abstracts

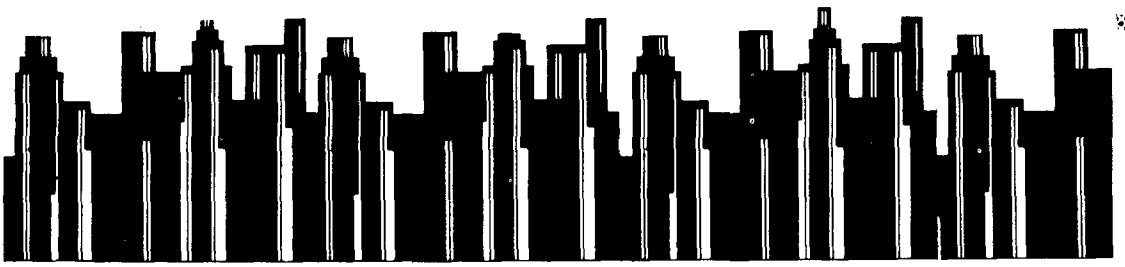
• Fats and Oils

THERMODYNAMIC EQUILIBBIA OF CHOLESTEROL-DETERGENT-WATER. D.B. Gilbert and J.A. Reynolds (Dept. of Biochem. and the Dept. of Med., Duke Univ. Med. Ctr., Durham, N.C. 27710) *Biochemistry* 15, 71–4 (1976). Cholesterol monomer is incorporated into alkyl sulfate micelles with a unitary free energy of −10.3 kcal/mol. This experimental free energy is in good agreement with that predicted by our previous determination of the hydrophobicity of the sterol suggesting that the partitioning is primarily hydrophobic with little or no contribution to the free energy from head group interactions in this system. The intrinsic hydrophobicity of cholesterol is shown to be insufficient for effective partitioning of the sterol between micelles (or bilayers) and its own self-associated form. This finding strongly supports a mode of phospholipid-cholesterol interaction involving significant free energy contributions from head group effects such as alterations in hydrogen bonds or hydration. Since these head group contributions are not observed in the cholesterol-alkyl sulfate system, one concludes that there is a high degree of specificity of interaction between the sterol OH and polar moieties of other amphiphilic molecules.

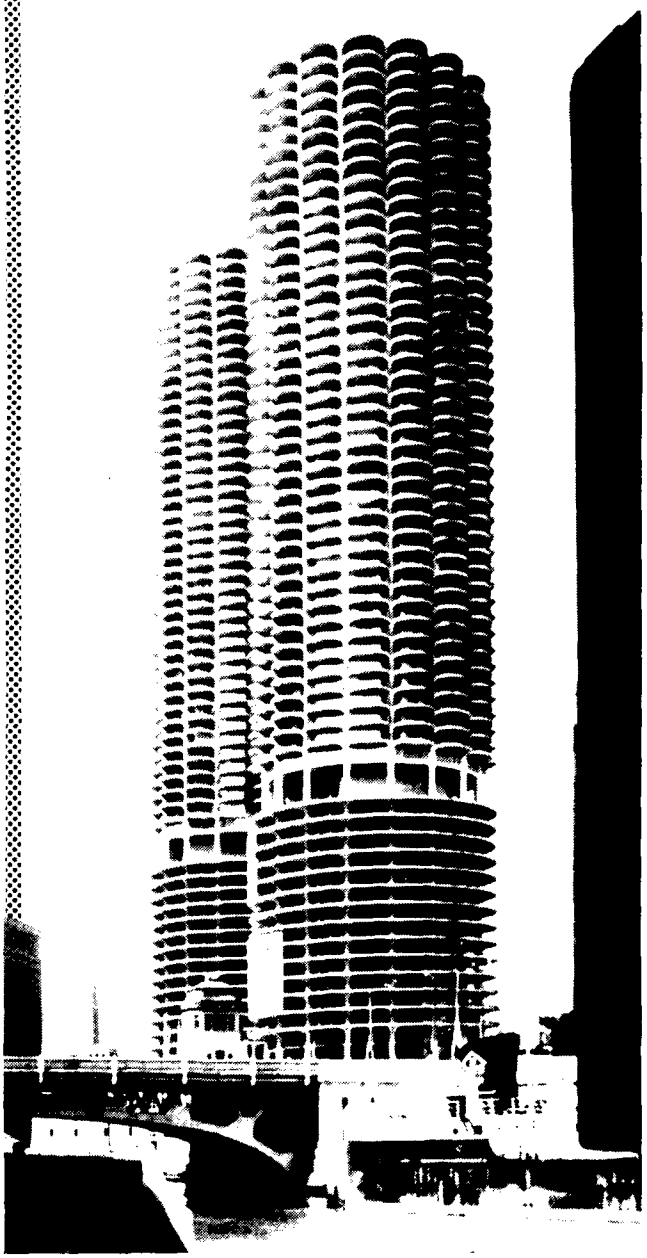
NUCLEAR MAGNETIC RESONANCE STUDIES OF THE AGGREGATION OF DIHEXANOYLLECITHIN AND OF DIHEPTANOYLLECITHIN IN AQUEOUS SOLUTIONS. R.D. Hershberg, G.H. Reed, A.J. Slotboom and G.H. DeHaas (Dept. of Biophys. and Phys. Biochem., Schl. of Med., Univ. of Pennsylvania, Philadelphia, Pa. 19174) *Biochim. Biophys. Acta* 424, 73–81 (1976). Aggregation of 1,2-dihexanoyl-*sn*-glycero-3-phosphocholine (dihexanoyllecithin) and 1,2-diheptanoyl-*sn*-glycero-3-phosphocholine (diheptanoyllecithin) in aqueous solutions has been investigated by ^1H nuclear magnetic resonance spectroscopy. The chemical shifts and line widths of the NMR signals of the lecithins are dependent on the total concentration of lecithin above the critical micelle concentration. Signals for both lecithins in the aggregated state exhibit line widths which are appreciably smaller than the dipolar line width calculated using the overall rotational correlation time of the micelle. Signals of the α-methylene protons of the carboxylic acid side chains of dihexanoyllecithin and diheptanoyllecithin undergo the greatest change in chemical shift on aggregation. A single average spectrum of the α-methylene protons is observed in lecithin solutions of concentrations ranging from one to four times the critical micelle concentration demonstrating that individual lecithin molecules are in rapid exchange, with respect to a frequency of 18 Hz, between the monomeric and the aggregated states.

WATER BINDING AND MOBILITY IN THE PHOSPHATIDYLCHOLINE/CHOLESTEROL/WATER LAMELLAR PHASE. P.T. Inglefield, K.A. Lindblom and A.M. Gottlieb (Jeppson Lab., Clark Univ., 950 Main Street, Worcester, Mass. 01610) *Biochim. Biophys. Acta* 419, 196–205 (1976). Measurements of hydration and water self diffusion in lamellar phases of the ternary system: phosphatidylcholine/cholesterol/water have been made using pulse NMR relaxation methods. Systems containing phosphatidylcholine and cholesterol in a 1:1 mol ratio with varying water contents are studied at 20.5 °C. The results indicate that 12 water molecules corresponds to complete hydration of the phosphatidylcholine/cholesterol unit, and in the region of this hydration a 5-fold decrease in water diffusion occurs. The nature of the bound water and its relationship to phase stability and overall water mobility in the system are discussed. It is concluded that at the stoichiometric composition the diffusion decreases due to the relative immobility of the bound water. The implications in terms of permeability regulation in the aqueous channels by water content and hydration are cited.

(Continued on page 283A)



AMERICAN OIL CHEMISTS' SOCIETY FALL MEETING AND EXHIBITION SEPTEMBER 26-29, 1976 CHICAGO, ILLINOIS



Chicago—the world's busiest air, rail, truck, and mail order center; the world's greatest inland seaport; home of the world's busiest airport (O'Hare), tallest building (Sears Tower), largest grain exchange (The Board of Trade), and leading market for farm commodities (Chicago Mercantile Exchange)—will host the 50th Annual Fall Meeting and Exhibition of the American Oil Chemists' Society, September 26-29, 1976.

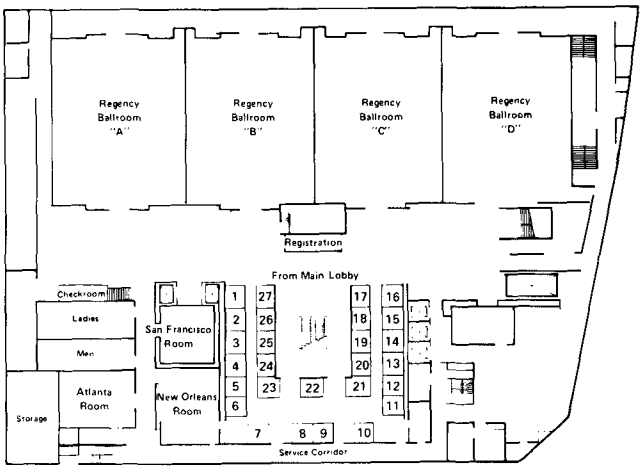
The Hyatt Regency Chicago, 35 stories high with 1,000 rooms, is the site of the semiannual meeting. Each guest room is beautifully decorated, spacious, and incorporates the advantages of AM/FM radios, alarm clocks, color television, individual temperature control, and separate sleeping and conversation areas—the latter including a sofa, a game table, and occasional chairs. As part of the Illinois Center Plaza, the Hyatt Regency Chicago is convenient to the Loop, the Near North Side, and popular points of interest. The location is one block east of Michigan Avenue at Stetson Avenue and Wacker Drive. All public transportation serves the hotel. Shops, offices, and businesses of all kinds are available to guests through the network of passages leading to the various buildings of this exciting complex.

Now is the time to plan on attending and/or exhibiting at the Fall Meeting. With the growing world population ever increasing, never before have the activities of AOCS members become so important.

Technical Program

Many technical programs will be held in the meeting rooms and ballrooms near the exhibition area. Excellent exposure for all exhibits is provided (see map below). Symposia and technical presentations are adjacent to the exhibits area which will give maximum display space for those firms attending. The registration desk is also conveniently located near exhibits to create additional floor traffic.

Exhibit Hours		Exhibit Rates
Sun., Sept. 26	2:00 p.m. – 5:00 p.m.	Booth Prices
Mon., Sept. 27	9:00 a.m. – 4:30 p.m.	One – $375.00
Tues., Sept. 28	9:00 a.m. – 4:30 p.m.	Two – $700.00
Wed., Sept. 29	9:00 a.m. – 11:00 a.m.	Three – $1,000.00



• **Abstracts** . . . . . .(Continued from page 281A)

24-METHYLENEDAMMARENOL: A NEW TRITERPENE ALCOHOL FROM SHEA BUTTER. T. Itoh, T. Tamura and T. Matsumoto (College of Sci. and Technology, Nihon Univ, 8, Kanda Surugadai, 1-chome, Chiyoda-ku, Tokyo, 101 Japan) *Lipids* 10, 808–13 (1975). A new triterpene alcohol was isolated from shea butter and its structure was shown to be 24-methylenedammarenol (24-methylene-5α-dammar-20[21]-en-3β-ol). Dammaradienol (5α-dammara-20[21], 24-dien-3β-ol) was isolated from shea butter.

APPARENT MODIFICATION OF FORCES BETWEEN LECITHIN BILAYERS. D.M. LeNeveu, R.P. Rand, D. Gingell and V.A. Parsegian (Brock Univ., St. Catharines, Ontario, Canada L2S 3A1) *Science* 191, 399–400 (1976). Small sugar solutes effect variation in the equilibrium separation of lecithin bilayers in aqueous solution. Since sugars have negligible influence on bilayer structure, they probably act by modifying interbilayer forces. The observed widening and narrowing of the bilayer separation is correlated with the predicted weakening and strengthening of the attractive van der Waals forces between lipid bilayers that occurs with increasing sugar concentrations.

PHOSPHOLIPID EXCHANGE BETWEEN BILAYER MEMBRANE VESICLES. F.J. Martin and R.C. MacDonald (Dept. of Biol. Sci., Northwestern Univ., Evanston, Ill. 60201) *Biochemistry* 15, 321–7 (1976). The turbidity of lipid vesicles, freshly prepared by sonicating purified dimyristoyllecithin (DML) in dilute KCl solutions, was measured as a function of time at various temperatures. A sharp maximum in the rate of increase of turbidity is found just above the crystal:liquid-crystal phase transition temperature (T_m). The initial rate of turbidity increase is first order with respect to DML concentration. Electron and light microscopy reveal large vesicles which are not present before incubation or after incubation at temperatures far from the T_m. When temperature, rather than time, is the independent variable, a sharp drop in turbidity is seen at the T_m. The magnitude of this drop and the temperature at which it occurs were used to measure the rate of lipid transfer between vesicles composed of different lipids.

