). In an accompanying publication by Duckwitz-Peterlein, Eilenberger and Overath it is shown that the exchange of lipid molecules between negatively charged vesicles consisting of total phospholipid extracts from *Escherichia coli* occurs by the transfer of single lipid monomers or small micelles through the water. Here a kinetic interpretation is presented in terms of a rate constant, k—, for the escape of lipid molecules from the vesicle bilayer into the water. The evaluated rate constants are k^P $(0.86 \pm 0.05) \cdot 10^{-5}$ s^{-1} and $k^E = (1.09 \pm 0.13) \cdot 10^{-6}$ s^{-1} for phospholipid molecules with *trans*-Δ^9-hexadecenoate and *trans*-Δ^9-octadecenoate, respectively, as the predominant acyl chain component. The rate constants are discussed in terms of the acyl chain and polar head group composition of the lipids.

LIPID SYNTHESIS IN CULTURED HUMAN EMBRYONIC FIBROBLASTS. M. Waite, L. Kucera, L. King and S. Crosland (The Depts. of Biochem., Microbiol., and Immunol., The Bowman Gray School of Med., Winston-Salem, NC) *Lipids* **12**, 698–706 (1977). We describe here the pathways by which human embryonic fibroblasts synthesize lipids. In these studies, we quantitated the phospholipids by their phosphorus content and by their acyl components. These determinations defined both the chemical composition of the cellular membranes as well as their metabolic turnover. Using radiolabeled precursors, we have shown synthesis of the glycerol moiety via glycolysis and the action of glycerokinase, utilization of both exogenously added and endogenously synthesized fatty acids, synthesis de novo of phosphatidyl choline and phosphatidyl ethanolamine from their base precursors, and the methylation of phosphatidyl ethanolamine yielding phosphatidyl choline. Dividing cells synthesized phosphoglyceride more rapidly than cells in the stationary phase. However, considerable turnover of cellular lipid did occur in the stationary phase.

THE MANIPULATION OF CELLULAR CYTOCHROME AND LIPID COMPOSITION IN A HAEM MUTANT OF SACCHAROMYCES CEREVISIAE. A.M. Astin, J.M. Haslam and R.A. Woods (Dept. of Biochem., Univ. of Liverpool, P.O. Box 147, Liverpool L69 3BX, U.K.) *Biochem. J.* **166**, 275–85 (1977). The *ole*-3 mutant of *Saccharomyces cerevisiae* has an early lesion in the pathway of porphyrin biosynthesis. This results in the loss of all haem-containing enzymes, including the mitochondrial cytochromes, and prevents the synthesis of components whose formation requires haem-containing enzymes, including unsaturated fatty acids, ergosterol and methionine. The pleiotropic effects of the primary lesion are reversed by growing mutant *ole*-3 aerobically in the presence of intermediates of the porphyrin-biosynthetic pathway, and the present work reports the degree of manipulation of lipid and respiratory-cytochrome composition. Supplements of δ-aminolaevulinate in the range 0.5–500 mg/l result in a progressive increase in the cellular content of unsaturated fatty acids and respiratory cytochromes, cause the replacement of lanosterol and squalene by ergosterol, and an increase in total sterol content. Haematoporphyrin and protoporphyrin IX have similar but less extensive effects on cellular composition, whereas haematin allows unsaturated fatty acid synthesis and some sterol synthesis, but has no effect on the formation of respiratory cytochromes. These results suggest that growth of the organism in the presence of defined amounts of δ-aminolaevulinate will be useful in the investigation of the role of lipids and cytochromes in the function and assembly of mitochondrial membranes.

THE EFFECTS OF ALTERED MEMBRANE STEROL COMPOSITION ON OXIDATIVE PHOSPHORYLATION IN A HAEM MUTANT OF SACCHAROMYCES CEREVISIAE. A.M. Astin and J.M. Haslam (Dept. of Biochem., Univ. of Liverpool, P.O. Box 147, Liverpool L69 3BX, U.K.) *Biochem. J.* **166**, 287–98 (1977). The sterol, unsaturated fatty acid and cytochrome contents of cells of a δ-aminolaevulinate synthase mutant of *Saccharomyces cerevisiae* are manipulated by growing the organism in media containing defined supplements of δ-aminolaevulinate and other phorphyrin intermediates. If unsaturated fatty acids are added to the growth medium as Tween 80, sterol content and respiratory cytochromes alone are manipulated. In the presence of δ-aminolaevulinate (10–50 mg/l) cells exhibit moderate to high respiratory activity, but growth yields are low, indicating a loss of oxidative phosphorylation. This is associated with the depletion of membrane lipids, either unsaturated fatty acids and sterols together or sterols alone. Sterol depletion leads to the loss of coupled mitochondrial oxidative phosphorylation *in vitro*. This indicates that sterols alone are probably directly responsible for the increased proton entry, owing to a reorganization of the lipid in the membrane.

ROLE OF LAMELLAR BODIES IN THE BIOSYNTHESIS OF PHOSPHATIDYLCHOLINE IN MOUSE LUNG. J. Baranska and I.M.G. Van Golde (Lab. of Vet. Biochem., State Univ. of Utrecht, Biltstraat 172, Utrecht, Netherlands). *Biochim. Biophys. Acta* **488** 285–93 (1977). A lamellar body-enriched fraction was isolated from whole lung homogenates of mouse lung and its contamination with microsomes, mitochondria, and cytosol protein assessed by marker enzyme analyses. By measuring the activity of cholinephosphotransferase (EC 2.7.8.2) in varying amounts of microsomes in the presence and absence of a fixed quantity of lamellar bodies, it could be demonstrated unequivocally that lamellar bodies of mouse lung lack the capacity to synthesize phosphatidycholine de novo. A similar approach allowed the conclusion that lamellar bodies of mouse lung do not contain lysophosphatidylcholine acyltransferase (EC 2.3.1.23) and lysophosphatidylcholine:lysophosphatidylcholine acyltransferase (EC 2.3.1.—), enzymes which play a putative role in the formation of pulmonary 1,2-dipalmitoyl-*sn*-glycerol-3-phosphocholine. The activities of these enzymes observed in lamellar body fractions could be attributed completely to contaminating microsomes and cytosol respectively. Lamellar bodies contributed to the activity of microsomal lysophosphatidylcholine acyltransferase by a cooperative effect. The possible role of this cooperation in the biosynthesis of 1,2-dipalmitoyl-*sn*-glycero-3-phosphocholine is discussed.

THE SELF-ASSOCIATION OF APOLIPOPROTEIN A-II FROM PLASMA HIGH DENSITY LIPOPROTEINS OF RHESUS MONKEY (MACACA MULATTA). D.L. Barbeau, Ta-Lee Teng and A.M. Scanu (Depts. of Med. and Biochem., The Univ. of Chicago Pritzker School of Med., Chicago, IL) *J. Biol. Chem.* **252**, 6745–9 (1977). The sedimentation equilibrium behavior of apo-lipoprotein A-II (apo-A-II) obtained from plasma high density lipoproteins (HDL) of the rhesus monkey *(Macaca mulatta)* was studied in aqueous solutions of 0.02 M EDTA, pH 8.6, at 20°. The ultracentrifugal analyses which were carried out at several initial protein concentrations and rotor speeds generated curvilinear plots of molecular weight *versus* concentration; the curves had overlapping segments, indicating that apo-A-II undergoes a reversible self-association. This process could best be described as either a monomer-dimer-tetramer equilibrium having association constants of $K_2 = 3.24 \times 10^3$ M^{-1}, $K_4 = 1.46 \times 10^{11}$ M^{-3}, or as a monomer-dimer-trimer-tetramer equilibrium having association constants of $K_2 = 3.04 \times 10^3$ M^{-1}, $K_3 = 3.49 \times 10^6$ M^{-2}, and $K_4 = 1.33 \times 10^{11}$ M^{-3}. The results did not permit a clear choice between the two possibilities, although the former model was favored. The self-associating property of rhesus apo-A-II (single chain) determined in this study is comparable qualitatively to that reported for human apo-A-II (two identical chains linked by a disulfide bridge), but differs significantly from that of apo-A-II after reduction and carboxymethylation. However, this difference may be attributable to the fact that the two proteins were not studied under the same concentration ranges.

EFFECT OF SUBSTRATE POLARITY ON THE ACTIVITY OF SOYBEAN LIPOXYGENASE ISOENZYMES. G.S. Bild, C.S. Ramadoss and B. Axelrod (Dept. of Biochem., Purdue Univ., West Lafayette, IN) *Lipids* **12**, 732–5 (1977). In order to characterize the several isoenzymes of soybeans, they were examined with respect to the effect of the polar nature of the substrate. In general, lipoxygenase-1 was most active when presented with charged substrates such as the anionic form of linoleic acid or of potassium linoleyl sulfate, whereas lipoxygenase-2 and -3 preferred nonpolar substrates such as unionized linoleic acid, methyl linoleate, linoleyl methane sulfonate, 10,13-nonadecadieneamine, or linoeyl acetate. Linoleyl sulfate, which has been advanced as an excellent readily soluble substrate for lipoxygenase, was indeed the best substrate found for lipoxygenase-1. Lipoxygenase-2 and -3 were, by contrast, totally inactive against this substrate. The favorable response of linoleic acid to lipoxygenase-2 and -3 at pH 6.8 was ascribed to the anomalously high pK_a value of linoleic acid compared to that of short chain carboxylic acids. The pH-activity profile obtained with lipoxygenase acting on linoleyl sulfate

(which was charged at all pH values examined) was shifted to lower pH values compared to the linoleic acid activity profile. The effect of changing from the charged to the uncharged substrate, when tested against liporygenase-1, was to increase the K_m by an order of magnitude.

INTERACTION OF FILIPIN WITH CHOLESTEROL IN VESICLES OF SATURATED PHOSPHOLIPIDS. L. Blau and R. Bittman (Dept. of Chem., Queens Col. of The City Univ. of New York, Flushing, N.Y.) *Biochemistry* **16**, 4139–44 (1977). Stopped-flow measurements were made of the initial rate of interaction of filipin with cholesterol in vesicles prepared from saturated phospholipids. The association process follows second order kinetics (first order in each reactant) in vesicles prepared from mixtures of cholesterol and dimyristoyl-, dipalmitoyl-, or reduced egg phosphatidylcholine, or sphingomyelin. The initial rate increased with increasing temperature for association of filipin with vesicles prepared from these phospholipids, but decreased with increasing temperature for reaction with cholesterol-containing didecanoylphosphatidylcholine and dipalmitoyl-phosphatidylserine vesicles. The reaction order and magnitude of the initial rate at 30°C were also markedly different for filipin association with cholesterol in vesicles prepared from the latter phospholipids compared with the other saturated phospholipids examined. The differences in the kinetics of filipin and amphotericin B association with vesicles are discussed.

