abstracts
EDITOR: S. KORITALA
ABSTRACTORS: N.E. Bednarcyk, J.C. Harris, M.G. Kokatnur, F.A. Kummerow, T. Mares, B. Matijasevic, J.C. Means, D.B.S. Min, E.G. Perkins, and R.A. Reiners

• Fats and Oils

PRESENCE OF POLYTHENE TYPE PLASTICS IN ANIMAL FATS. J. van der Veen (CIVO-TNO, Zeist, Netherlands). Voedingsmiddlentechnologie 9, 8–11 (1976). A survey is given of the problems, caused by the presence of polythene type plastic polymers (PE) in animal fats. A number of tentative methods for the determination of small amounts PE in fats are discussed and finally a new, short method for the qualitative as well as the quantitative analysis of PE in fats is given. The English translation of the last method, which has a probable accuracy of ± 18 mg/kg, is available from the author.

QUANTITATIVE DETERMINATION OF TRISATURATED TRIGLYCERIDES BY THIN-LAYER CHROMATOGRAPHY AND GAS-CHROMATOGRAPHY. APPLICATION TO RANDOM FATS. R.M. Utrilla, M. Juárez and I. Martínez (Instituto de Productos Lácteos. Arganda del Rey, Madrid) Grasas Aceites (Seville) 27, 5–7 (1976). A method for determining GS_3 content in natural fats is described. It makes use both T.L.C. on silica-NO_3Ag plates and G.C. of methyl esters. Trimargarine is incorporated in the fat to be analysed as an internal standard. Application of the method to transesterified fats made apparent a systematic error in the results. This deviation is imputed to the presence of carbonilic compounds produced by a side reaction during the process of esterification of the fat.

EXTRACTION OF OIL FROM WHOLE COTTONSEEDS BY DIFFERENT SOLVENTS AND THEIR EFFECT ON SEED VIABILITY. Abdel-Hamid Youssef Abdel-Rahman (Faculty of Agriculture, Alexandria University, Egypt) and Soad A.M. Youssef (Faculty of Agriculture, Kafr El-Sheikh, Tanta University, Egypt). Grasas Aceites (Seville) 27, 9–11 (1976). Nine pure solvents were tested for efficiency in extracting oil from whole cottonseeds of four Egyptian vaneties. The results showed that the yield of extracted oil varied markedly according to solvent used. Whereas ether ≅ peterolium ether ≅ benzene > acetone > carbon tetrachloride > heptane > ethanol ≅ methanol > n-butanol. Also, by increasing the time of soaking more oil was extracted, but the viability of the seeds was decreased.

DIRECTED TRANSESTERIFICATION OF FATS. II. CONVERSION TO TRISATURATED GLYCERIDES ON THE TEMPERATURE FUNCTION FOR DIFFERENT TRIGLYCERIDIC SYSTEMS. F.J. Nieto (Instituto de Productos Lácteos. Arganda del Rey, Madrid). Grasas Aceites (Seville) 27, 13–8 (1976). The temperature effect on the directed transesterification reaction from six glyceridic mixtures with saturated fatty acids percentages of about 20 to 40% and treated at temperatures between 11 and 40° C is studied. The melting point, the percentage of crystallized solids in acetone and the dilatometric characteristics of the modified fats are determined. The existence of conversion maximum to trisaturated triglycerides at temperatures depending from the saturated fatty acids level of the system it is proved in every case, being explained by the temperature influence on the selectivity crystallization.

DETERMINATION OF CHLORINATED INSECTICIDES RESIDUES IN OLIVES. A. Vioque and T. Albi (Instituto de la Grasa y sus Derivados. Sevilla). Grasas Aceites (Seville) 27, 19–25 (1976). A procedure using gas chromatography technique with an electron capture detector is described for the identification and determination of insecticides residues in olives samples. The extraction and purification of the insecticides residues are made by the Noren and Westöo method for meats, eggs and fishes. Special attention is paid to the establishment of the low limits of identification and determination in the described procedure.

GAS CHROMATOGRAPHIC ANALYSIS OF SYNTHETIC GLYCIDOL ESTERS, MONO-, DI- AND TRIGLYCERIDES. J.A.W. Engbersen and F. Van Stijn (Unilever Res., Vlaardingen, The Netherlands) *Chem. Phys. Lipids* 16, 133–41 (1976). The gas chromatographic analysis of glycidol esters and mono-, di-, and triglycerides of palmitic-, stearic-, and oleic acid mixtures is described. The composition of the products was determined by gas chromatography on OV-17 after trimethylsilylation. Base-line separations between 1- and 2-monoglycerides and between 1,2- and 1,3-diglycerides were obtained. Isomerisation of the trimethylsilyl ethers of monoglycerides was not observed, contrary to published work.

LIPOTEICHOIC ACID FROM BACILLUS LICHENIFORMIS 6346 MH-1. COMPARATIVE STUDIES ON THE LIPID PORTION OF THE LIPOTEICHOIC ACID AND THE MEMBRANE GLYCOLIPID. D. Button and N.L. Hemmings (National Inst. for Med. Res., Mill Hill, London NW7 1AA, United Kingdom) *Biochemistry* 15, 989–95 (1976). A lipoteichoic acid and membrane glycolipid were isolated from *Bacillus licheniformis* 6346 MH-1. The fatty acid composition of the two preparations were similar. Most of the fatty acids were of the branched chain type. The glycolipid was shown to be a diacyl derivative of 0-β-D-glucopyranosyl-(1 → 6)-0-β-D-glucopyranosyl-(1 → 3)-glycerol. The lipoteichoic acid contained lipid, polyglycerol phosphate, and glucosamine. The lipid was released by treatment with hydrofluoric acid and by hydrolysis in dilute acid and was shown to have a structure identical with that of the membrane glycolipid.

MICRODETERMINATION OF LIPID CLASSES AFTER THIN-LAYER CHROMATOGRAPHY. J.J. Kabara and J.S. Chen (Dept. of Biomech., Michigan State Univ., East Lansing, Mich. 48824) *Anal. Chem.* 48, 814–7 (1976). The charring of lipids by sulfuric acid after thin-layer chromatography and without elution is detailed. Particular attention to variables (purity of support media, residual iodine and solvent, and charring temperature) has made this a simple and reproducible technique. The present procedure is useful for tissue samples containing 10–100 μg of each lipid class. By using an external standard (cholesterol), quantification of lipid classes in this range can be determined by using previously obtained factors. The outlined method is highly accurate (100%) and reproducible (±4.0 μg). By using appropriate standards, the method may be useful for determining microquantities of any organic compound.

MODIFICATION OF THE FATTY ACID COMPOSITION OF EHRLICH ASCITES TUMOR CELL PLASMA MEMBRANES. A.B. Awad and A.A. Spector (Depts. of Biochem. and Med., Univ. of Iowa, Iowa City, Iowa 52242) *Biochim. Biophys. Acta* 426, 723–31 (1976). The fatty acyl group composition of Ehrlich ascites tumor cell plasma membranes was modified by feeding the tumor-bearing mice diets rich in either coconut or sunflower oil. When coconut oil was fed, the oleate content of the membrane phospholipids was elevated and the linoleate content reduced. The opposite occurred when sunflower oil was fed. Qualtitatively similar changes were observed in the plasma membrane phosphatidylethanolamine, phosphatidylcholine and mixed phosphatidylserine plus phosphatidylinositol fractions. These diets also produced differences in the sphingomyelin fraction, particularly in the palmitic and nervonic acid contents.

METHOD OF PRODUCING AN ANTIOXIDANT COMPOSITION FROM ROSEMARY AND SAGE. S.S. Chang, B. Matijasevic, C.-L. Huang and An-Li Hsieh (Rutgers Research and Educational Found.) *U.S. 3,950,266.* The method comprises extracting the active principle with a low boiling organic solvent, evaporating the solvent, dissolving the extract in a high boiling solvent, and recovering the antioxidant by distilling off the high boiling solvent.

SHORTENING CHIP MANUFACTURE. D.M. Collins (The Pillsbury Co.) *U.S. 3,950,561.* The shortening is solidified on a chill roll, but water is applied to the roll surface prior to application of the molten shortening so that a water film is continuously interposed between the shortening and the chilled surface.

METHOD OF SEPARATING MIXTURES OF FATTY SUBSTANCES. L. Jeromin, N. Bremus, G. Friederici and P. Peiffer (Henkel & Cie) *U.S. 3,950,371.* In the process for detergent fractionation of fatty acids, an aqueous, nonsurface active electrolyte solution is added to the partially melted fatty acid mixture. The entire mixture is cooled to the temperature of incipient crystallization by vacuum evaporation of part of the water with simultaneous intense mixing. The amount of aqueous phase at the end of the evaporative cooling step is 0.3–5 times the weight of the fatty acid mixture charged.

(Continued on page 523A)

• **Abstracts** . . . . . (Continued form page 522A)

REMOVAL OF LIGNIN FROM TALL OIL. F.T.E. Palmqvist (Alfa-Laval AB) *U.S. 3,948,874.* In the treatment of tall oil obtained by splitting sulfate soap with an acid and which, after removal of splitting liquid, still contains acid splitting liquid residues, lignin is obtained from the tall oil by drying to free it from an additional quantity of splitting liquid. Thereafter, lignin is mechanically separated in solid form together with an acid residue of salt crystals.

FROZEN DESSERT. J.A. Hellyer, R.G. Kess and P. Seiden (Procter & Gamble) *U.S. 3,949,102.* The frozen dessert composition comprises (a) 2–7% protein solids, (b) 5–25% edible triglyceride, (c) 0.2–2% emulsifier system consisting of polyglycerol fatty acid esters and sorbitan fatty acid esters, (d) 0.5–15% of the first emulsifier of anionic surfactant, (e) 10–40% saccharides, and (f) 45–65% water.

MARGARINE FAT. T. Wieske, I. Witte, J. Hannewijk and M.A.G. Willems (Lever Bros. Co.) *U.S. 3,949,105.* The fat blend, having dilatation values at 10–20 C of 200–100 and no more than 75 at 35 C, consists of 10–95% of a corandomized part and a balance of a nonrandomized part. The corandomized part consists of 10–50% unhydrogenated palm oil, 5–35% lauric fats, and 10–50% hydrogenated, trans-containing fats. The nonrandomized part contains fats selected from lauric fats, liquid oils, unhydrogenated palm oil, and hydrogenated trans-containing fats such that the fat blend contains 18–50% saturated fatty acids with 16–24 carbon atoms, 3–25% mono-trans unsaturated fatty acids with 16–24 carbon atoms, 3–30% saturated fatty acids with 12–14 carbon atoms, and the balance other fatty acids.

TREATMENT OF COOKING OIL. W.S. Clewell, Jr. and B. Friedman (Bernard Friedman, Allentown, Pa.) *U.S. 3,947,602.* A process for treating used cooking oil comprises contacting the oil with a solution containing a food compatible acid in an amount and concentration sufficient to extract food juice components from the oil and separating the acid solution from the oil which can then be reused.

PROCESS AND APPARATUS FOR TREATING FATTY WASTE WATER. A.J. Doncer and H.R. White (Alar Engineering Corp.) *U.S. 3,951,795.* The waste water is charged into a first treating zone where an aqueous ferric salt solution sufficient to lower the pH to 3–5 is mixed in. The mixture overflows to a second treatment zone where calcium hydroxide is added to bring the pH to 7–8. The mixture then overflows to a third zone where it settles. Finally it is removed from the third zone at a constant rate and passed through a cylindrical vacuum filter. The filter cake is continuously removed from the cylinder in a longitudinal direction.

REACTION PRODUCTS OF EPOXIDES, FATTY AMINES, AND FATTY ACIDS. R. Töpfl, M. Schwank and A. Maeder (Ciba-Geigy Corp.) *U.S. 3,951,891.* The product contains the reaction products of one epoxide equivalent of an epoxide containing at least two epoxide groups per molecule, 0.1–0.7 amino group equivalents of a fatty amine, 0.2–1.5 acid equivalents of a dimerized or trimerized fatty acid derived from monomeric unsaturated fatty acids, and an aminoplast precondensate containing alkyl ether groups.

RELEASING POLYURETHANE FOAMS USING ALUMINUM SALTS OF FATTY ACID MIXTURES. R.N. Özelli, G. Klement, and E. Scheidt (Henkel & Cie) *U.S. 3,952,079.* The fatty acid mixture whose aluminum salts are used as a mold release agent comprise 42–50% monounsaturated fatty acids of which at least 42% is oleic acid; 42–48% saturated fatty acids containing 22–28% palmitic and 14–20% stearic acid; and 3–10% polyunsaturated fatty acids of which 3–8% is linoleic acid. The aluminum salts are dissolved in a volatile organic solvent boiling at temperatures below 140 C.

COMPREHENSIVE EVALUATION OF FATTY ACIDS IN FOODS. VI. CEREAL PRODUCTS. J.L. Weihrauch, J.E. Kinsella and B.K. Watt (Consumer and Food Economics Inst., ARS, USDA, Hyattsville, Md.) *J. Am. Diet. Assoc.* 68, 335–40 (1976). This sixth report in the series presents representative data, gathered from the literature published since 1960, on the content of total fat and fatty acids (g/100 g food) in major food grains and related cereal products and discusses variables which might affect contents of these nutrients. Cereal products included are barley, buckwheat, bulgur, corn, farina, oats, rice, rye, sorghum, triticale, and wheat. Comparisons are made between total fat contents published in this report and those published in U.S.D.A. Handbook No 8 (1963) and between fatty acid composition data published here and in U.S.D.A. Home Economics Research Report No. 7 (1959). A table of conversion factors used to calculate the fatty acid content of the lipids is given.

PREPARATION OF MARGARINE PRODUCTS. J.A. Scharp (Lever Bros. Co.) *U.S. 3,946,122.* A process for preparing a margarine-like plastic fatty emulsion food spread resembling butter in consistency and containing an emulsifier system which exhibits both stabilizing and destabilizing functions comprises the steps of: (a) preparing an aqueous phase consisting of water and milk solids and up to 10% by weight of the spread of an emulsifier to stabilize the emulsion during homogenization as well as any heat treatment; (b) melting a fat having a dilatation of 100–400 mm^3/25 g at 25 C; (c) preparing a fatty phase containing the melted fat and up to 1% by weight of the spread of a destabilization emulsifier; (d) dispersing 70–90 parts of the fatty phase into 30–10 parts of the aqueous phase to form an emulsion in which the fatty phase is the disperse phase; (e) cooling the emulsion while at rest to 10–−25 C until the solid crystallized material amounts to at least 5% to form the spread. During the cooling step there is effected a destabilization of the spread to a degree of 0.15–0.75 whereby there is distributed in the disperse phase a proportion of the aqueous component measured by a decrease in electrical conductivity of the product of 5–80%. The emulsifier system is present in the finished product in amounts between 0.1 and 10%.

METHOD OF PURIFICATION OF FATTY ACID MIXTURES. H. Singer and W. Stein (Henkel & Cie) *U.S. 3,950,365.* A method for the separation of polyunsaturated components from mixtures of higher fatty acid compounds, comprising 3–25% polyunsaturated fatty acid and a major amount of monounsaturated fatty acids, consists of heating the mixture to 90–150 C in the presence of 2–15% of an organic macroporous acid ion exchange resin catalyst devoid of gel characteristics and having a specific surface area of at least 35 m^2/g. The catalyst is the sulfonation product of styrene-divinylbenzene copolymers which have been prepared by suspension polymerization. Contact between the fatty acid mixture and the catalyst is allowed for a time sufficient to give the desired amount of polyunsaturated fatty acids in the end-product, after which the catalyst is separated out and the fatty acids free of polyunsaturated components are recovered by distillation.

METHIONAL ANTIOXIDANT FOR POLYUNSATURATED OILS. R.J. Sims and J.A. Fioriti (General Foods Corp.). *U.S. 3,957,837.* There is claimed a stabilized polyunsaturated oil composition consisting of the oil and 0.005–0.5% of methional, its dimer, trimer, or any combination of these.

