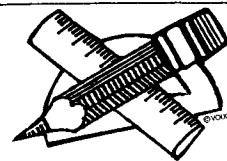


# Abstracts



EDITOR: S. KORITALA • ABSTRACTORS: J.C. Harris, M.G. Kokatnur, F.A. Kummerow, G. List, B. Matijasevic, K.D. Mukherjee, D.B.S. Min, R.A. Reiners, and P.Y. Vigneron

## • Drying Oils and Paints

MODERN ALKYD AND EPOXY RESINS. THEIR CURING BY RADIATION AND THEIR SUITABILITY AS BINDERS FOR OFFSET PRINTING INKS. B. Reisch and A. Rosenberg (Tech. Univ. Munchen). *Farbe+Lack* 84(4), 220-5 (1978). Curability by radiation and mechanical properties of the cured films of two kinds of binder systems were investigated. An acrylated castor oil modified alkyd resin, undiluted and mixed with different reactive dilutants and acrylated epoxy resins modified with stearic acid, 12-hydroxyoctadecanoic acid and aleuritic acid were exposed to electron beams. Curability of the binders was estimated by measurements of the gel content and the residual content of acryl-groups in the cured films.

UTILISING EMULSIFICATION IN SYNTHESIS OF DIHYDRO-EXO-DICYCLOPENTADIENYL ETHERS AND ESTERS. A. Hatano and Y. Iwase. *Bull. Chem. Soc. Jap.* 58(8), 2203-4 (1977). Alcohols and carboxylic acids were subjected to an addition reaction with dicyclopentadiene, using dodecylbenzenesulphonic acid as both emulsifying agent and acid catalyst. Dihydro-exo-dicyclopentadienyl ethers and esters were synthesised in good yields and found to be free from undesirable side reactions. They are useful as synthetic drying oils and plasticisers. (World Surface Coatings Abs. No. 429)

PREPARATION OF POLYBASIC CARBOXYLIC ACIDS. Unilever-Emery N.V. *Brit.* 1,488,098. The process, which yields products containing a significantly increased proportion of polybasic acids as opposed to dimers and trimers, and which may be used to prepare alkyd resins, epoxy esters and urethane resins for surface coatings, comprises heating a polymerised fatty acid containing 50 or more wt. % dimer acid and less than 5% monobasic acid at 50-190 deg. C. in the presence of 1-35% free-radical initiator. Especially suitable starting materials are the thermal or clay catalysed dimerisation products of oleic acid, linoleic acid and linolenic acid, or their mixtures. (World Surface Coatings Abs. No. 431)

DIMERIC HEPTADIENOIC ESTER DRYING OILS. Schering AG. *Ger.* 2,615,284, addn. to 2,517,376. Dimeric heptadienoic esters, which are excellent drying oils for use in alkyds, etc. are obtained by dimerisation with either (1) Group IA alkoxy, hydrides, amides or trityls at -20 to 120 deg. C, or (2) Group IIA alkoxy, amides or hydrides at 20 to 180 deg. C, e.g. barium ethoxide. (World Surface Coatings Abs. No. 431)

NEW DEVELOPMENTS IN TRIGLYCERIDE CHEMISTRY FOR PLASTICS AND COATINGS. L.H. Princen. *Proc. 3rd Internat. Conf. in Organic Coatings & Technology, Athens 1977*, 342-54. New fatty acid chemistry, leading to dibasic fatty acids, linseed vinyl ethers, epoxidised fatty acids, polyesteramides, cyclic fatty acids and formyl fatty acids; new oilseed crop research, and fats and oils availability and economics, are reviewed. (World Surface Coatings Abs. No. 431)

NEED FOR RENEWABLE COATINGS RAW MATERIALS AND WHAT COULD BE AVAILABLE TODAY. L.H. Princen. *J. Coatings Tech.* 49(635), 88-93 (1977). Prices of some agricultural and petroleum based chemicals in the U.S.A. are compared. Developments in fatty oil chemistry and new oilseed crops should increase the use of vegetable oils as a primary source of paint raw materials. (World Surface Coatings Abs. No. 431)

## • Fats and Oils

ENVIRONMENTAL PROBLEMS IN FATS AND OILS INDUSTRY. V. THE WASTE WATERS FROM RENDERING OF ANIMAL FATS. A. Prevot *Rev. Fr. Corps Gras* 25(3), 111-4 (1978). The waste waters from continuous rendering of animal fats and oils have a variable composition (dry extract: 2-3%); they contain fats and proteins in a ratio about  $\frac{1}{3}$  and  $\frac{2}{3}$ . The

amounts of degradation products are the more important as the decantation time is longer. Diglycerides, monoglycerides and phospholipids average contents in fats are high and lead to very stable emulsions. The aminoacid composition of proteins is analogous to that of greaves. An improvement of fats and proteins by continuous concentration is proposed.

ENVIRONMENTAL PROBLEMS IN FATS AND OILS INDUSTRY. VI. EXAMPLE OF INDUSTRIAL REALIZATION IN A RENDERING PLANT. P. Droste *Rev. Fr. Corps Gras* 25(3), 115-6 (1978). The studied plant has two fields: 1) Animal fats collecting and rendering; 2) Refining and packing of edible products. Seven sources of pollution are given. A whole reorganizing of water management in the plant has been carried out: 1) Separation of various effluents; 2) Treatment. The oxydisable products have been decreased by 94% and the MES by 96%.

ENVIRONMENTAL PROBLEMS IN FATS AND OILS INDUSTRY. VII. TREATMENT OF INDUSTRIAL WASTE WATERS IN CONTINUOUS RENDERING-PLANT. S. Menard *Rev. Fr. Corps Gras* 25(3), 117-8 (1978). The treatment of odours from dehydrations by traditional process of chemical washings after condensation or combustion in existing generators is a good solution. Biological treatments of effluents require primary efficient treatments to lead the fat content to a degree compatible with bacteria activity. The technological evolution must lead to a diminution of the effluent amounts permitting to avoid the biological treatments.

ENVIRONMENTAL PROBLEMS IN FATS AND OILS INDUSTRY. VIII. EVALUATION OF NUISANCES OWED TO ODOURS:OLFACTOMETRY AND ITS APPLICATIONS. M.F. Thal *Rev. Fr. Corps Gras* 25(3), 119-22 (1978). The olfactometry requires two types of measure: measure of the concentration, in "threshold" unit (or measure of the odorous gas to level of perception threshold); measure of the odorous intensity (by comparison with a reference scale). The olfactometry permits to select the best equipment and to optimize the functioning of a purifier.

STUDY OF HEATED OILS. IV. BIOCHEMICAL, NUTRITIONAL AND TOXICOLOGICAL ASPECTS. J. Causeret, B. Potteau and A. Grangirard. *Rev. Fr. Corps Gras* 25(4), 175-81 (1978). Oils containing linolenic acid, linseed oil or rapeseed oil, heated at 275 °C in azote and at 200 °C or 240 °C in air have been studied. Physiopathological effects have been determined on young rats, or after direct ingestion of heated oils, or indirectly after ingestion by the gestating and lactating mothers. Performances of reproduction have been also evaluated.

THERMAL BEHAVIOUR OF FATS AND OILS. I. PALM OIL AND DERIVATIVES. R. Perron and M. Broncy. *Rev. Fr. Corps Gras* 25(4), 165-73 (1978). In the scope of a general study on the relations between thermal behaviour and glycerides composition of fats and oils, we have first examined by pulsed NMR and DTA a refined palm oil and products derived by inter-esterification, fractionation and hydrogenation. A methodology was applied in order to make comparable the results obtained by these two methods.