HYDRATED POLYGLYCEROL ESTER COMPOSITION. J.L. Gabby, D.D. Corbin, and J.B. Lowe (Drackett Co.). *U.S. 3,936,391.* An improved polyglycerol ester emulsifier is prepared by heating a mixture consisting of 3 parts of polyglycerol ester, 3–5 parts of glycerol, and 1–3 parts of water at a temperature of 125–135 F until a homogenerous, paste-like consistency is achieved. The polyglycerol ester contains 3–10 glycerol units and 1–2 saturated fatty acyl ester groups each having 16–20 carbon atoms.

FREEZE-THAW STABLE LIQUID COFFEE WHITENER. C. Gilmore and D.E. Miller (SCM Corp.). *U.S. 3,935,325.* A pareve fluid coffee whitener characterized by enhanced freeze-thaw stability and improved whiteness consists of 5–18% of vegetable fat, 1–3% of vegetable protein, 5–15% of sweetener, emulsifiers, and water to make up 100%. The emulsifiers consist of (a) 0.3–0.6% of the whitener of monoglycerides; (b) 0.1–0.3% of an ethoxylated partial fatty acid ester of a hexitol selected from mannitol and sorbitol; (c) 0.05–0.2% of a partial fatty acid ester of a hexitol selected from mannitol and sorbitol; and (d) 0.05–0.6% of stearoyl-2-lactylic acid.

CREAM BASE FOR CONFECTIONARY USE. U. Persmark and J.-E. Stenback (AB Karlshamns Oljefabriker). *U.S. 3,935,324.* A ready to whip cream base for confectionary use requiring no auxiliary emulsifiers or foaming agents comprises 45–60% of a fat phase and a water phase. The fat phase comprises lecithin and a fat base consisting of 15–25% coconut oil, 30–50% hydrogenated oil of the stable β′-crystallizing type, and 35–45% liquid vegetable oil. Lecithin constitutes 0.5–1.5% of the fat base. The water phase consists of 10–35% water, 15–35% sugar, and 0.03–0.05% preservatives.

WATER IN OIL EMULSION. K. Terada, S. Fujita, S. Oinuma, and H. Kohno (Asahi Denka Kogyo Kabushiki). *U.S. 3,939,290.* A stable, edible water-in-oil emulsion which can be reversed mechanical working to an oil-in-water emulsion comprises 50–95% of a continuous oil phase, 5–50% of a dispersed aqueous phase, 0.25–2.5% of a polyhydric alcohol fatty acid ester, and 0.5–5% of a sucrose fatty acid ester having an HLB value of at least 10.

FOOD PRODUCT. N.J. Carlile and T.J. van Selm (Lever Bros. Co.). *U.S. 3,939,282.* A plastic emulsion food spread comprises an aqueous phase and a fat phase in the form of an emulsion. The fat phase is partly crystallized and comprises 5–40% of a triglyceride composition, the fatty acid residues of which are in random distribution and consist of the acid residues of palm oil and a major proportion of an additional fat selected from the group consisting of corn, cottonseed, groundnut, safflower, sunflower, sesame, and soybean oils.

EPOXY ACIDS AND EPOXY OILS. M. Hassan El-Mallah and S. El-Shami (Natl. Res. Center, Dokki, Cairo). *Seifen, Ole, fette, Wachse* 101(20), 573–4 (1975). In-situ epoxidation of butyl oleate when using different catalysts in the form of cation exchangers as a function of time are examined. It was found that the reaction process not only depends on the type of catalyst but also on its concentration. Amberlite-IR-120 has proved superior to two other catalysts. The maximum yields amounted to 98.8, 83.1 and 76.4% when Amberlite-IR-120. Lewatit S 100 and Merck I were used for reaction periods of 5, 10, and 3 hours. It is assumed that the physical and chemical stabilities are responsible for the characteristics of the catalytic effect.

INVESTIGATIONS INTO THE DEGREE OF OXIDATION, HYDROLYSIS AND POLYMERIZATION OF SUNFLOWER OIL, LARD AND BUTTER WHEN EXPOSED TO GAMMA RAYS. St. A. Ivanov and St. D. Stamatov (Plovdiver U. "P. hilendarski" teaching chair for Chem. Technol., Plovdiv, Bulgaria). *Seifen, Ole, Fette, Wachse* 101(20), 589–92 (1975). Using a new complex method, the influence of small, medium and large doses of gamma rays (Co^{60}) on the degree of oxidation, hydrolysis and polymerization (degree of decay) of sunflower oil, lard and butter is examined. The specific features of the decay caused by rays, the effect of the rays and the after-effect of after 16 and 32 weeks in dependence on the dose used and the kind of fats examined are described. There was found to be a comparatively good correlative connection between the degree of the individual types of decay and the changes in the organoleptic complex, which is most pronounced right after exposure to rays.

HYDROSILYLATION OF METHYL ELEOSTEARATE. S.F. Thames, B.G. Bufkin, S.J. Jen, J.M. Evans and J.S. Long (Dept. Polymer Sci., U. Southern Mississippi). *J. Coatings Technol.* 48(612), 46–50 (1976). Hydrosilylation on both methyl alpha and beta eleostearate yields either mono or dihydrosilylated products depending upon the stoichiometry of the reactants. Monohydrosilylation proceeds by 1,2 addition to the conjugated triene system of the alpha isomer and apparently occurs on the 13,14 double bond with the silicon atom attached to carbon 13. Technics employed in the elucidation of the mode of orientation which included infrared and ultraviolet spectroscopy, elemental analysis, and chemical modification of the hydrosilylated substrates do not allow differentiation between 1,2 addition to the 9,10 double bond, 1,2 addition to the 13,14 double bond and 1,6 addition to the conjugated triene in the beta isomer. However, the double bonds remaining are apparently conjugated with the silicon atom located in an allylic position. Such reactions open new routes to novel fatty acid derivatives.

• Biochemistry & Nutrition

STRUCTURAL AND DYNAMICAL STUDIES OF MIXED CHLOROPHYLL/PHOSPHATIDYLCHOLINE BILAYERS VIA X-RAY DIFFRACTION, ABSORPTION POLARIZATION SPECTROSCOPY AND NUCLEAR MAGNETIC RESONANCE. F. Podo, J.E. Cain and J.K. Blasie (Dept. of Biophys. and Phys. Biochem., Johnson Res. Found., Univ. of Penn., Philadelphia, Pa.) *Biochim. Biophys. Acta* 419, 19–41 (1976). The structure and dynamics of phosphatidylcholine bilayers containing chlorophyll were studied by X-ray diffraction and absorption polarization spectroscopy in the form of hydrated orientated multilayers below the thermal phase transition of the lipid chains and by nuclear magnetic resonance in the form of single-wall vesicles above the thermal transition. Our results show that chlorophyll is incorporated into the phosphatidylcholine bilayers with its porphyrin ring located anisotropically in the polar headgroup layer of the membrane and with its phytol chain penetrating in a relatively extended form between the phosphatidylcholine fatty acid chains in the hydrocarbon core of the mixed bilayer membrane and the intramolecular anisotropic rotational dynamics of the host phosphatidylcholine molecules are significantly perturbed upon chlorophyll incorporation into the bilayer at all levels of the phosphatidylcholine structure. These dynamics for the host phosphatidylcholine fatty acid chains are qualitatively different from that of the incorporated chlorophyll phytol chains on a 10^{-9}-10^{-10} s time scale in the ideally mixed two-component bilayer.

STRUCTURAL STUDIES OF BIOLOGICAL MEMBRANES AND RELATED MODEL SYSTEMS BY RAMAN SPECTROSCOPY. SPHINGOMYELIN AND 1,2-DILAUROYL PHOSPHATIDYLETHANOLAMINE. R. Mendelsohn, S. Sunder and H.J. Bernstein (Div. of Chem., Natl. Res. Council of Canada, Ottawa, Ontario, K1A OR6, Canada) *Biochim. Biophys. Acta* **413**, 329–40 (1975). Raman spectra are reported at relatively high resolution (1.5 cm^{-1}) for sphingomyelin and for 1,2-dilauroyl phosphatidylethanolamine above and below their melting temperatures. The spectra of 1,2-dilauroyl phosphatidylethanolamine below T_m show the hydrocarbon chains to be less ordered in the solid phase than the fatty acid of the same chain length, without the significant occurrence of *gauche* isomers. The spectra of sphingomyelin show significant formation of *gauche* isomers below T_m, indicating a less rigid environment for this molecule in the solid state.

MISE EN EVIDENCE ET ROLE DES DIACYLGLYCEROLS DE L'ENVELOPPE DES CHLOROPLASTES D'EPINARD. J. Joyard and R. Douce (Laboratoire de Biologie Vegetale, Dept. of Res. Foundation, Centre d'Etudes Nucleaires and Univ. Scientifique and Medicale de Grenoble, BP 85 Centre de Tri 38041 Grenoble Cedex, France). *Biochim. Biophys. Acta* **424**, 125–31 (1976). Galactolipids synthesis occurs in the envelope of spinach chloroplasts by galactosylation of a large endogenous pool of diacylglycerols.

RELATIVE ACTIVITY OF α-TOCOPHEROL AND γ-TOCOPHEROL IN PREVENTING OXIDATIVE RED CELL HEMOLYSIS. J.G. Bieri, R.P. Evarts and J.J. Gart (Lab. of Nutr. and Endocrinol., Natl. Inst. of Arthritis, Metab. and Digestive Diseases, and Biometry Branch, Div. of Cancer Cause and Prevention, Natl. Cancer Inst., Bethesda, Md. 20014) *J. Nutr.* **106**, 124–7 (1976). The purpose of this study was to compare the antioxidant activities of α-tocopherol and γ-tocopherol in protecting the red cell membrane against lipid peroxidation. Tocopherols were incorporated into the red cell membrane by incubating cells with solutions of the tocopherols in bovine albumin. The cells were then washed and subjected to the dialuric acid hemolysis test. Analysis of variance of the response curves revealed that γ-tocopherol had 38% of the activity of α-tocopherol. No evidence was found for an interaction between the two tocopherols when present in the red cell membranes simultaneously.

INTRAMOLECULAR DISORDER AND ITS RELATION TO MESOPHASE STRUCTURE IN LIPID/WATER MIXTURES. N. Boden, P. Jackson, Y.K. Levine and A.J.I. Ward (Dept. of Physical Chem., Univ. of Leeds, Leeds LS2 9JT, U.K.) *Biochim. Biophys. Acta* **419**, 395–403 (1976). NMR spinhalf pair dipolar echo measurements are reported for the lamellar (dispersions and multibilayer stacks) and hexagonal phases of potassium palmitate/^2H_2O mixtures. In the lamellar L_β and L_γ (gel) phases the alkyl chains are rigid and perfectly ordered, while in the lamellar L_α and hexagonal phases they are flexible and disordered. In particular, the measurements show that in the fluid lamellar L_α phase the chain is "bent" at the C_9–C_{10} segment; but is "straight" in the hexagonal phase.

TRIACYLGLYCEROL TURNOVER IN TETRAHYMENA PYRIFORMS. RELATION TO PHOSPHOLIPID SYNTHESIS. M.J. Borowitz and J.J. Blum (Dept. of Physiol. and Pharmacol., Duke Univ. Med. Ctr., Durham, N.C. 27710) *Biochim. Biophys. Acta* **424**, 114–24 (1976). The metabolic function of triacylglycerol in *Tetrahymena pyriforms* was investigated by prelabeling endogenous lipid with a ^{14}C-labeled short chain fatty acid, and then following the disappearance of radioactivity from triacylglycerol and its appearance in other products. In 90 min, up to 85% of the label in triacylglycerol turns over, and although some radioactivity appears in CO_2 and glycogen, most of the label appears in phospholipid. Starvation of the cells, as well as resuspension in enriched medium or provision of acetate all block triacylglycerol breakdown, while supplementation of the medium with pyruvate does not. The results demonstrate an important metabolic interrelationship between triacylglycerol catabolism and phospholipid synthesis and raise the question, in this cell at least, of the validity of considering triacylglycerol only as a fuel storage form.