PROCESS FOR PRODUCTION OF FATTY ACID SALT AND ESTER THEREOF BY ALKALINE FUSION OXIDATION REACTION. H. Nishino, H. Maruyama and M. Masuda (Kishimoto Sangyo Co.). *U.S. 3,957,838.* The process comprises reacting a primary aliphatic alcohol having 6–18 carbon atoms with a hydroxide of an alkali metal at atmospheric pressure in the presence of a catalytic amount of metallic zinc or a zinc compound. The primary aliphatic alcohol is refluxed with simultaneous distillation of water and removal of hydrogen gas evolved during the reaction.

PRODUCTION OF FAT CONTAINING FOOD. C.J. Fleck, J.M. De Pizzol and P. Tolar (CPC International, Inc.). *U.S. 3,958,031.* During mixing of fat with other ingredients, solid particles of dry ice of geometrically uniform size and shape are added in amounts such as to lower the temperature of the mixture without freezing it during mixing. As a result, the entire mixture is rendered free-flowing and homogeneous.

MARGARINE FAT. H.R. Kattenberg and L.A.M. Verhagen (Lever Bros. Co.). *U.S. 3,956,522.* The fat consists of a liquid oil containing at least 40% polyunsaturated fatty acid radicals and 6–12% of a hard stock consisting of (i) 65–100% of a hard bottom fraction obtained by removing 5–50% of the higher melting constituents of a hard fat and (ii) 0–35% of a second hard fat of a melting point higher than that of the bottom fraction. Prior to fractionation, the bottom fraction (i) consisted of an interesterified blend of two or more completely hydrogenated fats, at least one of which was a lauric fat of melting point 30–40 C and one of which contained at least 50% saturated fatty acids with 16–18 carbon atoms. The ratio of these two hydrogenated fats is (5–75) : (95–25).

METHOD AND COMPOSITION FOR TREATING EDIBLE OILS. R.L. Husch (Interstate Foods Corp.). *U.S. 3,954,819.* A method for treating edible oils to remove free fatty acids from them comprises passing the oil through a bed of molecular sieve. A continuous process requires two reactor beds, each filled with a Type X molecular sieve. One bed is regenerated while the other is in use. Using the continuous process. Crude oil may be cleaned up to the point where it may be used in cooking operations for the preparation of foods.

PREPARATION OF ICINGS. M.M. Hanamoto (U.S. Secy. of Agriculture). *U.S. 3,955,008.* An aerated icing for bakery products comprises sugar, water, edible fat, and 0.5–1.5%, based on the weight of the fat, of an additive. The additive is an ester of a fatty acid containing 12–18 carbon atoms and a polyoxyethylene ether of a propylene glycol glycoside, containing 1–2 moles of combined fatty acid and 20 moles of combined ethylene oxide per mole of glycoside.

GLYCERIDE OIL TREATMENT. H.J. Strauss, A.K. Sen Gupta and J.E. Rost (Lever Bros. Co.). *U.S. 3,955,004.* In the process for treating edible glyceride oils to improve their color and storage properties, the oil, in solution in nonpolar solvent, is first contacted at 0–60 C with a metal oxide or metalloid oxide adsorbent with an average pore size of 30–2000 Å. The adsorbent is selected from the group consisting of silicas and aluminas and is applied at ratios of oil to adsorbent of 0.3:1 to 20:1 in a column. After removal of the solvent, the oil is subsequently treated with a bleaching earth.

METHOD OF SEPARATING FATTY ACID FRACTIONS. L.L. Sutker. *U.S. 3,953,484.* A method of separating mixed fatty acids into high and low melting fractions comprises whipping the fatty acid mixture vigorously to produce a liquified, pumpable, gas-entrained slurry and filtering the slurry under pressure. The filtrate has a greater proportion of low melting constituents, and the cake contains more of the high melting constituents. If the starting mixture is tallow fatty acids, the filtrate is red oil, and the solid fraction is commercial grade stearic acid.

CONTINUOUS PROCESS FOR THE SEPARATION OF MIXTURES OF FATTY SUBSTANCES OF DIFFERENT MELTING POINTS. W. Stein and H. Hartmann (Henkel & Cie). *U.S. 3,953,485.* There is claimed a continuous process for the detergent fractionation of fatty acid esters or triglycerides.

PROCESS FOR SEPARATING FATTY MIXTURES. W. Stein and R. Schuh (Henkel & Cie). *U.S. 3,956,351.* In the process for separating a mixture of solid and liquid fatty acids by re-wetting, there is described the improvement which comprises heating the suspension of solid fatty acid particles in aqueous wetting agent solution separated from the liquid fatty acids to a temperature between the melting point of the solid fatty acids and 85 C in a separation zone. A three phase system consisting of a molten fatty acid portion as the lightest phase, an intermediate aqueous phase of medium specific gravity with a high concentration of wetting agent, and a heavy aqueous phase with a low concentration of wetting agent results. The molten fatty acid phase is separated from the other two, and part of the intermediate phase is recycled.

THE SEED OILS OF ALEURITES. G. Weismann (Inst. for Wood Chem. and Chem. Technol. of Woods of the Fed. Res. Inst. for Forest and Wood Mgt., Reinbek-Hamburg *Seifen Ole Fette Wachse* 102(3), 77–8 (1976). The composition of the fatty acids of seed oils from Aleurites trisperma and Aleurites moluccana were investigated. Eleostearic acid, which is characteristic for Aleurites seed oils, amounts to 38% in A. trisperma oil whereas in A moluccana seed oil it is present only in traces. For oil hardening of fiber board oils with high amounts of eleostearic acid are especially suited.

NEW COMPLEX METHOD OF SELECTIVE GROUP DETERMINATION OF TOTAL DEGREE OF SPOILAGE OF FATS AND OILS. St.A. Ivanov. *Seifen Ole Fette Wachse* 102(3), 63–7 (1976). New complex method of selective group determination of total degree of spoilage of fats and oils under the influence of external factors. Three kinds of change possible: oxidation, hydrolysis and polymerization. Depending on the character of the products formed, each kind of spoilage is divided into a number of genetically interconnected subgroups, the sum of which is indicative of the total degree of spoilage. The present knowledge of the mechanism of the spoilage, the products formed and the analytical progress are used as starting points for a new complex method of selective group determination of the degree of oxidation, hydrolysis and polymerization of fats and their uniform description on the basis of triglycerides.

• Biochemistry & Nutrition

EGG SUBSTITUTES: CHEMICAL AND BIOLOGICAL EVALUATIONS. M.T. Childs and J. Ostrander (School of Home Economics, Univ. of Washington, Seattle). *J. Am. Diet. Assoc.* 68, 229–34 (1976). This paper reports (a) the total lipid, fatty acid, cholesterol, and phospholipid composition of dried whole egg, a refrigerated liquid egg substitute, and a commercial egg yolk replacer; and (b) the effect of feeding diets containing egg yolk replacer or dried whole egg on rat liver and body weights, liver and serum cholesterol, and liver total lipids. All substitutes were found to contain less total lipid, cholesterol, and phospholipid than dried whole egg. The liquid substitute and the egg yolk replacer had fatty acid compositions suggestive of partially hydrogenated soybean oil whereas the powdered substitute contained normal egg fat. Rat growth response was greatest on the dried whole egg diets, either with or without vitamin and mineral supplementation, was intermediate on the supplemented egg yolk replacer diets, and was least on the unsupplemented egg yolk replacer diets. Some of the differences in response to whole egg containing diets and to the other diets could be due to the lower protein quality and lower fat concentration in the egg yolk replacer. Consumption of the whole egg containing diets caused greater liver weight, greater liver total lipid and total cholesterol contents, and slightly higher serum cholesterol.

DIETARY-ATHEROSCLEROSIS STUDY ON DECEASED PERSONS. M.C. Moore, M.A. Guzman, P.E. Schilling and J.P. Strong (Louisiana State Medical Center, New Orleans). *J. Am. Diet. Assoc.* 68, 216–23 (1976). Dietary histories designed to determine the usual 28 day pattern of food intake during the terminal year of life were obtained for 253 deceased New Orleans men. From this information the average daily intake of selected dietary components was estimated. Possible associations of nutrient intakes during the terminal year with the extent of raised lesion involvement in the three main coronary arteries measured at autopsy were determined. These analyses indicated that higher intakes of vegetable protein, total carbohydrate, starch, and crude fiber were associated with less atherosclerotic lesion involvement. For total calories, total protein, animal protein, total fat, animal or vegetable fat, saturated or unsaturated fatty acids, total sugars, and cholesterol, there were no indications that the daily consumption was related to atherosclerotic lesions. When the various nutrients were expressed as percentages of calories, starch and vegetable protein were associated with less lesion involvement, while animal protein and fat, regardless of source, were associated with greater atherosclerotic lesion involvement.

CYCLIC ANALOGUES OF THE INSECT JUVENILE HORMONE. K. Hejno and F. Sorm (Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Sciences, 166 10 Prague 6) Collect. Czech. Chem. Commun. 41(4), 1225–34 (1976). Derivatives of 3,7-dimethyl-9-(2-oxolanyl)-2,6-nonadienoic acid (methyl, ethyl, isopropyl, cyclopropylmethyl, and propargyl ester, N-ethylamide, N,N-diethylamide, and nitrile), 3,7-dimethyl-9-(2-oxolanyl)-2-nonenoic acid (methyl, ethyl, and isopropyl ester, N-ethylamide and N,N-diethylamide), and 3,7-dimethyl-9-(2-oxolanyl)-2,4-nonadienoic acid (methyl and isopropyl ester) have been prepared.

SOME OTHER CYCLIC ANALOGUES OF THE INSECT JUVENILE HORMONE. H. Hejno, L. Dolejs and F. Sorm (Institute of Organic Chemistry and Biochemistry, Czechoslovak Academy of Sciences, 166 10 Prague 6) Collect. Czech. Chem. Commun. 41(4), 1235–47 (1976). The preparation of ethyl 3-methyl-7-ethyl-10-(2-oxolanyl)-2-decenoate (*I*), some derivatives of 3-methyl-9-(5-methyloxolan-2-yl)-2-nonenoic acid (*XXIe*), and ethyl 3-methyl-9-(2-oxolanyl)-2-nonenoate (*XXIII*) has been described.

FATTY ACID BIOSYNTHESIS IN PLANTS. M. Mancha (Instituto de la Grasa y sus Derivados. Sevilla). Grasas Aceites (Seville) 27, 33–9 (1976). This review is concerned with the major pathways for fatty acid biosynthesis in plants. The mechanisms of the biosynthetic sequence are studied: the de novo synthesis of 16:0, the elongation to 18:0, the elongation to 20:0 and longer and the desaturation systems for 18:1, 18:2 and 18:3 formation. Finally the origin of the products which are essential components for these mechanisms and the localization of fatty acid biosynthesis are discussed.

ON THE MECHANISM OF MALONYL-COA-INDEPENDENT FATTY-ACID SYNTHESIS. DIFFERENT PROPERTIES OF THE MITOCHONDRIAL

CHAIN ELONGATION AND ENOYL-COA REDUCTASE IN VARIOUS TISSUES. W. Hinsch, C. Klages and W. Seubert (Physiologisch-Chemisches Institut der Universität Göttingen) Eur. J. Biochem. **64**, 45–55 (1976). NADPH-specific mitochondrial enoyl-CoA reductase can be assayed by a sensitive radioactive test, employing tritium-labelled NADPH, synthesized in a prefixed reaction from D-[1-^{3}H]-glucose *via* the hexokinase and glucose-6-phosphate dehydrogenase reactions. Liver, kidney cortex, heart muscle, skeletal muscle, brown adipose tissue, brain cortex, and aortic intimal tissue are investigated concerning chain lengths specificity of the chain elongation and the enoyl-CoA reductase. Medium-chain acyl-CoA compounds prove to be the best primers for the chain elongation. Enoyl-CoA reductases still show large incorporation rates with hexadecenoyl-CoA. The differences in the chain lengths specificity of the chain elongation and enoyl-CoA reductase can be explained by the inhibitory effect of long-chain acyl-CoA derivatives on the 3-hydroxyacyl-CoA dehydrogenase. The nucleotide specificity in the different tissues reveals two types of chain elongation: In addition to liver and kidney cortex, mitochondria of brown adipose tissue need NADH + NADPH for optimal chain elongation, whereas heart muscle, skeletal muscle and aortic intimal mitochondria only need NADH. Different physiological roles are proposed for the two types. The "heart type" may be of importance in the conservation of reducing equivalents or acetate units in the anaerobic state. the "liver type" may play a role in the transfer of hydrogen from NADPH to the respiratory chain. In addition, the mitochondrial chain elongation may serve as bypass of the first part of the respiratory chain.

METHODS FOR REDUCING CHOLESTEROL LEVELS. K. Sugimoto (Kabushiki-Kaisha Hayashibara Seibutsukagaku Kenkyujo). *U.S. 3,957,976.* A method of lowering the cholesterol absorbance from a cholesterol-containing food comprises feeding maltitol or lactitol along with the food. Similarly, addition of maltitol or lactitol to a sucrose-containing food is claimed to inhibit the increase in blood and liver cholesterol which can follow from ingesting the food by a person with a disease induced or aggrevated by excess blood or liver cholesterol.

PHARMACEUTICAL COMPOSITIONS FOR INHIBITING ABSORPTION OF CHOLESTEROL. F.H. Mattson and R.A. Volpenhein (Procter & Gamble). *U.S. 3,954,976.* The compositions, in effective unit dosage amounts, comprise 0.1–5 grams of a polyol fatty acid groups with 8–22 carbon atoms each. The polyol is selected from the group consisting of sugars and sugar alcohols containing 4–8 hydroxyl groups.

EFFECT OF DIETARY FATS ON LIPOGENESIS IN IRON DEFICIENCY ANEMIC CHICKS AND RATS. E.K. Amine, E.J. Desilets, and D.M. Hegsted (Dept. of Nutr., Harvard Schl. of Public Hlth., Boston, Mass. 02115) *J. Nutr.* **106**, 405–11 (1976). Chicks and female rats of the Charles River and Buffalo strains were fed diets low in iron which varied in the amount or kind of fat they contained. Iron deficiency was associated with a hyperlipemia in both chicks and rats fed saturated fat (coconut oil). The lipemia did not occur with diets low in fat or those containing safflower oil. Lipogenesis from labeled glucose by the liver was depressed by iron deficiency, particularly in the rats fed the low diet or the diet containing coconut oil. Lipogenesis in the gut was generally elevated in iron deficient rats. Lipogenesis in both liver and gut was substantially higher in rats of the Buffalo strain as compared to the Charles River strain.

REGULATION OF PYRUVATE DEHYDROGENASE BY FATTY ACID IN ISOLATED RAT LIVER MITOCHONDRIA. J.J. Batenburg and M.S. Olson (Dept. of Biochem., Col. of Med., Univ. of Arizona, Tucson, Ariz. 85724) *J. Biol. Chem.* **251**, 1364–70 (1976). The mechanism by which fatty acid addition leads to the inactivation of pyruvate dehydrogenase in intact rat liver mitochondria was investigated. In all cases the fatty acid octanoate was added to mitochondria oxidizing succinate. Addition of fatty acid caused an inactivation of pyruvate dehydrogenase in mitochondria incubated under State 3 conditions (glucose plus hexokinase), in uncoupled, oligomycin-treated mitochondria, and in rotenone-menadione-treated mitochondria, but not in uncoupled mitochondria or in mitochondria incubated under State 4 conditions. Further evidence supporting these experiments with intact mitochondria was the observation that the pyruvate dehydrogenase kinase activity of a mitochondrial extract was stimulated strongly by acetyl-CoA and was inhibited by NAD^+ and CoASH. In contrast to acetyl-CoA, octanoyl-CoA inhibited the kinase activity.

EFFECTS OF 1,3-BUTANEDIOL IN ALLEVIATING AND PREVENTING MILK FAT DEPRESSION IN COWS. J.M. Bonner, J.W. Young, and P.J. Berger (Dept. of Animal Sci., Iowa State Univ., Ames 50011) *J. Dairy Sci.* **59**, 431–8 (1976). In Trial I of two trials to study long-term effects of adding 1,3-butanediol to diets that cause milk fat depression in cows, 4% 1,3-butanediol was fed to three cows that were compared with four cows fed a fat-depressing diet for 6 mo. Trial II compared six cows fed 6% 1,3-butanediol for 3 mo with six cows fed a fat-depressing diet. The cows fed 1,3-butanediol did not show significant advantages in milk fat production for either trial. Milk protein tended to increase with high grain feeding, either with or without 1,3-butanediol. A third trial involved 12 cows in a 3-mo double reversal experiment to observe whether suddenly adding or deleting 6% 1,3-butanediol would cause rapid changes in milk fat production. Milk production and composition were similar in both dietary groups. Body weight gains were less in all three trials for cows fed 1,3-butanediol.