COMPLETE EXCHANGEABILITY OF CHOLESTEROL IN PHOSPHATIDYLCHOLINE/CHOLESTEROL VESICLES OF DIFFERENT DEGREES OF UNSATURATION. B. Bloj and D.B. Zilversmit (Div. of Nutr. Sci. and Sec. of Biochem., Molecular and Cell Biol., Div. of Biol. Sci., Cornell Univ., Ithaca, N.Y.) *Biochemistry* **16**, 3943–8 (1977). [^{14}C]-Cholesterol/phosphatidylcholine vesicles (molar ratio 0.8:1) prepared by sonication were fractionated on agarose columns. Cholesterol exchange between vesicles and erythrocytes is 13-fold faster than phosphatidylcholine exchange. Vesicles of labeled cholesterol and phosphatidylcholine of different degrees of unsaturation were incubated with an excess of erythrocytes. The half-lives for cholesterol exchange, for cholesterol incorporated in dipalmitoyl-, dimyristoyl-, dioleyl-, egg, and soy phosphatidylcholine vesicles are 4.7, 3.9, 2.6, 3.1, and 1.8 h, respectively. Nearly all the cholesterol in the sonicated vesicles appears to be exchangeable. The presence of 5% lysophosphatidylcholine in dipalmitoylphosphatidylcholine/cholesterol vesicles does not alter the cholesterol exchange rate in large or small vesicles.

THE MASS SPECTROMETRY OF ISO AND ANTEISO MONOENOIC FATTY ACIDS. J.J. Boon, B. van de Graaf, P.J.W. Schuyl, F. de Lange and J.W. de Leeuw (Dept. of Chem. and Chem. Engineering, de Vries van Heijst plantsoen 2, Delft, The Netherlands) *Lipids* **12**, 717–21 (1977). The normal, iso, and anteiso Δ^8- and Δ^9-17:1 fatty acid methyl esters were synthesized and their electron impact-induced fragmentation was studied by mass spectromety. The mass spectra of the preterminal branched monoenoic fatty acid methyl esters present characteristic fragment ions now understood to be indicative of the position of the methyl group. These fragment ions are in the iso compound m/e 227 $[M-55]^+$, m/e 195 $[M-87]^+$, and m/e 177 $[M-105]^+$, while in the anteiso compound these fragments are shifted by 14 mass units to m/e 213, m/e 181, and m/e 163. The 15-D-iso Δ^8- and Δ^9-17:1 methyl esters were synthesized because the characteristic fragment ions in the methyl branched compounds indicated a key role of the tertiary hydrogen atom in the rearrangement process. A fragmentation mechanism consisting of a double bond migration triggered by the tertiary hydrogen and an allylic cleavage assuming a displacement mechanism is proposed.

SELECTIVE EXTRACTION OF MEMBRANE-BOUND PROTEINS BY PHOSPHOLIPID VESICLES. S.R. Bouma, F.W. Drislane and W.H. Huestis (Dept. of Chem., Stanford Univ., Stanford, CA) *J. Biol. Chem.* **252**, 6759–63 (1977). Extraction of membrane proteins from erythrocytes into sonicated phosphatidylcholine vesicles is described. In a process involving phospholipid and neutral lipid exchange, cell membrane proteins associate with the vesicles and can be separated from the cells by centrifugation. The protein transfer appears to be reversible; phospholipid vesicles mediate the delivery of small amounts of previously extracted protein into cell membranes. Prior to extraction, all but one of the proteins are accessible to lactoperoxidase iodination, and lipid analysis indicates that primarily the outer monolayer of the cell is involved in phospholipid exchange. Among the extracted proteins is acetylcholinesterase which is removed much more efficiently by this procedure than by concentrated salt solutions. The most abundant proteins of the erythrocyte membrane are not represented in the vesicle extract.

NMR AND ESR STUDIES OF THE INTERACTIONS OF CYTOCHROME C WITH MIXED CARDIOLIPINPHOSPHATIDYLCHOLINE VESICLES. L.R. Brown and K. Wuthrich (Institut fur Molekularbiologie und Biophysik, Eidgenossische Technische Hochschule, 8093 Zurich-Honggerberg, Switzerland) *Biochim. Biophys. Acta* **468**, 389–410 (1977). Preparation and structural investigations of 1:4 cardiolipin-phosphatidylcholine vesicles with bound ferricytochrome *c* are reported. Size and homogeneity of the vesicles were characterized by column chromatography, ultrafiltration, gel filtration electron microscopy and ^{1}H NMR techniques. It was found that the diameter of the vesicles with and without bound cytochrome *c* was approximately 300 Å, that the appearance of the species was typical for single bilayer structures and that the vesicles were stable over several days. ^{1}H and ^{13}C NMR combined with ESR studies of spin labels covalently bound to cytochrome *c* was then used to investigate structural aspects of these systems. In agreement with earlier studies the experiments showed that cytochrome *c* is bound on the lipid bilayer surface mainly by ionic interactions. They further provided evidence that binding of cytochrome *c* affects the dynamic behavior of the lipid surface whereas the interior of the bilayer structure is rather insensitive to the protein.

ENHANCEMENT OF IRON ABSORPTION IN IRON DEPLETED RATS BY INCREASING DIETARY FAT. J. Bowering, G.A. Masch and A.R. Lewis (Div. of Nutr. Sci., Cornell Univ., Ithaca, NY) *J. Nutr.* **107**, 1687–93 (1977). The effect of changing the level and type of dietary fat on iron absorption in male weanling, iron depleted rats was studied. Changes in fat content included an increase from 5% to 20% of the diet and exchange of lard for corn oil. Both increasing the fat level and changing to a more saturated fat source were associated with small but significant increases in iron absorption when compared to the control diet containing 5% corn oil. The enhancing effect on iron absorption observed with changing the dietary fat was observed when ferrous sulfate was fed at sub-optimal, normal and excessive levels of iron compared to the NRC recommendation of 35 mg/kg diet for the growing rat. With 35 mg iron/kg of diet (the NRC recommendation), the whole body counts and liver iron accumulation, but not the final hemoglobin level showed the enhancing effect of fat. At the highest level of iron, 350 mg/kg, only liver iron accumulation was significantly enhanced by the increase in dietary fat.

INTERRELATED EFFECTS OF FOOD LIPIDS ON STEROID METABOLISM IN RATS. B.C. O'Brien, C.L. Skutches, G.R. Henderson and R. Reiser (Dept. of Biochem. and Biophys., Texas Agr. Exp. Station, Texas A&M Univ. System, College Station, TX) *J. Nutr.* **107**, 1444–54 (1977). Semipurified diets containing either: 1) 15% sterol-free lard; 2) 15% sterol-free safflower oil; 3) and 4) diets 1 and 2 with 0.5% cholesterol; 5) and 6) diets 3 and 4 with 0.25% mixed soybean sterols; and 7) and 8) diets 3 and 4 with 0.5% soybean sterols, were fed to female BHE rats for 10 weeks. Males were fed all diets except 6 and 8. The diet fats alone were found to have no significant effect on the serum cholesterol, but serum triglycerides were significantly lower when the safflower oil was fed to females. Diet fats had little effect on liver cholesterol, but ingestion of lard resulted in higher liver triglycerides in the female than when safflower oil was consumed. In the female, the addition of cholesterol to the sterol-free lard diet increased serum cholesterol from about 90 mg/100 ml to about 500 mg/100 ml. Its addition to the sterol-free safflower oil diet increased serum cholesterol in females to about 350 mg/100 ml. Diet cholesterol caused a large increase in fecal neutral sterols and bile acids, while plant sterols stimulated excretion of neutral sterols and reduced the level of fecal bile acids. The total and component bile acid quantities and distribution were dependent upon both diet fat and sex.

REGULATION OF PALMITATE METABOLISM BY CARNITINE AND GLUCAGON IN HEPATOCYTES ISOLATED FROM FASTED AND CARBOHYDRATE REFED FATS. R.Z. Christiansen (Inst. of Med. Biochem., Univ. of Oslo, Oslo, Karl Johansgt. 47, Norway) *Biochim. Biophys. Acta* **488**, 249–62 (1977). Glucagon stimulates the oxidation of palmitate in the liver cells isolated from carbohydrate-refed rats and incubated in a simple salt medium. The maximal stimulation was observed at the concentration of glucagon of $4 \cdot 10^{-8}$ M and was already noticeable after 5 min of incubation. The stimulation of the

oxidation was balanced mainly by the inhibition of triacylglycerol synthesis. The extent of stimulation was not dependent on the concentration of intracellular carnitine, but was decreased at higher concentrations of palmitate in the medium. The level of total long-chain acyl-CoA was increased by glucagon in refed cells. Carnitine increased the level of total long-chain acyl-CoA in fasted cells. It seems probable that in the presence of glucagon, the extramitochondrial acyl-CoA level is increased, which may indicate direct inhibition of the triacylglycerol synthesizing enzymes. It is concluded that glucagon acts at least in part at one of the early stages in fatty acid metabolism, i.e., carnitine acyltransferase and/or glycerophosphate acyltransferase.

PERMEABILITY OF ARTERIAL ENDOTHELIUM TO PLASMA MACROMOLECULES. S. Christensen and H. Nielsen (Dept. of Physiology and Med. Biochem., Univ. of Aarhus, Aarhus, Denmark). *Atherosclerosis* 27, 447–63 (1977). An in vivo model system for the study of plasma lipoprotein flux into arterial intima-media has been characterized as follows. Native, whole plasma from stilbestrol-treated, hyperlipidemic cockerels, which received (^{32}P)orthophosphate 24 h prior to exsanguination, was injected intravenously into normal recipient cockerels from which aortic intima-media layers were prepared 0.12, 1,5, and 10 h later. For at least 5 h it was seemingly possible to identify the (^{32}P) phosphoprotein influx to intima-media across the intimal endothelium with simple intima-media uptake values, i.e. efflux was not noticeable. The same applies to the labelled phospholipids. The mean molecular weight (MW) for the very low density lipoprotein which carries by far the greater part of the phospholipids in plasma from estrogenized birds was estimated to be about 3–4 × 10^6. The phosphoprotein complex present in this plasma showed for the greater part a MW of about 8 × 10^5. The lipoprotein flux was not measurably influenced by exposure of the birds to 200 ppm of carbon monoxide.