MASS SPECTROMETRIC STUDY OF THE ENZYMATIC CONVERSION OF CHOLESTEROL TO (22*R*)-22-HYDROXYCHOLESTEROL, (20*R*,22*R*)-20,22-DIHYDROXYCHOLESTEROL, AND PREGNENOLONE, AND OF (22*R*)-22-HYDROXYCHOLESTEROL TO THE GLYCOL AND PREGNENOLONE IN BOVINE ADRENOCORTICAL PREPARATIONS. MODE OF OXYGEN INCORPORATION. S. Burstein, B.S. Middleditch and M. Gut (Dept. of Cell Biol., Baylor College of Med., Houston, Texas 77025) *J. Biol. Chem.* **250**, 9028–37 (1975). Incubation of cholesterol with a bovine adrenocortical mitochondrial acetone-dried powder preparation yielded (22*R*)-22-hydroxycholesterol (I), (20*R*,22*R*)-20,22-dihydroxycholesterol (II), and pregnenolone (III) which were conclusively identified by combined gas chromatography-mass spectrometry. Incubations with [4-^{14}C]cholesterol yielded I, II, and III with specific activities (determined from partial mass-spectral scans) not significantly different from those of the used substrate or the cholesterol reisolated after the incubation, demonstrating that the isolated compounds arose mostly, if not entirely, from the substrate cholesterol. The distribution of the oxygen atoms in II after incubation with $^{18}O_2$ and $^{16}O_2$ (devoid of $^{16}O^{18}O$) proved that the hydroxyl groups of the side chain of II were introduced from two different molecules of oxygen, consistent with a sequential hydroxylation of cholesterol. No (20*S*)-20-hydroxycholesterol was found. Incubation of I in an ^{18}O-enriched atmosphere afforded II and III with ^{18}O at C-20.

STUDIES OF THE EFFECT OF DIETARY CHOLESTEROL ON HEPATIC PROTEIN SYNTHESIS, REDUCED GLUTATHIONE LEVELS AND SERINE DEHYDRATASE ACTIVITY IN THE RAT. S.D. Clarke, D.R. Romsos, A.C. Tsai, P.S. Belo, W.G. Bergen and G.A. Leveille (Dept. Food Sci. and Human Nutr., Mich. State Univ., East Lansing, Mich. 48824) *J. Nutr.* **106**, 94–102 (1976). A basal diet or a basal diet plus 1% of cholesterol and 0.33% cholic acid was fed to rats for varying lengths of time and the activities of liver phosphoenol-pyruvate-carboxykinase (PEP-CK), tyrosine transaminase (TT), and serine dehydratase (SD); the rate of total hepatic protein synthesis; and the concentration of hepatic reduced glutathione (GSH) were quantitated. The specific activity of PEP-CK was significantly depressed by cholesterol plus cholic acid feeding, while the specific activity of TT was unchanged. No significant effect of dietary cholesterol plus cholic acid was found on the total liver activities. In contrast, SD specific activity was increased 3-fold. On a per gram of liver basis, the concentration of GSH in the liver of rats fed a cholesterol plus cholic acid diet was significantly decreased. Considering the liver enlargement in rats fed cholesterol plus cholic acid, total organ GSH was found to be significantly greater than for rats fed a basal diet.

LIPID COMPOSITION AND PROTEIN PROFILES OF OUTER AND INNER MEMBRANES FROM HEART MITOCHONDRIA. COMPARISON WITH MICROSOMES. J. Comte, B. Maisterrena and D.C. Gautheron (Lab. de Biochim. Dynamique, ERA n° 266 du CNRS, Univ. Claude Bernard de Lyon, 43 Boulevard du 11 Novembre 1918, 69621 Villeurbanne, France) *Biochim. Biophys. Acta* **419**, 271–84 (1976). Mitochondria, inner and outer mitochondrial membranes and microsomes were isolated and purified from pig heart. Their lipid composition and protein components were studied. The fatty acid distribution in the main phospholipids seemed specific rather of a given phospholipid and not of one type of membrane. Inner mitochondrial membranes were characterized by a high content in cardiolipin and a very low level of triglycerides together with a high degree of unsaturation and C_{18} acids. Gel electrophoresis revealed 13 different polypeptide subunits of which 5 were major ranging in molecular weights from 10,000 to 215,000. In outer mitochondrial membranes, total lipid, phosphatidylcholine, phosphatidylinositol, plasmalogen and triglyceride contents were much higher than in inner membranes. Fatty acids of phospholipids were mostly saturated and the polypeptide pattern showed 12 components, of which 4 were major of mol. wt 75,000, 60,000, 20,000 and below 10,000.

THE EFFECT OF VITAMIN B-6 DEFICIENCY ON THE FATTY ACID COMPOSITION OF THE MAJOR PHOSPHOLIPIDS IN THE RAT. C.B. Delorme and P.J. Lupien (Centre de Recherches sur les Maladies Lipidiques and Centre de Recherche en Nutr., Dept. of Biochem., Faculty of Med., Laval Univ., Quebec 10, P.Q., Canada) *J. Nutr.* **106**, 169–80 (1976). We have studied the effect of vitamin B-6 deficiency in the rat on the fatty acid spectrum of phosphatidylcholine (PC), lysophosphatidylcholine (LPC), and phosphatidylethanolamine (PE) in liver, plasma and kidneys. In general, vitamin B-6 deficiency decreased the proportion of arachidonic acid in the phospholipid fractions studied and increased that of linoleic acid. These changes seem to be greatest in the liver, whose changes were reflected quite faithfully in the plasma and were least in the kidneys, especially in the case of PE. These differences of order of magnitude may be due to differences in the site of synthesis, in the function or in the turnover of these phospholipids in the different tissues. We have attempted to explain these changes on the basis of a decrease in the synthesis of PC by the pathway of methylation of PE, a pathway which leads mainly to the information of arachidonoyl-PC. The relative

importance of the *de novo* pathway, via CDP-choline, which produces mainly linoleoyl PC would thus increase. This mechanism, associated or not with a decrease in the synthesis of arachidonic acid from linoleic acid, could produce the effects observed on the fatty acid spectrum of the various phospholipids.

BIOSYNTHETIC STUDIES ON MANNOLIPIDS AND MANNOPROTEINS OF NORMAL AND VITAMIN A-DEPLETED HAMSTER LIVERS. L.M. De Luca, C.S. Silverman-Jones and R.M. Barr (Differentiation Control Sect., Exper. Pathol. Branch, Natl. Cancer Inst., Bethesda, Md. 20014) *Biochim. Biophys. Acta* 409, 342–59 (1975). The incorporation of [1-^{14}C]mannose into hamster liver glycolipids and glycoproteins was studied in normal and vitamin A-depleted hamsters. Severely (25% weight loss) and mildly (no weight loss) deficient animals were compared to vitamin A-fed controls. The incorporation of [^{14}C]mannose into glycolipids and glycoproteins decreased in mild and severe vitamin A deficiency by 63–90% compared to vitamin A-fed animals. These results were essentially the same whether expressed per g of wet liver, per DNA or per protein. Quantitation of mannose in glycoprotein showed a 79% decrease in vitamin A deficiency. Specific radioactivity of mannose in glycoproteins, 20 min after injection of the label, was 187 dpm/μg of mannose in the normal and 48 dpm/μg of mannose in the vitamin A-deficient livers. It is concluded that vitamin A is necessary for the biosynthesis of liver mannose-containing glycoproteins and glycolipids.

PATTERNS OF FATTY ACID RELEASE FROM ENDOGENOUS SUBSTRATES BY HUMAN PLATELET HOMOGENATES AND MEMBRANES. A. Derksen and P. Cohen (Dept. of Nutr., Harvard Schl. of Public Hlth., Boston, Massachusetts 02115) *J. Biol. Chem.* 250, 9342–7 (1975). We describe a method for measuring the release of fatty acids from endogenous substrates of human platelet homogenates and membranes. The method depends on the availability of lipids whose fatty acids are odd-chained and therefore suitable as internal reference compounds that, at the time of lipid extraction, can be added to an incubation to permit subsequent quantification of the content of free fatty acids or fatty acids esterified to specific lipids. We found four types of lipolytic activities in human platelets. Linoleic acid was not released in representative amounts by those reactions that released arachidonic acid, despite the overwhelming propensity of both to be esterified at the 2-position of phospholipids. Pertinently, the choline phospholipids are linoleic-rich and the non-choline phospholipids linoleic-poor, while both have a generous endowment of arachidonic acid. With this in mind, we raise the possibility that the phospholipase A_2 of human platelets is an endoenzyme because of its tendency to act on those phospholipids that are thought to comprise the inner layer of the cell membrane.

CARBON-13 NUCLEAR MAGNETIC RESONANCE SPECTRA OF HYDROXY STEROIDS. H. Eggert, C.L. VanAntwerp, N.S. Bhacca and C. Djerassi (Depts. of Chem., Univ. of Copenhagen, Copenhagen, Denmark) *J. Org. Chem.* 41, 71–8 (1976). ^{13}C NMR spectra have been obtained and the individual resonances assigned for 31 monohydroxylated androstanes and cholestanes as well as a number of acetoxy derivatives. The chemical shifts are rationalized in terms of α, β, γ, and δ substituent effects. The variation of these effects is discussed in terms of steric interactions of the hydroxyl group. Quantitative correlations are presented relating the α and β substituent effects to the type and number of specific steric interactions of the hydroxyl group. These correlations allow the estimation of substituent shifts of α- and β-carbon atom resonances within 2.0 and 1.0 ppm, respectively. The magnitude of the γ-gauche shift is correlated with 1,3-syn-diaxial OH-CH_3 interactions; furthermore, the possible dependence of the γ-gauche shift upon the presence of a proximate hydrogen atom at the γ-carbon is discussed. The downfield δ substituent effect found with OH-C(δ) skew pentane configurations is rationalized in terms of steric deformations to relieve the interaction.

FAMILIAL AND ACQUIRED TYPE V HYPERLIPOPROTEINEMIA. R.W. Fallat and C.J. Glueck (Gen. Clin. Res. Ctr., Univ. of Cincinnati, College of Med. and Dept. of Internal Med., Cincinnati Gen. Hosp., Cincinnati, Ohio) *Atherosclerosis* 23, 41–62 (1976). The nature of Type V hyperlipoproteinemia including mode of presentation, prominent clinical and biochemical features, and genetics, was examined in 29 adults presenting with the Type V lipoprotein phenotype. Initially 23 of the 29 patients had various metabolic stimuli (diabetes out of control, estrogenic agents, pancreatitis, ethanolism) superposed on their acute hypertriglyceridemia. After metabolic stabilization, 17 of the 29 subjects were shown to have familial hypertriglyceridemia. In the 17 kindreds with familial hypertriglyceridemia, the lack of a specific, distinctive genetic marker for the Type V genotype and for the Type IV genotype restricts the conclusion that the pattern of inheritance was consistent with an autosomal dominant trait.

FLUIDITY OF NATURAL MEMBRANES AND PHOSPHATIDYLSERINE AND GANGLIOSIDE DISPERSIONS. EFFECTS OF LOCAL ANESTHETICS, CHOLESTEROL AND PROTEIN. M.B. Feinstein, S.M. Fernandez and R.I. Sha'afi (Dept. of Pharmacol., Anat. and Physiol., Univ. of Conn., Schls. of Med. and Dental Med., Farmington, Conn. 06032) *Biochim. Biophys. Acta* 413, 354–70 (1975). The microviscosity of artificial lipid membranes and natural membranes was measured by the fluorescence polarization technique employing perylene as the probe. Lipid dispersions composed of brain gangliosides exhibited greater microviscosity than phosphatidylserine (268 cP vs 173 cP, at 25°C). Incorporation of cholesterol (30–50%) increased the microviscosity of lipid phases by 200–500 cP. Cholesterol's effect on membrane fluidity was completely reversed by digitonin but not by amphotericin B. Incorporation of membrane proteins into lipid vesicles gave varying results. Cytochrome b_5 did not alter membrane fluidity. The fluidity of natural membranes at 25°C varied as follows: polymorphonuclear leukocytes, 335 cP; bovine brain myelin, 270 cP; human erythrocyte, 180 cP; rat liver microsomes, 95 cP; rat liver mitochondria, 90 cP. In most cases the microviscosity of natural membranes reflects their cholesterol:phospholipid ratio. The natural variations in fluidity of cellular membranes probably reflect important functional requirements.