EFFECT OF LOW CALORIE DIET ON THE HYPERLIPIDEMIA, HYPERTENSION, AND LIFE SPAN OF GENETICALLY OBESE RATS (39212). S. Koletsky and D.I. Puterman (Dept. of Pathol., Case Western Reserve Univ., Schl. of Med., Cleveland, Ohio 44106) *Proc. Soc. Exp. Biol. Med.* **151**, 368–71 (1976). A new strain of genetically obese rat recently obtained in our laboratory exhibits endogenous hyperlipidemia (marked hypertriglyceridemia and moderate hypercholesterolemia) and spontaneous hypertension. The animals die prematurely from kidney failure or from the complications of atherosclerosis. A low calorie diet proved to be highly beneficial to these rats. Body weight declined, obesity diminished, the hypertriglyceridemia was almost eliminated, and the hypercholesterolemia was reduced. However, the hypertensive state was not alleviated. Since the life span of the rats was greatly prolonged by a low calorie diet, the latter undoubtedly served to prevent or arrest the development of renal and vascular disease in these obese animals.

THE ROLE OF INTRALIPID IN PROLONGED PARENTERAL NUTRITION. I. AS A CALORIC SUBSTITUTE FOR GLUCOSE. J.W. Broviac, M.C. Riella and B.H. Scribner (Dept. of Med., Univ. of Washington, Seattle, Wash. 98195) *Am. J. Clin. Nutr.* **29**, 255–7 (1976). Three stable patients were studied in order to assess the role of intravenous fat solutions (Intralipid) in long-term home parenteral nutrition. The standard source of nonprotein calories (NPC) in these patients was 60% glucose. Replacing 40% of NPC of NPC by Intralipid was effective in maintaining nitrogen balance and allowed total infusion time to be reduced from 12 hr to 8 hr. The serum triglyceride level was significantly elevated when glucose was used as the sole source of NPC, whereas serum cholesterol was significantly elevated when 40% of NPC were supplied by Intralipid.

INFLUENCE OF KETAMINE, PHENYLCYCLIDINE, AND PHENOBARBITAL ON CHOLESTEROL METABOLISM IN RATS (39231). D. Kritchevsky, S.A. Tepper, L.M. Davidson, and J.A. Story (The Wistar Inst. of Anat. and Biol., 36th St. at Spruce, Philadelphia, Pa. 19104) *Proc. Soc. Exp. Biol. Med.* **151**, 445–7 (1976). The effects of ip injections of phenobarbital (100 mg/kg), phenylcyclidine (Sernylan; [1-(1-phenylcyclohexyl)piperidine · HCl] (1 mg/kg), and ketamine (Ketaset; [dl(2-*O*-chlorophenyl)-2-(methylamino) cyclohexanone · HCl] (1 mg/kg) on lipid metabolism in rats were compared. This study was undertaken to determine whether the two sedatives currently used in primates share any of the undesirable effects of phenobarbital on lipid metabolism. All three compounds were administered to male Wistar rats for 6 days. Phenobarbital was hepatomegalic, stimulated 7α hydroxylation of cholesterol, and inhibited cholesterol synthesis by rat liver slices from mevalonate, but not acetate. The two other sedatives exhibited effects very similar to those observed in the controls. From our work in rats it is concluded that the use of Sernylan or Ketaset for sedation of nonhuman primates will not significantly affect these parameters of lipid metabolism.

VITAMIN A METABOLISM DURING THE REPLETION OF ZINC DEFICIENT RATS. E.D. Brown, W. Chan, and J.C. Smith, Jr. (Trace Element Res. Lab., Veterans Admin. Hosp., Washington, D.C. 20422) *J. Nutr.* **106**, 563–8 (1976). The experiments reported here were designed to determine if the low plasma vitamin A levels observed in zinc deficient rats are reversible as well as to examine the time required for any response. In experiment 1, rats previously zinc deficient were repleted for 6 days with a zinc sufficient diet, fed either ad libitum, or pair-fed the amount consumed by a zinc deficient

group. After repletion, plasma vitamin A concentration for the zinc sufficient group returned to within normal range while the pair-fed group had a plasma vitamin A concentration intermediate between the zinc sufficient ad libitum and zinc deficient groups. The zinc sufficient ad libitum group had a lower concentration but higher total liver content of vitamin A than the other groups. In experiment 2, the response of zinc deficient rats to intraperitoneal zinc repletion was examined daily for 7 days. There was a 3 day lag period before plasma vitamin A began to increase significantly following zinc treatment. By the fifth day, plasma vitamin A concentration increased to within the normal range. The data suggest that adequate food intake as well as zinc appears necessary to totally reverse low plasma vitamin A concentrations in zinc deficiency. Possible mechanisms are discussed.

HYPERCHOLESTEROLEMIA DUE TO ASCORBIC ACID (39263). L.M. Klevay (USDA, ARS, Human Nutr. Lab., Grand Forks, N.D. 58201) *Proc. Soc. Exp. Biol. Med.* **151**, 579–82 (1976). Rats fed a purified diet containing ascorbic acid developed hypercholesterolemia. Because rats do not require exogenous ascorbic acid, they may be comparable to humans who supplement their diets with ascorbic acid in capsular form. The amount of ascorbic acid in this experiment was equivalent to 82 to 630 mg of capsular ascorbic acid ingested by an average man and was well below the amount ingested by those in search of respiratory benefit. The data are consonant with those on humans consuming controlled diets.

SOME ASPECTS OF FATTY ACID OXIDATION IN ISOLATED FAT-CELL MITOCHONDRIA FROM RAT. R.D. Harper and E.D. Saggerson (Dept. of Biochem., Univ. College London, Gower St., London WC1E6BT, U.K.) *Biochem. J.* **152**, 485–94 (1975). Mitochondria were prepared from fat-cells isolated from rat epidiymal adipose tissues of fed and 48 hr-starved rats to study some aspects of fatty acid oxidation in this tissue. The data were compared with values obtained in parallel experiments with liver mitochondria that were prepared and incubated under identical conditions. In the presence of malonate, fluorocitrate and arsenite, malate, but not pyruvate + bicarbonate, facilitated palmitoyl-group oxidation in both types of mitochondria. In the presence of malate, fat-cell mitochondria exhibited slightly higher rates of palmitoylcarnitine oxidation than liver. Rates of octanoylcarnitine oxidation were similar in liver and fat-cell mitochondria. Uncoupling stimulated acylcarnitine oxidation in liver, but not in fat-cell mitochondria.

CHARACTERIZATION, DISTRIBUTION AND BIOSYNTHESIS OF THE MAJOR GANGLIOSIDE OF RAT INTESTINAL MUCOSA. R.M. Glickman and J.F. Bouhours (Depts. of Med., Harvard Med. Schl., and Mass. General Hosp., Gastrointestinal Unit, Boston, Mass. 02114) *Biochim. Biophys. Acta* **424**, 17–25 (1976). The major sialic acid containing glycolipid has been isolated from rat intestinal mucosa. Characterization of this ganglioside by thin layer and gas chromatographic analysis indicates that it is an hematoside (GM_3) with the major portion of the sialic acid in the *N*-glycolyl form. The distribution of this ganglioside content of crypt cells was found to be significantly decreased when compared to villus cells. CMP-sialic acid: lactosylceramide sialytransferase, responsible for the sialylation of lactosylceramide, was measured in differentiated villus and undifferentiated crypt cells and found to be greatly reduced in the crypt cell fraction. The present study demonstrates that marked differences in ganglioside content and biosynthesis occur in contiguous populations of cells in varying states of differentiation when isolated from normal rat intestine.

CHOLESTEROL TURNOVER AND TISSUE DISTRIBUTION IN THE GUINEA PIG IN RESPONSE TO DIETARY CHOLESTEROL. M.H. Green, M. Crim, M. Traber and R. Ostwald (Dept. of Nutr. Sci., Univ. of California, Berkeley, Calif. 94720) *J. Nutr.* **106**, 515–28 (1976). Cholesterol and tissue cholesterol distribution were studied in guinea pigs fed either a control diet or one containing 0.1% cholesterol. Dietary cholesterol caused a significant increase in the cholesterol concentration in liver, red blood cells and small intestine, but not in plasma. Most of the increase in total body cholesterol could be accounted for as an increase in liver esterified cholesterol content. Feeding the 0.1% cholesterol-containing diet did not significantly change either the absorption of an oral dose of tracer cholesterol or the endogenous cholesterol synthesis rate. Steady state cholesterol input-output rate and total traced mass of cholesterol were significantly greater, and mean transit time was significantly longer in the animals fed the cholesterol containing diet. These data suggest that the maintenance of cholesterol homeostasis in the non-hypercholesterolemic cholesterol-fed guinea pig depends on liver accumulation of esterified cholesterol as well as on increased output of cholesterol.

EFFECT OF POLYUNSATURATED FATTY ACIDS AND VITAMIN E LEVEL OF THE SOW GESTATION DIET ON REPRODUCTIVE PERFORMANCE AND ON LEVEL OF ALPHA TOCOPHEROL IN COLOSTRUM, MILK AND DAM AND PROGENY BLOOD SERUM. A. Malm, W.G. Pond, E.F. Walker, Jr., M. Homan, A. Aydin, and D. Kirtland (Cornell Univ., Ithaca, N.Y. 14853) *J. Anim. Sci.* **42**, 393–9 (1976). Sixteen Yorkshire gilts were assigned randomly to four semi-purified diets fed throughout gestation and lactation. Two sources of fat (stripped lard and stripped corn oil) were fed factorially with two levels of vitamin E (α-tocopheryl actate, 0 and 100 IU/kg of diet). All diets were supplemented with .05 ppm Se as Na_2SeO_3. Reproductive performance (litter size, individual pig birth weight, weaning weight and livability) was not affected by diet. No signs of selenium-vitamin E deficiency were noted in either dams or progeny. Serum α-tocopherol concentration of dams was significantly reduced with low vitamin E diets and was higher in diets containing lard plus vitamin E than in diets containing corn oil plus vitamin E at 2, 8 and 12 weeks and immediately pre-partum.

IN VITRO EVALUATION OF PROTECTED FEEDS FOR RUMINANTS FROM ALFALFA PROTEIN AND SAFFLOWER OIL. C.K. Lyon, D.A. Dinius and G.O. Kohler (USDA, Berkeley, Calif. 94710) *J. Anim. Sci.* **42**, 524–8 (1976). Protected feed supplements were prepared on a laboratory scale by emulsifying safflower oil with freshly pressed alfalfa juice and then coagulating the alfalfa protein either by heating to 80 C or by adjusting the pH to 3.5 at room temperature. In every case the oil came down almost quantitatively with the protein. The coagulated material was mixed with calculated amounts of 40% formaldehyde, held for 1 day and then dried at 50 C. Digestibility of protein in the samples was evaluated, *in vitro*, by incubation in ruminal fluid, followed by treatment with pepsin. Protection of linoleic acid from microbial hydrogenation was determined by gas-liquid chromatographic analysis of oil extracted from samples after the incubation in ruminal fluid. When the formaldehyde treatment was increased from 0 to 16% (based on protein), digestibility of protein in ruminal fluid decreased from about 50 to 1% and protection of linoleic acid increased from about 40 to 95%. Total digestibility of protein in ruminal fluid, then pepsin, was about 80% without formaldehyde treatment and remained at about 60% with addition of 1 to 16% formaldehyde. Added emulsifiers caused a small improvement in the protection of linoleic acid in acid-precipitated samples but had no significant effect on the degree of protection of heat-precipitated samples.

THE ISOMERIZATION OF 2,5- AND 9,12-OCTADECADIENOIC ACIDS BY AN EXTRACT OF BUTYRIVIBRIO FIBRISOLVENS. P.T. Garcia, W.W. Christie, H.M. Jenkin, L. Anderson and R.T. Holman (Centro de Investigaciones en Ciencias Veterinarias, Inst. Nacional de Tecnologia Agripecuaria, Villa Udaondo, Castelar, Argentina) *Biochim. Biophys. Acta* **424**, 296–302 (1976). A cell-free particulate preparation from *Butyrivibrio fibrisolvens* was used to study the relative rates of isomerization of all *cis,cis*-methylene-interrupted isomers of octadecadienoic acid. Only two isomers were found to be substrates, the 9,12-isomer was isomerized at 41 $\pm$ 4 μmol/min per mg protein, and the 2,5-isomer at 11 $\pm$ 1 μmol/min per mg. The product of the isomerization of the 2,5-isomer had an ultraviolet absorption maximum at 233 nm indicating that it was the 3,5-isomer. The isomerization of the 2,5-isomer was studied in detail. Its rate of isomerization was linear with protein concentration up to 0.047 mg/ml, and was linear with substrate concentration up to 48 μM. The pH optimum was 6.8. Below pH 6, the substrate was also subject to spontaneous isomerization. The inhibition of isomerization of the 9,12-isomer by the other isomers was studied. Those isomers in which the double bonds are close to the carboxyl group were the most effective inhibitors. The preparation was also found capable of hydrogenating the conjugated diene product from the 2,5-isomer to a monoene after prolonged incubation.

ACTIVATION OF C_{55}-ISOPRENOID ALCOHOL PHOSPHOKINASE FROM STAPHYLOCOCCUS AUREUS. I. ACTIVATION OF PHOSPHOLIPIDS AND FATTY ACIDS. R.B. Gennis and J.L. Strominger (Biol. Labs., Harvard Univ., Cambridge, Mass. 02138) *J. Biol. Chem.* **251**, 1264–9 (1976). The activation of C_{55}-isoprenoid alcohol

phosphokinase by a variety of lipids has been investigated. A number of amphipathic lipids can serve as effective kinase activators. Both the nature of the polar and nonpolar groups are important, but kinase activation does not depend on any particular chemical structure or charge on the lipid. The structure of those lipids which are most effective, as well as an analysis of their temperature profiles, suggests that bulk physical properties are significant. Lipids which provide a hydrated, loosely packed, highly fluid environment are often effective activators.

A NEW PATHWAY FOR THE SYNTHESIS OF FATTY ACIDS: A ROLE FOR PHOSPHOENOLPYRUVATE CARBOXYLASE IN LIPOGENESIS. C.T. Jones (The Nuffield Inst. for Med. Res., The Univ. of Oxford, Oxford OX3 9DS, England) *FEBS Lett.* 63, 77–81 (1976). Largely through studies on the rat liver, acetyl CoA for lipid synthesis in the cytosol is thought to be formed predominantly within the mitochondrion. As it has a low mitochondrial permeability a scheme involving citrate transport from the mitochondrion and its subsequent breakdown to acetyl CoA and oxaloacetate by the action of ATP-citrate lyase has been proposed. The rate of incorporation of radioactivity labelled citrate into lipid by subcellular fractions of rat liver has supported this pathway, but an investigation into lipid synthesis in mouse tissues has not. The rat liver pathway is also supported by observations on its sensitivity to the specific ATP-citrate lyase inhibitor, (−)-hydroxy-citrate.

INHIBITION OF GLUTAMATE DEHYDROGENASE AND MALATE DEHYDROGENASES BY PALMITOYL COENZYME *A*. A. Kawaguchi and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge, Mass. 02138) *J. Biol. Chem.* 251, 1406–12 (1976). In extension of a previous study with yeast glucose-6-P dehydrogenase, the structural changes accompanying the inhibition of glutamate dehydrogenase and several malate dehydrogenases by palmitoyl-CoA and by sodium dodecyl sulfate have been investigated. Palmitoyl-CoA converts liver glutamate dehydrogenase to enzymatically inactive dimeric subunits ($M_r = 1.2 \times 10^6$) and tightly binds to the dissociated enzyme. Removal of the inhibitor from the palmitoyl-CoA dimer complex fails to regenerate enzyme activity. While the differences in palmitoyl-CoA sensitivity in the forward and backward reactions catalyzed by mitochondrial dehydrogenase are unexplained, a physiological rationale for these differential effects is offered. Sodium dodecyl sulfate dissociates the various dehydrogenases to monomeric subunits in contrast to the more selective effects of palmitoyl-CoA.