EVALUATION OF THE END OF FATS AND OILS GLYCEROLYSIS. E. Sambuc and G. Reymond. *Rev. Fr. Corps Gras* 25(4), 187-9 (1978). The end of oils glycerolysis can be controlled by a simple test of miscibility, whatever be the glycerol/triglycerides relation. The nature of solvent depends on glycerol/triglycerides relation, but is easily determined.

DETERMINATION OF MELTING CURVES OF FATS BY LOW RESOLUTION NUCLEAR MAGNETIC RESONANCE. C. Desarzens, A. Besson and J.-P. Bouldoires. *Rev. Fr. Corps Gras* 25(4), 183-6 (1978). Calorimetry and low resolution nuclear magnetic resonance are two techniques used to determine the amount of solid and/or liquid fat. We compare the results obtained on several samples of cocoa butter and vegetable fats. Each sample is in a definite crystalline form to prevent the influence of thermal history. Finally we show the interest for

measuring the Solid Fat Index by pulsed nuclear magnetic resonance.

CATALYTIC HYDROGENATION OF FATS, OILS, AND FATTY ACIDS. P. Reimann, *Oleagineux* 33(2), 87-90 (1978). The hydrogenation of triglycerides and of fatty acids may be satisfactorily carried out in an installation of the reactor loop type comprising the following principal elements: autoclave, circulation pump, heat changer, reaction head. This process makes it possible to obtain results which are interesting from the point of view of reaction time, selectivity, and consumption of catalyser. The procedure is as well adapted to the treatment of vegetable oils (soy, rapeseed, sunflower, peanut, palm, copra, etc.) as to that of animal fats (fish, tallow, etc.) and fatty acids obtained from these products.

AUTOXIDATION OF POLYUNSATURATED FATTY ACIDS. I. EFFECT OF OZONE ON AUTOXIDATION OF METHYL LINOLEATE AND METHYL LINOLENATE. W.A. Pryor, J.P. Stanley, E. Blair and G.B. Cullen. *Archives Environmental Health* 1976, Jul/Aug, 201-10. Samples of polyunsaturated fatty esters were exposed to ozone in a flow system and the formation of peroxides, conjugated dienes and thiobarbituric acid (TBA)-reactive material was followed as a function of time. The effect of ozone is to shorten the induction period normally observed in autoxidation studies, but the ozone at the concentrations used here (0-1.5 ppm) appears to have no effect on the rates of product formation after the induction period. During the induction period, increasing ozone concentrations give rise to substantially increased rates of peroxide (or materials which titrate like peroxide) formation, a slightly increased rate of conjugated diene formation, and no significant increase in the rate of production of TBA-reactive material. (World Surface Coatings Abs. No. 429)

CYCLOPROPENE FATTY ACIDS OF SELECTED SEED OILS FROM BOMBACACEAE, MALVACEAE, AND STERCULIACEAE. M.B. Bohannon and R. Kleiman (North Regional Res. Center, Agr. Res. Service, U.S. Dept. of Agr., Peoria, IL) *Lipids* 13, 270-3 (1978). Fatty acid compositions of seed oils from three species of Bombacaceae, eleven from Malvaceae, and six from Sterculiaceae were determined. Each of the seed oils contains varying amounts of both malvalic and sterculic acids accompanied by one or both of the corresponding cyclopropane fatty acids. In addition, the seed oil of *Pachira aquatica* Aubl. (Bombacaceae) contains 12.8%  $\alpha$ -hydroxy-sterculic acid.

FORMATION OF TRANS-12, 13-EPOXY-9-HYDROPEROXY-TRANS-10-OCTADECENOIC ACID FROM 13-L-HYDROPEROXY-CIS-9, TRANS-11, OCTADECADIENOIC ACID CATALYZED BY EITHER A SOYBEAN EXTRACT OR CYSTEINE-FeCl<sub>3</sub>. H.W. Gardner, D. Weisleder, and R. Kleiman (Northern Regional Res. Center, Agr. Res. Service, U.S. Dept. of Agr., Peoria, Ill.) *Lipids* 13, 246-52 (1978). A soybean extract or ethanolic solution of cysteine and ferric chloride catalyzed the conversion of 13-L-hydroperoxy-cis-9, trans-11-octadecadienoic acid to numerous products among which was trans-12,13-epoxy-9-hydroperoxy-trans-10-octadecenoic acid. When this fatty acid was treated further with the cysteine-ferric chloride solution, 9-hydroxy-12,13-epoxy-10-octadecenoic and 9-oxo-12,13-epoxy-10-octadecenoic acids were formed. Thus, trans-12,13-epoxy-9-hydroperoxy-trans-10-octadecenoic acid probably is an intermediate in the formation of the latter two compounds. Additionally, the erythro and threo isomers of trans-12,13-epoxy-11-hydroperoxy-cis-9-octadecenoic acid tentatively were identified as products.

NMR AND CALORIMETRIC STUDIES OF CHANGES IN PHASE TRANSITION OF HEAD GROUP MODIFIED PHOSPHOLIPIDS. K. Gawrisch, K. Arnold, H.-J. Rieger, P. Kertscher and P. Nuhn (Dept. of Phys. and Biol. of the Karl Marx Univ., Leipzig, GDR) *Chem. Phys. Lipids* 20, 285-93 (1978). The <sup>13</sup>C- and <sup>31</sup>P-NMR spectra and DSC thermograms of unsaturated dispersions consisting of phospholipids of varying methylation stages of the propanolamine head group were investigated. Methylation of the head group was accompanied by a corresponding reduction in the phase transition temperatures. In the liquid crystalline state the <sup>31</sup>P-anisotropy of the chemical shift is about equal for all studied compounds, demonstrating that the motion of the phosphate group is not influenced by modifications of the propanolamine group.

FATTY ACIDS, PART 51. THE LONG-CHAIN OXO ACIDS (ARGEMONIC ACID) IN ARGEMONE MEXICANA SEED OIL. F.D. Gunstone, J.A. Holliday and C.M. Scrimgeour (Dept. of Chem., Univ. of St. Andrews, St. Andrews, Fife KY16, Scotland)

*Chem. Phys. Lipids* 20, 331-5 (1977). The crystalline material which separates from *Argemone mexicana* seed oil is a mixture of 9- and 11-oxo-octacosanoic and 11-oxotriacontanoic acids.

CHEMICAL COMPOSITION OF THE PREEN GLAND SECRETIONS FROM SOME CICONIFORM BIRDS. J. Jacob (Biochemisches Institut für Umweltcareinogene, Sicker Landstrasse 19, D-2070 Ahrensburg/Holst., West Germany) *Lipids* 13, 274-82 (1978). The preen waxes from four ciconiiformes species are shown to be ester waxes of very different composition. Three species possess monoester waxes with branched wax acids and alcohols. In one of these waxes, homologous series of ethyl-substituted constituents are observed. In contrast to this, the uropygial gland secretion of the marabou is a triglyceride mixture.

FLAVOR AND CHEMICAL EVALUATION OF POTATO CHIPS FRIED IN SUNFLOWER, COTTONSEED AND PALM OILS. J.A. Robertson, W.H. Morrison, B.G. Lyon and R.L. Shaw (Field Crops Utilization and Marketing Res. Lab., USDA, Richard B. Russell Agr. Res. Center, ARS, Athens, GA) *J. Food Sci.* 43, 420-3 (1978). Oil from sunflowers grown in southern U.S. was compared with cottonseed and palm oils for frying potato chips. Chips fried in each oil were evaluated by chemical and sensory methods at 2-wk intervals during 10 wk storage at 31°C. At each evaluation interval, sensory scores did not differ markedly among chips fried in the three oils. Flavor of chips from all oils decreased in quality during storage at the same rate and differed significantly between chips stored 0 and 10 wk. However, quality deterioration was not clearly defined as rancidity by the panel. In general, chemical and sensory analyses of the potato chips and of heated oils indicated no difference in the performance of the oils.