GLYCOPROTEIN BIOSYNTHESIS IN PLANTS. DEMONSTRATION OF LIPID-LINKED OLIGOSACCHARIDES OF MANNOSE AND *N*-ACETYLGLUCOSAMINE. W.T. Forsee and A.D. Elbein (Dept. of Biochem., Univ. of Texas Hlth. Sci. Ctr., San Antonio, Texas 78284) *J. Biol. Chem.* 250, 9283–93 (1975). Previous studies from this laboratory have shown that particulate preparations from maturing cotton fibers catalyze the transfer of mannose for GDP-[^{14}C]-mannose into mannosylphosphorylpolyisoprenol. In this report, we show that these particulate preparations also catalyze the incorporation of mannose from GDP-[^{14}C]-mannose into lipid-linked oligosaccharides and into glycoprotein. The oligosaccharide-lipids were treated with dilute acid to liberate the water-soluble oligosaccharides and these oligosaccharides could then be separated into seven or eight distinct radioactive peaks by paper chromatography in isobutyric acid/NH_4OH/H_2O (57/4/39). The GlcNAc-labeled oligosaccharides also contain GlcNAc at the reducing end and some mannose in α linkages at the nonreducing end. [^{3}H]GlcNAc-labeled glycopeptides were also isolated from the insoluble residue by Pronase digestion.

THE EFFECT OF DIETARY VANADIUM OF FATTY ACID AND CHOLESTEROL SYNTHESIS AND TURNOVER IN THE CHICK. Y. Hafez and F.H. Kratzer (Dept. of Avian Sci., Univ. of Calif., Davis, Calif. 95616) *J. Nutr.* 106, 249–57 (1976). Day-old male, broiler type chicks were used to study the effect of 100 ppm dietary vanadium on fatty acid and cholesterol synthesis and turnover in vivo. After feeding the experimental diets for 4 weeks body weight and liver weight of chicks fed 100 ppm vanadium were significantly less than those of the control chicks and liver total lipid and cholesterol tended to be slightly higher than the levels of the control chicks. [1-^{14}C]Acetate was administered intravenously and the specific activities of plasma and liver total lipid, cholesterol and fatty acid were determined at 0.25, 0.50, 1.0, 4.0, 8.0 and 15.0 hours after the injection. Plasma total lipid and cholesterol were significantly higher than the levels in the control chicks. The rate of incorporation of [1-^{14}C]acetate into plasma and liver total lipid, cholesterol and fatty acid was higher in chicks fed vanadium than the control group at any of the time being tested after the injection. There was a significant increase in the hepatic citrate cleavage enzyme activity among chicks fed 100 ppm vanadium, whereas, there was no significant change in acetate thiokinase activity. Turnover rate of plasma total lipid and fatty acid in vanadium fed chicks was lower than the control. The turnover rate of plasma cholesterol determined by administering [4-^{14}C]cholesterol and periodically measuring the specific activity of plasma cholesterol was higher in chicks fed vanadium than in those fed the basal diet.

INJECTABLE VITAMINS A, D, AND E: A FIELD STUDY. D.A. Hartman, R.P. Natzke and R.W. Everett (Dept. of Animal Sci., Cornell Univ., Ithaca, N.Y. 14853) *J. Dairy Sci.* 59, 91–6 (1976). Injectable vitamins A, D, and E and saline were applied alternately to 957 milk cows in nine New York State

Holstein herds at drying off and freshening between July, 1972, and July, 1973. Production from Dairy Herd Improvement, measures of reproductive performance, and occurrences of anomalies and disposals were recorded. No effect was significantly beneficial for injectable vitamins A, D, and E on any of 26 recorded measures of production, reproductive efficiency, or herd health.

EFFECT OF CYTOCHROME b_5 ON THE SIZE, DENSITY, AND PERMEABILITY OF PHOSPHATIDYLCHOLINE VESICLES. P.W. Holloway and J.T. Katz (Dept. of Biochem., Univ. of Virginia Schl. of Med., Charlottesville, Va. 22901) *J. Biol. Chem.* 250, 9002–7 (1975). Cytochrome b_5, isolated from rabbit liver by a procedure using detergent, was incubated with phosphatidylcholine bilayer vesicles at 37° for 30 min. A comparison of a number of physical properties was made between the cytochrome b_5 · phosphatidylcholine complex (at a molar ratio of 1:1,000) and the phosphatidylcholine vesicles. The binding of the protein to the vesicle caused no aggregation and no detectable change in Stokes radius of the vesicle as monitored by gel filtration. Only small increases in s_{20} (from 2.67 up to 3.82×10^{-13} s) and density (from 1.025 up to 1.042 g ml^{-1}) were observed upon binding of the cytochrome b_5 to phosphatidylcholine vesicles. At molar ratios of 5:1,000, and above, two types of complexes could be detected by sucrose density gradient centrifugation: one had a molar ratio of approximately 4:1,000 (density approximately 1.066 g ml^{-1}) the other, a more constant ratio of 20:1,000 (density greater than 1.107 g ml^{-1}). Cytochrome b_5 was also incubated with phosphatidylcholine vesicles prepared with ferricyanide trapped inside. The leakage of the ferricyanide from inside the vesicles was increased when cytochrome b_5 was present, but the vesicles, although leaking, were not completely depleted of their ferricyanide, and so must still be intact.

LIPID COMPOSITION IN POSTNATAL METHYLAZOXYMETHANOL-TREATED SWISS ALBINO MOUSE CEREBELLUM. M. Jones, W. Taylor and A. Sculthorpe (Dept. of Pathol., Dept. of Food Sci. and Human Nutr., Mich. State Univ., East Lansing, Mich. 48824) *Pro. Soc. Exper. Biol. Med.* 150, 622–7 (1975). Postnatal Swiss albino mice were treated either with methylazoxymethanol acetate (MAM) or saline and sacrificed at 25 days of age. Granule cell depletion resulted. Significant reduction in the cerebellar weight, protein, ganglioside sialic acid, cerebrosides, sulfatides, and phospholipids were documented. There was not, however, selective reduction of any component known to be associated with the synaptic structures. Specific association of cerebellar ganglioside with its granule cell population was not substantiated. Cerebroside/sulfatide ratios were not different in the two groups, indicating that significant alterations previously observed in spinal cord were not present in the cerebellum. It was concluded that the bulk of cerebellar granule cells and their synaptic connections could be deleted without affecting total ganglioside and phospholipid concentrations.

REGULATION OF 3-HYDROXY-3-METHYLGLUTARYL COENZYME A REDUCTASE ACTIVITY AND THE ESTERIFICATION OF CHOLESTEROL IN HUMAN LONG TERM LYMPHOID CELL LINES. H.J. Kayden, L. Hatam and N.G. Beratis (New York Univ. Schl. of Med., New York, N.Y. 10016) *Biochemistry* 15, 521–8 (1976). The regulation of the rate-controlling enzyme in cholesterol biosynthesis and of the incorporation of [^{14}C]oleate into cholesterol esters were studied in established lymphoid cell lines from normal subjects and compared with that of eight patients with genetic abnormalities of lipid metabolism. The results of these studies in lymphocyte cell lines are compared with the findings in cultured human fibroblasts obtained from normal subjects and from patients with homozygous familial hypercholesterolemia. Studies of the regulation of cholesterol biosynthesis in the apparently permanent lymphoid cell line maintained in suspension culture offer certain advantages over cultured skin fibroblasts, and, in addition, provide a second tissue for the study of genetic abnormalities from the same patient.

COMBINED PARA-AMINOSALICYLIC ACID AND DIETARY THERAPY IN LONG-TERM CONTROL OF HYPERCHOLESTEROLEMIA AND HYPERTRIGLYCERIDEMIA (TYPES II_a AND II_b HYPERLIPOPROTEINEMIA). P.T. Kuo, W.C. Fan, J.B. Kostis and K. Hayase (Div. of Cardiovascular Diseases, Dept. of Med. and Dentistry of New Jersey, Rutgers Med. Schl., Piscataway, N.J.) *Circulation* 53, 338–41 (1976). The hypolipidemic effect of PAS-diet treatment was studied in 63 patients with Types II_a and II_b hyperlipoproteinemia for 6–36 months. Serum lipids and body weights of all patients were stabilized by a low cholesterol-saturated fat-refined carbohydrate diet before the initiation of an eight-week placebo-drug single-blind cross-over study. During the placebo period the plasma lipids levels. mean ± SD: cholesterol 355 ± 63.5 mg%, triglyceride 141 ± 68.7 mg%, and LDL-cholesterol 279 ± 56.8 mg% were lowered to 274 ± 53.1 mg%, 98 ± 40.6 mg%, and 209 ± 52.9 mg%, respectively ($P < 0.001$ in each instance), with 7.5–11.0 grams of PAS-C/day given in one to three divided doses. In ten patients who have completed three years of treatment similar results were obtained. They showed no tendency to develop drug tolerance. Eight had watery diarrhea during the initial period which promptly sudsided with interruption of drug therapy. Reintroduction of PAS-C in smaller dose (4.5 g/day) with gradual increment to effective dosage level was tolerated by all. No hematologic, hepatic, and ophthalmologic abnormalities were demonstrated by periodic monitoring. The hypolipidemic effect of the drug was found to be diminished by alcohol and caloric excess.

INHIBITION OF FATTY ACID SYNTHESIS AND STIMULATION OF GLYCOGEN BREAKDOWN BY VASOPRESSIN IN THE PERFUSED MOUSE LIVER. G.Y. Ma and D.A. Hems (Dept. of Biochem., Imperial College of Sci. and Technol., London SW72AZ, U.K.) *Biochem. J.* 152, 389–92 (1975). Vasopressin (anti-diuretic hormone, [8-arginine]vasopressin) inhibited the synthesis *de novo* of fatty acids (measured with ^3H_2O and U-^{14}C-labelled lactate or U-^{14}C-labelled glucose) and stimulated glycogen breakdown in the perfused liver of fed mice. The concentration dependence of these effects (range 200–1,000 μunits/ml, i.e. 0.5–2.5 ng/ml) resembled that for the action on glycogen breakdown which was previously reported for rat liver. The appearance of newly synthesized fatty acids in both phospholipids and triglycerides was inhibited by vasopressin, whereas synthesis of cholesterol was less affected. Inhibition of hepatic lipogenesis by vasopressin is the most potent short-term hormonal action on this process yet reported. Aspects of the effect are discussed, including the lack of a role for cyclic AMP, and a possible link with vasopressin action on glycogen metabolism.

STUDIES ON THE ISOLATION AND PARTIAL CHARACTERIZATION OF APOLIPOPROTEIN D AND LIPOPROTEIN D OF HUMAN PLASMA. W.J. McConathy and P. Alaupovic (Lipoprotein Lab., Oklahoma Med. Res. Foundation, Oklahoma City, Okla. 73104) *Biochemistry* 15, 515–20 (1976). This report describes further studies on the characterization of apolipoprotein D (ApoD), a recently recognized human plasma apolipoprotein, and presents results on the isolation and distribution of its lipoprotein from, lipoprotein D (LP-D). ApoD, isolated by a procedure combining hydroxylapatite and Sephadex G-100 column chromatography, migrated on 7% polyacrylamide gel as a single band with a mobility intermediate between those of A-II and C-II polypeptides. On double diffusion and immunoelectrophoresis, ApoD reacted only with antiserum to ApoD. It was characterized by the presence of all common amino acids including half-cystine. The lipid moiety contains cholesterol, cholesterol ester, triglyceride, and phospholipid. The phospholipid composition is characterized by a relative high content of lysolecithin and sphingomyelin and a relatively low content of lecithin. We have concluded from these studies that ApoD is a unique apolipoprotein that exists in the form of a distinct lipoprotein family with a macromolecular distribution extending from very low density lipoproteins into very high density lipoproteins, but with a maximum concentration in high density lipoproteins$_3$ and a minimum concentration in high density lipoproteins$_2$.