TRIACYLGLYCEROL SYNTHESIS IN ISOLATED FAT CELLS. AN EFFECT OF INSULIN ON MICROSOMAL FATTY ACID AND COENZYME A LIGASE ACTIVITY. C.J. Jason, M.A. Polokoff, and R.M. Bell (Dept. of Biochem., Duke Univ. Med. Ctr., Durham, N.C. 27710) *J. Biol. Chem.* 251, 1488–92 (1976). Fatty acid CoA ligase (AMP) (EC 6.2.1.3) specific activity was increased approximately 2-fold in microsomes prepared from isolated rat fed cells incubated with 400 microunits of insulin/ml (2.9 nM) for 45 to 60 min compared to paired controls using an assay based on the conversion of [^{3}H]oleic acid to [^{3}H]-oleoyl-CoA. Similar insulin-dependent increases in microsomal fatty acid CoA ligase specific activities were observed using an assay based on the conversion of [^{3}H]CoA to fatty acyl-[^{3}H]CoA. Fatty acid CoA ligase activity was predominantly (about 80%) associated with the microsomal fraction. The insulin-dependent increase in microsomal fatty acid CoA ligase specific activity was maximal in 2 to 5 min at 400 microunits/ml. At 10 min, 80 to 100 microunits of insulin/ml caused a maximal increase in fatty acid CoA ligase specific activity. Similar apparent K_m values for ATP, CoA, and fatty acid were observed for fatty acid CoA ligase activity in microsomal preparations from control and insulin-exposed cells. These data suggest that fatty acid CoA ligase activity is regulated in adipose tissue by insulin. Such regulation may serve to promote the capture of fatty acid and thereby, triacylglycerol synthesis in adipose tissue.

CHANGES IN PHOSPHOLIPIDS IN CHICKEN TISSUES DURING COOKING IN FRESH AND REUSED COOKING OIL, AND DURING FROZEN STORAGE. W.T. Lee and L.E. Dawson (Dept. of Food Sci. and Human Nutr., Michigan State Univ., East Lansing, Mich. 48824) *J. Food Sci.* 41, 598–600 (1976). Chicken pieces were cooked in fresh corn oil and in corn oil previously heated up to 42 hr. Both raw and cooked chicken pieces were also frozen and stored for periods up to 6 months prior to analyses. Phospholipids were separated from muscle and skin, and identified primarily as phosphatidylethanolamine, phosphatidylserine, phosphatidylcholine, sphingomyelin and lysophosphatidylcholine. Total phosphorus content of phospholipids decreased during cooking in fresh corn oil by chemical reactions and/or by rendering fats from muscle. Phosphatidylcholine decreased the most. Use of reheated corn oil accentuated the changes in phospholipids. During frozen storage, phosphorus content of muscle decreased by an amount similar to that which occurred during cooking. Chicken skin contained less total phosphorus than muscle, and increased slightly during the cooking process.

CONDITIONS AFFECTING THE BIOSYNTHESIS OF LIPIDS IN THE SMALL INTESTINE. C.M. Mansbach II (Veterans Admin. Hosp. and Div. of Gastroenterol., Dept. of Med., Duke Univ. Med. Ctr., Durham, N.C. 27710) *Am. J. Clin. Nutr.* 29, 295–301 (1976). In health, lipid biosynthetic enzyme activity related to the absorption of lipids is greatest in the proximal intestine; under various experimental and pathological conditions which increase the delivery of lipid to the distal gut, enzyme activity in the ileum is increased. It has been proved that the ileum has the ability to resynthesize triglyceride and lecithin from absorbed hydrolytic products, preparatory to their transport from the gut, and that intraluminal conditions, at least through the mid-ileum, favor lipid absorption. Further studies are needed to document the extent to which the ileum participates in lipid absorption in various pathophysiological states, and to assess the route by which the absorbed lipid is transported from the gut. Since the ileum is known to form chylomicrons more slowly than the jejunum, it may be necessary to find alternate pathways for the transport of absorbed lipid. Such studies will increase our understanding of ileal functions beyond those of absorbing vitamin B_{12} and bile acids.

INFLUENCE OF DIET ON DEVELOPMENT OF THE ABDOMINAL FAT PAD IN THE PULLET. F.E. Pfaff, Jr. and R.E. Austic (Dept. of Poultry Sci. and Div. of Nutr. Sci., Cornell Univ., Ithaca, N.Y. 14853) *J. Nutr.* 106, 443–50 (1976). Adipose tissue developed by hyperplasia during the growth of the pullet until approximately 12 to 15 weeks of age. Feeding low energy or high protein diets, which limited adipose tissue accumulation, appeared to delay the time at which hyperplastic growth ceased, but did not alter cellularity of the abdominal fat pad at maturity. Although hypertrophic growth occurred throughout development of the abdominal fat pad, it was most pronounced after week 7; it was depressed by low energy or high protein diets. In two experiments the differences persisted after pullets previously fed either a low energy or high protein diet had been fed a control diet for several weeks. In one experiment, chicks fed the low energy diet until 9.5 weeks had fat pads of reduced size at 22 weeks of age. Moreover, the fat pads were similar in size to those of chicks fed the low energy diet from hatching until 22 weeks. In a second experiment pullets maintained the differences in fat pad weight throughout 19 weeks of egg production during which all groups received the same diet. These results suggest that adiposity in the pullet may be influenced by nutritional treatment during the period of growth and development prior to sexual maturity.

STUDY OF THE TRANSVERSE DIFFUSION OF SPIN-LABELED PHOSPHOLIPIDS IN BIOLOGICAL MEMBRANES. II. INNER MITOCHONDRIAL MEMBRANE OF RAT LIVER: USE OF PHOSPHATIDYLCHOLINE EXCHANGE PROTEIN. A. Rousselet, A. Colbeau, P.M. Vignais and P.F. Devaux (Biophysique Moleculaire, GPS-ENS, Tour 23, Univ. Paris VII-2 place Jussieu 75221 Paris Cedex 05) *Biochim. Biophys. Acta* 426, 372–84 (1976). Spin-labeled phosphatidylcholine was incorporated into the membrane of isolated "inner membrane + matrix" particles of rat liver mitochondria by incubation with sonicated spin-labeled phosphatidylcholine vesicles at 22°C. When the spin label was on the acyl chain the incorporation of phosphatidylcholine into the membrane was stimulated by the presence of the phosphatidylcholine exchange protein extracted from rat or beef liver. On the other hand no stimulation was observed when the nitroxide was on the polar head-group. The anisotropic distribution of spin-labeled phosphatidylcholine in the mitochondrial membrane was found to be stable at 25°C for more than 2 h. It is therefore concluded that the rate of outside-inside and inside-outside transitions are extremely slow (half-life greater than 24 h).

EFFECT OF QUALITY AND QUANTITY OF DIETARY FAT AND DIETARY FAT AND DIMETHYLHYDRAZINE IN COLON CARCINOGENESIS IN RATS (39181). B.S. Reddy, T. Narisawa, D. Vukusich, J.H. Weisburger, and E.L. Wynder (Naylor Dana Inst. for Disease Preven., American Hlth. Found., Valhalla, N.Y. 10595) *Proc.*

Soc. Exp. Biol. Med. **151**, 237–9 (1976). The effect, quality, and quantity of dietary fat on colon tumor induction by DMH were studied in rats exposed to a given regimen for two generations prior to treatment with DMH. Animals fed a 20% corn oil or 20% lard and treated with DMH had a higher incidence of colonic tumors than did rats fed a 5% corn oil, 5% lard or Purina lab chow and treated similarly. The quality of fat had no major difference on the incidence of colonic tumors.

VASCULAR RESPONSES TO ARACHIDONIC ACID IN THE PERFUSED CANINE LUNG. T.C. Wicks, J.C. Rose, M. Johnson, P.W. Ramwell, and P.A. Kot (Dept. of Physiol. and Biophys., Georgetown Univ. Med. Ctr., Washington, D.C.) *Circ. Res.* **38**, 167–71 (1976). We compared the effects of arachidonic acid (AA), the bisenoic prostaglandin precursor, with those of prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) and norepinephrine (NE) on pulmonary vascular resistance in the isolated (in situ), perfused canine lung lobe. The isolated lobe was perfused with autologous blood or an artificial perfusate under conditions of constant flow. Lobar artery and venous pressures were constantly monitored after bolus injections of AA, $PGF_{2\alpha}$, and NE into the inflow cannula. The pressor effect of AA was not blocked by pretreatment with phentolamine, propranolol, cyproheptadine, or atropine. The use of an artificial perfusate free of cellular elements did not prevent the vasoconstrictor action of AA. The times to onset of action of the three agents were similar, and short.

PHOSPHOLIPIDS AS IONOPHORES. C.A. Tyson, H.V. Zande, and D.E. Green (Inst. for Enzyme Res., Univ. of Wisconsin, Madison, Wisc. 53706) *J. Biol. Chem.* **251**, 1326–32 (1976). The ionophoretic capabilities of phospholipids have been examined by direct measurement in a Pressman cell of the phospholipid-mediated translocation of cations across an organic phase separating two aqueous phases. Cardiolipin and phosphatidic acid were the most active ionophores among the phospholipids tested, with activities comparable to that of X537A in respect to the translocation of divalent cations. Cardiolipin translocates both divalent and monovalent cations at approximately equal rates. The ionophoretic activity of cardiolipin could be modulated by other phospholipids (inhibition), by butacaine (stimulation), by complexation with cytochrome *c* (inhibition), and by ruthenium red and lanthanum (inhibition). The rate of translocation of cations mediated by cardiolipin was independent of pH over a wide pH range (5.4 to 8.3). The same general pattern of properties observed for cardiolipin applied to phosphatidic acid except for stimulation by butacaine. Complexation of phospholipid mixtures, such as asolectin or mitochondrial lipid with reduced cytochrome *c*, enhanced the ionophoretic capability of these phospholipids by 1 order of magnitude. The complex thus formed has the properties of a polyionophore. The possible physiological significance of this enormous ionophoretic potential of phospholipids is examined.

IN VIVO INHIBITION OF CHOLESTEROL UPTAKE IN RABBIT AORTAS BY 7-KETOCHOLESTEROL (39197). J.S.M. Sarma, R. Fischer, S. Ikeda, and R.J. Bing (Huntington Memorial Hosp., Pasadena, Calif. 91105) *Proc. Soc. Exp. Biol. Med.* **151**, 303–6 (1976). The iv injection of 7-ketocholesterol into rabbits, made soluble by combining with bile salts, inhibited cholesterol uptake by the aorta. However, the inhibition was not as marked or as uniform as previously demonstrated in *in vitro* experiments. This difference may have been the result of lower plasma concentrations of 7-ketocholesterol in the injected animals. Gastric feeding of 7-ketocholesterol failed to inhibit aortic cholesterol uptake, probably because of inadequate plasma concentrations of the inhibitory steroid. The results suggest that the mechanism of 7-ketocholesterol on aortic cholesterol uptake is through competitive inhibition.

ALTERATIONS IN VITAMIN A METABOLISM DURING ZINC DEFICIENCY AND FOOD AND GROWTH RESTRICTION. J.C. Smith, Jr., E.D. Brown, E.G. McDaniel and W. Chan (Trace Element Res. Lab., Veterans Admin. Hosp., Washington, D.C. 20422) *J. Nutr.* **106**, 569–74 (1976). The purpose of these experiments was to further elucidate the effect of the trace element, zinc, on vitamin A metabolism. Three experiments were conducted at two different locations using different sources of animals. A total of 95 rats were used; 71 specific pathogen free and 24 germfree. The results indicate that plasma vitamin A is depressed in zinc deficient animals or animals severely restricted in food and growth. Liver stores of vitamin A were adequate in both groups. Thus, the normal mechanism for maintaining plasma vitamin A appears to be altered by either zinc deficiency and/or severe food and growth restriction.

CHANGES IN (Na^+ + K^+)-ATPASE ACTIVITY OF EHRLICH ASCITES TUMOR CELLS PRODUCED BY ALTERATION OF MEMBRANE FATTY ACID COMPOSITION. L.P. Solomonson, V.A. Liepkalns and A.A. Spector (Depts. of Biochem. and Med., Univ. of Iowa, Iowa City, Ia. 52242) *Biochemistry* **15**, 892–97 (1976). The fatty acid composition of plasma membrane derived from Ehrlich ascites tumor cells was altered in vivo by changing the dietary lipid of the tumor-bearing mice. The activity of (sodium + potassium)-adenosinetriphosphatase ((Na^+ + K^+)-ATPase), in partially purified plasma membranes, was measured as a function of temperature. Arrhenius plots of the data were biphasic. Striking differences, dependent on the membrane fatty acid composition, were observed in the transition temperatures and in the energies of activation below the transition temperature. There were no significant differences in the cholesterol or phospholipid content in the three types of plasma membranes. However, there were marked differences in the fatty acyl composition of PM_{TS} as compared with either the control (PM_C) or PM_{SU} membranes. It is concluded that dietary lipid induced changes in membrane fatty acyl composition can change the activity of the plasma membrane (Na^+ + K^+)-ATPase.

CHAIN ELONGATION AND DESATURATION OF PALMITIC ACID IN LIVER MICROSOMES OF RATS SUBJECTED TO HYPERBARIC EXPOSURE (39225). T.K. Yang, H.M. Jenkin, T.W. Nielsen, and K.R. Holmes (The Hormel Inst., Univ. of Minnesota, Austin, Minn. 55912) *Proc. Soc. Exp. Biol. Med.* **151**, 422–4 (1976). The enzyme activities associated with chain elongation and desaturation of fatty acid in hepatic microsomes from rats held at 1 ATA of air, 1 ATA of He-O_2, and 20 ATA of He-O_2 were studied. It was found that both the microsomal chain elongation and desaturation of fatty acids were depressed in rats held at 1 ATA of He-O_2 as compared to animals held at 1 ATA of air. When animals were exposed to an environment of 20 ATA of He-O_2, the chain elongation of fatty acid was about the same as for rats held at 1 ATA of air and was two times greater than for the rats held at 1 ATA of He-O_2. The desaturase activity was depressed as compared to the two groups of control animals held at 1 ATA of air and 1 ATA of He-O_2.

INCREASING POLYUNSATURATION OF MILK FATS BY FEEDING FORMALDEHYDE PROTECTED SUNFLOWER-SOYBEAN SUPPLEMENT. T.R. Wrenn, J.R. Weyant, D.L. Wood, J. Bitman, R.M. Rawlings and K.E. Lyon (USDA, ARS, Animal Physiol. and Genetics Inst., Nutrient Utilization Lab., Beltsville, Md. 20705) *J. Dairy Sci.* **59**, 627–35 (1976). A practical means of protecting fats of a feed concentrate containing high polyunsaturated fatty acids is described. A ground mixture of 30% soybeans and 70% sunflower seeds was treated with 1% formaldehyde to protect the unsaturated lipids from microbial hydrogenation in the rumen. This was fed as a supplement to two Holstein cows in amounts that were doubled weekly. These ranged from 524 to 8384 g/day and provided successively increasing intakes of 100, 200, 400, 800, and 1600 g of linoleic acid daily. Percent milk fat increased by more than one, and linoleic acid (C18:2) of milk fat increased from 2.5 to 20% with compensatory declines in myristic (C14:0) and palmitic (C16:0) acids. Cholesterol and vitamin E of plasma both doubled at the highest supplementation. Milk yield, solids-not-fat, protein, and milk cholesterol were unaltered. Fat in feces doubled from about 3 to 6%. Daily linoleic acid content of feces increased from 25 g to 120 g, indicating a dietary loss of 7 to 10% of this polyunsaturated acid. These cheaper feed ingredients elevated the polyunsaturated fats in milk as effectively as the expensive purified casein and safflower oil supplements in previous experiments.