FATTY ACID COMPOSITION OF SELECTED ORGANS OF GERBILS MAINTAINED ON A FAT-DEFICIENT OR FAT-SUPPLEMENTED DIET. J.G. Coniglio and D.G. Harris (Dept. of Biochem., Vanderbilt Univ., School of Med., Nashville, TN) *Lipids* 12, 741–6 (1977). The fatty acid composition of liver, heart, and testes was determined in gerbils maintained on a fat-deficient or fat-supplemented diet since the age of twenty-eight days and in gerbil pups, the mothers of which were placed on the respective diets on the day of delivery. Pups born to these mothers were killed at 11 to 19 days at which time increased concentrations of 16:1, 18:1, and 20:3ω9 and decreased concentrations of 18:2 and 20:4 (and 22:5ω6 in testes) were apparent in organs of fat-deficient compared to fat-supplemented gerbils. Similar but more marked changes occurred in organs of gerbils placed on the fat-deficient diet at twenty-eight days of age and examined at intervals of time up to two months later. In these animals, minimal changes were seen also in fatty acids of the brain. The concentration of 22:6ω3 was resistant to change with the fat-deficient diet. Deficient gerbils had hair loss, decreased quantities of spermatids and spermatozoa in the testis, and most but not all had decreased body weight compared to the fat-supplemented controls. Extremely high concentrations of oleic acid were present in carcass fatty acids of deficient compared to supplemented gerbils, indicating an extremely dynamic fatty acid metabolism in these animals.

TIME SEQUENCE OF CHANGES IN HEPATIC FATTY ACID SYNTHESIS IN RATS MEAL-FED POLYUNSATURATED FATTY ACIDS. S.D. Clarke, D.R. Romsos and G.A. Leveille (Dept. of Food Sci. and Human Nutr., Michigan State Univ., East Lansing, MI) *J. Nutr.* 107, 1468–76 (1977). Rats were meal-fed once daily methyl esters of palmitate ($C_{16:0}$); stearate ($C_{18:0}$); linoleate ($C_{18:2}$) and linolenate ($C_{18:3}$) to determine the influence of these fatty acids on glucokinase and fatty acid synthetase activities and on in vivo rates of fatty acid synthesis in the liver. Addition of 7% $C_{16:0}$ or 3% $C_{18:3}$ to a fat-free basal diet did not alter the rate at which the diet was removed from the stomach and small intestine. Consumption of a diet containing $C_{18:2}$ for eight meals significantly reduced hepatic fatty acid synthetase activity and in vivo rates of fatty acid synthesis by 40%, but did not alter glucokinase activity. The results of this study suggest that polyunsaturated fatty acids can specifically influence hepatic fatty acid synthesis and fatty acid synthetase activity without altering glucokinase activity, and that meal-fed rats must consume at least three meals containing polyunsaturated fatty acids before hepatic fatty acid synthesis or fatty acid synthetase activity is altered.

DIETARY ENERGY AND FAT CONTENT AS FACTORS IN THE NUTRITION OF DEVELOPING EGG STRAIN PULLETS AND YOUNG HENS. 2. EFFECTS ON SUBSEQUENT PRODUCTIVE PERFORMANCE AND BODY CHEMICAL COMPOSITION OF PRESENT DAY EGG STRAIN LAYERS AT THE TERMINATION OF LAY. D.C. Cunningham and W.D. Morrison (Dept. of Animal and Poultry Sci., Univ. of Guelph, Guelph, Ontario, Canada, N1G 2W1) *Poult. Sci.* 56, 1405–16 (1977). Four hundred commercial S.C.W.L. chicks of two strains were floor reared on two dietary programmes (pullet *versus* broiler diets) which differed in energy content by approximately 457 kcal. of M.E./kg. for the starting and growing diets. At 18 weeks of age the pullets were moved to a windowless cage house, housed in individual cages, fed two laying diets that differed in energy and fat content and sacrificed after 280 days of lay. Moisture, fat, nitrogen and ash were determined on each carcass and liver. While feeding of the high energy rearing diet depressed feed intake (approximately 7% over the duration of the rearing period) and resulted in a marked increase in caloric intake from 6 to 18 weeks of age, energy level of the rearing diet failed ($P = 0.05$) to affect mortality or body weight gains. While many strain differences were noted in the various parameters studied, of considerable importance was the finding of no significant strain by diet energy level interaction. Body and liver composition for the two strains did not differ at the end of lay.

EFFECT OF DIETARY VITAMIN E AND AGING ON TISSUE LIPOFUSCIN PIGMENT CONCENTRATION IN MICE. A.S. Csallany, K.L. Ayaz and L-C. Su (Dept. of Food Sci. and Nutr., Univ. of Minnesota, St. Paul, Mn.) *J. Nutr.* 107, 1792–9 (1977). This study reports a re-investigation of the effect of dietary vitamin E upon tissue organic solvent soluble lipofuscin pigment concentrations. Female weanling mice were fed a vitamin E deficient, vitamin E or N,N'-diphenyl-phenylenediamine (DPPD) supplemented diet up to 18 months of age. Lipofuscin concentrations were measured by a quantitative method which is based on fluorescence spectroscopy. Of all tissues measured (uterus, lung, spleen, kidney, liver, heart and brain), only the liver responded and showed lower pigment concentrations due to vitamin E treatment. In addition, in the liver, up to 12 months of age, vitamin E supplementation resulted in gradually decreasing pigment concentrations, but by 18 months of age, pigment concentrations were increased by 5 to 10 times in all diet groups. The effect of DPPD was similar to vitamin E. Tissue lipofuscin pigment concentrations in 18-month-old mice were lowest in the uterus and highest in the heart. The data indicate the possibility of a turnover of the organic solvent soluble lipofuscin pigments in the liver.

EARLY EFFECTS OF HYPERVITAMINOSIS A ON GLUCONEOGENIC ACTIVITY AND AMINO ACID METABOLIZING ENZYMES OF RAT LIVER. K.N. Dileepan, V.N. Singh and C.K. Ramachandran (Dept. of Biochem., Vallabhbhai Patel Chest Inst., Univ. of Delhi, Delhi-110007, India) *J. Nutr.* 197, 1809–15 (1977). In an earlier report from this laboratory, one of the early manifestations of hypervitaminosis A was shown to be a marked stimulation of hepatic gluconeogenesis. In the present study, effects of feeding 30,000 IU of retinyl palmitate to young rats (80–100 g), once daily, for 2 days on the incorporation of ^{14}C-labeled precursors into glucose and glycogen by liver slices, levels of amino acids in blood and tissues, and activities of some important amino acid catabolizing enzymes in the liver were investigated. A stimulation of hepatic gluconeogenesis in hypervitaminosis A was indicated by the increased incorporation of ^{14}C-labeled alanine and bicarbonate into glucose and glycogen by liver slices. Excessive intake of retinol caused a marked increase in the activities of hepatic alanine aminotransferase and ornithine aminotransferase and a decrease in that of tryptophan pyrrolase, without affecting those of tyrosine aminotransferase and serine dehydratase. The ratio of NADH:NAD in the livers of rats fed excess retinol was significantly increased. It is suggested that enhancement of gluconeogenesis in hypervitaminosis A is caused by a stimulation of gluconeogenic activity of the liver.

EFFECT OF INCREASED FREE FATTY ACIDS ON MYOCARDIAL OXYGEN EXTRACTION AND ANGINA THRESHOLD DURING ATRIAL PACING. G.R. Dagenais and B. Jalbert (Quebec Inst., Laval Univ. Schl. of Med., Quebec, Canada). *Circulation* 56, 315–9 (1977). To evaluate whether elevated arterial free fatty acids

(FFA) increase myocardial oxygen demand and ischemia, 15 fasting patients with coronary artery disease underwent a standardized atrial pacing test before (PT1) and during (PT2) herapin infusion. The patients were monitored for clinical and electrocardiographic (ECG) manifestations of ischemia. Myocardial extraction of lactate, inorganic phosphate, oxygen and FFA was measured before and during each PT. The control arterial FFA was 0.65 ± 0.03 μmole/ml and rose to 1.8 ± 0.16 μmole/ml during herapin infusion. Myocardial oxygen extraction at rest and during PT was not affected by the increase in arterial FFA. Seven patients asymptomatic during PT1 did not develop ischemic manifestations during PT2. In eight patients with angina during both PTs, increased arterial FFA concentration did not modify the severity of anginal pain, the amount of ST-segment depression and the myocardial balance of lactate or inorganic phosphate. Elevation of arterial FFA by heparin neither increased myocardial oxygen extraction at rest or during pacing nor accentuated ischemic manifestations during PT.

EFFECT OF DIETARY FATS ON OXIDATIVE PHOSPHORYLATION AND FATTY ACID PROFILE OF RAT LIVER MITOCHONDRIA. P. Divakaran and A. Venkataraman (Dept. of Physio., Univ. of Texas Med. Schl. at Houston, P.O. Box 20708, Houston, Texas) *J. Nutr.* **107**, 1621–31 (1977). Hydrogenated coconut oil or safflower seed oil were fed at 20% levels to weanling male albino rats for 2 months. The fatty acid patterns of the liver homogenates, mitochondria and the microsomes were determined by gas chromatography as were also the fatty acid patterns of the liver cholesterol esters and the phospholipids. The mitochondrial phospholipids were fractionated by thin layer chromatography and the fatty acid moieties of the individual phospholipids were screened on a gas chromatograph. The oxidative phosphorylation in the liver mitochondria was determined using glutamate, malate and succinate as substrates. The liver fatty acid pattern, especially that of the subcellular particles, seemed to be dependent upon the dietary fat. The fatty acid composition of the mitochondrial phospholipids varied with the dietary fat. Oxidative phosphorylation for glutamate and malate was higher in the group fed safflower oil compared to that in the group fed saturated fat; in the case of succinate, no such difference was noticed. These results suggest that the changes in the phosphorylation capacity are due to the changes in the mitochondrial phospholipids which reflect the composition of the dietary fat.

CHANGES IN PHOSPHATIDYLINOSITOL METABOLISM CORRELATED TO GROWTH STATE OF NORMAL AND ROUS SARCOMA VIRUS-TRANSFORMED JAPANESE QUAIL CELLS. H. Diringer and R.R. Friis (Institut fur Virologie, Justus-Liebig-Universitat Giessen, West Germany) *Cancer Res.* **37**, 2979–84 (1977). Second-passage Japanese quail embryo cell cultures, normal or quantitatively transformed by Rous sarcoma virus, were investigated for phospholipid composition and metabolism. Cells cultivated at low and high population density as well as in the presence or absence of serum, have been compared by chemical analysis and in pulse-chase experiments. No differences in the lipid compositions between the normal and the tumor cells or between cells under different culture conditions were detected. In no case was the metabolism of phosphatidylserine or sphingomyelin affected by culture conditions. The metabolism of the choline and ethaholamine glycerophospholipids, however, differed according to culture conditions, whether cells were normal or transformed.