OCCURRENCE OF DOLICHOL IN HUMAN TISSUES. C.A. Rupar and K.K. Carroll (Dept. of Biochem., Univ. of Western Ontario, London, Ontario, Canada, N6A 5C1) *Lipids* 13, 291-3 (1978). The concentration of dolichol has been determined in various human tissues obtained at autopsy. The highest levels (~3000 µg/g wet weight) were found in testes. Liver and several other endocrine tissues contained about 1000 µg/g. Lower levels were present in other tissues examined. Only a small proportion of the total dolichol in human tissues was esterified to fatty acids.

A MONOLAYER ( $\pi$ ,  $\Delta V$ ), STUDY OF THE IONIC PROPERTIES OF ALANYLPHOSPHATIDYLGLYCEROL: EFFECTS OF pH AND IONS. M.M. Sacre, E.M. El Mashak and J.F. Tocanne (Centre de Biochim. et de Genetique Cellulaires, 118, route de Narbonne, 31077 Toulouse, France) *Chem. Phys. Lipids* 20, 305-18 (1978). 1,2-Didodecanoyl-sn-glycero-3-phosphoryl-1'-3'-O-L-alanyl-sn-glycerol (Ala-PG) has been synthesized. Its ionic properties have been studied at the air-water interface through film compressions and surface potential measurements as a function of subphase pH and ionic content (NaCl, Na<sub>2</sub>MoO<sub>4</sub>, CaCl<sub>2</sub>). The existence of the polar head in a loop conformation allowing for interactions between phosphate and amino groups is suggested. Ionic properties of Ala-PG clearly depended on subphase ionic strength but no specific interactions between either cations or anions in the subphase and phosphate or amino groups in the film could be detected. Results are interpreted in terms of ion-pair interactions at the interface between these two groups, induced by increasing subphase ionic strength, is postulated. Since the molecular packing appeared independent of the subphase ionic content over a large domain of pH(3-8) and surface pressure ( $\pi > 5$  dyne/cm) and since the lipid can be considered as zwitterionic or slightly positive below pH 5-6, it is suggested that in the parent bacteria, grown under acidic conditions, Ala-PG could play a role in maintaining the membrane integrity and in preventing the passive diffusion of protons.

CHARACTERIZATION OF A PROSTAGLANDIN-LIKE METABOLITE OF LINOLENIC ACID PRODUCED BY A FLAXSEED EXTRACT. D.C. Zimmerman and P. Feng (Agr. Res. Service, U.S. Dept. of Agr., Dept. of Biochem., North Dakota State Univ., Fargo, ND) *Lipids* 13, 313-6 (1978). One of the products formed upon incubation of linolenic acid (cis 9, 12, 15-octadecatrienoic acid) with an extract of flaxseed acetone powder has been characterized as 8-12-(cis-pent-2-enyl)-3-oxo-cis-cyclopent-4-enyl octanoic acid. The cyclopentenone ring structure of this acid is analogous to that of the A-type prostaglandins produced in mammalian systems.

RELATIVE BOILING POINTS AND GLC RETENTION TIMES OF METHYL ESTERS OF ISOMERIC MONOETHYLENIC OCTADECENOIC

ACIDS, OF HEXADECANOIC AND HEXADECENOIC ACIDS, AND OF C<sub>18</sub> UNSATURATED ACIDS. R.G. Ackman and J.L. Sebedio (Department of Fisheries, Fisheries and Marine Service, Technology Branch, P.O. Box 550, Halifax Nova Scotia B3J 2S7 Canada) *J. Chromatogr. Sci.* 16, 204-7 (1978). An efficient large-scale distillation of the methyl esters of fatty acids from herring oil showed an initial enrichment in the *cis*-7-octadecenoate relative to the *cis*-9-octadecenoate. It is proposed that in the gas-liquid chromatographic analysis of longer-chain mono-ethylenic fatty acids at elevated temperatures the influence of the carboxyl group extends much farther along the chain than commonly thought promoting most isomer separations on polar liquid phases. A similar distillation with methyl esters of rapeseed oil fatty acids but in a different distillation system failed to show differences in volatility between *cis*-7-hexadecenoate and *cis*-9-hexadecenoate, but this distillation confirmed the volatility of C<sub>18</sub> polyunsaturated acids as triene > diene > monoene.

SINGLE-CELL PROTEINS FROM METHANOL: ELUCIDATION OF THE STRUCTURES OF THE UNSATURATED FATTY ACIDS. L. Cavalli, A. Landone, G. Cancellieri and A. Zotti (EUTEKO SpA, Centro Ricerche, Via Reali 4, 20037 Paderno Dugnano (Milan), Italy) *Analyst (London)* 103, 259-67 (1978). The unsaturated fatty acids contained in single-cell proteins prepared from Li 70 yeasts grown on methanol were studied in order to ascertain the position of unsaturation and the stereochemistry of the double bonds. The location of the double bonds was obtained by gas-chromatographic-mass-spectrometric analysis. The stereochemistry was deduced by nuclear magnetic resonance spectroscopy. The three most abundant unsaturated fatty acids display the following structure: 9*c*-C<sub>18:1</sub> (22.5%), 9*c*-C<sub>18:1</sub> (19.4%) and 9*c*,12*c*-C<sub>18:2</sub> (29.2%). All double bonds possess a *cis*-configuration; the position of the double bond is at C9-C10 for the monounsaturated acids and C9-C10 and C12-C13 for diunsaturated acids.

SIMPLE SEMI-AUTOMATED PROCEDURE FOR DETERMINING THE LIPOPHILIC NATURE OF ORGANIC COMPOUNDS. (Agrochemicals Division, CIBA-GEIGY Ltd., Basle, Switzerland) *Analyst (London)* 103, 233-7 (1978). This paper describes a semi-automated procedure for determination of the relative lipophilicities of organic compounds within a homologous series. The principle of the method is based on the ability of flexible polymer tubing to absorb highly lipophilic materials more readily than less lipophilic materials. Substituted phenylureas and sulphonamides were screened by the new procedure and the results compared with those obtained by more conventional approaches using linear regression analysis.

## • Biochemistry and Nutrition

ASYMMETRY OF THE PHOSPHOLIPID BILAYER OF RAT LIVER ENDOPLASMIC RETICULUM. J.A. Higgins and R.M.C. Dawson (Dept. of Biochem., Agr. Res. Council Inst. of Animal Physiol., Babraham, Cambridge CB2 4AT, U.K.) *Biochim. Biophys. Acta* 470, 342-56 (1977). The phospholipids of intact microsomal membranes were hydrolysed 50% by phospholipase C of *Clostridium welchii*, without loss of the secretory protein contents of the vesicle, which are therefore not permeable to the phospholipase. Phospholipids extracted from microsomes and dispersed by sonication were hydrolysed rapidly by phospholipase C-Cl. *welchii* with the exception of phosphatidylinositol. Phospholipase A<sub>2</sub> of bee venom and phospholipase of C of *Bacillus cereus* caused rapid loss of vesicle contents and complete hydrolysis of the membrane phospholipids, with the exception of sphingomyelin which is not hydrolysed by the former enzyme.