MUTANTS OF ESCHERICHIA COLI DEFECTIVE IN MEMBRANE PHOSPHOLIPID SYNTHESIS. EFFECT OF CESSATION OF NET PHOSPHOLIPID SYNTHESIS ON CYTOPLASMIC AND OUTER MEMBRANES. T.M. McIntyre and R.M. Bell (Dept. of Biochem., Duke Univ. Med. Ctr., Durham, North Carolina 27710) *J. Biol. Chem.* 250, 9053–9 (1975). The effect of cessation of net phospholipid synthesis on the cytoplasmic and outer membranes of *Escherichia coli* was investigated in a mutant strain defective in the first enzyme of phospholipid synthesis, the *sn*-glycerol-3-phosphate (glycerol-P) acyltransferase. The glycerol-P (glycerol) auxotropic phenotype of this strain resulted from an altered membranous glycerol-P acyltransferase activity with an apparent K_m for glycerol-P 10 times higher than that of the parental activity. When net phospholipid synthesis was halted during glycerol deprivation, both soluble and cell envelope protein synthesis continued. Fractionation of the membranes derived from glycerol-supplemented and glycerol-deprived cultures by isopycnic banding in sucrose gradients revealed that both the cytoplasmic and outer membranes of the deprived culture banded at higher buoyant densities.

HYPERPROLACTINEMIA AND STEROID METABOLISM BY RAT MAMMARY ADENOCARCINOMAS. W.R. Miller (Dept. of Clin. Surgery, Univ. Med. Schl., Edinburgh EH8 9AG, Scotland) *Cancer Res.* 36, 336-8 (1976). The metabolism of both testosterone and dehydroepiandrosterone by 10 adenocarcinomas induced and grown in the presence of high prolactin (plasma prolactin > 220 ng/ml) was compared with the metabolism of 10 adenocarcinomas induced and grown in the presence of normal levels (plasma prolactin < 60 ng/ml). The tumors associated with high prolactin significantly metabolized more testosterone to both 5α-dihydrotestosterone and 5α-androstanediol. The metabolism of dehydroepiandrosterone was similar in both groups of tumors. It is concluded that prolactin may differentially influence the metabolism of C_{19} steroids by rat mammary adenocarcinomas.

MUTAGENICITY OF MALONALDEHYDE, A DECOMPOSITION PRODUCT OF PEROXIDIZED POLYUNSATURATED FATTY ACIDS. F.H. Mukai and B.D. Goldstein (Depts. of Environmental Med. and Med., New York Univ. Med. Ctr., N.Y. 10016) *Science* 191, 868-9 (1976). Incubation of histidine requiring auxotrophs of the bacterium *Salmonella typhimurium* with malonaldehyde, a three-carbon dialdehyde, produced an increased number of revertants in specific strains. Mutagenesis was only observed in frameshift mutants with normal excision repair and did not occur in those base-pair substitution mutants tested. The results are consistent with the cross-linking of bacterial DNA by malonaldehyde leading to mutagenesis expressed through the error-prone repair system.

DIETARY FATTY ACIDS AND THE CONTROL OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE AND MALIC ENZYME IN THE STARVED-REFED RAT. C.S. Nace and B. Szepesi (Nutr. Inst., Agr. Res. Service, U.S. Dept. of Agr., Beltsville, Md. 20705) *J. Nutr.* 106, 285-91 (1976). The role of dietary unsaturated fat in the control of hepatic glucose-6-phosphate dehydrogenase (G6PD) (EC 1.1.1.49) and malic enzyme (ME) (EC 1.1.1.40) was studied in rats subjected to one or two cycles of starvation-refeeding. Rats starved and refed a control (5% corn oil) diet showed a threefold increase in G6PD activity and a two-fold increase in ME activity as compared to ad libitum-fed rats. After a second cycle of starvation-refeeding G6PD and ME activities showed fourfold and threefold increases, respectively, as compared to ad libitum-fed rats. Feeding rats diets containing 8% linoleic or linolenic acid (as triglycerides) prevented the increase in G6PD and ME activities upon starvation-refeeding, diets with oleic, palmitic, and stearic acids when fed did not prevent this increase. Feeding rats various combinations of linoleic, linolenic and oleic acids following starvation prevented the additional increase in G6PD and ME activities after a second starvation-refeeding cycle; however, linoleic acid fed alone during the first refeeding prevented the additional increase in ME activity but not in G6PD activity. It is suggested that the dietary control of these enzymes involves one or more specific polyunsaturated fatty acids.

THE EFFECTS OF DIETARY FATTY ACIDS AND CHOLESTEROL ON THE MILK LIPIDS OF LACTATING WOMEN AND THE PLASMA CHOLESTEROL OF BREAST-FED INFANTS. J.M. Potter and P.J. Nestel (Dept. of Clin. Sci., John Curtin School of Medical Res., Australian National Univ., Canberra, Australia) *Amer. J. Clin. Nutr.* 29, 54-60 (1976). The plasma cholesterol concentration and the composition of the plasma fatty acids was altered by dietary means in 10 lactating women. The effects of these changes in the plasma on the lipid constituents of mature human milk were studied over periods of several weeks. In eight infants who were being breast-fed, the changes in the plasma cholesterol concentration were correlated with the changes that were induced in the milk lipids. Significant alteration in the women's plasma cholesterol levels did not change the cholesterol concentration in milk. The cholesterol content of milk was closely correlated with the concentrations of the other milk lipids, supporting a functional role for the cholesterol in the secretion of milk fat. In the maternal milk consumed by the eight infants the linoleate content rose from 9.4% to 15.5% of total fatty acids as a result of a moderate increase in dietary polyunsaturated fat. This led to a fall in the infants' plasma cholesterol levels, from an average of 185 to 157 mg/100 ml.

STUDIES ON THE FATTY ACID INACTIVATION OF PHOSPHOFRUCTOKINASE. C.S. Ramadoss, K. Uyeda and J.M. Johnston (Dept. of Cellular Regulation, Vet. Admin. Hosp., and the Dept. of Biochem., The Univ. of Texas Hlth. Sci. Ctr., Dallas, Tx. 75216) *J. Biol. Chem.* 251, 98-107 (1976). Investigation of phosphofructokinase in normal and regenerating livers led to the discovery of an inactivating factor in the extracts of these livers. The inactivating factor was found to be a mixture of free fatty acids. The fatty acid compositions of most of the fatty acids are at least 3 to 4 times higher in the latter. Binding studies with [^{3}H]oleate revealed at least three types of binding sites. The first site binds 2 to 4 mol of oleate/mol of enzyme. Oleate binding to this site did not seem to affect the enzyme activity. The second binding site binds 5 to 15 mol of oleate/mol of enzyme resulting in complete loss of the activity. This is followed by an increase in oleate binding to the third site of the enzyme. Sucrose density gradient centrifugation of oleate-inactivated enzyme indicated that the enzyme dissociated to the dimeric form. Similarly, centrifugation of [^{3}H]oleate-treated enzyme revealed that all polymeric forms of phosphofructokinase bound approximately 6 to 8 mol of oleate/mol of enzyme. In the presence of fructose-6-P, oleate is bound to the polymers to a lesser degree and therefore protects against the fatty acid inactivation. Various polymers which are cross-linked with dimethylsuberimidate are also inhibited by oleate.

STEAROYL-CoA DESATURASE ACTIVITY IN MAMMARY ADENOCARCINOMAS CARRIED BY C_3H MICE. G.A. Rao and S. Abraham (Vet. Admin. Hosp., Martinez, Calif. 94553) *Lipids* 10, 835-9 (1975). Transplantable mammary adenocarcinomas and livers of C_3H mice fed a stock diet or a linoleate rich diet (15% corn oil) contain similar amounts of oleate (ca 3 mg/gm tissue). On feeding either a high carbohydrate, fat free or a high carbohydrate, saturated fat-containing (15% hydrogenated coconut or cottonseed oil) diet for 6 weeks, oleate levels increased 2-fold in tumor and 5-fold in liver. The specific activity of stearoyl-CoA desaturase in liver microsomes was similar to that in the corresponding fractions of mammary glands of lactating mice. In liver, this activity was enhanced 2- to 3-fold by feeding a high carbohydrate, fat free or a high carbohydrate, saturated fat diet. The desaturase activity in mammary tumor microsomes, while only 10% of that in hepatic microsomes, remained unaltered regardless of the type of diet fed. These observations suggest that a major portion of the oleate in the mammary tumor is not produced within the tissue, dietary adaptation is not a general characteristic of stearoyl-CoA desaturase in neoplastic tissues, and enhanced desaturase activity in liver is directly related to the absence of linoleate or oleate, or to a large decrease in oleate in the diet.

INFLUENCE OF MEMBRANE LIPID FLUIDITY ON GLUCOSE AND URIDINE FACILITATED DIFFUSION IN HUMAN ERYTHROCYTES. B.D. Read and R.N. McElhaney (Dept. of Biochem., Univ. of Alberta, Edmonton, Alberta, T6G 2H7, Canada) *Biochim. Biophys. Acta* 419, 331-41 (1976). A central question which must be resolved before acceptable molecular descriptions of facilitated diffusion systems can be provided is the nature of the spatial and functional relationships between the transport proteins and the membrane lipids. In the work reported here, this question was addressed by investigating the dependence of the rates of glucose and uridine facilitated diffusion in human erythrocytes on membrane lipid fluidity. Two approaches were used to alter the lipid fluidity: treatment with ether, an anesthetic, and the exchange of a synthetic 3-ketosteroid, cholest-4-en-3-one, for membrane cholesterol. The absence of the expected increase in the V of facilitated diffusion with increasing membrane fluidity observed here with human erythrocytes is not consistent with models for the transport process which feature movement of transport proteins which are in direct contact with the bulk lipids of the membrane.

VERY LOW DENSITY LIPOPROTEINS IN NORMAL AND CHOLESTEROL-FED RABBITS: LIPID AND PROTEIN COMPOSITION AND METABOLISM. PART 2. METABOLISM OF VERY LOW DENSITY LIPOPROTEINS IN RABBITS. J.L. Rodriguez, A. Catapano, G.C. Ghiselli and C.R. Sirtori (Ctr. "E. Grossi Paoletti" for the Study of Metab. Diseases and Hyperlipidemias, Univ. of Milan, 20129—Milan, Italy) *Atherosclerosis* 23, 85-96 (1976). The metabolic fate of very low density lipoproteins (VLDL) in normal and hypercholesteremic (h.c.) rabbits has been investigated. VLDL were labelled with ^{125}I in the protein moieties and injected into normal and h.c. animals. The turnover of h.c. VLDL is markedly delayed as compared to that of normal VLDL, and conversion into lipoprotein classes of higher density is considerably decreased. This is observed when h.c. VLDL are injected either into h.c., or into normal rabbits. Arterial uptake of radioactivity is much higher with h.c. VLDL than with the normal lipoproteins, and it is highest when h.c. VLDL are injected into normal recipients. These data, together with those reported in the previous study, support the hypothesis

that h.c. VLDL have an inherent atherogenicity. Injection of h.c. VLDL into normal animals also offers an experimental model for testing drugs or diets against atherosclerosis, using untreated animals.

BUTANEDIOL AND LIPID METABOLISM. D.R. Romsos, P.S. Belo and G.A. Leveille (Dept. of Food Sci. and Human Nutr., Michigan State Univ., East Lansing, Mich. 48824) *Fed. Proc.* **34**, 2186–90 (1975). Young growing rats, chicks and pigs were fed diets containing graded levels of 1,3-butanediol (BD). Replacement of up to 20% of the dietary carbohydrate energy with BD did not affect body weight gain of food efficiency in these species. Blood β-hydroxybutyrate levels were markedly elevated when BD was added to the diet. We propose that the hepatic conversion of BD to β-hydroxybutyrate in the rat shifts the cytoplasmic redox state, reduces the glycolytic rate, and reduces substrate availability for fatty acid synthesis. Further, the concomitant shift in the mitochondrial redox state allows long-chain acyl CoA levels to increase. The overall effect is a decrease in the rate of fatty acid synthesis in livers of rats fed BD.