LIPOGENESIS IN THE DEVELOPING BRAIN FROM INTRACRANIALLY ADMINISTERED [1-^{14}C]ACETATE AND [U-^{14}C]GLUCOSE. G.A. Dhopeshwarkar and C. Subramanian (Lab. of Nuclear Med. and Radiation Biol., Div. of Nutr. and Environ. Sci., UCLA School of Public Health, Los Angeles, CA) *Lipids* **12**, 762–4 (1977). Fifteen-day-old rats divided into two groups were given [1-^{14}C]glucose by intracranial injection and were sacrificed after 1 hr. Analysis of lipids from the two groups showed differences in the incorporation of radioactivity in the polar lipids and cholesterol. Analysis of brain fatty acid showed that whereas radioactivity from acetate was incorporated into saturated, mono- and polyunsaturated fatty acids, the radioactivity from [U-^{14}C]glucose was found only in 16:0, 18:0, and 18:1. No radioactivity was found in polyunsaturated fatty acids even after concentration of this fraction by $AgNO_3$:SiO_2 thin layer chromatographic method. This difference is discussed in hypothetical terms of nonhomogeneous acetyl CoA pool, formation of acetyl CoA from glucose exclusively inside the mitochondria, and activation of injected acetate to acetyl CoA.

THE EFFECT OF A LOW-CHOLESTEROL, HIGH-POLYUNSATURATE DIET ON SERUM LIPIDS LEVELS, APOLIPOPROTEIN B LEVELS AND TRIGLYCERIDE FATTY ACID COMPOSITION. P.N. Durrington, C.H. Bolton, M. Hartog, R. Angelinetta, P. Emmett and S. Furniss (The Univ. of Bristol, Dept. of Med., Bristol, Great Britain). *Atherosclerosis* **27**, 465–75 (1977). Seven healthy normolipaemic men aged 28–46 years (mean 33 years) were studied for four weeks on their usual diet, the mean polyunsaturated to saturated fat (P:S) ratio of which was approximately 0.23 and the cholesterol content 667 mg/day, and for four weeks on an isocaloric diet, containing similar proportions of protein, carbohydrate and fat, but with a mean P:S ratio of approximately 2.82 and a cholesterol content of 112 mg/day. Total serum apolipoprotein B concentration fell by 23 ± 2.6% during the PUF diet. There was a decrease of similar magnitude in serum LDL apolipoprotein B, but no sustained effect on serum VLDL apolipoprotein B. Serum VLDL and LDL lipid to apolipoprotein B ratios did not change significantly during the study.

DETERMINATION OF ALL-TRANS AND 13-CIS VITAMIN A IN FOOD PRODUCTS BY HIGH-PRESSURE LIQUID CHROMATOGRAPHY. D.C. Egberg, J.C. Heroff, and R.H. Potter (Medallion Lab., General Mills, Inc., Minneapolis, Minn.) *J. Agric. Food Chem.* **25**, 1127–32 (1977). A high-pressure liquid chromatography (HPLC) procedure has been developed for the determination of retinol and its esters in food products. The method quantitates both the all-trans and 13-cis isomers. The presence of the 13-cis isomer in a number of food products was demonstrated. Recovery studies on different food products showed an average recovery of 94.6 ± 6.6%. Reproducibility data were generated showing a pooled relative standard deviation of 3.9%. The HPLC procedure was compared with an AOAC colorimetric procedure for six products; there was no statistical difference between the means.

7-KETOCHOLESTEROL. ITS EFFECT ON HEPATIC CHOLESTEROGENESIS AND ITS HEPATIC METABOLISM IN VIVO AND IN VITRO. S.K. Erickson, A.D. Cooper, S.M. Matsui and R.G. Gould (Dept. of Med., Stanford Univ. School of Med., Stanford, CA) *J. Biol. Chem.* **252**, 5186–93 (1977). The effects of 7-ketocholesterol on cholesterol biosynthesis and metabolism in the rat were investigated using the isolated, perfused liver and the whole animal. 3-Hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase was rapidly inhibited in both systems. In the whole animal, HMG-CoA reductase was inhibited by 60 to 70% after feeding 0.1% or 0.5% 7-ketocholesterol in the diet for 18 h. In both the intact rat and the perfused liver 7-keto[^{3}H]-cholesterol was rapidly metabolized to more polar derivatives and to cholesterol itself, primarily in the microsomal fraction. In the perfused liver the sterol and its metabolites were rapidly excreted in bile. The proportion of radioactivity in more polar metabolites increased with time, thus providing an explanation for the rapid development of tolerance. These results suggest 7-ketocholesterol is not promising as a hypocholesterolemic agent although it is a useful probe in the investigation of cholesterol metabolism.

IMPROVED TECHNIQUES FOR STUDIES OF ADIPOCYTE CELLULARITY AND METABOLISM. T.D. Etherton, E.H. Thompson, and C.E. Allen (Dept. of Animal Sci., Andrew Boss Lab., Meat Sci., Univ. of Minnesota, St. Paul, Minn.). *J. Lipid Res.* **18**, 552–7 (1977). Two methods are described for the study of adipose tissue cellularity and metabolism. In the first, 8 M urea was used to liberate osmium tetroxide-fixed adipocytes from the connective tissue matrix. The second method entailed the use of hydrogen peroxide to volatilize the black, osmium tetroxide-fatty acid complex of osmium tetroxide-fixed adipocytes, containing radioactivity, resulting in colorless lipid suitable for liquid scintillation counting. This latter technique permits incubation of unfixed adipose tissue slices with a radioactive substrate, followed by fixation with osmium tetroxide and subsequent separation of the adipocytes, by screening, into the desired size ranges. Adipocytes in various size fractions can then be counted, sized, and then decolorized with hydrogen peroxide in order to quantitate the amount of radioactivity within the adipocytes. There was no loss of radioactivity from the fixed cells with hydrogen peroxide treatment.

PHASE TRANSITION IN CHARGED LIPID MEMBRANES. P.A. Forsyth, Jr., S. Marcelja, D.J. Mitchell and B.W. Ninham (Dept. of Applied Math., Res. School of Phys. Sci., Inst. of Advanced Studies, The Australian Natl. Univ., Canberra, A.C.T. 2600, Australia) *Biochim. Biophys. Acta* **469**, 335–44 (1977). Experimental results on the effect of electrostatics

on bilayer phase transitions are compared with corresponding data for monolayers and the predictions of electrical double layer theory. The two substantial conclusions which emerge are that: double layer theory based on a continuous surface charge distribution cannot explain all the relevant data, a situation which may be improved by taking into account the discrete nature of the surface charge distribution; the crystal - liquid crystal phase transition of charged bilayer membranes is always a continuous one which takes place through an intermediate state consisting of both fluid and frozen domains.

PENTACYCLIC STEROIDS. SYNTHESIS OF 4,6β-ETHANOESTRADIOL, 4,6β-ETHANOESTRONE, AND 17α-ETHYNYL-4,6β-ETHANOESTRADIOL. A.C. Ghosh, B.G. Hazra and W.L. Duax (SISA Inc. and Sheehan Inst. for Res., Inc., Cambridge, Mass.) *J. Org. Chem.* **42**, 3091–4 (1977). Synthesis of a new series of pentacyclic steroids, 4,6β-ethanoestradiol (1), 4,6β-ethanoestrone (2), and 17α-ethynyl-4,6β-ethanoestradiol (3), is described. Estrone is converted into the key intermediate 17β-acetoxy-3-methoxy-1,3,5(10)-estratriene-6β-acetic acid (13) in 11 steps. Friedel-Crafts cyclization of the acid chloride of 13 with aluminum chloride provides compounds 14 and 15. Further structural modifications lead to 1, 2, and 3. The absolute configuration of the *p*-bromobenzoate derivative of 1 has been confirmed by x-ray crystallography. Fusion of the ethano bridge at positions C-4 and C-6 from the β face leads to a unique class of steroids in which the β ring assumes a highly distorted conformation.

THE EFFECT OF CERULENIN ON STEROL BIOSYNTHESIS IN SACCHAROMYCES CEREVISIAE. M.D. Greenspan, R.C. Mackow and S. Omura (Merck Inst. for Therapeutic Res., Rahway, NJ) *Lipids* **12**, 729–31 (1977). Cerulenin specifically inhibited fatty acid biosynthesis in *Saccharomyces cerevisiae* without having an effect on sterol formation. Ergosterol was not required for cell growth in the presence of cerulenin (1 μg/ml). The addition of fatty acids to the growth medium reduced the amount of ergosterol formed by 45%; further addition of cerulenin to the media had no effect on the amount of ergosterol synthesized by the cells. The incorporation of ^3H from ^3H_2O into ergosterol was not affected by cerulenin whereas incorporation into fatty acids was inhibited by 90%.

AMINOPHYLLINE STIMULATES THE INCORPORATION OF CHOLINE INTO PHOSPHOLIPID IN EXPLANTS OF FETAL RAT LUNG IN ORGAN CULTURE. I. Gross and S.A. Rooney (The Div. of Perinatal Med., Depts. of Pediatrics and Obstetrics and Gynecol., and Lung Res. Ctr., Yale Univ. School of Med., New Haven, CN) *Biochim. Biophys. Acta* **488**, 263–9 (1977). We have investigated the direct effect of aminophylline, a cyclic AMP phosphodiesterase inhibitor, and of cyclic AMP on choline incorporation into phospholipid in explants of fetal rat lung in organ culture. These data suggest that aminophylline has a direct stimulatory effect on the incorporation of choline into phospholipid in fetal rat lung and that this effect is probably cyclic AMP mediated.

SURFACE POTENTIAL EFFECTS ON METAL ION BINDING TO PHOSPHATIDYLCHOLINE MEMBRANES. ^{31}P NMR STUDY OF LANTHANIDE AND CALCIUM ION BINDING TO EGG-YOLK LECITHIN VESICLES. H. Grasdalen, L.E.G. Eriksson, J. Westman and A. Ehrenberg (Dept. of Biophys., Univ. of Stockholm, Arrhenius Lab., S-106 91 Stockholm, Sweden) *Biochim. Biophys. Acta* **469**, 151–62 (1977). ^{31}P NMR of phosphatidylcholine (lecithin) from egg-yolk in sonicated vesicles has been measured in the presence of various ions. Addition of Ln^{3+} or Ca^{2+} shifted the ^{31}P resonance of the phosphate groups of the outer surface of the vesicles. These shifts were measured at varied lanthanide or Ca^{2+} concentration at different ionic strengths obtained by addition of NaCl. The shifts induced by Tb^{3+} and Ca^{2+} have been analyzed using the theory of the diffuse double layer. Corrections were introduced for the effect of the ionic strength on the activities of the ions. The binding efficiency is shown to be controlled by the electrostatic potential produced by the bound cations at the membrane surface. This potential is slightly modified due to weak chloride binding. Binding constants have been derived.