CAROTENE OXIDIZING FACTORS IN RED PEPPER FRUITS (CAPSICUM ANNUUM L.): PEROXIDASE ACTIVITY. F. Kanner, H. Mendel and P. Budowski (Div. of Food Tech., Agr. Res. Organization, Volcani Center, P.O.B. 6, Bet Dagan 50-100, Israel) *J. Food Sci.* 42, 1549-51 (1977). The activity of aqueous extracts from red pepper fruits (*capsicum annum* L.) toward the oxidation of carotene in presence of linoleate was measured by a colorimetric method. Highest activities were achieved by using, as extractant distilled water or Tris buffer at pH 7.0, whereas solubilization of carotene-bleaching factors by Triton X-100 or preparation of acetone powder from pepper fruit extracts resulted in losses in carotene-oxidizing activity. After dialysis, ammonium sulfate precipitation and chromatographic

purification on Ecteola and Sepharose 6-B a proteinous carotene-oxidizing fraction was obtained which exhibited properties similar to those of a peroxidase, i.e., high specific activity toward guaiacol oxidation in the presence of hydrogen peroxide, precipitation with ammonium sulfate between 60 and 95% saturation, change in spectral absorbance upon addition of cyanide, inhibition of carotene bleaching activity by KCN, and typical changes in carotene-bleaching activity with pH and protein concentration.

EFFECT OF ALFALFA SAPONINS ON INTESTINAL CHOLESTEROL ABSORPTION IN RATS. M.R. Malinow, P. McLaughlin, L. Papworth, C. Stafford, G.O. Kohler, A.L. Livingston, and P.R. Cheeke (Oregon Regional Primate Res. Center, 505 N.W. 185th Avenue, Beaverton, Oregon) *Am. J. Clin. Nutr.* 30, 2061-7 (1977). Five to 20 mg of saponins obtained from alfalfa tops or roots were introduced intragastrically in rats also receiving oral and intravenous ring-labeled cholesterol. The saponins were tested before and after partial acid hydrolysis. Absorption of cholesterol was determined by estimation of fecal sterols and by a dual isotope technique involving assay of plasma radioactivity. Alfalfa top saponins (nonhydrolyzed) reduced absorption of cholesterol. Acid hydrolysis of alfalfa top or root saponins enhanced their ability to inhibit cholesterol absorption.

IODINATED PHOSPHOLIPID AND THE IN VITRO IODINATION OF PROTEINS OF DOG THYROID GLAND. J.L. Rabinowitz and C.J. Tavares (Veterans Administration Hospital-Univ. of Pennsylvania, Philadelphia, PA) *Biochem. J.* 168, 155-60 (1977). Slices of dog thyroid gland were incubated with liposomes consisting of <sup>125</sup>I-labelled phosphatidylcholine (the iodine was covalently linked to unsaturated fatty acyl chains). The <sup>125</sup>I label of <sup>125</sup>I-labelled liposomes was incorporated into thyroid protein and/or thyroglobulin at a higher rate than was the <sup>131</sup>I label if either Na<sup>131</sup>I or <sup>131</sup>I<sub>2</sub>. The iodine was shown to be protein-bound by the co-migration of the labelled iodine with protein under conditions where free iodine, iodide and lipid-bound iodine were removed from protein. The uptake of iodine from the iodinated phospholipid was probably due to phospholipid exchange between the iodinated liposomes and the thyroid cell membrane, since (a) <sup>14</sup>C-labelled phospholipid was metabolized to <sup>14</sup>CO<sub>2</sub> and (b) many lipids in the tissue slice became <sup>14</sup>C-labelled. A very strong inhibition of iodine 'uptake' from Na<sup>131</sup>I, caused by thiosulphate, produced only a minor inhibition of the incorporation of <sup>125</sup>I from <sup>125</sup>I-labelled liposomes into thyroid protein and/or thyroglobulin. This implies that free iodide may not necessarily be formed from the iodinated phospholipids before their entrance or utilization in the cell.

IDENTIFICATION OF BOUND PYRUVATE ESSENTIAL FOR THE ACTIVITY OF PHOSPHATIDYL SERINE DECARBOXYLASE OF ESCHERICHIA COLI. M. Satre and E.P. Kennedy (Dept. of Biol. Chem., Harvard Med. Schl., Boston, Ms) *J. Biol. Chem.* 253, 479-83 (1978). Phosphatidylserine decarboxylase, an intrinsic membrane protein of *Escherichia coli*, catalyzes the decarboxylation of phosphatidylserine, the final step in the biosynthesis of phosphatidylethanolamine, the principal membrane lipid of this organism. The purified enzyme lacks the absorption spectrum characteristic of pyridoxal-containing enzymes, and it has now been found to contain bound pyruvate, the carbonyl function of which is essential for catalytic activity. The decarboxylase is inactivated by treatment with a number of reagents that attack carbonyl groups, including sodium borohydride. Reduction with tritiated borohydride leads to the introduction of stably bound radioactivity, which, after acid hydrolysis, has been identified as tritiated lactate by several chromatographic procedures and by treatment with lactate dehydrogenase.

CYCLOPROPANECARBOXYLIC ACID: CHAIN ELONGATION TO ω-CYCLOPROPYL FATTY ACIDS BY MAMMALS AND PLANTS. D.A. Schooley, G.B. Quistad and L.E. Staiger (Zoecon Corporation Res. Lab., 975 California Avenue, Palo Alto, California) *Science* 199, 544-5 (1978). Rats dosed orally with [carboxyl-<sup>14</sup>C]cyclopropanecarboxylic acid (or its hexadecyl ester) retain radioactivity in tissue as novel triacylglycerols. The most abundant <sup>14</sup>C-labeled metabolites were identified by gas-liquid chromatography-mass spectrometry as 13-cyclopropyltridecanoic and 15-cyclopropylpentadecanoic acids. Similar ω-cyclopropyl fatty acids are produced by beagle dogs and a lactating cow, as well as by apple and orange trees.

IRON DEFICIENCY HYPERLIPIDEMIA IN 18-DAY-OLD RAT PUPS: EFFECTS OF MILK LIPIDS, LIPOPROTEIN LIPASE, AND TRIGLYCERIDE

**SYNTHESES.** A.R. Sherman, H.A. Guthrie, I. Wolinsky and I.M. Zulak (College of Human Development, Pennsylvania State Univ., Univ. Park, Pa) *J. Nutr.* **108**, 152-62 (1978). Three levels of iron (5, 29, 307 ppm iron) were fed to rats from conception through the 18th day of lactation. Dams in the 5 ppm iron group and pups in the 5 and 29 ppm iron groups developed anemia characterized by lower hemoglobin and hematocrit values than control animals. Liver and spleen levels of iron in dams and pups in the 5 and 29 ppm iron groups were lower than in the 307 ppm iron groups. Milk iron was lower in the 5 ppm iron group had hyperlipidemia characterized by elevated serum triglycerides, cholesterol, and phospholipids. Milk lipids and post-heparin plasma lipoprotein lipase levels in pups did not differ among experimental groups. Triglycerides and CO<sub>2</sub> production from U-<sup>14</sup>C glucose were significantly greater in the iron-deficient pups than in control pups. Hyperlipidemia in 18-day-old iron-deficient rat pups appears to be related to increased endogenous production of triglycerides.