ETHER LIPID METABOLISM. INCORPORATION OF *O*-HEXADECYL ETHANEDIOL INTO RAT BRAIN LIPIDS. H.H.O. Schmid, P.C. Bandi, N.C. Chang, T.H. Madson and W.J. Baumann (The Hormel Inst., Univ. of Minn., Austin, Minn. 55912) *Biochim. Biophys. Acta* **409**, 311–9 (1975). 1-*O*-[1′-^{14}C]Hexadecyl ethanediol was administered intracerebrally to myelinating rat brain, and incorporation of radioactivity into brain lipids was followed over a 48-h period: *O*-Hexadecyl ethanediol was metabolized primarily through oxidative ether bond cleavage, and much of the label was recovered in phospholipid acyl groups. Substantial amounts of radioactivity were also found in choline and ethanolamine phospholipids having an *O*-hexadecyloxyethyl glycerol backbone. This means that alkyl ethanediol was used in glycerol ether biosynthesis as are long-chain primary alcohols. Acidic hydrolysis of the ethanolamine glycerophosphatide fraction yielded also labeled hexadecanol which may indicate desaturation of 1-*O*-hexadecyloxyethyl 2-acyl glycerophosphoryl ethanolamine to the plasmalogen analogue. Small amounts of the substrate were oxidized to *O*-hexadecyl glycolic acid and incorporated into the phospholipids. The substrate did not serve as precursor of *O*-hexadecyl ethanediol phosphorylcholine or phosphorylethanolamine in the brain.

ORGAN AND INTRACELLULAR LOCALIZATION OF SHORT-CHAIN ACYL-CoA SYNTHETASES IN RAT AND GUINEA-PIG. H.R. Scholte and P.H.E. Groot (Dept. of Biochem. I, Med. Faculty, Erasmus Univ.. Rotterdam, The Netherlands) *Biochim. Biophys. Acta* **409**, 283–96 (1975). Homogenates of rat epididymal fat pad, heart, kidney, lactating mammary gland, liver, skeletal muscle and small intestinal mucosa have been partitioned into a particulate and supernatant fraction. With reliable marker enzymes for the mitochondrial matrix and the cytosol: propionyl-CoA carboxylase and pyruvate kinase, the distributions of the acyl-CoA synthetase activities measured at 1 and 10 mM C_2, C_3 and C_4 over mitochondria and cytosol have been calculated. From these values an estimate was made of the $K_{0.5}$ of the fatty acids. Mitochondrial acetyl-CoA and butyryl-CoA synthetases were found in adipose tissue, gut, heart, kidney, mammary gland and muscle. They were absent in liver. Adipose tissue and liver contained a mitochondrial propionyl-CoA synthetase with activities at 1 mM C_3 of 0.014 and 1.50 μmol C_3 activated per min per g wet weight, respectively. In guinea-pig heart, kidney, liver and muscle about the same partitions have been found as in the respective rat organs. The acetate activation in liver was a factor 6 lower. Acetate and butyrate activation in guinea-pig muscle was much higher (6 and 37 times, respectively).

BIOSYNTHESIS OF CHONDROITIN SULFATE. ROLE OF PHOSPHOLIPIDS IN THE ACTIVITY OF UDP-D-GALACTOSE:D-XYLOSE. N.B. Schwartz (Depts. of Pediatrics and Biochem. and the Joseph P. Kennedy, Jr. Mental Retardation Res. Ctr., Univ. of Chicago, Chicago, Ill. 60637) *J. Biol. Chem.* **251**, 285–91 (1976). The role of phospholipids in the activity of UDP-D-galactose:D-xylose galactosyltransferase (galactosyltransferase I) from embryonic chick cartilage was investigated. Phospholipase C treatment of particulate galactosyltransferase I caused inactivation of this enzyme to the extent of 60 to 70% as well as hydrolysis of 75 to 80% of the membrane phospholipids. Addition of phospholipid restored activity to nearly control levels. Neither phospholipase C treatment nor exogenous phospholipid had any significant effect on three of the other chondroitin sulfate glycosyltransferases (UDP-D-xylose:core protein xylosyltransferase, UDP-D-glucuronic acid:3-*O*-β-D-galactosyl-D-galactose glucuronosyltransferase, and UDP-*N*-acetyl-D-galactosamine:(GlcUA-GalNAc-4-sulfate)$_4$ *N*-acetylgalactosaminyltransferase). On lipid analysis by thin layer chromatography, phosphatidylcholine and phosphatidylethanolamine were found to be the major phospholipids of particulate and solubilized glycosyltransferase preparations from embryonic chick cartilage, while lysophosphatidylcholine and lysophosphatidylethanolamine were barely detectable components. The concentration of these specific phospholipids was diminished greatly following phospholipase C treatment.

THE EFFECT OF MASSIVE DOSES OF VITAMIN A ON THE SIGNS OF VITAMIN A DEFICIENCY IN PRESCHOOL CHILDREN. D.P. Sinha and F.B. Bang (Nutr. and Infection Project, Johns Hopkins Ctr. for Med. Res., Calcutta, India) *Amer. J. Clin. Nutr.* **29**, 110–5 (1976). Marked seasonal variation in the prevalence of signs of vitamin A deficiency was found in the 2nd year of a continuing study of children age 0 to 4½ years in a village in West Bengal, confirming results of a previous 18-month study. Administration of 200,000 IU of vitamin A every 4 months completely eliminated night blindness and prevented the development of new cases of Bitot's spot in a statistically significant number of children. The effectiveness of massive doses of vitamin A, administered at intervals of 4 months, as a short-term measure to fight the problem, was confirmed in this village. The study yielded additional evidence of the complex etiology of Bitot's spot, since alternate day dose of vitamin A in addition to massive therapy failed to eliminate these spots.

THE KINETICS OF INCORPORATION IN VIVO OF [1^{14}C]ACETATE AND [^{14}C]CARBON DIOXIDE INTO THE FATTY ACIDS OF GLYCEROLIPIDS IN DEVELOPING LEAVES. C.R. Slack and P.G. Roughan (Plant Physiology Div., D.S.I.R., Private Bag, Pamlerston North, New Zealand) *Biochem. J.* **152**, 217–28 (1975). The patterns of incorporation of ^{14}C into glycerolipid fatty acids of developing maize leaf lamina from supplied [1-^{14}C]acetate and from $^{14}CO_2$ during steady-state photosynthesis were similar. Oleate of phosphatidylcholine and palmitate of phosphatidylglycerol attained linear rates of labelling more rapidly than did other fatty acids, particularly the linoleate and linolenate of mongalactosyl diacylglycerol. The rapidly labelled phospholipids, phosphatidylcholine and phosphatidylglycerol, were shown by differential and sucrose-density-gradient centrifugation to be associated with different organelles, the former being mainly in a low-density membrane fraction, probably microsomal, and the latter mainly in chloroplasts. During a 48 h period after supplying spinach leaves with [^{14}C]acetate, radioactivity was lost from the oleate of phosphatidylcholine present in fractions sedimented at 12,000g and 150,000g, and accumulated in the linolenate of monogalactosyl diacylglycerol of the chloroplast.

DETERMINATION OF PHYSICAL PROPERTIES OF BOVINE SERUM LIPOPROTEINS BY ANALYTICAL ULTRACENTRIFUGATION. D. Stead and V.A. Welch (Natl. Inst. for Res. in Dairying, Shinfield, Reading, England RG2 9AT) *J. Dairy Sci.* **59**, 9–13 (1976). Pure samples of low density lipoprotein-one (d 1.019 to 1.039 g/ml), low density lipoprotein-two (d 1.039 to 1.060 g/ml), and high density lipoprotein (d 1.060 to 1.210 g/ml) were isolated from bovine serum and their properties studied in the analytical ultracentrifuge. Approach-to-equilibrium experiments indicated that the lipoprotein classes were homogeneous. Molecular weights of the lipoproteins given by this method (low density lipoprotein-one, 1.14×10^6; low density lipoprotein-two, 2.37×10^6; high density lipoprotein, $.576 \times 10^6$) agreed well with those obtained by a high-speed-equilibrium method (1.03×10^6, 2.15×10^6, and $.567 \times 10^6$). Linear plots of flotation rate (corrected for viscosity) against the density of the medium were obtained in sedimentation velocity experiments and on extrapolation gave values for the hydrated density of 1.032 g/ml for low density lipoprotein-one, 1.044 g/ml for low density lipoprotein-two, and 1.071 g/ml for high density lipoprotein. The density of the material which would have to be added to high density lipoprotein to give it the physical properties of low density lipoprotein-one was less than 1 g/ml, which suggested that it was predominantly lipid.

IMMUNOLOGICAL PROPERTIES OF BOVINE SERUM LIPOPROTEINS AND CHEMICAL ANALYSIS OF THEIR PROTEIN MOIETIES. D. Stead and V.A. Welch (Natl. Inst. for Res. in Dairying Shinfield, Reading, England RG2 9AT) *J. Dairy Sci.* **59**, 1–8 (1976). Four classes of bovine serum lipoproteins were isolated by precipitation with dextran sulfate, ultracentrifugation, and preparative electrophoresis on polyacrylamide gel. Very low density lipoprotein ($d < 1.019$ g/ml) was related immunologically to low density lipoprotein-two (d 1.039 to 1.060

g/ml) and high density lipoprotein (d 1.060 to 1.210 g/ml) was related immunologically to low density lipoprotein-one (d 1.019 to 1.039 g/ml), but the two pairs were immunologically distinct. The major N-terminal amino acid of both high density lipoprotein and low density lipoprotein-one was aspartic acid, and that of low density lipoprotein-two was glutamic acid. It is concluded that the proteins of high density lipoprotein and of low density lipoprotein-one are related and are different from that of low density lipoprotein-two. The protein of very low density lipoprotein is related to that of low density lipoprotein-two but may contain polypeptides of high density lipoprotein or low density lipoprotein-one.

THE EFFECT OF OCTADECENOIC ACID ON THE GROWTH OF JAPANESE ENCEPHALITIS VIRUS IN NOVIKOFF HEPATOMA CELLS. W. Steele and H.M. Jenkin (Hormel Inst., Univ. of Minnesota, Austin, Minn. 59912) *Pro. Soc. Exper. Biol. Med.* **150**, 630–5 (1975). The growth characteristics of Japanese encephalitis virus cultivated in Novikoff hepatoma cells grown in shaker culture can be differentially altered by the presence of 6-*cis*- or *cis*-9-octadecenoic acid in Swim's 67-G medium. The addition of 125 μg of the 6-isomer per ml medium reduced the number of infectious particles produced, whereas the same amount of the 9-isomer enhanced virus production. The virus was found to be more stable in cell-free spent medium than in fresh medium. The presence of 125 μg 6-18:1 per ml in fresh medium resulted in a rapid loss of virus infectivity.

STUDIES ON THE SYNTHESIS OF RAT LIVER FATTY ACID SYNTHETASE. L.D. Strawser and A.R. Larrabee (Dept. of Chem., Memphis State Univ., Memphis, Tenn. 38152) *J. Biol. Chem.* **251**, 720–4 (1976). The synthesis of the multienzyme complex rat liver fatty acid synthetase was investigated utilizing modifications of methods developed in the laboratory of Schimke. The relative amounts of radioactivity from a pulse of labeled lysine appearing in polypeptides derived from purified synthetase complex can be measured compensating for the varying amounts of lysine per polypeptide chain. The results show that labeled amino acid is incorporated into polypeptides derived from the complex at heterogeneous rates. However, 10 to 15 hours after the administration of a pulse, the amount of label per lysine residue in these polypeptides is identical. The results support the previously proposed model of this multienzyme complex. The previous work and that reported here suggests the existence of a pool of synthetase subunits which is an obligatory intermediate in both synthesis and turnover of the complex. The results obtained in this work are consistent with this model if the exchange of subunits into the intact complex is a relatively slow process requiring several hours to reach equilibrium.

CERAMIDES OF HUMAN NORMAL AND CATARACTOUS LENS. R.V.P. Tao and E. Cotlier (Biochem. Labs., Dept. of Ophthalmology, Univ. of Ill. at the Med. Ctr., 1855 W. Taylor St., Chicago, Ill. 60612) *Biochim. Biophys. Acta* **409**, 329–41 (1975). Ceramides were quantitatively isolated from human normal and cataractous lens by solvent extraction, silicic acid chromatography, thin-layer chromatography, and gas-liquid chromatography. Only two species of ceramides with normal fatty acids were detected. In the mature cataracts, there was an increase in palmitate and nervonate at the expense of the other fatty acids. Due to the increase of 24:1, the ratio of 24:1/24:0 increased significantly from normals to cataracts. Sphinganine was the major long-chain base, but 4-sphingenine was also present. The total amount of ceramides in the immature and mature cataracts was 1.8 and 3.0 times higher than the normals of the same age group. Such an increase does not seem to be the result of an age-dependent process.