MEMBRANE CHOLESTEROL AND CELL FUSION OF HEN AND GUINEA-PIG ERYTHROCYTES. M.J. Hope, K.R. Bruckdorfer, C.A. Hart and J.A. Lucy (Dept. of Biochem. and Chem., Royal Free Hosp. School of Med., Univ. of London, 8 Hunter St., London WC1N 1BP, U.K.) *Biochem. J.* **166**, 255–63 (1977). The cholesterol content of hen erythrocytes was modified by treating the cells with phospholipid liposomes. Depletion of cellular cholesterol, by using liposomes of dipalmitoylglycerophosphocholine or phosphatidylcholine from hen erythrocytes, had no effect on the susceptibility of the cells to fusion induced by oleoylglycerol, but markedly decreased fusion induced by Sendai virus. By contrast, enrichment of cellular cholesterol by using liposomes of dipalmitoylglycerophosphocholine and cholesterol increased cell fusion induced by oleoylglycerol, poly(ethylene glycol) and Sendai virus. Virus-induced cell fusion of guinea-pig erythrocytes, which were enriched in cholesterol by feeding a cholesterol-rich diet to the animals, was also enhanced. Hen erythrocytes that were treated with liposomes prepared from egg phosphatidylcholine contained increased quantities of phospholipid phosphorus and fused readily on incubation with retinol, independently of their cholesterol content. It is suggested that cholesterol may enhance cell fusion by acting to facilitate a phase separation of protein-free areas of lipid bilayer, which subsequently provide the sites for cell fusion.

A COMPARISON OF LIPOPROTEIN LIPASE ACTIVITY AND ADIPOCYTE DIFFERENTIATION IN GROWING MALE RATS. E. Hientanen and M.R.C. Greenwood (Inst. of Human Nutr. and Dept. of Genetics and Human Development, Columbia Univ., Col. of Physicians and Surgeons, New York, N.Y.) *J. Lipid Res.* **18**, 480–90 (1977). During adipose tissue development changes in lipoprotein lipase activity per adipocyte precede significant changes in fat cell size. Lipoprotein lipase activity per adipocyte increases fourfold from the second to seventh postnatal week. Furthermore, when isolated adipocytes and stromal-vascular cells are prepared by collagenase digestion of adipose tissue, there is a progressive shift in enzyme activity during development from the stromal-vascular compartment to the adipocyte fraction. The data support the concept that during normal development a "bed" of preadipocytes is synthesized during the suckling period. The data further suggest a regulatory role for lipoprotein lipase in the control of "lipid-filling" during early postnatal development.

GLUCOCORTICOID IN INFLAMMATORY PROLIFERATIVE SKIN DISEASE REDUCES ARACHIDONIC AND HYDROXYEICOSATETRAENOIC ACIDS. S. Hammarstrom, M. Hamberg, E.A. Duell, M.A. Stawiski, T.F. Anderson and J.J. Voorhees (Dept. of Chem., Karolinska Institutet, S-104 01 Stockholm 60 Sweden) *Science* **197**, 994–6 (1977). Psoriasis is a prototype of several common, glucocorticoid responsive, inflammatory proliferative skin diseases. Within 28 hours, glucocorticoid reduced the increased concentration of free arachidonic acid in diseased tissue. This reduction was observed prior to visible improvement of disease and may be an important molecular mechanism for the therapeutic efficacy of glucocorticoids in psoriasis and similar inflammatory diseases.

METABOLISM OF 3α,7α,12α-TRIHYDROXY-5β-CHOLESTAN-26-OIC ACID IN NORMAL SUBJECTS WITH AN INTACT ENTEROHEPATIC CIRCULATION. R.F. Hanson and G.C. Williams (Gastroenterology Unit, Dept. of Internal Med., Univ. of Minnesota, Minneapolis, Mn.) *J. Lipid Res.* **18**, 656–9 (1977). The formation of cholic acid from 3α,7α,12α-trihydroxy-5β-cholestan-26-oic acid (THCA) was studied in two normal subjects. [^3H]THCA and [^{14}C]cholic acid were administered intravenously by simultaneous injection and the specific activities (percent injected amount/μmol) of [^3H]- and [^{14}C]cholic acid were measured in bile samples collected over a 5-day period. If the administered [^3H]THCA is rapidly and completely metabolized into cholic acid, the areas under the specific activity curves of [^3H]- and [^{14}C]cholic acid should be identical. In these two subjects, the area under the [^3H]cholic acid specific activity decay curves was only 18.4% and 9.0% less than the area under the [^{14}C]cholic acid specific activity decay curves. Thus, there is rapid and nearly complete metabolism of intravenously administered [^3H]THCA into cholic acid.

PHOSPHOLIPIDS AND DETERGENTS AS EFFECTORS IN THE LIVER MICROSOMAL HYDROXYLASE SYSTEM. M. Ingelman-Sundberg (Dept. of Chem., Karolinska Inst., S-104 01 Stockholm, Sweden) *Biochim. Biophys. Acta* **488**, 225–34 (1977). When rat liver microsomes were delipidated with phospholipases and organic solvent extractions, 80–85% of the phospholipids and essentially all neutral lipids were removed. After delipidation, the measurable amount of cytochrome *P*-450, determined by the CO-difference spectra, represented only 20–25% of the amount originally present. However, when the delipidated

microsomes were treated with different phospholipids (phosphatidylcholine being most effective) or non-ionic detergents, the measurable amount of cytochrome *P*-450 increased by up to three times. It is suggested that the phospholipid participates in the liver microsomal hydroxylase system by: specific binding to cytochrome *P*-450 so that the enzyme assumes the active conformation, and formation of a fluid environment to facilitate electron transport from NADPH to cytochrome *P*-450.

FLUIDITY DIFFERENCE OF MEMBRANE LIPIDS IN HUMAN NORMAL AND LEUKEMIC LYMPHOCYTES AS CONTROLLED BY SERUM COMPONENTS. M. Inbar, R. Goldman, L. Inbar, I. Bursuker, B. Goldman, E. Akstein, P. Segal, E. Ipp, and I. Ben-Bassat (Dept. of Membrane Res., The Weizmann Inst. of Sci., Rehovot, Israel) *Cancer Res.* 37, 3037–41 (1977). Lymphocytes isolated from the peripheral blood of patients with chronic lymphatic leukemia and from normal healthy donors were analyzed for fluidity of membrane lipids. The degree of lipid fluidity in normal and leukemic lymphocytes was quantitatively monitored by a method based on fluorescence polarization analysis of a fluorescent probe that is embedded in lipid regions of cellular membranes. The present studies were performed on lymphocytes isolated from 26 blood samples from 16 patients with chronic lymphatic leukemia and 36 blood samples from 36 normal healthy donors. These observations suggest that normal and leukemic lymphocytes can be quantitatively characterized by monitoring the degree of fluidity of cellular membrane lipids and that the fluidity difference between normal and leukemic lymphocytes is controlled by components in the blood serum.

A MORE SENSITIVE AND STABLE COLORIMETRIC DETERMINATION OF FREE FATTY ACIDS IN BLOOD. K. Itaya (Dept. of Physiol. Chem., Faculty of Pharmaceutical Sci., Hokkaido Univ., Sapporo 060, Japan) *J. Lipid Res.* 18, 663–5 (1977). A sensitive method is proposed for the colorimetric determination of free fatty acids (FFA). Diphenylcarbazide containing diphenylcarbazone is used as the color developing reagent instead of diethyldithiocarbamate which was employed in the previous method. The present method was successfully applied to the determination of FFA present in as little as 40 μl of whole blood.

A THEORY OF PHASE TRANSITIONS AND PHASE DIAGRAMS FOR ONE- AND TWO-COMPONENT PHOSPHOLIPID BILAYERS. R.E. Jacobs, B.S. Hudson and H.C. Andersen (Dept. of Chem., Stanford Univ., Stanford, Ca.) *Biochemistry:* 16, 4349–59 (1977). A statistical mechanical partition function for phospholipid bilayers is constructed to obtain a theoretical description of the chain melting phase transition in lipid bilayer membranes and of the phase diagrams for two-component bilayers. In addition to providing an accurate representation of the transition temperatures and enthalpies of one-component bilayers composed of 1,2-diacylphosphatidylcholines, the theory can also account for the shapes of the phase diagrams observed for bilayers which are binary mixtures of these compounds with two different hydrocarbon chain lengths.

ALTERATIONS OF RAT HEPATIC CHOLESTEROGENESIS BY HETEROLOGOUS LIPOPROTEINS. L. Jakoi and S.H. Quarfordt (Div. of Gastroenterol., Dept. of Med., Duke Univ. Med. Ctr., Durham, NC) *J. Biol. Chem.* 252, 6856–60 (1977). Heterologous human lipoproteins were infused into rats in order to change acutely the lipoprotein pattern to a predominant kind and the effect on hepatic cholesterogenesis was subsequently observed. A 4-h intravenous infusion of human low density and very low density lipoproteins into rats produced a significant decrease in the incorporation of acetate into cholesterol in both liver slices and homogenates. An infusion of similar concentrations of human high density lipoprotein produced a significant increase in hepatic cholesterol synthesis. These infusions did not change mevalonate conversion to cholesterol in either the homogenates or slices. Concomitant with the changes in hepatic cholesterol synthesis were changes of similar magnitudes in the activity of the enzyme 3-hydroxy-3-methylglutaryl coenzyme A reductase. These alterations in hepatic cholesterol synthesis were associated with significant changes in microsomal cholesterol content. There was a significant increase in hepatic cholesterol synthesis with the infusion of apoproteins of high density lipoprotein. The apoproteins of very low density lipoprotein had no effect on hepatic cholesterogenesis. These studies indicate that circulating lipoproteins modify hepatic cholesterol synthesis and that the apoproteins of these lipoproteins may themselves be important for this action.

PROPERTIES OF LIPID BILAYER MEMBRANES MADE FROM LIPIDS CONTAINING PHYTANIC ACID. K. Janko and R. Benz (Fachbereich Biologie, Univ. Constance, D-7750 Constance, G.F.R.) *Biochim. Biophys. Acta* 470, 8–16 (1977). Besides the preparation of phytanic acid (3,7,11,15-tetramethylhexadecylic acid) according to the Dumas-Stass reaction, the synthesis of four different lipids containing phytanic acid residues is described. Diphytanoyl phosphatidylcholine was synthesized beginning from glycerylphosphorylcholine, whereas the other lipids, diphytanoyl phosphatidylethanolamine, diphytanoyl phosphatidylserine and monophytanoyl glyceride were prepared by total synthesis. Some properties of lipid bilayer membranes made from the lipids containing phytanic acid were investigated. The specific capacity of these membranes was measured. Its value of approximately 400 nF cm^{-2} was found to be similar to the value of membranes from lipids with unbranched fatty acid residues. Charge pulse experiments were performed using dipicrylamine as a molecular probe of membrane structure. The results were discussed on the basis of a higher viscosity of the membranes from lipids containing phytanic acid residues compared with unbranched fatty acid residues.