**EFFECT OF BRANCHED-CHAIN KETO-ACIDS AND DIETARY PROTEIN CONTENT ON THE ACTIVITY OF BRANCHED-CHAIN AMINO ACID TRANSFERASE IN RAT TISSUES.** W. Chan and M. Walser (Dept. of Pharmacology and Experimental Therapeutics and Dept. of Med., Johns Hopkins Univ. Schl. of Med., Baltimore, MD) *J. Nutr.* **108**, 40-5 (1978). Rats fed branched-chain keto-acids in place of branched-chain amino acids exhibited increased specific activity of branched-chain amino acid transferase (BATase) in muscle, intestine, brain and liver as compared with controls fed sufficient diet to achieve comparable weight gain. This increase was observed whether or not methionine and phenylalanine were also replaced by their N-free analogues. Kidney BATase was unaffected. Rats fed a protein-free diet exhibited higher BATase specific activity in kidney, brain, liver and intestine than rats fed diets containing 6% casein; but little change in specific activity in these organs was seen as casein intake was progressively increased from 6% to 18%. Muscle BATase specific activity was the same between 0 and 18% dietary casein. The results show that branched-chain ketoanalogues augment BATase in several tissues, including muscle. In contrast, varying casein intake from 6% to 18% had little effect, although protein-free feeding augments BATase in some organs.

**SERUM LIPID CHANGES IN MEDICAL STUDENTS.** B. Yates, W.D. Johnson, C. Wingo, and A. Lopez-s (Nutrition Section, Department of Medicine, Louisiana State University School of Medicine, New Orleans) *J. Am. Diet. Assoc.* **72**, 398 (1978). Changes in serum lipids and reasons for these changes were studied in 108 medical students over a four-year period. There was a statistically significant decrease in mean cholesterol level of the students, while the means for triglyceride levels and weight increased slightly. The change in serum lipids could be partially attributed to the students' change in diet and exercise habits. Results suggest that detection and education may contribute to changes in certain risk factors associated with coronary heart disease.

**FAMILY COOPERATION AND EFFECTIVENESS IN A CHOLESTEROL-LOWERING DIET.** J.C. Witsehi, M. Singer, M. Wu-Lee, and F. J. Stare (Department of Nutrition, Harvard School of Public Health, Boston) *J. Am. Diet. Assoc.* **72**, 384, (1978). An average reduction in serum cholesterol approximating 10 per cent was achieved in a short-term, family-centered study in which intakes of cholesterol and saturated fats were decreased and sunflower oil and margarine were added as the major sources of polyunsaturated fats. Dietary Achievement Scores demonstrated shifts in food consumption between baseline and diet periods. Changes were evident in all fat-containing food groups; meat was the least altered. A high degree of cooperation was evident in participating families, implying the possibilities for complete family cooperation in preventive or therapeutic dietary programs. Approximately three months after the end of the test period.

**CHOLESTEROLEMIA AND CARDIOVASCULAR ABNORMALITIES IN RATS CAUSED BY COPPER DEFICIENCY.** K.G.D. Allen and L.M. Klevay (Dept. of Biochem., Univ. of North Dakota, and United States Dept. of Agr., Agricultural Res. Service, Human Nutr. Lab., Grand Forks, N.D. *Atherosclerosis* **29**, 81-93 (1978). The association of copper with cardiovascular disease and a possible involvement of copper in the metabolism of cholesterol prompted the study on hypercholesterolemia mediated by copper deficiency. Copper deficient rats were

found to exhibit a highly significant cholesterolemia (P 0.001), and plasma cholesterol showed a significant correlation with hepatic copper concentration (P 0.03). Two copper deficient rats died with hemothorax. The hearts of copper deficient rats were hypertrophied with large areas of hemorrhage, inflammation and focal necrosis. Prominent sub-endocardial fibroplasia was evident in copper deficient animals. The myocardial arterioles of copper deficient rats were normal, however, aortas showed large areas of distorted and depleted elastic fibers. The results are discussed in terms of a possible role for copper in cholesterol metabolism, and in the pathogenesis of atherosclerosis.

**ANION DIFFUSION SELECTIVITY IN A PORE MODEL THE PHOSPHATIDYLCHOLINE-WATER LAMELLAR PHASE.** M. Benyoucef, J.L. Rigaud and C.M. Gary-Bobo (Laboratoire de Physiologie Cellulaire (CNRS-LA 219) College de France, Paris 5eme, France) *Biochim. Biophys. Acta* **507**, 219-29 (1978). The diffusion coefficients D (cm<sup>2</sup> · s<sup>-1</sup>) of the sodium of a series of hydrophilic mono- and dicarboxylic acids, have been measured in the hydrophilic layers of phosphatidylcholine-water lamellar phases, as a function of phase hydration. At pH 9.0, the diffusion rates of the anionic (RCOO<sup>-</sup>) form of the acid exhibit a prominent increase within a narrow range of water content, specific to each anion. This high diffusion rate seems to occur when the Stokes diameter of an anion is equal to the thickness of the aqueous layer between the two planes formed by the quaternary ammonium groups of the choline phosphate dipoles of two facing layers of phosphatidylcholine molecules. This phenomenon demonstrates the importance of the spatial organization of successive binding sites in the rate constant of diffusional processes in hydrophilic channels.

**PROSTAGLANDIN METABOLISM BY HUMAN TESTIS.** M.P. Carpenter, R.D. Robinson, and L.P. Thuy (Biomembrane Res. Lab., Oklahoma Med. Res. Foundation, and Dept. of Biochem. and Molecular Biology, Univ. of Oklahoma Health Sci. center, Oklahoma City, Oklahoma) *Lipids* **13**, 308-11 (1978). Human testis preparations appear to carry out both the synthesis and turnover of prostaglandins. Prostaglandins and prostaglandin metabolites were extracted from whole tissue. Testis microsomes converted both endogenous and exogenous substrate to prostaglandins. Microsomal prostaglandin biosynthesis was inhibited by indomethacin. Prostaglandin E<sub>2</sub>-9-ketoreductase was present in both the cytosolic and microsomal fractions of human testis. Prostaglandin metabolism by human testis has not previously been reported.

**INITIAL CHOLESTEROL UPTAKE BY EVERTED SACS OF RAT SMALL INTESTINE: KINETIC AND THERMODYNAMIC ASPECTS.** S. Chow and D. Hollander (Div. of Gastroenterology, Wayne State Univ. and Harper Hospt., Detroit, Michigan) *Lipids* **13**, 239-45 (1978). The kinetics of initial cholesterol uptake by everted rat proximal and distal small intestinal sacs were evaluated in vitro. The mucosal incubation solution consisted of 0.05 mM cholesterol solubilized in 4.8 mM sodium taurocholate micellar solution at pH 7.4. Experiments were performed at temperatures from 26 to 38 C. The rate of cholesterol uptake followed a linear relationship when plotted against time indicating an apparent zero-order kinetics mechanism for initial uptake. An Arrhenius plot of the results of uptake versus temperature remained linear over the entire range of temperatures studied. The large free energy of activation (20 kcal/mole) suggests that an energy barrier for cholesterol uptake exists at the enterocyte luminal cell membrane and may be an important limiting step in cholesterol uptake. It is proposed that a transient association between cholesterol and a component of the enterocyte luminal cell membrane is formed during initial uptake of cholesterol. The transient association may be an activated complex formed with proteins present at or within the luminal enterocyte cell membrane.