EVALUATION OF VITAMIN A ANALOGS IN MODULATING EPITHELIAL DIFFERENTIATION OF 13-DAY CHICK EMBRYO METATARSAL SKIN EXPLANTS. L.J. Wilkoff, J.C. Peckham, Elizabeth A. Dulmadge, R.W. Mowry and D.P. Chopra (Kettering-Meyer Lab., Southern Res. Inst., and the Dept. of Pathol., Univ. of Alabama, Birmingham, Ala. 35205) *Cancer Res.* **36**, 964–972 (1976). Seventeen vitamin A compounds were evaluated in organ culture for activity in altering epithelial differentiation of metatarsal skin explants from 13-day-old chick embryos. The explants keratinized in 6 to 8 days and, when cultured in the presence of β-retinoic acid (RA), inhibition of keratinization occurred and a mucous metaplasia developed. Since the property of altering epithelial differentiation may be a fundamental requirement for the prophylaxis and/or treatment of malignant epithelial lesions, this system can be used

to determine whether the new synthetic analogs of vitamin A are active in modulating epithelial differentiation.

REGULATION OF PHOSPHOLIPID METABOLISM IN DIFFERENTIATING CELLS FROM RAT BRAIN CEREBRAL HEMISPHERES IN CULTURE. PATTERNS OF ACETYLCHOLINE, PHOSPHOCHOLINE, AND CHOLINE PHOSPHOGLYCERIDES LABELING FROM [METHYL-^{14}C]CHOLINE. E. Yavin (Dept. of Biochem., Neurobiol. Unit, The Weizmann Inst. of Sci., Rehovot, Israel) *J. Biol. Chem.* 251, 1392–7 (1976). The uptake and metabolism of [^{14}C]choline in dissociated rat brain embryo cell cultures was examined as a function of the extracellular choline concentration. Choline uptake did not follow normal Michaelis-Menten kinetics, but rather exhibited two components with apparent K_m of 0.016 mM and 0.96 mM. At low choline concentrations (high affinity uptake) most of the [^{14}C]choline label was present in the phosphocholine fraction prior to the appearance of label in phospholipids. At high choline concentrations (low affinity uptake) a large proportion of the radioactivity was converted into acetylcholine. The dissimilarities between the formation of phosphocholine and acetylcholine as a function of choline concentration might be explained by the existence of two mutally independent enzymatic activities with different K_m affinities for choline.

PHOSPHATIDYLGLYCEROL BIOSYNTHESIS IN BACILLUS LICHENIFORMIS. RESOLUTION OF MEMBRANE-BOUND ENZYMES BY AFFINITY CHROMATOGRAPHY OF CYTIDINEDIPHOSPHO-SN-1,2-DIACYLGLYCEROL SEPHAROSE. T.J. Larson, T. Hirabayashi and W. Dowhan (Dept. of Biochem. and Molecular Biol., Univ. of Texas Med. Schl. at Houston, Houston, Texas 77025) *Biochemistry* 15, 974–9 (1976). Cytidinediphospho-*sn*-1,2-diacylglycerol (CDP-diglyceride) has been covalently linked to Sepharose 4B via an adipic acid dihydrazide spacer arm forming an effective affinity chromatography column. This liponucleotide ligand and *sn*-glycero-3-phosphate are substrates for the formation of 3-*sn*-phosphatidyl-1′-*sn*-glycero-3-phosphate (PGP) catalyzed in both eukaryotic and prokaryotic organisms by *sn*-glycero-3-phosphate:CMP phosphatidyltransferase (PGP synthetase). The solubilized and partially purified PGP synthetase required magnesium ion and a nonionic detergent such as Triton X-100 for the stoichiometric conversion of CDP-diglyceride and *sn*-glycero-3-phosphate to PGP and CMP. The solubilized PGP phosphatase required a nonionic detergent and little, if any, magnesium for the conversion of PGP to PG and inorganic phosphate.

MOTION OF SPIN-LABELED FATTY ACIDS IN MURINE MACROPHAGES RELATION TO CELLULAR PHAGOCYTIC ACTIVITY. A.J. Schroit, S. Rottem and R. Gallily (The Lautenberg Ctr. for General and Tumor Immunology, and the Dept. of Clin. Microbiology, The Hebrew Univ.-Hadassah Med. Schl., Jerusalem, Israel) *Biochim. Biophys. Acta* 426, 499–512 (1976). Macrophage membrane fluidity was investigated with respect to cellular phagocytic activity through the use of fatty acids spin labels. Spin-labeled fatty acid derivatives were incorporated into intact mouse peritoneal macrophages by exchange from bovine serum albumin. The electron spin resonance (ESR) spectra of the spin-labeled fatty acids in the macrophages showed a pronounced temperature dependence and a decrease in the hyperfine splittings ($2T_{II}$) of the spectra as the nitroxide radical was moved away from the polar head group of the fatty acid derivatives. Enrichment of the fatty acids composition of the macrophage membrane with *cis-* or *trans*-unsaturated fatty acids had striking effects on cellular phagocytic activity, while no significant changes could be detected in the freedom of motion of incorporated fatty acid spin labels at the degree of specific enrichment achieved here. Thus no correlation between cellular phagocytic activity and lipid motion could be detected.

LIPID MOLECULAR MOTION AND ENZYME ACTIVITY IN SARCOPLASMIC RETICULUM MEMBRANE. D.G. Davis, G. Inesi and T. Gulik-Krzywicki (Lab. of Phys. and Biophys., Univ. of the Pacific, San Francisco, Calif. 94115) *Biochemistry* 15, 1271–6 (1976). In biochemically active sarcoplasmic reticulum vesicles (SR) the physical state of the membrane lipids was studied by high angle x-ray diffraction and proton nuclear magnetic resonance (NMR) at 220 MHz, and related to thermal effects observed in SR functional parameters. It is shown by high angle x-ray diffraction that even at temperatures as low as 1° C nearly all the SR lipid hydrocarbon chains are in a disordered conformation and only a very small part (less than 3%) are in rigid crystalline order. Consistent with this observation, the NMR data indicate that the majority of SR phospholipid molecules are in a state of restricted anisotropic motion having no apparent crystalline order at temperatures as low as 5° C. At this temperature most of the resonance signal is contained in a broad featureless line of 700-Hz half-width.

ASYMMETRY AND TRANSPOSITION RATES OF PHOSPHATIDYLCHOLINE IN RAT ERYTHROCYTE GHOSTS. B. Bloj and D.B. Zilversmit (Div. of Nutr. Sci., and Section of Biochem., Molecular and Cell Biology, Div. of Biol. Sci., Cornell Univ., Ithaca, N.Y. 14853) *Biochemistry* 15, 1277–83 (1976). Purified phospholipid exchange protein from beef heart cytosol is used to accelerate the exchange of phospholipids between labeled sealed ghosts and phosphatidylcholine/cholesterol liposomes. The purified protein accelerates the transfer of phosphatidylcholine and, to a lesser degree, that of sphingomyelin, phosphatidylinositol, and lysophosphatidylcholine. The presence of exchange protein does not accelerate the exchange of phospholipids between intact red blood cells and liposomes, but 75% of the phosphatidylcholine of sealed ghosts is readily available for exchange. The remaining 25% is also exchangeable but at a slower rate.

BINDING OF BOVINE CYTOCHROME b_5 TO PHOSPHATIDYLCHOLINE LIPOSOMES. CHARACTERIZATION OF THE RECONSTITUTED LIPID-PROTEIN VESICLES. J. Dufourcq, R. Bernon and C. Lussan (Centre de Recherche Paul Pascal, Domaine Univ., 33405, Talence, France) *Biochim. Biophys. Acta* 433, 252–63 (1976). Cytochrome b_5 was extracted and purified from beef liver by a detergent method (cytochrome d-b_5). The hydrophilic moiety which carries the heme group (cytochrome t-b_5) was prepared by trypsin action upon pure cytochrome d-b_5. Single-shelled lecithin liposomes form complexes with cytochrome d-b_5 up to a molar ratio of one protein for 35 phospholipids. The lipid-protein complexes were isolated by gel filtration on Sepharose 4B. They are hollow vesicles in which [^{3}H]-glucose can be trapped. Their diameter is greater than that of the initial liposomes. Cytochrome t-b_5 does not interact with the vesicles. These results show that the hydrophobic tail is necessary for the binding and that the hydrophilic part of the protein is located on the outer face of the vesicles. This asymmetry is also proved by the action of reducing agents. Experiments with saturated phosphatidylcholines show that the protein interacts with the lipids both below the transition temperature T_M, i.e. when the aliphatic chains are in a crystalline state, and above T_M, when the aliphatic chain are in a fluid state. H NMR spectra show that even at the maximum cytochrome d-b_5 concentration the presence of the proteins does not markedly change the dynamics of the phospholipid molecules. An asymmetric single-shelled vesicle structure is proposed for the complex.

BIOHYDROGENATION OF UNSATURATED FATTY ACIDS. HYDROGENATION BY CELL-FREE PREPARATIONS OF BUTYRIVIBRIO FIBRISOLVENS. W.J. Hunter, F.C. Baker, I.S. Rosenfeld, J.B. Keyser and S.B. Tove (Dept. of Biochem., North Carolina State Univ., Raleigh, North Carolina 27607) *J. Biol. Chem.* 251, 2241–7 (1976). Hydrogenation of *cis*-9,*trans*-11-octadecadienoic acid to yield *trans*-11-octadecenoic acid by cell-free preparations of *Butyrivibrio fibrisolvens* has been obtained under strictly anaerobic conditions. Reduced methyl viologen, NADH, and an endogenous electron donor each can serve as a reductant. Inhibition studies and gel filtration patterns reveal the presence of at least two hydrogenation systems, one of which is coupled through a flavin, possibly FMN. Although the enzymes comprising the biohydrogenation pathway, the fatty acid reductases and linoleic acid isomerase, are part of the bacterial membrane, they do not appear to be constituted as a multienzyme complex.

BOVINE PANCREATIC LIPASE. II. STABILITY AND EFFECT OF ACTIVATORS AND INHIBITORS. I.M. Khan, R.C. Chandan and K.M. Shahani (Dept. of Food Sci. and Tech., Univ. of Nebraska, Lincoln, Nebraska 68503) *J. Dairy Sci.* 59, 840–6 (1976). Purified bovine pancreatic lipase was highly unstable at and above refrigeration temperature. However, it could be stored frozen without loss of activity. Milk solids had some protective effect upon the enzyme against γ-irradiation. Low concentrations of sodium, calcium, and magnesium salts stimulated lipolytic activity. However, heavy metal salts, such as ferric, cupric, and mercuric chlorides, were highly inhibitory. The bovine pancreatic lipase appeared to contain sulfhydryl groups which may be essential for the lipolytic activity since p-chloromercuribenzoate, N-ethylmaleimide, sodium arsenite, and iodoacetate inhibited the enzyme. A comparison of bovine pancreatic lipase and milk lipase revealed that the two enzymes were similar in thermal

stability and effect of some of the activators and inhibitors on lipolytic activity.

BOVINE PANCREATIC LIPASE. III. LIPOLYSIS OF OILS AND FATS AND FATTY ACID SPECIFICITY. R.C. Chandan, I.M. Khan and K.M. Shahani (Dept. of Food Sci. and Tech., Univ. of Nebraska, Lincoln, Nebraska 68503) *J. Dairy Sci.* **59**, 847–53 (1976). Purified bovine pancreatic lipase hydrolyzed butter-oil, vegetable oils, and synthetic glycerides. The enzyme hydrolyzed triglycerides more rapidly than di- and mono-glycerides and tripropionin faster than any other synthetic glyceride. Triacetin was the least hydrolyzed glyceride. Gas-liquid chromatographic analysis of the free fatty acids liberated by the lipase from milk fat indicated that the enzyme selectively liberated butyric acid in higher proportion than the relative amount originally in the fat. The enzyme released saturated as well as unsaturated fatty acids from commercial vegetable oils. With regard to the lipolytic behavior, in general, the bovine pancreatic lipase closely resembled milk lipase.

CORTICOSTEROIDS AND PHOSPHATIDYLCHOLINE BIOSYNTHESIS IN MICROSOMAL FRACTIONS FROM L5178Y LYMPHOMA. G. Melnykovych, M. Standaert, E. Matthews and S. Gray (Research Service, United States Veterans Administration Hosp., Kansas City, Mo. 66103) *Cancer Res.* **36**, 1545–50 (1976). Microsomal fractions from mouse lymphoma L5178Y and from rat thymocytes were used to follow incorporation of radiolabel from cytidine diphosphate-[methyl-^{14}C]choline into microsomal lipids. Dexamethasone, at concentrations ranging from 2.8×10^{-6}M to 2.8×10^{-5}M, partially inhibited this transfer reaction. Microsomes prepared from freshly isolated thymocytes were more sensitive to the effects of dexamethasone showing inhibition at concentrations of steroid as low at 2.8×10^{-8}M. The inhibitory effect did not depend on the amount of the available endogenous diglycerides and was not related to a possible stimulation of cytidine diphosphate choline transferase back reaction by the steroid. The survey of a broad selection of different steroids revealed a lack of correlation between the known lymphocytolytic properties of steroids and their effects on cytidine diphosphate choline transferase. Dexamethasone was the only steroid of the glucocorticoid group that inhibited this reaction in microsomal fractions of L5178Y lymphoma. The structural requirement for the inhibitory effect was related to the absence of oxygen functions in positions 11 and 17 of the steroid and, possibly, to the presence of both C-20 and C-21 on the side chain.

EFFECT OF DIETARY FAT ON FLUORIDE ABSORPTION AND TISSUE FLUORIDE RETENTION IN RATS. E.L. McGown, D.L. Kolstad and J.W. Suttie (Dept. of Biochem., Col. of Agr. and Life Sci., Univ. of Wisconsin-Madison, Madison, Wisc. 53706) *J. Nutr.* **106**, 575–9 (1976). The effect of dietary fat on fluoride toxicity was investigated in rats fed isoenergetic diets with graded levels of fat (0, 10%, 30% or 50% of energy) containing 400 ppm fluoride. Growth rate was depressed in all groups receiving fluoride but most severely in the 50% dietary fat group. Plasma, liver and femur fluoride concentrations were increased by increasing dietary fat. This was apparently due to increased absorption of fluoride, since urinary fluoride increased and fecal fluoride excretion decreased as fat intake was elevated. The enhancement of fluoride absorption by fat is believed to be due to the delaying effect of fat and fluoride on gastric emptying, thereby allowing more time for the fluoride to be absorbed from the stomach.

EFFECT OF EXCESS AND DEFICIENCY OF INDIVIDUAL ESSENTIAL AMINO ACIDS IN DIETS ON THE LIVER LIPID CONTENT OF GROWING RATS. Y. Aoyama and K. Ashida (Lab. of Nutr. Biochem., Dept. of Agr. Chem., Nagoya Univ., Chikusa, Nagoya, Japan) *J. Nutr.* **102**, 1025–32 (1976). In an attempt to determine the effect of individual essential amino acids on the level of liver lipids, growing rats were fed diets consisting of an amino acid mixture in which the content of a particular amino acid was either 50% more or 50% less than that in the control diet. Feeding excessive amounts of individual essential amino acids did not affect food intake, body weight gain, feed efficiency or liver lipid content except when excessive amounts of methionine plus cystine were fed. Feeding excessive amounts of sulfur-containing amino acids caused an increase in liver lipids, but had no effect on the other parameters measured. The feeding of a diet deficient in both threonine and sulfur-containing amino acids did not cause a change in either growth rate or food efficiency as compared with feeding a threonine-deficient diet. However, the feeding of a diet deficient in both lysine and sulfur-containing amino acids caused a reduction in both growth rate and food efficiency as compared with feeding a lysine-deficient diet.

EFFECT OF PHENOBARBITONE ON PLASMA LIPIDS IN NORMAL SUBJECTS. P.N. Durrington, C.J. Roberts, L. Jackson, R.A. Branch and M. Hartog (Dept. of Med., Univ. of Bristol, Bristol Royal Infirmary, Bristol, U.K.) *Clin. Sci. Mol. Med.* **50**, 349–53 (1976). Phenobarbitone in a dose of 180 mg daily was administered to ten normal subjects for 3 weeks. There was a significant increase in total plasma cholesterol, plasma low-density-lipoprotein cholesterol, plasma low-density-lipoprotein (LDL) triglycerides and plasma LDL protein. The increase in plasma LDL cholesterol accounted for the increase in total plasma cholesterol. There was a significant reduction in the ratio of LDL cholesterol to LDL protein. No significant changes were observed in total plasma triglycerides, plasma very-low-density-lipoprotein (VLDL) triglycerides, plasma VLDL cholesterol of plasma VLDL protein. Evidence that drug-metabolizing enzymes were induced by phenobarbitone was provided by an increase in antipyrine clearance. No relationship was observed between changes in plasma cholesterol and changes in antipyrine clearance. Serum γ-glutamyl transpeptidase was also increased after phenobarbitone administration, the increase being unrelated to changes in antipyrine clearance or plasma cholesterol.