INFLUENCE OF CERTAIN DIETARY FIBERS ON SERUM AND TISSUE CHOLESTEROL LEVELS IN RATS. A.C. Tsai, J. Elias, J.J. Kelley, R.C. Lin and J.R.K. Robson (Human Nutr. Prog., Schl. Public Health, Univ. Mich., Ann Arbor, Mich. 48104) *J. Nutr.* **106**, 118–23 (1976). Pectin, carragheenan, agar, gum arabic, cellulose and wheat bran were each fed to rats at a level of 5 or 7% to examine their effect on serum, liver and tissue cholesterol levels. Diets (casein-sucrose diet containing 10–15% soybean oil, or skim milk-wheat flour diet containing 10–15% soybean oil) supplemented with either 0, 0.2, or 0.5% cholesterol were used to test the possible dietary interactions. Among the fibers tested, pectin displayed the most hypocholesterolemic effect. In some experiments, pectin lowered the level of cholesterol in the serum, liver, and aorta, but it elevated body cholesterol levels. Carragheenan was inconsistent in lowering serum cholesterol levels and tended to increase liver and carcass cholesterol levels. Feeding of wheat bran or cellulose had no significant effect on either serum or liver cholesterol levels. The study indicates that the effect of dietary fiber is dependent on the composition of the diet. Furthermore, while some fibers such as pectin may exhibit a hypocholesterolemic effect in rats, other fibers such as gum arabic and agar may actually elevate serum or tissue cholesterol levels.

BRAIN LIPIDS FROM THE PORPOISE (DELPHINUS DELPHIS). PHOSPHOGLYCERIDES RICH IN ISOVALERIC ACID AND LONG-CHAIN ISO-ACIDS. U. Varanasi and D.C. Malins (Seattle Univ., Seattle, Wash. 98122) *Biochim. Biophys. Acta* **409**, 304–10 (1975). The whole brain of a porpoise *(Delphinus delphis)* comprised 23.1 wt% of phospholipids on a dry weight basis. Ethanolamine phosphoglycerides (36.6 wt%), choline phosphoglycerides (27.3 wt%), and serine phosphoglycerides (16.9 wt%) were the major components of the phospholipids. A unique feature of the data was the occurrence of large amounts of isovaleric acid in choline phosphoglycerides (28.1 mol%) and ethanolamine phosphoglycerides (6.4 mol%), together with 11.6 and 15.2 mol% of long-chain (C_{15}-C_{16}) isoacids, respectively. Interestingly, serine phosphoglycerides did not contain detectable amounts of isovaleric acid although trace amounts of long-chain iso-acids were present. No previous evidence exists to show that appreciable amounts of a short-chain acid can be accommodated in animal phospholipids. The occurrence of isovaleric acid in the principal phosphoglycerides of the porpoise brain elicits an interest in how such an anomalous structure is accommodated in the lipid bilayers of the neural membranes.

EXCHANGE OF 3-*O*-METHYLGLUCOSE IN ISOLATED FAT CELLS. CONCENTRATION DEPENDENCE AND EFFECT OF INSULIN. J. Vinten, J. Gliemann and K. Osterlind (Inst. of Med. Physiol. C, Raadmandsgade 71, 2200 Copenhagen N, Denmark) *J. Biol. Chem.* **251**, 794–800 (1976). 3-*O*-Methylglucose was used to study the insulin action on the sugar transport in white fat cells. The experiments comprised determinations of the 3-*O*-methylglucose space at stationary distribution, of the rate constants for 3-*O*-methylglucose equilibrium exchange under various conditions, and of the 3-*O*-methylglucose inhibition of the lipogenesis from glucose. The inhibition constant estimated from such experiments was about 5 mM both in the absence and the presence of insulin, and the insulin-induced increase in the rate of glucose incorporation was similar to the increase in the rate of the 3-*O*-methylglucose exchange process. It is concluded that exchange of 3-*O*-methylglucose proceeds via a mechanism which shows stereospecificity and saturability and that insulin acts by increasing the maximal transport capacity without changing the half-saturation constant.

EFFECTIVENESS OF VARIOUS UNSATURATED FATTY ACIDS IN SUPPORTING GROWTH AND RESPIRATION IN SACCHAROMYCES CEREVISIAE. R.W. Walenga and W.E.M. Lands (Dept. of Biol. Chem., Univ. of Mich., Ann Arbor, Mich. 48104) *J. Biol. Chem.* **250**, 9121–9 (1975). The unsaturated fatty acid auxotroph of *Saccharomyces cerevisiae*, KD115, was used to determine the efficiency of various unsaturated fatty acids in supporting growth. The efficiency, as the number of cells produced per fmol of unsaturated fatty acid, ranged from zero for a number of acids to over 26 cells per fmol of eicosapentaenoic acid. Efficiencies tended to be higher for acids with fewer carbons or more double bonds. In a series of positional isomers of *cis*-octadecenoic acid, the Δ9 isomer had the greatest efficiency (12 cells per fmol). Exogenous oleic acid was taken up and incorporated into cellular lipid early in the growth of the cells. Further growth proceeded with a decrease in the relative content of oleate in lipids until a minimum value of 9 mol % was reached at stationary phase. The initial concentration of supplemental acid did not affect the final mole % value. Other unsaturated fatty acids reached limiting values of mole % in phospholipid at stationary phase that were characteristic for the acid used.

REQUIREMENTS FOR UNSATURATED FATTY ACIDS FOR THE INDUCTION OF RESPIRATION IN SACCHAROMYCES CEREVISIAE. R.W. Walenga and W.E.M. Lands (Dept. of Biol. Chem., Univ. of Mich., Ann Arbor, Mich. 48104) *J. Biol. Chem.* **250**, 9130–6 (1975). Unsaturated fatty acids provided during the release from glucose repression were shown to be essential for derepression of respiration in an unsaturated fatty acid auxotroph of *Saccharomyces cerevisiae* (KD115). Cells derepressed in the presence of oleic acid contained three to six times as much cytochrome per cell as those derepressed in the absence of unsaturated fatty acid or those derepressed with eicosaenoic acid. The Δ9 isomer was the most efficient of the *cis*-octadecenoic acid isomers in supporting that increase, and

eicosaenoic acid supported an increase at only 15% the rate observed with oleic acid. Derepression, even in the presence of oleic acid, proceeeded only after a lag of 3 hours. When glucose was removed prior to the addition of oleate, the lag was reduced by the time of the preincubation with glycerol. Derepression in the absence of oleate for 3 hours lessened the inhibition of respiration induction by ethidium bromide. This result indicates that the transcription of mitochondrial DNA necessary for the induction of respiration may have occurred in the absence of added unsaturated fatty acid, but that some subsequent event required added esterified unsaturated fatty acid.

CHANGES IN PLASMA TRIGLYCERIDE FATTY ACIDS DURING LACTATION. R.W. Wallenius and R.E. Whitehurch (Dept. of Animal Sci., Wash. St. Univ., Pullman, Wash. 99163) *J. Dairy Sci.* 59, 85–7 (1976). Total blood plasma lipid and plasma triglyceride fatty acids were analyzed at an average of 33, 89, and 139 days of lactation (ranges 20 to 57, 52 to 129, and 122 to 157 days for periods I, II, and III) for 35 Holstein cows in their second or later lactation. Average milk production in the test periods was 35.7, 30.0, and 25.5 kg/day. Lipid analysis was part of a study comparing methionine hydroxy analog or sulfur for lactating cows with effects of treatment and time separated statistically. Cows fed methionine analog had a lower percent palmitate in the triglyceride fatty acid, but there was no other treatment effect. There were significant changes with time in percent total lipid and triglyceride fatty acid. Total lipid averaged 424, 526, and 529 mg/dl. Average percents of measured triglyceride fatty acid and differences with stage of lactation were: myristic, 2.96; palmitic, 27.52, I > II or III; palmitoleic, 2.83, I > II or III; stearic, 38.58, I < II < III; oleic, 20.75, I > II or III; and linoleic, 4.59.

EFFECTS OF BILE SALTS ON LACTOSYLCERAMIDE β-GALACTOSIDASE ACTIVITES IN HUMAN BRAIN, LIVER AND CULTURED SKIN FIBROBLASTS. D.A. Wenger, M. Sattler and C. Clark (B.F. Stolinsky Res. Lab., Depts. of Pediatrics and Neurol., Univ. Colo. Med. Ctr., Denver, Colo. 80220) *Biochim. Biophys. Acta* 409, 297–303 (1975). The effect of bile salts on the hydrolysis of lactosylceramide by human β-galactosidases in vitro was studied using cultured skin fibroblasts, liver and brain tissue. The evidence for two distinct enzymes than can catalyze the hydrolysis of lactosylceramide was observed when the bile salt was changed from pure sodium taurocholate to either crude taurocholate, or pure glycodeoxycholate, taurodeoxycholate or taurochenodeoxycholate. Tissues from patients with Krabbe's disease were found to be deficient in lactosylceramide β-galactosidase activity (lactosylceramidase I) when pure taurocholate was used in the assay. When crude taurocholate was used in the assay, the Krabbe patients appeared to have normal activity for this enzyme. Therefore, lactosylceramidase I is stimulated only by pure taurocholate, but lactosylceramidase II is stimulated by crude taurocholate or pure glycodeoxycholate, taurodeoxycholate and taurochenodeoxycholate. The use of pure bile salts to assay lactosylceramidase I and II will result in better reproducibility for these enzyme activities between laboratories.

INHIBITION OF CATION COTRANSPORT BY CHOLESTEROL ENRICH-

MENT OF HUMAN RED CELL MEMBRANES. J.S. Wiley and R.A. Cooper (Hematol.-Oncol. Sec., Dept. of Med., Hospital of the Univ. of Penn., Philadelphia, Pa. 19104) *Biochim. Biophys. Acta* 413, 425–31 (1975). Human red cells were enriched with cholesterol by incubation with lipid dispersions having a high cholesterol:phospholipid mol ratio and the kinetics of the furosemide-sensitive cotransport system for Na^+ and K^+ were measured. Influxes of both K^+ and Na^+ through this system were inhibited by 70 and 76% in cholesterol-rich cells (cholesterol:phospholipid mol ratio 1.80) and the K_m of the furosemide-sensitive flux components for both K^+ and Na^+ was decreased. Effluxes of both K^+ and Na^+ are inhibited by furosemide and the magnitudes of these furosemide-sensitive components are markedly decreased in cholesterol-rich cells. The inhibitory effect of cholesterol enrichment on this carrier-mediated transport of cations suggests that cholesterol may either alter the position of the carrier or retard its movement within a more viscous membrane micro-environment.

HEPATOMA, HOST LIVER, AND NORMAL RAT LIVER LIPIDS: DISTRIBUTION OF ISOMERIC MONOENE FATTY ACIDS IN INDIVIDUAL LIPID CLASSES. R. Wood and R.D. Wiegand (Div. of Gastroenterology, Dept. of Med. and Biochem., Univ. of Missouri Schl. of Med., Columbia, Missouri 65201) *Lipids* 10, 746–9 (1975). Monoenoic acid fractions were isolated from phosphatidylcholine, phosphatidylethanolamine, triglycerides, and cholesteryl esters of hepatoma 7288CTC, host liver, and normal liver from animals maintained on chow and fat free diets. Hexadecenoate (16:1), octadecenoate (18:1), and eicosenoate (20:1) fractions were analyzed quantitatively for their isomeric composition. The fat free diet had little or no effect relative to the chow diet on the isomeric composition of 16:1, 18:1, and 20:1 from any lipid class in either hepatoma, host liver, or normal liver. Host livers were reduced in palmitoleic acid, and oleic and eicos-11-enoic acids were increased relative to normal liver.

RELATION OF KETOSIS TO METABOLIC CHANGES INDUCED BY ACUTE MEDIUM-CHAIN TRIGLYCERIDE FEEDING IN RATS. Yu-Yan Yeh and Paulus Zee (Lab. of Nutr. and Metab., St. Jude Children's Res. Hosp., Memphis, Tenn. 38101) *J. Nutr.* 106, 58–67 (1976). Medium-chain triglycerides (MCT) induce ketosis in several mammalian species including man. To clarify the regulation of this metabolic alteration, we fed rats either MCT or long-chain triglyceride (corn oil) and then attempted to correlate ketosis with changes in concentrations of selected metabolites in plasma and the synthetic and oxidative capacities of the liver. A marked increase of long-chain fatty acids in plasma was observed in rats fed corn oil but not in rats fed MCT. These results support the concept that ketosis induced by MCT stems from rapid oxidation of medium-chain fatty acids. Hyperinsulinemia, hypoglycemia and depressed lipogenesis resulting from MCT feeding appear to potentiate but not initiate ketosis.