**THE ROLE OF DIETARY LONG CHAIN FATTY ACIDS IN MITOCHONDRIAL STRUCTURE AND FUNCTION. EFFECTS ON RAT CARDIAC MITOCHONDRIAL RESPIRATION.** M.T. Clandinin (Dept. of Biochem., Faculty of Med., Univ. of Alberta, Edmonton, Alberta, Canada T6G 2H7) *J. Nutr.* **108**, 273-81 (1978). To evaluate the effect of dietary rapeseed oils on cardiac mitochondrial function and metabolic conservation of energy, male weaning rats derived from the Sprague-Dawley strain were fed three rations containing either 15% (w/w) soybean oil, low erucic acid rapeseed oil or a high erucic acid rapeseed oil. Cardiac mitochondria were isolated for measurement of

mitochondrial respiratory functions. Pyruvate and malate plus malonate or succinate plus amytal, or  $\alpha$ -ketoglutarate and malate plus malonate were utilized as substrates for oxidative phosphorylation. When pyruvate and malate plus malonate were utilized as substrates, reduced rates of ATP synthesis were observed after chronic feeding of high erucic acid rapeseed oil diets. Only prolonged feeding of low erucic acid rapeseed oils resulted in significant alteration in the efficiency of oxidative phosphorylation.

**LIPOPROTEIN LIPASE ACTIVITY IN THE TISSUES OF GUINEA PIGS EXPOSED TO DIFFERENT DIETARY FATS FROM CONCEPTION TO THREE MONTHS OF AGE.** A. Cryer, J. Kirtland, H.M. Jones and M.I. Gurr (Dept. of Biochem., Univ. College, P.O. Box 78, Cardiff CF1 1XL, Wales, U.K.) *Biochem. J.* 170, 169-72 (1978). Long-term exposure of guinea pigs to a diet rich in maize oil caused an increase in adipose-tissue lipoprotein lipase activity. A similar diet rich beef tallow had no such effect, and neither diet affected the enzyme activity in heart, lung, diaphragm or skeletal muscle.

**EFFECTS OF ACTIVATED CARBON, PHENOBARBITAL, AND VITAMINS A, D, AND E ON POLYBROMINATED BIPHENYL EXCRETION IN COWS.** R.M. Cook, L.R. Prewitt, G.F. Fries (Dept. of Dairy Sci., Michigan State Univ., East Lansing) *J. Dairy Sci.* 61, 414-9 (1978). Twelve cows environmentally contaminated with polybrominated biphenyl residues were in a balanced two-period changeover experiment. The treatments were activated carbon and sodium phenobarbital; sodium phenobarbital and injections of vitamins A, D, and E; activated carbon, phenobarbital, and vitamins A, D, and E; and control. A standard roughage and concentrate diet was fed. Average initial concentrations of polybrominated biphenyls in the milk fat ranged from 92 to 236 ppm. The experimental treatments did not affect significantly excretion of polybrominated biphenyls in milk and feces or the apparent half-life of residues in milk fat or body fat. Half-life residues in milk fat averaged 60 days but ranged from 36 to 301 days. The longer half-life in early lactation than in later lactation indicated an effect of change of body weight on half-life. Milk was the major route of excretion, averaging 6.5 times that of fecal excretion. Polybrominated biphenyl in milk fat, body fat, blood, and feces followed parallel concentrations throughout the study.

**EFFECT OF ICED STORAGE ON FREE FATTY ACID PRODUCTION AND LIPID OXIDATION IN MULLET MUSCLE.** J.C. Deng (Food Sci. Dept. IFAS, Univ. of Florida, Gainesville, FL) *J. Food Sci.* 43, 337-40 (1978). The influence of two periods of iced storage followed by up to 12 months frozen storage on development of free fatty acid and oxidative rancidity was studied. Mullet held in the round for 1 day and 7 days iced storage were processed into various forms of mullet flesh; mullet in the round, boneless skin-on and skin-off fillets with and without antioxidant treatment and were then stored at  $-18^{\circ}\text{C}$ . Generally, higher free fatty acid levels and less lipid oxidation (TBA and peroxide value) were observed in frozen mullet fillets (with and without skin) with a longer period of iced storage, except for the frozen skin-on fillets which showed no significant difference in oxidation between the two periods of iced storage. However-frozen, antioxidant-treated (immersed in 0.25% TBHQ + 2% ascorbic acid) fillets with the longer period of iced storage had less free fatty acid production than the fillets with the shorter period of iced storage. Both free fatty acid and oxidative rancidity were higher in the frozen sample with 7 days iced storage than the samples with 1 day iced storage.

**STERIC REQUIREMENTS FOR THE STIMULATION OF GLYCOSYLTRANSFERASE ACTIVITY BY LYSOPHOSPHATIDYLCHOLINE.** P.J.A. O'Doherty (G.F. Strong Lab, for Med. Res., Dept. of Med., Univ. of British Columbia, Vancouver, British Columbia, Canada V5Z 1M9) *Lipids* 13, 297-300 (1978). 1-Palmitoyl-*sn*-glycerol-3-phosphocholine and 3-palmitoyl-*sn*-glycerol-1-phosphocholine have been found to be equipotent in the stimulation of membrane-bound glycosyltransferases in microsomes of rat intestinal villus cells. This indicates that the stimulatory effect of lysophosphatidylcholine is not stereospecific, but that it may be related to a specific detergent property dependent upon the peculiar balance of hydrophilic and hydrophobic components in the molecule.

**THE EFFECT OF PHOSPHOLIPASE D ON THE FUNCTION OF FRAGMENTED SARCOPLASMIC RETICULUM.** W. Fiehn (Medizinische

Universitäts-Poliklinik, 6900 Heidelberg, Germany) *Lipids* 13, 264-9 (1978). Incubations of fresh preparations of fragmented sarcoplasmic reticulum (FSR) were carried out at pH 5.7. This pH was necessary for hydrolysis of phospholipids by phospholipase D. The pH did not influence calcium uptake or the activity of calcium-stimulated ATPase of FSR. Treatment of FSR with phospholipase D caused hydrolysis of the membrane phospholipids. The phosphatidic acid produced remained bound to membrane. Increasing phospholipid cleavage was paralleled by loss of calcium uptake, which was complete when about two-thirds of the membrane phospholipids were hydrolyzed.

**FRACTIONATION OF HUMAN SERUM LIPOPROTEINS BY SINGLE-SPIN GRADIENT ULTRACENTRIFUGATION: QUANTIFICATION OF APOLIPOPROTEINS B AND A-1 AND LIPID COMPONENTS.** J.R. Foreman, J.B. Karlin, C. Edelstein, D.J. Juhn, A.H. Rubenstein, and A.M. Scanu (Dept. of Med. and Biochem., The Univ. of Chicago, Pritzker Schl. of Med. and the Franklin McClean Memorial Res. Inst., Chicago, IL) *J. Lipid Res.* 18, 759-67 (1977). A sensitive and reproducible method has been developed for separation of the major serum lipoproteins from 1 ml or less of human serum by isopycnic density gradient ultracentrifugation. The serum, applied to a step gradient (total volume 12.8 ml), was spun for 48 hr at 38,000 rpm at  $10^{\circ}\text{C}$  and, in each of the fractions, apolipoproteins B and A-1 were quantified by the respective radioimmunoassays. The markers for lipid distribution used were  $4\text{-}^{14}\text{C}$  lecithin, each incubated with an aliquot of serum at  $20^{\circ}\text{C}$  for 75 min prior to ultracentrifugation. In control sera, three main fractions, very low density (VLDL), low density (LDL), and high density (HDL) lipoproteins were clearly separated from a bottom fraction. Their flotation, electrophoretic, and chemical properties were in good agreement with those reported for the corresponding lipoproteins separated by conventional ultracentrifugation. Both apo B and A-1 were fully recovered.