THE INTERACTION OF 1-ANILINO-8-NAPHTHALENESULFONATE WITH THYROID LIPIDS AND MEMBRANES: A NUCLEAR MAGNETIC RESONANCE STUDY. G.L. Jendrasiak and T.N. Estep (Dept. of Physiol and Biophysics, Univ. of Illinois, Urbana, Il.) *Chem. Phys. Lipids* 19, 323–37 (1977). The proton magnetic resonance (PMR) spectra of thyroid cell membranes and their total lipid extracts, in the presence of 1-anilino-8-naphthalenesulfonate (ANS), have been studied. The addition of ANS causes a shifting of the head group PMR signal, a splitting of the signal into two components and an increase in total spectral intensity. The data suggest that ANS interacts with phospholipid in the membrane as it does in total lipid vesicles. Evidence is also presented for the removal of lipids from the membrane, by ANS, and the subsequent formation of micelles. The membrane results are compared with our earlier work on the interaction of ANS with egg phosphatidylcholine (P.C.) vesicles and the results are used in explaining the inhibition of iodide transport in isolated thyroid slices.

PYRIDOXINE DEFICIENCY AND POSTNATAL DEVELOPMENT OF BRAIN ASPARTATE AND ALANINE AMINOTRANSFERASE ACTIVITIES, AND CHOLESTEROL LEVELS IN CHICKS. F. Jourdikian and N. Daghir (Schl. of Agr., American Univ. of Beirut, Beirut, Lebanon) *J. Nutr.* 107, 1602–9 (1977). Feeding a pyridoxine deficient diet, for 2 weeks after hatching, had no effect on post-hatching development of chick brain asparatate aminotransferase (L-aspartate:2-oxoglutarate aminotransferase, EC 2.6.1.1) activity or on cholesterol deposition in the brain, but significantly depressed the development of brain alanine aminotransferase (L-alanine:2-oxoglutarate aminotransferas, EC 2.5.1.2) activity. Feeding a pyridoxine deficient diet from 3 to 8 weeks of age had no effect on any of the three parameters studied.

EFFECT OF DIETARY BRANCHED-CHAIN α-KETO ACIDS ON HEPATIC BRANCHED-CHAIN α-KETO ACID DEHYDROGENASE IN THE RAT. B.S. Khatra, R.K. Chawla, A.D. Wadsworth and D. Rudman (Depts. of Surgery and Med., Emory Univ. School of Med., Atlanta, GA) *J. Nutr.* 107, 1528–36 (1977). Male albino rats (80–100 g) were tube-fed for 3 days with a complete purified amino acid diet minus valine, or this diet containing 70 to 210 μmole/g of valine (1 to 3 times the minimal daily requirement, MDR) or equimolar amounts of its α-keto analogue (KIV); complete diet minus leucine, or this diet containing 85 to 225 μmole/g of either leucine (1 to 3 times the MDR) or its α-keto analogue (KIC); complete diet minus valine, leucine and isoleucine, or this diet containing 63 to 170 μmole/g of these amino acids (1 to 2 times the MDR) or their α-keto analogues (KIV, KIC, KMV). The stimulation of hepatic branched-chain dehydrogenase by BCKA may play a role in the limited nutritional efficiency of these nitrogen-free substitutes for the BCAA compared to α-keto analogues of other essential amino acids.

SPECIFIC CYTOSOL-BINDING PROTEIN FOR 1,25-DIHYDROXYVITAMIN D_3 IN RAT INTESTINE. B.E. Kream, S. Yamada, H.K. Schnoes and H.F. DeLuca (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wisconsin-Madison, Madison, Wisc.). *J. Biol. Chem.* 252, 4501–5 (1977). Cytosol prepared from intestinal homogenates of vitamin D_3-deficient rats demonstrate a 3.2 S protein having a high affinity and a low capacity for 1,25-dihydroxyvitamin D_3. Apperance of the protein is

dependent upon the presence of 0.3 M potassium chloride and dithiothreitol in the homogenization buffer. A 6 S protein having a greater affinity for 25-hydroxyvitamin D_3 than 1,25-dihydroxyvitamin D_3 is observed using all conditions and is increased by the addition of the rat serum to cytosol. The 3.2 S protein is neither a serum contaminant nor a component of the 6 S protein and is probably not a constituent of tissues which are not responsive to vitamin D_3.

CHARACTERIZATION OF MECHANISMS FOR TRANSFER OF CHOLESTEROL BETWEEN HUMAN ERYTHROCYTES AND PLASMA. Y. Lange and J.S. D'Alessandro (Biophys. Div., Boston Univ. Schl. of Med., Boston, Mass.) *Biochemistry* **16**, 4339–43 (1977). The removal from human erythrocytes of cholesterol (mass) and of [^{3}H]cholesterol which had been introduced into the erythrocyte by exchange was studied. Removal was accomplished by incubating erythrocytes in plasma, the free cholesterol content of which had been lowered by the action of lecithin:cholesterol acyltransferase. It was shown that the exchange of cholesterol between erythrocytes and plasma and the net movement of cholesterol out of the membrane into plasma are characterized by the same rate constant and are driven by cholesterol to phospholipid ratios in cells and plasma. The apparent limitation on cholesterol depletion of erythrocytes observed in experiments of this type is explicable as the result of equilibrium between cholesterol in the membrane and in the plasma, an equilibrium reached when there is still cholesterol left in the cells. It is concluded from this study that all the exchangeable cholesterol in human erythrocytes is available for removal from the membrane.

MEASUREMENT OF RATE OF RAT LIVER STEROL SYNTHESIS IN VIVO USING TRITIATED WATER. M.R. Lakshmanan and R.L. Veech (Lab. of Basic Alcohol Sciences, Natl. Inst. on Alcohol Abuse and Alcoholism, St. Elizabeth's Hosp., Washington, D.C.). *J. Biol. Chem.* **252**, 4667–73 (1977). The number of tritium atoms from tritiated water incorporated into cholesterol during its biosynthesis from mevalonate has been determined *in vivo* and correlated with the theoretically expected value. *In vivo* incorporation of tritium from tritiated water into hepatic sterol was determined as a function of various dosages of DL-mevalonate in meal-fed rats. The number of microgram atoms of tritium incorporated into per μmol of cholesterol synthesized reached a constant value of around 10.4 between the dosages of 2 and 10 mmol of DL-mevalonate injected/kg body weight. This value agrees closely with the theoretical value of 9.5 based upon the biosynthetic steps from the mevalonate to cholesterol. Such a close agreement between two independent methods strongly supports the validity of the tritium incorporation method for the accurate measurement of sterol synthesis *in vivo*.

ARTERIOSCLEROSIS: IS STRESS-INDUCED IMMUNE SUPPRESSION A RISK FACTOR? E.C. Lattime and H.R. Strausser (Dept. of Zool. and Physiol., Rutgers Univ.-Newark, Newark, NJ) *Science* **198**, 302–3 (1977). Female Sprague-Dawley rats, purchased as retired breeders, developed arteriosclerosis that was accompanied by immune complex deposition in the arterial lesion and depressed immune responsiveness to T cell mitogens.

STUDIES OF PLASMA VISCOSITY IN PRIMARY HYPERLIPOPROTEINAEMIA. H. Leonhardt, H.-R. Arntz and U.H. Klemens (Klinikum Steglitz der Freien Universitat Berlin, Medizinische Klinik, Hinderburgdamm 30, D-1-Berlin 45 Germany) *Atherosclerosis* **28**, 29–40 (1977). Using an Ubbelohde capillary viscometer, viscosity was determined in the plasma of 39 patients with a primary hyperlipoproteinaemia (type IIa, $n = 13$; type IV, $n = 12$; type IIb, $n = 14$), in isolated lipoprotein fractions as well as in sera which differed only in their lipoprotein concentration. Plasma viscosity of the patients with hyperlipoproteinaemia was compared to that of a normolipidaemic control group and correlated with the lipid fractions characteristic of the different hyperlipoproteinaemia types. Plasma viscosity in types IIa, IV and IIb was found to be significantly higher than in the control group. Of the different hyperlipoproteinaemia types, IIa exhibited the lowest and IIb the highest plasma viscosity levels. The elevation of plasma viscosity was correlated with the concentration of lipoproteins (lipid fractions). In viscosity measurements of sera which varied only in lipoprotein concentrations, a correlation between the increase of viscosity and lipoprotein concentration as well as a greater efficiency of VLDL fractions was observed, similar to the viscosity results from isolated lipoproteins.

ANTIMICROBIAL LIPIDS: NATURAL AND SYNTHETIC FATTY ACIDS AND MONOGLYCERIDES. J.J. Kabara, R. Vrable and M.S.F. Lie Ken Jie (Dept. of Biomechanics, Col. of Osteopathic Med., Michigan State Univ., East Lansing, MI) *Lipids* **12**, 753–9 (1977). Over 40 natural or synthetic lipophilic compounds were screened for antimicrobial activity. Gram (+) bacteria and yeasts but not Gram (−) bacteria were affected by these agents. Epimino and selena fatty acids are more active than their corresponding straight chain unsubstituted fatty acids. The position of selenium influenced the antimicrobial activity of the fatty acid. The presence and position of a double or triple bond, usually an important factor in long chain fatty acids ($> C_{14}$) had little or no effect in C_{11} fatty acids. Optimum antimicrobial activity was found for fatty acids and their corresponding monoglycerides when the chain length was C_{12}. The dilaurin derivative was not active.

INFLUENCE OF DIET ON IN VITRO AND IN VIVO RATES OF FATTY ACID SYNTHESIS IN COHO SALMON [ONCORHYNCHUS KISUTCH (WALBAUM)]. H. Lin, D.R. Romsos, P.I. Tack and G.A. Leveille (Dept. of Fisheries and Wildlife and Dept. of Food Sci. and Human Nutr., Michigan State Univ., East Lansing, Mich.) *J. Nutr.* **107**, 1677–82 (1977). The site and the influence of diet on fatty acid synthesis in juvenile coho salmon were investigated. Tritiated water was used to obtain estimates of the rates of fatty acid synthesis. Liver slices and mesenteric adipose tissue were incubated in media containing 5 mM acetate, 10 mM glucose and tritiated water. The rate of fatty acid synthesis averaged 1172 ± 126 and 40 ± 8 nmoles tritium incorporated into fatty acids per 2 hours per 100 mg of liver and adipose tissue, respectively. The pattern of [1-^{14}C]acetate incorporation into fatty acids in the liver slices indicated that de novo fatty acid synthesis, rather than chain elongation, was occurring. In vivo rates of fatty acid synthesis in liver were approximately linear for 30 minutes. In vivo rates of fatty acid synthesis averaged 244 ± 14 and 44 ± 11 dpm of tritium incorporated into fatty acids per 20 minutes per 100 mg of liver and adipose tissue, respectively. Consumption of a high-fat diet or fasting for 2 days decreased the in vitro and in vivo rates of fatty acid synthesis in fish liver. Refeeding fasted (48 hours) fish with a high-carbohydrate diet for 4 hours increased the rate of hepatic fatty acid synthesis. The major site of fatty acid synthesis in coho salmon appears to be the liver, and dietary alterations influence the rate of fatty acid synthesis.