EFFECT OF PREGNANCY AND LACTATION ON TRIGLYCERIDES OF VERY-LOW-DENSITY LIPOPROTEINS OF RAT PLASMA. R.W. Smith and V.A. Welch (Biochem. Dept., National Inst. for Res. in Dairying, Shinfield, Reading, RG2 9AT, England) *J. Dairy Sci.* **59**, 876–9 (1976). Triglyceride in the blood of rats increased during pregnancy, decreased to control during lactation, and increased again on weaning. The triglyceride content of the very-low-density lipoproteins ($d < 1.006$ g/ml) changed in parallel with that of the plasma, and its magnitude indicated that it was chiefly responsible for the transport of triglycerides in the blood. These changes were accompanied by changes in the electrophoretic pattern of the lipoproteins of rat plasma, but no such changes were observed in lipoproteins of ovine and caprine serum.

EVIDENCE FOR A PHOSPHOLIPID REQUIREMENT IN THE SPECIFIC BINDING OF GLUCOCORTICOIDS TO RECEPTORS OF FIBROBLASTS AND THYMIC LYMPHOCYTES. H.F. Schulte, C.J. Nielsen, J.J. Sando and W.B. Pratt (Dept. of Pharmacology, Univ. of Mich. Schl. of Med., Ann Arbor, Mich. 48104) *J. Biol. Chem.* **251**, 2279–89 (1976). The specific steroid binding capacity of soluble preparations from mouse fibroblasts and rat thymic lymphocytes is inactivated by incubation with phospholipases. Receptor binding is drastically reduced by very low concentrations of boiled phospholipase A preparations from bee venom and snake venoms. The enzyme effect is calcium-dependent and is blocked by both phospholipid and a substrate analog that is a competitive inhibitor of phospholipase A. The specific binding capacity is also sensitive to digestion by phospholipase C. Two possible mechanisms are considered for the phospholipase A effect: (a) the receptor protein may be associated with a phospholipid component which is required for specific hormone binding; (b) phospholipase A may be producing detergent products that are indirectly inactivating the receptor. Examination of the effects of lysophosphatide on the receptor and assay of lipid phosphate in the receptor preparation do not support a mechanism based solely on detergent effects. Because phospholipase C, which does not produce detergent products, also inactivates the binding, we propose that the phospholipases may be digesting phospholipid which is a requisite component of the glucocorticoid receptor.

HYDROLYSIS OF PHOSPHATIDYLCHOLINE LIPOSOMES BY PHOSPHOLIPASES A_2. EFFECTS OF THE LOCAL ANESTHETIC DIBUCAINE. J.C. Wilschut, J. Regts, H. Westenberg and G. Scherphof (Lab. of Physiol. Chem., Univ. of Groningen, Bloemsingel 10, Groningen, the Netherlands) *Biochim. Biophys. Acta* **433**, 20–31 (1976). Dibucaine evokes a downward shift in the phase transition temperature of saturated phosphatidylcholines, while it also affects the pretransition. The binding of dibucaine to phosphatidylcholine liposomes increases sharply when the lipid is transformed from the gel phase to the liquid-crystalline phase. The uptake of dibucaine by positively charged liposomes composed of phosphatidylcholine and stearylamine is considerably reduced in comparison with pure phosphatidylcholine liposomes. This decrease is paralleled by a reduction of the inhibitory and stimulatory effects of dibucaine on the

hydrolysis of such liposomes by pancreatic and *Naja naja* phospholipase, respectively. The inhibitory action of dibucaine towards the pancreatic phospholipase is lowered by increasing $CaCl_2$ concentrations. This reduction is accompanied by a decreased uptake of anesthetic by the liposomes.

INVESTIGATIONS IN EXPERIMENTAL ATHEROSCLEROSIS. PART 2. THE EFFECT OF PHOSPHATIDYLCHOLINE (EPL) ON EXPERIMENTAL ATHEROSCLEROTIC CHANGES IN MINIATURE PIGS. L. Samochowiec, D. Kadlubowska, L. Rozewicka, W. Kuzna and K. Szyszka (Depts. of Pharmacol., Histol. and Embryol., and Biol., Pomeranian Med. Academy, Powstancow Wlkp. 72, 70–111 Szczecin, Poland) *Atherosclerosis* 23, 319–31 (1976). The influence of atherogenic diet (AD) and "essential" phospholipid (EPL) on atherosclerotic changes in miniature pigs was investigated. AD caused generalized disturbances of lipid metabolism and atherosclerotic lesions in the cardiovascular system of miniature pigs. Phosphatidylcholine (EPL), administered in doses of 28–280 mg/kg, has a curative action in experimental atherosclerosis of miniature pigs.

LIVER PLASMA MEMBRANES FROM ESSENTIAL FATTY ACID-DEFICIENT RATS. ISOLATION, FATTY ACID COMPOSITION, AND ACTIVITIES OF 5′-NUCLEOTIDASE, ATPASE AND ADENYLATE CYCLASE. R.P. Bribio-Haugland, S.L. Louis, K. Musch, N. Waldeck and M.A. Williams (Dept. of Nutr. Sci., Univ. of California Berkeley, Calif. 94720) *Biochim. Biophys. Acta* 433, 150–63 (1976). To determine whether changes in unsaturation of fatty acids in rat liver plasma membranes might alter activities of membrane-associated enzymes, liver plasma membranes were prepared from rats fed purified diets lacking or supplemented with essential fatty acids. Two methods of membrane purification were used. A similar degree of purification was obtained with both methods for both depleted and control membranes, as indicated by marker enzyme purification. The proportion of essential fatty acids of the linoleate series was significantly lower in phospholipids from depleted rats. Supplementation of deficient rats with a source of essential fatty acids (corn oil) restored V and apparent K_m values to normal. Adenylate cyclase activity in the presence of fluoride, glucagon or glucagon plus GTP was significantly lower in the depleted plasma membranes.

REVERSAL OF ADVANCED ATHEROSCLEROSIS IN RHESUS MONKEYS. PART 1. LIGHT-MICROSCOPIC STUDIES. D. Vesselinovitch, R.W. Wissler, R. Hughes and J. Borensztajn (Dept. of Pathol. and Specialized Ctr. of Res. in Athero., Univ. of Chicago, Chicago, Ill.) *Atherosclerosis* 23, 155–76 (1976). The regression of atherosclerotic lesions in Rhesus monkeys was evaluated by means of a low-fat, low-cholesterol diet with or without N-γ-phenylpropyl-N-benzyloxy acetamide (W-1372). Moderate to severe aortic and coronary atherosclerosis was induced by feeding 4 groups of male monkeys a high-fat, high-cholesterol diet for 18 months, after which the first group was autopsied for assessment of the lesions. During a subsequent 18-month regression period, the second group of animals was fed a low-fat, low-cholesterol diet with W-1372, and the third group the low-fat, low-cholesterol diet without W-1372. A pair of monkeys (the fourth "group") was fed an atherogenic diet throughout the experiment. The aortas of the animals treated with the low-fat, low-cholesterol diet with or without W-1372 showed about two-thirds as many lesions which were on the average about half as severe as those in the animals killed at 18 months. The coronary artery lesions showed a similar contrast, with the treated groups having about one-third to one-half as many lesions which were about one-half to two-thirds as severe.

THE EFFECTS OF CARBON MONOXIDE ON THE DEVELOPMENT OF ATHEROSCLEROSIS IN THE WHITE CARNEAU PIGEON. A.K. Armitage, R.F. Davies and D.M. Turner (Tobacco Res. Council Labs., Harrogate, Great Britain) *Atherosclerosis* 23, 333–44 (1976). The effects on the extent and severity of atherosclerosis of intermittent exposure to carbon monoxide have been studied in normo- and hypercholesterolaemic White Carneau pigeons. Carbon monoxide had no enhancing effect in normocholesterolaemic birds. In hypercholesterolaemic birds (induced by adding 1% cholesterol to the diet), the severity of coronary artery atherosclerosis was significantly more in birds exposed to carbon monoxide than in nonexposed birds after 52 weeks exposure but not after 84 weeks. The severity of atherosclerosis was related to the degree of hypercholesterolaemia. It is suggested that, in the White Carneau pigeon, exposure to carbon monoxide has an aggravating effect on plasma cholesterol levels which in turn affects the development of the disease. The possible role of carbon monoxide in relation to the development of human arterial disease is discussed.

THE INFLUENCE OF DIETARY INOSITOL ON GLYCERIDE COMPOSITION AND SYNTHESIS IN LIVERS OF RATS FED DIFFERENT FATS. D.B. Andersen and B.J. Holub (Dept. of Nutr., College of Biol. Sci., Univ. of Guelph, Guelph, Ontario N1G 2W1, Canada) *J. Nutr.* 106, 529–36 (1976). The effect of inositol supplementation on the composition and biosynthesis of glycerides in the livers of rats fed diets containing fats with differing fatty acid composition was investigated. The dietary fats employed in these studies included corn oil, Tower rapeseed oil (RSO), partially hydrogenated soybean oil (SBO), and tallow. No significant influence of inositol on hepatic triglyceride levels was found in animals fed corn oil and SBO whereas inositol deficiency caused a two- and four-fold elevation in triglyceride concentrations in the RSO and tallow groups respectively. The results indicate that triglyceride accumulation in liver under conditions of inositol deficiency is not only produced with highly saturated fats since the most unsaturated of all the fats tested, Tower RSO, also gave the syndrome.

THE OUTER MEMBRANE OF PROTEUS MIRABILIS III. SPECIFIC LABELING AND ENZYMIC HYDROLYSIS OF THE PROTEIN AND PHOSPHOLIPID COMPONENTS OF THE OUTER AND CYTOPLASMIC MEMBRANES. Miriam Hasin, S. Razin and S. Rottem (Biomembrane Research Laboratory, Dept. Clin. Micro., The Hebrew Univ.-Hadassah Med. Schl., Jerusalem, Israel) *Biochim. Biophys. Acta* 433, 229–39 (1976). The question of whether part of the outer membrane proteins and phospholipids are exposed on the external cell surface of *Proteus mirabilis* was approached by comparing the action of proteases, phospholipases and specific labeling reagents on intact cells and isolated outer membranes. Pronase and trysin degraded some of the outer membrane proteins in isolated membranes, but had no effect on intact cells. Likewise, the outer membrane proteins were intensely labeled by the lactoperoxidase-mediated iodination technique on treatment of isolated membranes, but were very poorly labeled on treatment of intact cells. Phospholipase A from bee venom effectively hydrolyzed the outer membrane phospholipids in isolated membranes and in intact cells, whereas phospholipase C from *Bacillus cereus* hydrolyzed the phospholipids in isolated membranes only. An endogenous phospholipase A activity, triggered by cell rupture, was found to be associated mostly with the other membrane. Our results suggest that the protein and phospholipid components of the outer membrane of *P. mirabilis* are partially shielded on the external cell surface, most probably by the long carbohydrate chains of the lipopolysaccharide molecules.

TURNOVER OF PLASMA GLUCOSE AND FREE FATTY ACIDS IN PATIENTS ON THE FIRST DAY AFTER MYOCARDIAL INFARCTION. I.A. Nimmo, R.H. Smith, M.A. Dolder, and M.F. Oliver (Dept. of Biochem., Univ. of Edinburgh and the Coronary Care Unit and Dept. of Cardiology, Royal Infirmary, Edinburgh, Scotland) *Clin. Sci. Mol. Med.* 50, 401–7 (1976). The turnover of plasma glucose and free fatty acids was measured in ten patients within 24h of the onset of symptoms of acute myocardial infarction and in two with symptoms of acute myocardial ischaemia. The measurements were repeated in seven of the patients 12–40 weeks after the acute episode. For all the individuals studied the turnover of free fatty acids increased with the concentration of these but was not related to the turnover of glucose or the plasma concentrations of glucose, insulin or total catecholamines. There was no obvious difference in the nature of the free fatty acids turnover-concentration relationship between the patients with acute myocardial infarction, with acute myocardial ischaemia and on re-examination.

VITAMIN A DEFICIENCY AND THE METABOLISM OF GLYCOSAMINOGLYCANS AND ASCORBIC ACID IN THE RAT. M. Mohanram, R.B. Rucker, R.E. Hodges, and D. Ney (Dept. of Nutr., College of Agr. and Env. Sci., and Dept. of Internal Med., Schl. of Med., Univ. of Cal., Davis, Calif. 95616) *J. Nutr.* 106, 471–7 (1976). Weanling rats were fed diets with and without the addition of retinyl palmitate at 6,500 units/kg. The supplemented groups were fed either ad libitum or food was restricted daily to that amount consumed by the group of rats receiving the unsupplemented diet. After a 10 week experimental period, signs of vitamin A deficiency were observed (growth plateau, xerophthalmia) and liver values as retinol were only 1% of control values. Relative to the two control groups, vitamin A deficiency resulted in approximately 30% lower liver, 50% lower blood and 40% lower urinary

ascorbic acid. Vitamin A deficiency did not appear to result in significant and direct impairment of GAG sulfate metabolism. Although the total amount of GAG in rat skin was increased, the composition of GAG fractions did not appear to be altered by vitamin A deficiency.

YOLK LIPIDS OF DEVELOPING ATHEROSCLEROSIS-SUSCEPTIBLE WHITE CARNEAU AND ATHEROSCLEROSIS-RESISTANT SHOW RACER PIGEON EMBRYOS. E.B. Cramer and S.C. Smith (Dept. of Animal Sci., Univ. of New Hampshire, Durham, New Hampshire 03824) *J. Nutr.* **106**, 627–30 (1976). The lipid composition of yolks of developing embryonic atherosclerosis-susceptible White Carneau (WC) and -resistant Show Racer (SR) pigeons was analyzed to determine whether embryonic nutrition might be a factor in the difference in susceptibility to aortic atherosclerosis. The yolks of 1-day and 18-day old embryos were analyzed, and the amounts of phospholipid, sterol, non-esterified fatty acid, triglyceride, cholesteryl ester, and hydrocarbon were determined. On the first day of development in both breeds, triglycerides composed 80% of the total lipid content of the yolk; phospholipids, cholesteryl ester, sterols and non-esterified fatty acids comprised the rest. There was no difference between breeds in the amount of lipid in each class or in the total lipid. Therefore, the initial lipid diet of these embryos is not a factor in development of the disease. Examination of the yolk just prior to hatching, revealed that in both breeds there was a significant decrease in total yolk lipids, but unequal utilization of lipid constituents between breeds. Significantly higher amounts of phospholipids remained in the yolk of the WC pigeons. During embryogenesis, the SR pigeons consumed significantly more of each lipid than the atherosclerosis-susceptible breed. This may indicate that there is a difference between the two breeds in lipid metabolism.

AN INVESTIGATION OF THE SURFACE LIPIDS OF THE GLABROUS COTTON (GOSSYPIUM HIRSUTUM L.) STRAIN, BAYOU SM1. B.W. Hanny and R.C. Gueldner (Cotton Physiol. Lab., Agric. Res. Service, U.S. Dept. of Agric., Southern Region, Stoneville, Miss. 38776) *J. Agric. Food Chem.* **24**, 401–3 (1976). The surface lipids of the glabrous cotton (*Gossypium hirsutum* L.) strain, Bayou SM1, were analyzed with an integrated gas chromatography-mass spectrometry system. *n*-Alkanes, C_{27}–C_{33}, account for 49.9% of the total wax, with *n*-nonacosane ($C_{29}H_{60}$) as the major wax constituent (28.7%). *n*-Primary alcohols C_{26}, C_{27}, and C_{28} account for 5.5% of the wax, with *n*-octacosanol ($C_{28}H_{58}O$) predominating (4.4%). Nineteen sterols and triterpenoids were detected and identities for nine are proposed: cholesterol (0.7%), 24ξ-methyl-$\Delta^{5,22}$-cholestadien-3β-ol (0.4%), stigmasterol (2.7%), fucosterol (4.5%), 24-methylenelophenol (3.4%), 4,4,14α-trimethyl-$\Delta^{7,9(11),24}$-cholestatrien-3β-ol (0.8%), 24-ethylidenelophenol (3.6%), 24-methylenecycloartanol (0.8%), and 24-methylcycloartanol (1.0%). The sterol and triterpenoid fraction accounts for 44.6% of the total wax, with an unidentified $C_{29}H_{48}O$ (M^+ 412) as the major constituent (6.5%).