**CHANGES IN FATTY ACID COMPOSITION OF CARDIAC MITOCHONDRIAL PHOSPHOLIPIDS IN RATS FED RAPESEED OIL.** P. Dewailly, A. Nouvelot, G. Sezille, J.C. Fruchart, and J. Jaillard (Laboratoire UER de Physiopathologie des Lipides, Institut Pasteur, 20 boulevard Louis XIV, 59012 Lille Cedex, France, ERA-CNRS n 070497) *Lipids* 13, 301-4 (1978). Male Wistar rats were fed rapeseed oil containing high or low levels of erucic acid for 20 weeks, and changes in the fatty acid composition of cardiac mitochondrial phospholipids were studied. Treatment with rapeseed oil containing 46.2% erucic acid showed incorporation of 22:1 (5.6%) into isolated cardiolipin from heart mitochondria. After high or low (3.7%) erucic rapeseed oil feeding, linolenic acid was slightly incorporated into cardiolipin. Moreover, both of these rapeseed oils induced a significant increase of linoleate-arachidonate ratio in phosphatidylethanolamine and phosphatidylcholine. This ratio was also significantly increased in fatty acids esterified to the  $\beta$ -position of these phospholipids. On the basis of such results, we have to consider the role of linolenic acid which is present at a high level in the different rapeseed oils used, as a possible inhibitor of heart microsomal enzymes involved in linoleate arachidonate conversion. Such alterations might account for mitochondrial fragility and myocardial lesions obtained in long term rapeseed oil feeding experiments.

**BINDING, INTERIORIZATION AND DEGRADATION OF CHOLESTERYL ESTER-LABELLED CHYLOMICRON-REMNANT PARTICLES BY RAT HEPATOCYTE MONOLAYERS.** C.H. Floren and A. Nilsson (Dept. of Physiological Chem., Univ. of Lund, Lund, Sweden) *Biochem. J.* 168, 483-94 (1977). The cholesteryl ester of isolated chylomicron-remnant particles was efficiently degraded by hepatocyte monolayers. The degradation was sensitive to metabolic inhibitors. With increasing amounts of remnant cholesteryl ester the rate of uptake approached saturation and conformed to a linear double-reciprocal plot. The  $V_{\text{max}}$  was determined as 80ng of cholesteryl ester/h per mg of protein and the apparent  $K_m$  as 1.4 g of cholesteryl ester per mg of protein. The time course for the uptake and hydrolysis suggested that binding of particles to the cell surface preceded the degradation. Cholesteryl esters of native chylomicrons were degraded to a much smaller extent and their presence had only a small inhibitory effect on the degradation of chylomicron remnants. Intestinal very-low-density lipoproteins were degraded somewhat faster than chylomicrons, and caused more inhibition of remnant degradation. Rat high-density lipoproteins inhibited the hydrolysis



of remnant cholesteryl ester by up to 50% but had less influence on the amount of cholesteryl ester that was bound to the cells.

DIETARY STUDIES AND THE RELATIONSHIP OF DIET TO CARDIOVASCULAR DISEASE RISK FACTOR VARIABLES IN 10-YEAR-OLD CHILDREN—THE BOGALUSA HEART STUDY. G.C. Frank, M.P.H., R.D., G.S. Berenson, M.D., and L.S. Webber, Ph.D. (Dept. of Med., Louisiana State Univ. Med. Center, New Orleans, Louisiana) *Am. J. Clin. Nutr.* 31, 328-40 (1978). A dietary study of 10-year-old children was incorporated into a larger epidemiological survey investigating the distributions, interrelationships, and course-over-time of arteriosclerosis risk factor variables in children. Food intakes, eating patterns, and diet-risk factor interrelationships are described for 185 children (35% black, 65% white) using an improved 24-hr dietary recall method. Protein intakes were high. The polyunsaturated-to-saturated fatty acid ratio averaged 0.4 and a sucrose-to-starch proportion of 1.1 was noted. A lack of correlation was noted in large matrices of dietary components and risk factor variables, but results of the comparison of mean intakes of dietary components for children grouped according to serum cholesterol showed significant differences in the intakes of various forms of fat and carbohydrate.

EFFECT OF VITAMIN A DEFICIENCY ON CALCIUM AND GLYCOSAMINOGLYCAN METABOLISM IN GUINEA PIG BONE. S.S. Harris and J.M. Navia (The Institute of Dental Research, School of Dentistry, Univ. of Alabama in Birmingham) *J. Nutr.* 107, 2198-205 (1977). Using a standardized guinea pig model system, the effect of vitamin A deficiency on new bone formation was investigated. Guinea pigs were fed a purified gel diet with vitamin A (28.5 mg/kg) or without it (A-). The onset of deficiency was determined by a decrease in the serum vitamin A concentrations of the A- guinea pigs. The right incisor was then extracted from each animal and a L cm tube implanted in the alveolar cavity. Half of the number of guinea pigs in the A- group were fed retinoic acid (A-/A+; 1 µg/day). The controls (A+) and those receiving retinoic acid (A-/A+) were pair-fed to the A- group. Fourteen days after implantation, the guinea pigs were killed and the nylon tubes filled with new bone (tissue implants, TI) were removed and placed in a tissue culture system in the presence of <sup>45</sup>Ca or <sup>35</sup>SO<sub>4</sub> for 48 hours. Thus, the lack of dietary vitamin A increased the amount of the sulfur present in the glycosaminoglycan fraction, possibly indicating an increase in the amount of sulfated glycosaminoglycans present.

GLYCEROLIPID BIOSYNTHESIS IN RAT ADIPOSE TISSUE: INFLUENCE OF ADIPOSE-CELL SIZE AND SITE OF ADIPOSE TISSUE ON TRIACYLGLYCEROL FORMATION IN LEAN AND OBESE RATS. S.C. Jamdar (Dept. of Med. and Biochem., Med. College of Virginia, Virginia Commonwealth Univ., Richmond, VA) *Biochem. J.* 170, 153-60 (1978). The rats of lipid formation were compared in different fat-depots from lean and obese rats by using <sup>14</sup>C glycerol 3-phosphate, <sup>14</sup>C glucose or <sup>14</sup>C acetate as substrates. In lean animals, subcutaneous adipose tissue showed significantly lower rates of lipid synthesis than did perirenal and gonadal fat-tissue. In obese animals, the rates of lipid synthesis were significantly higher and did not vary from one fat-depot to another. Difference in the rates of lipid formation between lean and obese rats disappeared during dietary restriction of obese animals. The isolated adipocyte preparation did not reflect the true metabolic activity of the adipose organ, since this preparation was mainly derived from smaller adipocytes that were metabolically less active than larger adipocytes. The present study suggests that it is better to use whole tissue preparations to measure lipogenesis and esterification reactions, because these measurements represent the contribution of both larger and smaller adipocytes towards lipid formation.

ENHANCED RENAL PROSTAGLANDIN PRODUCTION IN THE DOG: THE EFFECT OF SODIUM ARACHIDONATE IN NONFILTERING KIDNEY. J.G. Gerber, J.L. Data, and A.S. Nies *Circ. Res.* 42, 43-5 (1978). Sodium arachidonate, 10<sup>-5</sup> g/kg per minute, was infused into the renal artery of a nonfiltering canine kidney in situ in order to determine the effects of enhanced prostaglandin synthesis on renal blood flow and its distribution in circumstances where prostaglandins produced in the medulla could not gain access to the cortex via tabular fluid. The contralateral normal kidney was also infused with sodium arachidonate and served as control. Radioactive micro-

pheres were used to calculate the hemodynamic effects. In the nonfiltering kidney, the total renal blood flow increased after sodium arachidonate from a mean of 105 ml/min per 100 g to 146 ml/min per 100 g (P 0.01). This increase was completely abolished by prior treatment with indomethacin, 8 mg/kg, intravenously. The normal kidney responded significantly to all cortical zones except the outermost (zone 1), but the fractional distribution or renal blood flow was significantly increased only in the innermost cortex (zone 4). Since the kidneys were nonfiltering, the increase of renal blood flow during infusion of arachidonic acid cannot be explained by prostaglandins being transported from renal medulla to the cortex through renal tubules. Most likely prostaglandins are produced locally in the cortex and have only local effects.