INHIBITION OF RAT LIVER ACETYL COENZYME A CARBOXYLASE BY LONG CHAIN ACYL COENZYME A AND FATTY ACID. MODULATION BY FATTY ACID-BINDING PROTEIN. M.A. Lunzer, J.A. Manning and R.K. Ockner (Dept. of Med. and Liver Ctr., Univ. of California, School of Med., San Francisco, CA) *J. Biol. Chem.* **252**, 5483–8 (1977). We tested the hypothesis that cytosolic proteins modulate the inhibition of rat liver acetyl-CoA carboxylase by long chain acyl-CoA thioesters and fatty acids. During Sephadex G-75 chromatography of rat liver $105{,}000 \times g$ supernatant at 4°, 59% of added [^{14}C]-palmitoyl-CoA was hydrolyzed to [^{14}C]palmitic acid, reflecting thioesterase activity. Despite this, both the unhydrolyzed acyl-CoA and the free fatty acid were principally bound to the $M_r = 12{,}000$ fatty acid-binding protein (FABP) fraction. In experiments with the partially purified FABP fraction, both ligands bound to a limited number of sites and appeared to interact either competitively or through negative cooperativity. These experiments support the concept that FABP may participate in the short term regulation of lipogenesis by modulating the fatty acid and acyl-CoA inhibition of acetyl-CoA carboxylase activity. This mechanism appears analogous to the role of soluble polysaccharides in the modulation of fatty acid synthetase activity in Mycobacteria.

REDETERMINATION OF THE PRESSURE DEPENDENCE OF THE LIPID BILAYER PHASE TRANSITION. Nan-I Liu and R.L. Kay (Dept. of Chem., Carnegie-Mellon Univ., Pittsburgh, Penn.). *Biochemistry* **16**, 3483–6 (1977). The effect of pressure on the phase transition temperature for the dipalmitoyllecithin bilayer was redetermined by following the volume change accompanying the transition. These measurements were carried out isothermally with the transition from the ordered to the disordered phase induced by decreasing the pressure. This contrasts with our previous measurements which were carried out at a constant pressure and increasing temperature. The transition at every temperature was sharp and confirmed our previous observation that the volume change associated with the transition (0.033 mL^{-1}) is invariant with pressure. However, our present measurements, in contrast to our previous results, indicate that dP_m/dT_m at all pressures is in agreement with the 1 atm value of $\Delta H/T_m\Delta V$ within experimental error

where T_m and P_m are the temperature and pressure of the phase transition, respectively. These results, which are now in agreement with all other known pressure data, indicate that the entropy change associated with the transition is invariant with pressure.

BIOHYDROGENATION AND AVAILABILITY OF LINOLEIC ACID IN LACTATING COWS. W. Mattos and D.L. Palmquist (Dept. of Dairy Sci., Ohio Agr. Res. and Dev. Center, Wooster, OH) *J. Nutr.* **107**, 1755–61 (1977). Linoleic acid biohydrogenation, absorption and availability for maintenance and milk production in dairy cows fed high grain (60–85% of dry matter) diets were quantitatively estimated by isotope dilution, using two methods of dosing. [1-^{14}C]Linoleic acid-labeled chylomicra and very low density lipoproteins (VLDL) were obtained from lymph of a calf fed [1-^{14}C]linoleic acid and fitted with a thoracic duct-venous shunt. The biohydrogenation data indicate that both methods of dosing the cows were equally dependable. The estimates of linoleic acid biohydrogenation are consistent with limited data previously reported, indicating that the isotope dilution technique used is a reliable method to estimate linoleic acid absorption in lactating cows. Linoleic acid available to the lactating cow above milk production requirements was more than double the requirement of weanling female rats, when compared on the basis of metabolic body size.

PHYTOSTEROLS AND CHOLESTEROL IN MALIGNANT AND BENIGN BREAST TUMORS. M.J. Mellies, T.T. Ishikawa, C.J. Glueck and J.D. Crissman (Lipid Res. and Gen. Clinical Res. Centers, and the Dept. of Pathology, Univ. of Cincinnati, Coll. of Med., Cinn., Ohio) *Cancer Res.* **37**, 3034–6 (1977). Tissue phytosterol and cholesterol levels in 10 benign and 8 malignant breast tumors were quantitated to reexamine the hypothesis that malignant tumors had distinctive phytosterol content. Phytosterols were present in 9 of 10 benign and 7 of 8 malignant breast tumors. Mean ($\pm$ S.E.) cholesterol, campesterol, stigmasterol, and β-sitosterol in malignant and benign tumors (μg/g wet weight) did not significantly differ ($p > 0.1$). In the malignant tumors, tissue cholesterol correlated with campesterol ($r = 0.97$) and β-sitosterol ($r = 0.97$) ($p < 0.01$), but not with stigmasterol ($r = -0.06$). In benign tumors, tissue cholesterol correlated with campesterol ($r = 0.43$), stigmasterol ($r = 0.64$), and β-sitosterol ($r = 0.94$), with $p < 0.01$ for the latter two. Phytosterols were present in four samples of normal breast tissue with mean ($\pm$ S.E.) campesterol, stigmasterol, and β-sitosterol (2 ± 0.8, 15 ± 9, 7 ± 5 μg/g wet weight) slightly but not significantly lower than in benign and malignant breast tumors, $p > 0.1$. The comparability of tissue phytosterols in benign and malignant breast tumors and in normal breast tissue appears to render unlikely any putative etiological relationship between phytosterols and breast carcinoma.

UTILIZATION OF EXOGENOUS LINOLENIC AND OLEIC ACIDS FOR PLASMA MEMBRANE PHOSPHOGLYCERIDE SYNTHESIS IN L-FIBROBLASTS. J.J. Mulligan, R.D. Lynch, E.E. Schneeberger and R.P. Geyer (Dept. of Nutr., Harvard School of Public Health, 665 Huntington Ave., Boston, MA) *Biochim. Biophys. Acta* **470**, 92–103 (1977). The inability of the strain L-fibroblast to synthesize quantitatively significant amounts of polyenoic fatty acid and the apparent lack of turnover of their phosphoglyceride acyl groups under the usual conditions of cell culture makes them especially well suited for studies concerning the effect of fatty acid unsaturation on biological membranes. Such cells grown in the absence of exogenous lipid sources have in their phosphoglycerides only traces of polyenoic fatty acid. The data show that alterations in surface membrane and homogenate polyenoic fatty acid composition are minimal when oleic acid is supplied to the culture. During exposure to large amounts of polyenoic fatty acid, however, the unsaturation of plasma membrane total phosphoglyceride fraction in less than that of the cell homogenate. This effect is more pronounced in the phosphatidylethanolamine than in the phosphatidylcholine fraction.

BINDING, INTERNALIZATION AND DEGRADATION OF HIGH DENSITY LIPOPROTEIN BY CULTURED NORMAL HUMAN FIBROBLASTS. N.E. Miller, D.B. Weinstein and D. Steinberg (Div. of Metabolic Disease, Dept. of Medicine, Univ. of California, San Diego, La Jolla, Ca.) *J. Lipid Res.* **18**, 438–50 (1977). Comparative studies were made of the metabolism of plasma high density lipoprotein (HDL) and low density lipoprotein (LDL) by cultured normal human fibroblasts. On a molar basis, the surface binding of ^{125}I-HDL was only slightly less than that of ^{125}I-LDL, whereas the rates of internalization and degradation of ^{125}I-HDL were very low relative to those of ^{125}I-LDL. The relationships of internalization and degradation to binding suggested the presence of a saturable uptake mechanism for LDL functionally related to high-affinity binding. These findings imply that, at most, only a small fraction of bound HDL binds to the high-affinity LDL receptor and/or that HDL binding there is internalized very slowly. The rate of ^{125}I-HDL in vivo, suggesting that peripheral tissues may contribute to HDL catabolism. In accordance with their differening rates of uptake and cholesterol content, LDL increased the cholesterol content of fibroblasts and selectively inhibited sterol biosynthesis, whereas HDL had neither effect.

PURIFIED HUMAN LIVER ACID β-D-GALACTOSIDASES POSSESSING ACTIVITY TOWARDS G_{M1}-GANGLIOSIDE AND LACTOSYLCERAMIDE. A.L. Miller, R.G. Frost and J.S. O'Brien (Dept. of Neurosci., School of Med., Univ. of California, San Diego, La Jolla, CA) *Biochem. J.* **165**, 591–4 (1977). Our studies with purified human liver acid β-D-galactosidases (EC 3.2.1.23) indicate that 4-methylumbelliferyl β-D-galactosidase and G_{M1}-ganglioside β-D-galactosidase activities are identical with lactosylceramidase II activity. Evidence for this includes co-purification of all enzyme activities by affinity chromatography to yield a single band on polyacrylamide-gel electrophoresis and coincident elution from Sepharose 6B of all three enzyme activities.

SYNTHETIC PHOSPHATIDYLETHANOLAMINES AS RENIN INHIBITORS. M. Miyazaki and K. Yamamoto (Dept. of Pharmacol., Osaka City Univ. Med. School, Osaka City, Osaka 545, Japan) *Proc. Soc. Exp. Biol. Med.* **155**, 468–73 (1977). Anti-renin and hypotensive effects of synthetic PEs were examined. Eighteen PEs including optical isomers were newly synthesized. Arachidonic acid, linolenic acid, and stearic acid were substituted at the positions of β, γ, or both. Natural PE was extracted from porcine kidney, and the lyso form was prepared by treatment of phospholipase A. Anti-renin activity of these compounds was determined using high-renin plasma obtained from the dog. The inhibition of renin activity was expressed as a percentage of the reduction in the production rate of angiotensin I as measured by radioimmunoassay. The inhibitory effects of PE(β-$C_{18}^{=8}$, γ-C_{18}) series, D- and DL-PE(β-$C_{20}^{=4}$, γ-C_{18}), and DL- and L-PE(β-C_{18}, γ-$C_{20}^{=4}$) were greater than that of the natural PE, but did not exceed the effect of lyso-PE. Hypotensive effect was evaluated in conscious normotensive, spontaneously hypertensive, and renal hypertensive rats by daily im injection of the test compounds. Following repeated administration of natural PE, D-PE(β-C_{18}, γ-$C_{20}^{=4}$), and D-PE(β-C_{18}, γ-$C_{18}^{=8}$) to renal hypertensive rats, blood pressure decreased by more than 30 mm Hg. D- and DL-PE(β-$C_{18}^{=8}$, γ-$C_{20}^{=4}$), DL-PE (β-C_{18}, γ-$C_{18}^{=8}$), and DL-PE(β-C_{18}, γ-$C_{20}^{=4}$) lowered pressure more than 40 mm Hg. DL-PE(β-C_{18}, γ-$C_{20}^{=4}$) showed hypotensive effects both in renal hypertensive and spontaneously hypertensive rats, but not in normotensive rats.