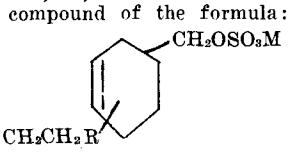
STIMULATION OF CHOLESTEROL ESTER EXCHANGE BY LIPOPROTEIN-FREE RABBIT PLASMA. D.B. Zilversmit, L.B. Hughes and J. Balmer (Div. of Nutr. Sci., and Sect. of Biochem., Molec. and Cell Biol., Div. of Biol. Sci., Cornell Univ., Ithaca, N.Y. 14853) *Biochim. Biophys. Acta* 409, 393–8 (1975). A fraction in normal and hypercholesterolemic rabbit plasma of density greater than 1.25 stimulates the exchange of cholesterol esters between very low density and low density lipoproteins from hypercholesterolemic rabbit plasma. The exchange does not result from lecithin:cholesterol acyltransferase activity. The active factor appears to be a high molecular weight globulin with an isoelectric point of 5.2.

• Drying Oils and Paints

NOVEL AQUEOUS COATING COMPOSITION. T. Go, T. Suzuki, and M. Inoue (Nippon Zeon Co.). *U.S. 3,935,140.* The composition comprises a water soluble or dispersible material prepared by addition reacting a mixture containing (1) 90–50 parts of a natural drying oil and (2) 10–50 parts of a liquid copolymer having an average molecular weight of 500–5,000 and containing 90–50% of 1,3-pentadiene polymerization units and 10–50% of 1,3-butadiene polymerization units. The liquid copolymer is obtained by polymerizing a corresponding monomeric mixture of 1,3-pentadiene and 1,3-butadiene in the presence of a Friedal-Crafts type catalyst with at least one α,β-unsaturated compound. The addition product is then neutralized to make it soluble or dispersible in water.

• Detergents

BIODEGRADABLE DETERGENTS. H.S. Bloch (Universal Oil Products Co.). *U.S. 3,931,272.* There is claimed a biodegradable detergent compound of the formula:



M is an alkali metal and R is an alkyl group of 1–14 carbon atoms.

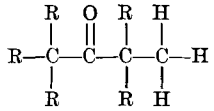
DISHWASHING COMPOSITIONS. H.-J. Lehmann, M. Bischoff, H. Baumann, and P. Krings (Henkel & Cie). *U.S. 3,936,317.* An anionic surface active composition for manually washing and cleansing dishes consists of 20–90% of a first component selected from the group consisting of alkyl sulfonates, olefin sulfonates, α-sulfofatty acid alkyl esters, dialkyl sulfosuccinic acid esters, alkylbenzene sulfonates, alkyl sulfates, and mixtures of these; and 10–80% of a second component selected from the group consisting of monoglycol ether monosulfate of a 1,2-alkanediol having 10–22 carbon atoms and a polyglycol ether monosulfate of a 1,2-alkanediol having 10–22 carbon atoms. The sulfation product contains 0.7–1.1 moles of sulfuric acid ester per mole of ether diol and is an adduct of no more than 5 mols of an alkylene oxide having 2–3 carbon atoms on the diol. The two components are present in the form of their alkali metal, ammonium, lower alkanolamine, and lower alkylamine salts.

SILICATES IN LIQUID LAUNDRY DETERGENT. T.C. Campbell (Philadelphia Quartz Co., Lafayette Hill, Pa.). *Soap/Cosmetics/Chemical Specialties* 52(1), 31–9, 60, 127 (January, 1976). In an attempt to provide an alternative approach to heavy-duty liquid detergents built with phosphates or citrates and nonbuilt liquids containing mixed surfactant systems, formulations were developed using various liquid sodium silicates in combination with different types of surfactants and hydrotropes. Detergency performance on soiled swatches of cotton and Dacron/cotton was measured in a "Terg-O-Tometer." Other characteristics determined were oily soil removal effectiveness, anti-redeposition performance, effect of concentration on detergency, and cold water performance. On a cost of raw materials per wash load basis, the silicate-based formulas were lower than commercial liquid products due to lower surfactant use and less costly builder. The results of the study indicate that silicate-built liquid laundry formulations can be considered as reasonable alternates to phosphate-built or citrate built formulations. Under these test conditions, the silicate-based formulations showed performance advantages over the surfactant-built products. A silicate-built liquid detergent system providing good performance over a wide range of wash conditions is described.

DETERGENT-COMPATIBLE FABRIC SOFTENING AND ANTISTATIC COMPOSITIONS. R.J. Baskerville, Jr. and F.G. Schiro (Procter & Gamble). *U.S. 3,936,537.* A detergent composition adapted to prevent static buildup on textiles laundered with it consists of 50–90% of a surfactant and 10–50% of a particulate combination comprising an intimate mixture of 80–20% of quaternary ammonium compounds and 20–80% of a dispersion inhibitor selected from the group consisting of paraffinic waxes, mono- and polyhydric alcohols, aliphatic carboxylic acids and esters, and alkylene oxide condensates of any of these compounds. All of the particles are in the size range 10–500 μ. The product has a water solubility of 50 ppm maximum at 25 C and a softening point in the range 100–200 F.

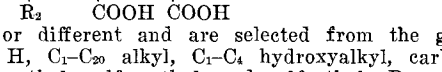
POLYMERIC FILM DRYER-ADDED FABRIC SOFTENING COMPOSITIONS. S.K. Marshall, T.G. Gerding, and E.M. King (Calgon Consumer Products Co.). *U.S. 3,936,538.* A fabric softening composition consists of a uniform, self-supporting preformed film comprising at least one film-forming polymer having a molecular weight of at least 100,000, a fabric softener, and a waxy surfactant.

DETERGENT BUILDERS. H.A. Bruson and H. Gould (Olin Corp.). *U.S. 3,936,498.* A detergent builder composition has the formula



R is —CH_2—CH_2—COOX. X is hydrogen, alkali metal, or ammonium.

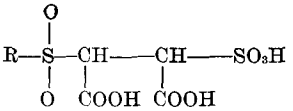
α-AMINO-β-SULFOSUCCINATES. V. Lamberti (Lever Bros. Co.). *U.S. 3,936,448.* An α-substituted-β-sulfosuccinic acid has the formula



be the same or different and are selected from the group consisting of H, C_1–C_{20} alkyl, C_1–C_4 hydroxyalkyl, carboxymethyl, carboxyethyl, sulfomethyl, and sulfoethyl. R_1 and R_2 may not at the same time be H. Various alkali metal, ammonium, and substituted ammonium salts of the acid are also described.

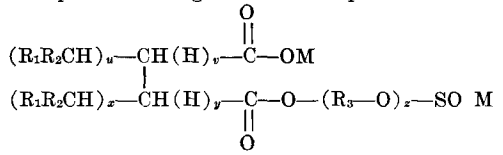
DISHWASHING COMPOSITIONS. D.S. Corliss and J.F. Pacheco (FMC Corp.). *U.S. 3,936,386.* An agglomerated dishwashing detergent composition contains 0.5–10% sodium dichloroisocyanurate dihydrate, 25–60% of a polyphosphate having an Na_2O or K_2O to P_2O_5 ratio of 1:1 to 2:1, 0–60% sodium carbonate, 10–15% of a sodium silicate having a SiO_2 to Na_2O ratio of 2.40 to 3.22, 1–10% low foaming chlorine-compatible nonionic surfactant, and 5–20% water.

SULFOSUCCINATE DERIVATIVES AS DETERGENT BUILDERS. V. Lamberti (Lever Bros. Co.). *U.S. 3,935,206.* The builder is an α-alkylsulfonyl-β-sulfosuccinic acid having the general formula



or the alkali metal, ammonium, monoethanolammonium, diethanolammonium, trimethylammonium, tetramethylammonium, morpholinium, N-methylmonoethanolammonium, and N-ethylmonoethanolammonium salt thereof. R is an alkyl containing 1–30 carbon atoms.

HIGH SUDSING PHOSPHATE-FREE DETERGENT COMPOSITION. S.H. Sharman (Chevron Research Co.). *U.S. 3,935,131.* The composition comprises a detergent active component of the formula



R_1 and R_2 are linear aliphatic groups of 3–19 carbon atoms; R_3 is alkylene of 2–4 carbon atoms; *u*, *v*, *x*, and *y* are 0 or 1; *z* is an integer from 1 to 4; and M is H or a water soluble salt-forming cation. The foam enhancing component is a straight chain primary alcohol of 11 to 14 carbon atoms.

DETERGENT COMPOSITION FOR CLEANING BATHTUBS. S. Hirano, J. Tsumura, I. Imaseki and Y. Kawasaki (Kabushiki Kaisha Tsumura Juntendo). *U.S. 3,935,130.* The composition consists of (1) 100 parts of a detergent base comprising 40–85% of an alkylaryl sulfonate, 10–40% of a polyoxyethylene alkylaryl ether, and 5–20% of a cyclic imidinium compound; (2) 9–30 parts of a diethylene glycol monoalkyl ether; (3) 2–15 parts of an ethanolamine; and (4) sufficient water to provide an aqueous solution of components (1) through (3).

LIQUID CLEANING COMPOSITIONS. W.J. Jabalee. *U.S. 3,935,129.* An aqueous detergent composition comprises 0–65 parts of an alkali metal silicate and a combination of an anionic organic detergent, a nonionic organic detergent, triethanolamine, glycerine, and urea, each in certain proportions to the silicate.

COMBINATION DETERGENT BUILDER. T.J. Hau and S.D. Cherney (Procter & Gamble). *U.S. 3,939,100.* The detergent additive comprises an alkali metal pyrophosphate and an alkaline earth metal pyrophosphate having a mean particle diameter of less than 25 microns. The ratio of the alkali metal pyrophosphate to the other pyrophosphate ranges from 60:1 to 1:8. A detergent composition comprises 5–60% alkali metal pyrophosphate, 1–50% alkaline metal pyrophosphate, and 2–40% organic detergent.

THE SYNTHESIS OF A HOMOLOGOUS SERIES OF PURE A-LAUROYL-W-HYDROXY POLYOXYETHYLENES. W. Gerhardt and H-R. Holzbauer. *Tenside Deterg.* 12(6), 313–5 (1975). In continuation of work on defined polyethylene oxide adducts, the preparation of a-lauroyl-w-hydroxy polyoxyethylenes of the homologous polyethylene oxide series of ethylene glycol to a hydro-w-hydroxy-octa (oxyethylene) with yields of about 95%. The structure and purity are determined by thin-layer chromatography and infrared spectroscopy.

RESEARCH ON THE BIODEGRADABILITY AND FISH TOXICITY OF TWO ORGANIC COMPLEX FORMERS BASED ON PHOSPHONIC ACID (ATMP AND HEDP). L. Huber. *Tenside Deterg.* 12(6), 316–22 (1975). Tests were carried out on the biodegradability and inhibiting behavior as well as the fish toxicity of two organic complex formers based on phosphonic acid (aminotrimethylenephosphonic acid and hydroxyethane-1,1-diphosphonic acid). Advantages and disadvantages of these products when used in cooling and process water circuits, as well as possibly detergents and cleaners, and the resulting influences on waterways, rivers, lakes, etc. are to be appraised.

SOME ASPECTS ON THE DETERMINATION OF HLB OF SURFACE-ACTIVE AGENTS. A. Olano and I. Martinez. *Tenside Deterg.* 12(6), 334–6 (1975). Theoretical HLB values, calculated according to Davies and Griffin's formulae have been critically examined by comparing them with both retention values in GLC and water number when a group of highly pure fatty esters of polyhydric alcohols were tested.

OIL HERDERS—A NEW ASSISTANT TO DEOILERS FROM WATER SURFACES. H. Hellmann, (Koblenz). *Tenside Deterg.* 12(6), 330–34 (1975). The tendency of mineral oils at a density below 1.0 to spread on water surfaces inhibited in some cases the rational use of oil adsorbants and collectors. New chemicals (e.g. Shell Oil Herder) cause a contraction of already wide spread oil films at a thickness of 0.5 to 5 millimeters. The possible practical importance and harmful effects of water biocoenoses are discussed. ■