STUDIES ON LIPIDS OF NATTO. K. Kiuchi, T. Ohta, H. Itoh, T. Takabayahsi, and H. Ebine (Div. of Applied Microbiol., Natl. Food Res. Inst., Ministry of Agr. and Forestry, Koto-ku, Tokyo, Japan) *J. Agric. Food Chem.* **24**, 404–7 (1976). The lipid contents and compositions of three kinds of natto, Itohiki-, Yukiwari-, and Hamanatto, were investigated. The lipid contents of the finished products of Itohiki-, Yukiwari-, and Hama-natto were 2.8, 10.9, and 6.4%, respectively. The lipid composition was determined by high-speed liquid chromatographic analysis. The pattern of the lipids of Itohiki-natto was found to be similar to that of soybean. Yukiwari-natto contained 5 to 18% free fatty acids and Hama-natto contained 78% free fatty acids in total lipids. Gas chromatographic patterns of fatty acid composition of Itohiki- and Hama-natto were similar to those of raw soybean, and that of Yukiwarinatto was observed to contain lauric and myristic acids in addition.

DIESTERS OF ALKANE DIOLS AND 2-HYDROXY FATTY ACIDS: IDENTIFICATION AND DISCRIMINATION OF ISOMERS WITH THE AID OF NMR SPECTROSCOPY. M.K. Logani, D.B. Nhari and R.E. Davies (Skin and Cancer Hosp. of Philadelphia, Temple Univ. Hlth. Sci. Ctr., Philadelphia, Pa. 19140) *Chem. Phys. Lipids* **16**, 80–8 (1976). High resolution nuclear magnetic resonance spectroscopy has been shown to be extremely useful for the identification and discrimination of naturally occurring diesters of 1,2- and 2,3-alkanediols as well as for fatty alkyl esters of acylated 2-hydroxy fatty acids. *Erythro-* and *threo*-2,3-alkanediol diesters have also been distinguished from each other; two α-methylenes in erythro isomers appear as partially overlapping triplets while these protons in *threo* isomer display an apparent quartet centered at 2.22 ppm. Fatty alkyl esters of acylated 2-hydroxy fatty acids display a triplet at 4.79 for 2-position methylene proton, a distinguishing feature not shown by diacyl alkanediols. A distinction between diester lipids and other classes of neutral lipids has also been achieved by the study of nuclear magnetic resonance spectra, particularly in the region of 3–6 ppm.

RANDOMIZATION OF MEMBRANE LIPIDS IN RELATION TO TRANSPORT SYSTEM ASSEMBLY IN ESCHERICHIA COLI. L. Thilo and P. Overath (Max-Planck-Inst. fur Biologie, D 74 Tübingen, Federal Republic of Germany) *Biochemistry* **15**, 328–34 (1976). The distribution of newly synthesized lipid molecules in the pre-existing lipid phase of the membrane was studied in whole cells of the fatty acid requiring *Escherichia coli* strain K1062. The fluorescence probe *N*-phenyl-1-naphthylamine revealed reversible lipid phase transitions in cells supplemented with *cis*-Δ^9-octadecenoate (transition temperature T_t = 14°C; width of the transition ΔT = 13°C) or *trans*-Δ^9-hexadecenoate (T_t = 27°C; ΔT = 7°C). Cells were first grown in the presence of *cis*-Δ^9-octadecenoate at 37°C and subsequently for various periods in the presence of *trans*-Δ^9-hexadecenoate at 37 or 22°C, i.e. above or below the transition of the newly formed lipids. Reproducible phase transition with single, well-defined T_t value between 14 and 27°C were observed under both conditions. Since conserved domains of newly synthesized lipids surrounding simultaneously formed transport proteins could not be demonstrated, the results do not support a membrane assembly mechanism proposed by N. Tsukagoshi and C. F. Fox.

A CALORIMETRIC AND FLUORESCENT PROBE STUDY OF THE GEL-LIQUID CRYSTALLINE PHASE TRANSITION IN SMALL, SINGLE-LAMELLAR DIPALMITOYLPHOSPHATIDYLCHOLINE VESICLES. J. Suurkuusk, B.R. Lentz, Y. Barenholz, R.L. Biltonen and T.E. Thompson (Dept. of Biochem., Univ. of Virginia Schl. of Med., Charlottesville, Va. 22901) *Biochemistry* **15**, 1393–401 (1976). The results of a calorimetric and fluorescent probe study of the thermotropic behavior of various types of dispersions of dipalmitoylphosphatidylcholine bilayer vesicles are reported. Bangham-type, multilamellar vesicles exhibit two distinct phase transitions at 34.6 and 41.2°C. On the other hand, single-lamellar spherical vesicles appear to exhibit a single transition at 37°C. The single-lamellar vesicles are thermodynamically unstable below 27°C and slowly transform into a multilamellar structure with a single phase transition of 41.2°C. These transformed structures resemble, but are not identical with, Bangham-type vesicles. An experimentally testable thermodynamic and kinetic model based upon these results is developed.

IONIC INFLUENCES ON THE PHASE TRANSITION OF DIPALMITOYLPHOSPHATIDYLSERINE. R.C. MacDonald, S.A. Simon, and E. Baer (Dept. of Biol. Sci., Northwestern Univ., Evanston, Ill. 60201) *Biochemistry* **15**, 885–91 (1976). The ionization and phase behavior of 1,2-dipalmitoyl-*sn*-glycero-3-phosphoserine have been investigated under a variety of conditions by several different methods. As measured by turbidity changes, the temperature of the crystal-liquid phase transition of this lipid is influenced by pH and mono- and divalent cation concentrations. The pH-transition temperature curve is congruent with the curve relating temperature to the degree of ionization of the carboxyl group of the crystalline form. The transition temperature falls from an upper plateau of 72°C at low pH values, where the carboxyl group is fully protonated, to a lower plateau of 55°C at high pH values, where this group is fully ionized. The apparent p*K* (pH at 50% ionization) of the crystalline form shifts from 6.0 to 4.6 to 3.7 with an increase of NaCl concentration from 10^{-3} to 0.1 to 1.0 M, respectively. These observations are in accord with a simple theoretical analysis that utilizes diffuse double layer theory and the influence of surface potential on surface concentration of protons. As a result of diminished proton competition, the interaction of divalent cations is stronger the higher the pH. Sodium and potassium ions reduce interaction with divalent cations by depressing the surface potential and reducing the surface concentration of the divalent ion.

SESQUITERPENE LACTONES OF EUPATORIUM HYSSOPIFOLIUM. A GERMACRANOLIDE WITH AN UNUSUAL LIPID ESTER SIDE CHAIN. W. Herz and R.P. Sharma (Dept. of Chem., The Florida State Univ., Tallahasse, Fla. 32306) *J. Org. Chem.* **41**, 1015–20 (1976). The isolation and structure determination of three new closely related germacranolides, eupassopin, eupassopilin, and eupassofilin, from *Eupatorium hyssopifolium* L. are re-

ported. Eupassofilin is highly unusual in being the first ester of D(−)-3-hydroxyoctadecanoic acid isolated from a higher plant. Generalizations for the ease of hydrolysis of five-carbon unsaturated ester side chains in germacranolides are presented.

SYNTHESIS OF 2-N-(HEXADECANOYL)-AMINO-4-NITROPHENYL PHOSPHORYLCHOLINE-HYDROXIDE, A CHROMOGENIC SUBSTRATE FOR ASSAYING SPHINGOMYELINASE ACTIVITY. A.E. Gal and F.J. Fash (Developmental and Metabolic Neurol. Branch., Natl. Inst. of Neurol. and Communicative Disorders and Stroke, Natl. Inst. of Hlth., Bethesda, Md. 20014) *Chem. Phys. Lipids* 16, 71–9 (1976). 2-N-(Hexadecanoyl)-amino-4-nitrophenyl phosphoryl-choline-hydroxide a compound resembling sphingomyelin is synthesized. It is cleaved by sphingomyelinase to the chromogenic N-acylaminonitrophenyl moiety. Phospholipase C preparations do not hydrolyze this compound. The starting material is 2-amino-4-nitrophenol which when acylated with palmitoyl chloride yields the hexadecananilide. Reaction with β-bromoethylphosphoryldichloride gives the phosphate which is quaternized with trimethylamine to give the title compound.

THE FLAGELLAR MEMBRANE OF OCHROMONAS DANICA. LIPID COMPOSITION. L.L. Chen, M. Pousada, and T.H. Haines (Dept. of Chem., City Col. of The City Univ. of New York, New York, N.Y. 10031) *J. Biol. Chem.* 251, 1835–42 (1976). The lipids of the whole flagella and the flagellar membrane of the phytoflagellate *Ochromonas danica* were isolated and compared with those of the whole cell. The polar lipids were separated by two-dimensional thin layer chromatography. One-dimensional thin layer chromatography was used for the separation of the nonpolar lipids. In all respects the lipids of the whole flagella were identical with those of the flagellar membrane. These methods established the presence in flagellar membrane of the polychlorosulfolipids of *O. danica* as more than 90 molar per cent of the total polar lipids. Analysis of the nonpolar lipids of the flagellar membrane showed that free fatty acids constitute about 12 molar per cent of the total lipids. These free fatty acids could be true components of the membrane or artifacts of the extraction procedure although every precaution was taken to prevent artifactual production of free fatty acids. The sterols constitute nearly 10 molar per cent of total lipids. Sterol esters were absent from the membrane. There are two additional major unknown nonpolar lipids present. The implications of such a high proportion of chlorosulfolipids as a polar lipid component in the membrane are important because of the unique structures of these lipids, which have ionic groups at or near both ends of the aliphatic chain.

THE TILTING OF THE HYDROCARBON CHAINS IN A SINGLE BILAYER OF PHOSPHOLIPID. S.W. Hui (Electron Optics Lab., Biophys. Dept., Roswell Park Memorial Inst., Buffalo, N.Y. 14263) *Chem. Phys. Lipids* 16, 9–18 (1976). The tilt angle of the hydrocarbon chains to the planes of a dipalmitoyl lecithin single bilayer and multilayers were estimated by the asymmetry of the electron diffraction patterns of respective hydrated specimens. The chains in a single bilayer were found to be perpendicular to the bilayer plane, whereas the chains in the multilayers were found to be tilted with respect to the normal of the plane. Thermal analysis data also supported this conclusion.

SYNTHESIS OF DL-2,3-DIACYLOXYPROPYLPHOSPHONYLCHOLINES FROM DL-2,3-DIACYLOXYIODOPROPANES. P.W. Deroo, A.F. Rosenthal, Y.A. Isaacson, L.A. Vargas and R. Bittman (Dept. of Labs., The Long Island Jewish-Hillside Med. Ctr., New Hyde Park, N.Y. 11040) *Chem. Phys. Lipids* 16, 60–70 (1976). The chemical synthesis of racemic diacyloxypropylphosphonylcholines having octanoyl, myristoyl, oleoyl and stearoyl groups is described. The route involved reaction of dioactanoyloxy-, dimyristoyloxy-, dioleoyloxy-, and distearoyloxypropyliodide with tris(trimethylsilyl) phosphite to yield the corresponding bis(trimethylsilyl) phosphonate. Removal of the trimethylsilyl groups by neutral aqueous hydrolysis gave the free diacylpropylphosphonic acids, which, when treated with choline toluenesulfonate, yielded the desired dioctanoyloxy-, dimyristoyloxy-, dioleoyloxy-, and distearoyloxypropylphosphonylcholines. The paper also describes the synthesis of 2-octadecyleicosylphosphorylcholine.

KINETICS OF PHASE EQUILIBRIUM IN A BINARY MIXTURE OF PHOSPHOLIPIDS. Philippe Brûlet and H.M. McConnell (Dept. of Chem., Stanford Univ., Stanford, Calif. 94305) *J. Amer. Chem. Soc.* 98, 1314–8 (1976). A 50:50 mol % binary mixture of dipalmitoylphosphatidylcholine (DPPC) and dielaidoylphosphatidylcholine (DEPC) has been studied using ^{13}C nuclear magnetic resonance at 25.2 and 90.5 MHz. Each phospholipid was enriched in the choline methyl groups with ^{13}C. The line width of the ^{13}C resonance of the higher melting lipid (DPPC) in this binary mixture increases rapidly at temperatures below ~32°C, the same temperature as determined earlier by spin label paramagnetic resonance and by freeze-fracture electron microscopy to mark the onset of a lateral phase separation in the plane of the membrane. The temperature dependence of the observed ^{13}C line widths differs quantitatively but not qualitatively from the oretically calculated line widths based on the previously reported phase diagram for this mixture of lipids. The discrepancy may be due to density and composition fluctuations (nucleation) in the fluid phase of the lipids. Such fluctuations are suspected to be of importance for the transport of certain molecules through cell membranes.

ENDOTOXIC ACTIVITY OF COMPLEXES OF MYRISTIC ACID AND PROTEINS. S.G. Bradley (Dept. of Microbiol., Virginia Commonwealth Univ., Richmond, Va. 23298) *Proc. Soc. Exper. Biol. Med.* 151, 267–70 (1976). Complexes of myristic acid and bovine serum albumin, myristic acid and concanavalin A, β-hydroxymyristic acid and concanavalin A, or dimethyl myristamide and concanavalin A are lethal for male BALB/c mice treated with mithramycin. Prior treatment of mice with myristic acid-protein complexes renders the animals resistant to a dose of bacterial endotoxin that is lethal for untreated animals. Prior treatment of mice with bacterial endotoxin renders them resistant to a combination of mithramycin and a complex of myristic acid and bovine serum albumin or dimethyl myristamide and concanvalin A that is lethal for untreated animals. These data indicate that a fatty acid is an important functional component of the endotoxin toxophore.

MEASUREMENT AND INTERPRETATION OF FLUORESCENCE POLARISATIONS IN PHOSPHOLIPID DISPERSIONS. C.L. Bashford, C.G. Morgan and G.K. Radda (Dept. of Biochem., Univ. of Oxford, South Parks Road, Oxford OX1 3QU, U.K.) *Biochim. Biophys. Acta* 426, 157–72 (1976). An instrument that measures the temperature dependence of fluorescence polarisation and intensity directly and continuously is described. The behaviour of four fluorescent probes bound to a number of well characterized model systems was then examined. The motional properties of the probes were determined from the polarisation and intensity data and were found to be sensitive to the crystalline-liquid crystalline phase transitions in phospholipid vesicles of dimyristoyl and dipalmitoyl phosphatidylcholine. Binary mixture of dilauroyl and dipalmitoyl phosphatidylcholine show lateral phase separation and in this system the probes partition preferentially into the more 'fluid' phase. In systems that have been reported to contain 'short range order' or 'liquid clustering', such as dioleoyl phosphatidylcholine and liquid paraffin, the motion of the probes was found to have anomalous Arrhenius behaviour consistent with the idea that homogenous phases were not being sampled. The significance of these findings for the interpretation of the behaviour of fluorescent probes bound to natural membranes is discussed.

SINGLE CHANNEL CONDUCTANCE AT LIPID BILAYER MEMBRANES IN PRESENCE OF MONAZOMYCIN. E. Bamberg and K. Janko (Fachbereich Biol., Univ. Konstanz, G.F.R.) *Biochim. Biophys. Acta* 426, 447–50 (1976). The single channel conductance in the presence of the antibiotic monazomycin at lipid bilayer membranes was measured. It was found to be 3 times smaller than the single channel conductance of gramicidin A under the same conditions. The conductance of the monoazomycin pore is voltage independent.