HYDROLYSIS OF ANIMAL FAT AND VEGETABLE OIL WITH MUCOR MIEHEI ESTERASE. PROPERTIES OF THE ENZYME. G.J. Moswowitz, R. Cassaigne, I.R. West, Theresa Shen, and L.I. Feldman (Wallerstein Co., Div. of Baxter Travenol Lab., Inc., Morton Grove, Il.) *J. Agric. Food Chem.* **25**, 1146–50 (1977). Enzymatic action is largely responsible for the enhancement of flavor in a number of food products. The development of the characteristic flavor of Italian cheese is enhanced by the addition of various esterases to the milk, including the *Mucor miehei* (strain Cooney and Emerson) esterase. *M. miehei* esterase will readily attack a number of natural fats such as vegetable oils, beef tallow, and lard oil and a number of synthetic substrates including sorbital esters of fatty acids. Fatty acid profiles produced by the hydrolysis of soy oil and beef tallow at pH 8.0 with either *M. miehei* esterase or pancreatic lipase are similar. *M. miehei* esterase shows a pH dependent substrate especificity on synthetic triglycerides. The enzyme is more specific for low molecular weight fatty acid containing triglycerides at pH 5.3 than at pH 8.0. At 50°C, the enzyme has a pH optimum of 9.0 on beef tallow and a temperature optimum of 45°C when evaluated on olive oil. At 25°C, *M. miehei* esterase is stable over the pH range of 4.0–10.0 and is also stable up to 45°C at pH 8.0.

EFFECT OF EXPERIMENTAL DIABETES AND INSULIN ON LIPID METABOLISM IN THE ISOLATED PERFUSED RAT LUNG. M.A. Moxley and W.J. Longmore (Dept. of Biochem., St. Louis Univ. Schl. of Med., 1402 S. Grand Blvd., St. Louis, MO).

Biochim. Biophys. Acta **488**, 218–24 (1977). The isolated perfused rat lung was used as a model to study the possible hormonal regulation of lipid metabolism in the mammalian adult lung. Experimental diabetes, whether induced by alloxan or streptozotocin, decreased the incorporation of [U-^{14}C] glucose into neutral lipids and phospholipids of both the surfactant fraction and the residual fraction of the lung by 60–80%. Glucose incorporation into phosphatidylcholine and phosphatidylglycerol is decreased in experimental diabetes in both the surfactant and residual fractions to a comparable degree. Glucose incorporation is decreased in both the fatty acid and the glycerophosphocholine moieties of phosphatidylcholine isolated from the surfactant and residual fractions. Insulin treatment of normal animals 30 or 15 min prior to perfusion resulted in an approximate doubling of the incorporation of glucose into the phosphatidylcholine and phosphatidylglycerol isolated from the surfactant and residual fractions of the lung. The incorporation of glucose into palmitic acid isolated from phosphatidylcholine was also shown to increase similarly. The results of these investigations indicate that insulin may play a role in regulating the synthesis of the important lipid components of the mammalian pulmonary surfactant complex.

EFFECT OF VITAMIN D_3 AND CALCIUM ON THE REPRODUCTIVE CHARACTERISTICS OF THE TURKEY HEN. H. Menge, E.G. Geis, P.E. James and L.T. Frobish (U.S. Dept. of Agr., A.R.S., Beltsville, MD) *Poult. Sci.* **56**, 1472–80 (1977). Nine groups of 12 Small-type White turkey hens each were used to study dietary vitamin D_3 and calcium and their effect on egg production, eggshell quality, and hatchability. The 3 × 3 factorial arrangement of treatments consisted of three levels of calcium (1.16, 2.25, and 3.34%) and three levels of vitamin D_3 (cholecalciferol) at 900, 6,900, and 12,900 International Units per kg. of diet. Increasing dietary calcium to 2.25% significantly improved body weight, egg production and feed efficiency (feed/kg. eggs). The 3.34% level of calcium stimulated an increase in percentage hatchability of fertile eggs and produced the lowest percentage of 28-day embryonic mortalities. Dietary vitamin D_3 in excess of established requirements had no statistically significant effects on any of the parameters studied. Positive correlations were noted between beta-backscatter counts, shell weight, shell thickness and percentage calcium content of the egg. Percentage hatchability of fertile eggs was negatively associated with percentage moisture loss during the first seven days of incubation. The data presented in this paper show no beneficial action in the turkey hen from vitamin D_3 fed in excess of recommendations, but dietary calcium in excess (3.34%) promoted an increase in hatchability and a decrease in embryonic mortality.

α-HYDROXYLATION OF FATTY ACIDS IN BRAIN. S. Murad, R.H.K. Chen and Y. Kishimoto (Eunice Kennedy Shriver Ctr. for Mental Retardation at the Walter E. Fernald State School, Waltham, MA) *J. Biol. Chem.* **252**, 5206–10 (1977). The α-hydroxylation of fatty acids with various chain length by a rat brain postnuclear preparation was investigated. The maximum velocity of the α-hydroxylation were higher for lignoceric (tetracosanoic), tricosanoic, docosanoic, and heneicosanoic acids and lower for hexacosanoic, pentacosanoic, eicosanoic, and nonadecanoic acids. Stearic, palmitic, and phytanic (3,7,11,15-tetramethylpalmitic) acids were not hydroxylated by this preparation. Apparent K_m values were lower for fatty acids with the higher V_{max} and higher for those with the lower V_{max} values. The relative order of α-hydroxylation strongly resembles the relative distribution of these fatty acids in brain cerebrosides, and we suggest that α-hydroxylation plays an important role in determining this distribution. An improved synthesis of (U^{14}C)phytanic acid is described. The rate of α-hydroxylation with (2-$^2H_2$) lignoceric acid was one-fifth of nondeuterated lignoceric acid and one-third of (3-$^2H_2$)lignoceric acid, while apparent K_m values for these acids were similar. The reduced rate with (2-$^2H_2$)lignoceric acid indicates that the cleavage of the C—H bond is the rate-limiting step of the α-hydroxylation.

DISCRIMINATION OF FAMILIAL HYPERCHOLESTEROLEMIA AND SECONDARY HYPERCHOLESTEROLEMIA BY ACHILLES' TENDON THICKNESS. H. Mabuchi, S. Ito, T. Haba, K. Ueda, R. Ueda, R. Tatami, T. Kametani, J. Koizumi, M. Ohta, S. Miyamoto, R. Takeda and T. Takegoshi (Second Dept. of Internal Med., School of Med., Kanazawa Univ., Kanazawa, Japan) *Atherosclerosis* **28**, 61–8 (1977). We examined the Achilles' tendon thickness in familial hypercholesterolemia, with and without xanthoma, and compared it with that in normal subjects and in secondary hypercholesterolemia (hypothyroidism and nephrotic syndrome). The Achilles' tendon thickness in normal subjects was 6.3 ± 0.2 mm (mean ± SEM). The thickness was significantly correlated with age and the corresponding equation was: Y (Achilles' tendon thickness in mm) = 0.044 X (age in years) + 3.77 (r = 0.543, $P < 0.01$). Achilles' tendon thickness was significantly correlated with serum cholesterol and the regression equation was: Y (Achilles' tendon thickness in mm) = 0.016 X (serum cholesterol in mg/100 ml) + 2.94 (r = 0.454, $P < 0.01$). Achilles' tendon thickness and serum triglyceride levels were not correlated (r = 0.171, n.s.). Thus, the measurement of Achilles' tendon thickness makes it possible to discriminate familial hypercholesterolemia from secondary hypercholesterolemia in patients whose family histories are incomplete.

DETECTION OF MYOCARDIAL INFARCTION IN VITRO BASED ON ALTERED ATTENUATION OF ULTRASOUND. J.W. Mimbs, D.E. Yuhas, J.G. Miller, A.N. Weiss and B.E. Sobel (Cardiovascular Div. and Dept. of Physics, Washington Univ., St. Louis, MO) *Circ. Res.* **41**, 192–8 (1977). This study was designed to determine whether attenuation of ultrasound by myocardium is potentially useful in detecting and quantifying infarction. Accordingly, we analyzed 44 regions of myocardium from 11 dogs 4–10 weeks after coronary occlusion. Attenuation of ultrasound in each region was assessed by transmitting a broadband pulse through the tissue in vitro and carefully gating the appropriate pulse into a spectrum analyzer for

Fourier analysis (frequency range, 2–9.5 MHz). An ultrasonic index of attenuation was derived from the slope of the best-fit line relating attenuation and frequency obtained from the Fourier transform. Acquisition of ultrasonic data was improved with the use of a specially designed small diameter receiving transducer. Myocardial creatine kinase content was assayed in each region to provide an independent index of regional injury. Results obtained from ultrasonic and biochemical analyses correlated with a correlation coefficient between the two of 0.80 in 24 regions of myocardium from the six dogs studied 4–5 weeks after infarction, and 0.72 in 20 regions from the five dogs studied 9–11 weeks after infarction. These findings indicate that regional infarction is associated with quantitative changes in ultrasonic attenuation.

THE ERYSICHTHON SYNDROME. PROGRESSION OF CORONARY ATHEROSCLEROSIS AND DIETARY HYPERLIPIDEMIA. D.T. Nash, G. Gensini, H. Simon, T. Arno and S.D. Nash (Upstate Med. Center, SUNY Buffalo, and Hamilton Col., N.Y.) *Circulation* **56**, 363–6 (1977). One hundred nineteen patients with coronary artery disease confirmed by coronary arteriograms were studied. Cine coronary arteriography confirmed progression if atherselerosis in 106 (89%) patients (mean age 50.9 yr) and nonprogression in 13 (11%) patients (mean age 50.3 yr). Progression was defined as follows: any increase to 50% stenosis, 50% to 75% narrowing, 75% to 90%, 90% to 99%, 99% to total occlusion. Only one patient of the 106 who progressed (less than 1%) had ideal values for both cholesterol and triglyceride. Three of 13 patients (23%) who did not progress had ideal lipid values ($P < 0.005$). Fifty-four of 106 patients who progressed had cholesterol levels $\geqslant 250$ mg%; none of 13 patients who did not progress had such levels ($P < 0.005$). Thirty-nine of 98 (40%) patients who progressed had hypertension; only one (8%) who did not progress had hypertension ($P < 0.025$). Seventy-four of 96 patients who progressed were smokers (77%); two of 13 nonprogression patients smoked (15%) ($P < 0.005$).

MONTE CARLO STUDIES OF THE HYDROCARBON REGION OF LIPID BILAYERS. H.L. Scott, Jr. (Dept. of Physics, Oklahoma State Univ., Stillwater, OK) *Biochim. Biophys. Acta* **469**, 264–71 (1977). We present the results of a Monte Carlo study of systems of hydrocarbon chains attached to a plane interface and interacting through hard core repulsive forces only. The chain-order parameters which we find in our studies are compared to experimental results (NMR and ESR). The role of "kink" states and the relevance of our studies to theoretical models are also discussed. •

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