^{31}P NUCLEAR MAGNETIC RESONANCE CHEMICAL SHIELDING TENSORS OF PHOSPHORYLETHANOLAMINE, LECITHIN, AND RELATED COMPOUNDS: APPLICATIONS TO HEAD-GROUP MOTION IN MODEL MEMBRANES. S.J. Kohler and M.P. Klein (Lab. of Chem. Biodynamics, Lawrence Berkeley Lab., Univ. of California, Berkeley, Calif. 94720) *Biochemistry* 15, 967–73 (1976). ^{31}P nuclear magnetic resonance (NMR) powder spectra have been used to obtain the principal values of the chemical shielding tensors of dipalmitoyllecithin (DPL), dipalmitoylphosphatidylethanolamine, and several related organophosphate mono- and diesters. In addition, the principal values and orientation of the phosphorylethanolamine shielding tensor were determined from ^{31}P NMR spectra of a single crystal. In all compounds studied the shielding tensors were clearly nonaxial.

COMPUTER SIMULATION OF MODEL LIPID MEMBRANE DYNAMICS. R.M.J. Cotterill (Dept. of Structural Properties of Materials,

The Technical Univ. of Denmark, Bldg. 307, DK-2800 Lyngby, Denmark) *Biochim. Biophys. Acta* **433**, 264–70 (1976). The motions of individual lipid molecules in a model membrane have been studied by computer simulation using the molecular dynamics technique. The intermolecular forces were of both the Lennard-Jones and the Coulomb type. The influence of temperature and electrical screening on the order-disorder transition was examined, and it was also found that this transition is initiated by the spontaneous generation of disclinations.

EFFECT OF THE GEL TO LIQUID CRYSTALLINE PHASE TRANSITION ON THE OSMOTIC BEHAVIOUR OF PHOSPHATIDYLCHOLINE LIPOSOMES. M.C. Blok, L.L.M. van Deenen and J. De Gier (Lab. of Biochem., Univ. of Utrecht, Transitorium 3, Padualaan 8, Utrecht, the Netherlands) *Biochim. Biophys. Acta* **433**, 1–12 (1976). Aspects of osmotic properties of liposomes, prepared from synthetic lecithin, above, at and below the gel to liquid crystalline phase transition temperature are described. The experiments show that liposomal membranes with their lipids in the gel state are still permeable to water. The rate of water permeation changes drastically on passing the transition temperature. The water permeation has activation energies of 9.5 ± 1.28 and 26.4 ± 0.9 kcal/mol above and below the transition temperature, respectively, indicating that the diffusion processes take place by different mechanisms.

EFFECTS OF PH DURING RECOMBINATION OF HUMAN ERYTHROCYTE MEMBRANE APOPROTEIN AND LIPID. E. Wehrli, S. Moser and P. Zahler (Theodor Kocher Inst. and Dept. of Anat., Univ. of Bern, Central Labs. of the Swiss Blood Transfusion Service SRK, Freiestrasse 1, Bern, Switzerland) *Biochim. Biophys. Acta* **426**, 271–87 (1976). The recombinates from human red cell membrane proteins and lipids resulting from dialysis of the components in 2-chloroethanol against aqueous buffers from pH 2-12 have been studied by density gradient centrifugation, polyacrylamide gel electrophoresis and freeze-fracture electron microscopy. Between pH 4 and 10 most of the proteins were found in the recombinates whereas below pH 4 and above pH 10 only part of them were recovered in the lipoprotein band after density gradient centrifugation. At low pH, increasing incorporation of the "major glycoprotein" into the recombinates was detected by gel electrophoresis and in parallel increasing amounts of particles were found in the freeze-fractured membrane faces. The necessity of working at low pH values from pH 2–4, however, and a critical evaluation of all the data presently available leads to the conclusion that the 2-chloroethanol technique is not adequate for recombination studies tending to membrane reconstitution.

FACTORS AFFECTING THE MOTION OF THE POLAR HEADGROUP IN PHOSPHOLIPID BILAYERS. A ^{31}P NMR STUDY OF UNSONICATED PHOSPHATIDYLCHOLINE LIPOSOMES. P.R. Cullis, B. De Kruyff and R.E. Richards (Dept. of Biochem., Univ. of Oxford, South Parks Road, Oxford, U.K.) *Biochim. Biophys. Acta* **426**, 433–46 (1976). The 129 MHz and 36.4 MHz ^{31}P NMR spectra of unsonicated liposomes consisting of phosphatidylcholines of varying chain length and unsaturation have been investigated. In the liquid crystalline state the ^{31}P NMR liposome spectra are similar for both saturated and unsaturated phosphatidylcholines, demonstrating that the motion of the polar headgroup is not sensitive to the fatty acid composition in the disordered liquid crystalline state. Below the hydrocarbon phase transition temperature there is a marked increase in the linewidth of the ^{31}P NMR liposome spectra, indicating a reduction in the motion of the polar headgroup. The addition of equimolar concentrations of cholesterol to phosphatidylcholine eliminates phase transition effects experienced by the polar headgroup. The motion of the polar headgroup is then very similar to that obtained in the liquid crystalline state for pure phosphatidylcholine bilayers. In the liquid crystalline state the motion of the polar headgroup in the phosphate region is insensitive to changes in the available area per phosphatidylcholine molecule.

FUSION OF LIPOSOMES CONTAINING CONDUCTANCE PROBES WITH BLACK LIPID FILMS. M.R. Moore (Physio. Lab., Downing Street, Cambridge CB2 3EG, U.K.) *Biochim. Biophys. Acta* **426**, 765–71 (1976). The fusion of liposomes with black lipid films was studied using gramicidin A and amphotericin B as conductance probes. Nonpolar alkyl solvents, which have been shown not to injure several membrane functions, facilitated fusion.

INFLUENCE OF BASIC POLYPEPTIDES ON THE PHASE TRANSITION OF PHOSPHOLIPID LIPOSOMES. D. Bach and I.R. Miller (Dept. of Membranes and Bioregulation, The Weizmann Inst. of Sci., Rehovot, Israel) *Biochim. Biophys. Acta* **433**, 13–9 (1976). Interaction of basic polypeptides (copolymers of lysine with phenylalanine or tyrosine) with phosphatidylserine or dipalmitoyl phosphatidylcholine liposomes was investigated by differential scanning calorimetry. The polypeptides cause a decrease in enthalpy of melting of the phospholipids almost without affecting the midpoint melting temperature.

STUDY OF THE TRANSVERSE DIFFUSION OF SPIN LABELED PHOSPHOLIPIDS IN BIOLOGICAL MEMBRANES. I. HUMAN RED BLOOD CELLS. Annie Rousselet, Claudine Guthmann, Jean Matricon, A. Bienvenue and P.F. Devaux (Biophys. Moleculaire, GPS-ENS, Tour 23, Univ. Paris VII-2, place Jussieu, 75221 Paris Cedex 05, France) *Biochim. Biophys. Acta* **426**, 357–71 (1976). Spin labeled analogs of phosphatidylcholine were used to study the transverse diffusion (flip-flop) of phospholipids in the erythrocyte membrane. The nitroxide spin label was placed either on the β acyl chain or on the choline group. These labeled phosphatidylcholine molecules were incorporated into the membrane by incubation of the red cells at 22° C with sonicated spin labeled phosphatidylcholine vesicles from which all traces of free fatty acids and lyso derivatives were carefully removed by bovine serum albumin treatment. This incorporation did not provide any change in the morphology of the cell as indicated by scanning electron microscopy. The anisotropic distribution of spin-labeled phosphatidylcholine in the erythrocyte membrane was found to be stable at 22 and 37° C for more than 4 h. It is therefore concluded that the rate of outside-inside and inside-outside transition is so slow that the anisotropic distribution of the phospholipids in the erythrocyte membrane can be maintained during cell life.

STUDY OF WATER PERMEABILITY THROUGH PHOSPHOLIPID VESICLE MEMBRANES BY ^{17}O NMR. N. Haran and M. Shporer (Dept. of Isotope Res., The Weizmann Inst. of Sci., Rehovot, Israel) *Biochim. Biophys. Acta* **426**, 638–46 (1976). Vesicle suspensions of up to 5% egg lecithin and 2.5% cholesterol have been found to have no effect on the NMR relaxation times of ^{17}O from water. Addition of 1–5 mM Mn^{2+} to an equimolar vesicle suspension of egg lecithin and cholesterol permitted resolution of the free induction decay into two exponential components, a fast one arising from the external water and a slow one arising from the intravesicular fluid. From the rates of relaxation the mean life time of the water molecules within the vesicles was calculated to be 1 ± 0.1 ms at 22° C. The size of the vesicle was estimated from electron micrographs to be about 500 Å in diameter. These data yield an equilibrium water permeability, P_w, of about 8 μs^{-1} for the vesicle membranes. From the temperature dependence of P_w an activation energy of 12 ± 2 kcal/mol was obtained. The longitudinal relaxation time (T_1) of water within vesicles remained the same as in pure water.

• Edible Proteins

PROTEIN PRODUCT AND METHOD FOR FORMING. R.J. Flier (Ralston Purina Co.). *U.S. 3,940,495*. A method of treating a defatted oilseed meal, such as soybean meal, to form a porous, fibrous food product comprises the steps of moistening the protein-containing vegetable material to at least 20% water while maintaining the pH close to the neutral point of the vegetable material; mechanically working the moistened material under pressure at temperatures above 212 C; passing the worked material through a first restricted orifice while maintaining the temperature and pressure; and then extruding the material through a second restricted orifice into a low pressure area, thereby causing expansion of the product and the formation of a puffed and fibrous meat-like structure.

PROCESS FOR MANUFACTURE OF SOYBEAN PROTEIN PRODUCTS. E. Fridman and A. Dolev (Centre for Industrial Research, Haifa, Israel). *U.S. 3,944,676*. The process comprises the steps of (a) leaching soybean meal with an aqueous solution and separating the solid residue to obtain an extract; (b) adjusting the pH of the extract to 6.5–7.0 to give a soybean milk; (c) sterilizing the milk to destroy the antidigestive factors and reduce the beany flavor of the meal; (d) fermenting the sterilized soybean milk with a lactic culture under conditions suitable for utilizing natural sugar present in the milk as a source of carbohydrates to produce a soybean curd; (e) separating the curd; and (f) transforming the curd into soybean products.

METHOD OF MAKING SOY MILK. F.G. Drachenberg and P.E. Allred. *U.S. 3,941,890.* The method of making the milk comprises the steps of (a) cooking soybean material with microwaves for a sufficient length of time to destroy the trypsin inhibitor but without appreciably roasting the material; (b) slurrying the microwaved material in water at less than 70 C; (c) adding suitable enzymes to act upon the protein, carbohydrate, and cellulose and thus prevent their sedimentation in the finished milk; (d) treating the slurry to reduce the particles to colloidal size; (e) adding water and boiling the slurry to destroy the remaining enzymes; and (f) adding sufficient quantities of such materials as oil, sugar, flavoring material, and a suspending agent to impart the desired qualities of taste and mouth feel to the finished product.

PROCESS OF MAKING SOY-BASED MEAT SUBSTITUTE. G. Puski and A.H. Konwinski (Central Soya Co.) *U.S. 3,950,564.* An aqueous mixture of oilseed proteinaceous material, containing 30–60% water, is passed through a shaping die at the end of an extruder at a pressure of less than 100 psi and temperature of less than 212 F. The final zone has an area to length ratio of less than 10 in^2 per inch to provide a product having flat, longitudinally aligned, compacted protein fibers having the appearance of stacked platelets. Zero to 25% of the product volume is voids having the general contour of the platelets.

FORTIFICATION OF FOODSTUFFS WITH N-ACYL DERIVATIVES OF SULFUR-CONTAINING L-AMINO ACID ESTERS. R.A. Damico and R.W. Boggs (Procter & Gamble). *U.S. 3,952,115.* A proteinaceous foodstuff comprises a sulfur amino acid deficient protein and a nutritionally supplemental amount of a sulfur-containing amino acid derivative selected from the group consisting of N-acyl L-methionine ester, N,N'-diacyl L-cystine ester, and N-acyl L-cysteine ester. The acyl group is derived from fatty acids having 1–9 carbon atoms, and the ester group is derived from fatty alcohols having 1–22 carbon atoms.

PREPARATION OF WET SPUN PROTEINACEOUS FILAMENTS. M.M. Sternberg and C.Y. Kim (Miles Laboratories, Inc.). *U.S. 3,956,514.* The process comprises (a) forming an aqueous first slurry of a pulverized, functional, low purity, defatted leguminous material having a protein content on a dry weight basis of 45–55%; (b) adjusting the pH of the slurry to the isoelectric point of the protein to precipitate it on and into the insoluble portion of the leguminous material; (c) separating the solids from the liquid portion of the slurry; (d) forming an aqueous second slurry of the separated solids; (e) adjusting the pH of this slurry to 12.0–13.2 to produce a spinning dope; and (f) forcing the dope through a spinneret and into a coagulating bath to form the filaments.

PREPARATION OF A FIBROUS PROTEIN PRODUCT. M.J. Coplan, R.B. Davis and D.K. Schiffer (Miles Laboratories, Inc.). *U.S. 3,953,612.* A process for producing a semi-unitary protein product consisting of a bundle of intermittently fused protein fibers comprises forming a 25–60% aqueous mixture of oilseed protein material, heating the mixture to 100–180 C, and extruding it into an inert gaseous medium whereby intermittent fusing of the protein fibers occurs. The orifices in the spinneret at the outlet of the extruder are 0.001–0.01 inches in diameter and are separated from one another by distances no greater than the diameters of the holes.

• Drying Oils and Paints

THERMAL POLYMERISATION OF DRYING OILS. I-EFFECTS OF VARIOUS ADDITIVES ON THERMAL POLYMERISATION OF LINSEED OIL. M. Nagakura, A. Takada, Y. Kai and Y. Ogawa *J. Jap. Soc. Col. Mat.* 48, 217–22 (1975). The effects were studied of various additives, such as benzoyl peroxide, anthraquinone, benzoquinone, acetic acid/boron trifluoride complex, tin chloride, zinc stearate, lead naphthenate and sodium methoxide, on the thermal polymerisation of linseed oil under decreased pressure at 280 C. In all cases the same mathematical relationship between reaction time and viscosity held, provided that the viscosity of the oil obtained did not exceed 100 st. The use of tin and zinc chloride gave dark coloured products owing to thermal decomposition. The products obtained by the use of zinc or lead salts were turbid because of formation of heavy metal soaps. (World Surface Coatings Abs. No. 403)

LINSEED OIL FORMULATIONS AS CURING AND ANTI-SCALING COMPOUNDS FOR CONCRETE. C.H. Best et al. *Trans. Res. Record* 1974, No 504, 63–70. An extensive testing program to determine the effectiveness of linseed oil in mineral spirits as a curing and anti-scaling compound is discussed in the light of immediate and residual effectiveness, and the value of such linseed oil formulation treatments. (World Surface Coatings Abs. No. 401)

FUNDAMENTAL REACTIONS IN LIPID CHEMICAL ANALYSIS. I-SPECTROPHOTOMETRIC INVESTIGATIONS OF HIGH FATTY ACID METHYL ESTERS OBTAINED BY DIFFERENT METHODS. S. Ivanov, Z. Dimitrova and V. Stankova. *Nauc. tr. Himija* 12(3), 99–106 (1974). It was shown that during the esterification of fatty acids of different types of fat, position isomerisation of unsatd. fatty acids occurs which results in errors in determining fatty acid composition. UV and IR spectroscopy were used. (World Surface Coatings Abs. No. 404)

MODIFIED CASTOR OIL. M.I. Arkhipov and Yu.P. Kudyukov. *U.S.S.R. 445,688: Soviet Invent. Ill.* 1975, Vol W No 33, Gp G, 1. Castor oil (100 g.) is heated with maleic anhydride (13.6 g.) at 120° to 140° C. in an inert gas stream (for 3 hrs.). The product has an AV of 60–110, an ester value of 220–246 and a free maleic anhydride content of less than 4%. In presence of peroxide initiator and drier, the product dries at 100–150° C. (World Surface Coatings Abs. No. 405)

RESINS FROM EPOXY OILS FOR SURFACE COATING. S.B. Dabhade, P.K. Matai and G.C. Patil. *Paintindia* 25(8), 12–6 (1975). A series of resins were prepared from epoxidised neem oil, rubber seed oil, chaulmoogra oil, castor oil and linseed oil by reaction with dibasic acid, e.g. phthalic anhydride. The resins were mixed with boiled linseed oil in different proportions and their film properties determined. Epoxidised neem, rubber seed and chaulmoogra oils gave the best results, the optimum ratio being 20% resin to 80% boiled linseed oil. (World Surface Coatings Abs. N. 405) ■