BIOCHEMICAL CHARACTERIZATION OF THE SUBMICROSOMAL MEMBRANE OF THE RAT BRAIN: SELECTIVE SOLUBILIZATION OF THE COMPONENTS OF THE LIGHT SMOOTH-SURFACED MEMBRANE BY LYSOPHOSPHATIDYLCHOLINE. K. Katsuta, Y. Tamai, T. Watanabe, S. Fujita and M. Satake (Dept. of Neurochem., Brain Res. Inst., Niigata Univ., Niigata, Japan) *Biochim. Biophys. Acta* 507, 271-9 (1978). The light smooth-surfaced membrane, one of the three membrane fractions derived from the rat brain microsomal fraction, was fractionated into its soluble and insoluble parts by the use of lysophosphatidylcholine and the chemical composition of these was investigated. Under the condition whereby the maximal amount of the membrane protein was solubilized by lysophosphatidylcholine (0.5% lysophosphatidylcholine at 37°C for 10 min), the insoluble residue, which accounted for approximately 30% of the membrane protein, was ultracentrifugally homogeneous and showed a granular structure under the electron microscope. The lipid composition of the soluble and insoluble fractions, as well as their protein composition, revealed a preferential and limited solubilization of the constituents of the membrane by lysophosphatidylcholine.

OXIDATION, EXCRETION, AND TISSUE DISTRIBUTION OF [26-<sup>14</sup>C] CHOLESTEROL IN COPPER-DEFICIENT RATS. K.Y. Lei (Nutr. Program, Dept. of Home Economics, Mississippi State Univ., Mississippi State, Ms) *J. Nutr.* 108, 232-7 (1978). The effect of copper deficiency on in vivo catabolism and excretion of [26-<sup>14</sup>C]cholesterol was studied in male rats. The study involved four treatments, namely, control, copper-deficient, control plus cholesterol, and copper-deficient plus cholesterol supplement. Significant elevations of serum ester and total cholesterol concentrations and reductions of serum free, ester, and total cholesterol specific activities were observed in rats fed the copper-deficient diets. In addition, a significant reduction of liver free cholesterol concentration was observed in rats fed the copper-deficient diets. The rates of oxidation and excretion [26-<sup>14</sup>C]cholesterol were not influenced by dietary copper but were significantly increased by cholesterol supplementation. A shift of cholesterol from the liver to the serum pool appeared to be responsible for the hypercholesterolemia observed in copper deficiency.

MOLECULAR ARRANGEMENTS OF SPHINGOLIPIDS. THE MONOLAYER BEHAVIOUR OF CERAMIDES. H. Lofgren and I. Pascher (Dept. of Structural Chem., Inst. of Med. Chem., Univ. of Goteborg, P.O. Box, S-400 33 Goteborg 33, Sweden). *Chem. Phys. Lipids* 20, 273-84 (1978). A series of synthetic ceramides have been studied at the air-water interface by recording the surface pressure-area isotherms at continuous compression. Ceramides that contain a 4,5-*trans*-double bond in the long chain base were found to condense into a close-packed arrangement with vertical chains already at a very low surface pressure. The corresponding saturated compounds adopt a similar close packed arrangement only at high surface pressure. At 30 dynes/cm, a lateral pressure representative of biological membranes, the area per molecule and compressibility was further found to depend on the number and configuration of the hydroxyl groups. The presence of a 2-D-hydroxyl group in the fatty acid generally promotes the condensation. A similar effect is observed if the long chain base contains a 4-D-hydroxyl group. *Cis*-double bonds or methyl branches in the fatty acid chain, which increase the space requirement, limit the lateral interaction of the polar group. However the 15-*cis*-double bond of nervonic acid can be accommodated without any distortion of the close-packing arrangement.

SERUM LIPIDS AND CORONARY HEART DISEASE IN HETEROZYGOUS FAMILIAL HYPERCHOLESTEROLEMIA IN THE HOKURIKU DISTRICT

OF JAPAN. H. Mabuchi et al. (Second Dept. of Internal Med., Schl. of Med., Kanazawa Univ., Kanazawa, Japan) *Atherosclerosis* 28, 417-23 (1977). The serum cholesterol and triglyceride levels and the incidence of ischemic heart disease were studied in 122 (55 men and 67 women) consecutive heterozygous familial hypercholesterolemic patients in the Hokuriku district of Japan. The mean  $\pm$  SD of serum cholesterol level was  $354.0 \pm 71.0$  mg/100 ml, which was lower than those of the Western countries by about 60-70 mg/100 ml. The mean  $\pm$  SD of serum triglyceride level was  $116.5 \pm 54.0$  mg/100 ml. The average serum cholesterol values in the 20-50-year-old group showed no differences from those of the Western countries. However, in the above 50 years of age group the serum cholesterol levels were much lower than those in the United States. The occurrence of ischemic heart disease in 83 heterozygous familial hypercholesterolemic patients was 43.3%. The incidence of myocardial infarction was 20.5%. Thus, familial hypercholesterolemia is as highly atherogenic as that of the Western countries even in Japan where the low incidence of coronary heart disease in the general population has been attributed to the low level of serum cholesterol.

ADIPOSE TISSUE CHOLESTEROL STORAGE: THE EFFECT OF ESSENTIAL FATTY ACID DEFICIENCY. B.R. Krause, S.Q. Alam and A.D. Hartman (Dept. of Physiol. and Biochem., Louisiana State Univ. Med. Center, New Orleans, Louisiana) *Proc. Soc. Exp. Biol. Med.* 157, 297-300 (1978). Essential fatty acid deficiency was induced in one group of rats by feeding a fat-free diet, and in another group by supplying hydrogenated coconut oil. All deficient animals had significantly reduced weight gain and tended to have decreased epididymal fat cell size compared to controls. Rats in the fat-free group had significantly more adipocyte free cholesterol than control animals, but no significant alteration in stored free sterol occurred in rats made essential fatty acid deficient with hydrogenated coconut oil. Between experimental essential fatty acid deficient groups, the fat-free group had greater quantities of adipocyte free, and hence, total cholesterol. No alterations in ester content due to essential fatty acid deficiency could be demonstrated, although the percentage of total cholesterol as esters decreased significantly in both experimental groups. It is suggested that adipose tissue responds differently than other peripheral tissues to essential fatty acid deficiency.

THE DISPERSION OF CHOLESTEROL WITH PHOSPHOLIPIDS AND GLYCOLIPIDS. P.J. McCabe and C. Green (Dept. of Biochem., Univ. of Liverpool P.O. Box 147, Liverpool L69 3BX, U.K.) *Chem. Phys. Lipids* 20, 319-30 (1977). Of the polar lipids studied (phospholipids and glycolipids), only phosphatidylcholine and sphingomyelin can disperse in water with up to 2 mol cholesterol/mol polar lipid. However, mixtures of phosphatidylethanolamine with small amounts of phosphatidylcholine and mixed lipids from mitochondria and myelin will also form sterol-rich dispersions. Steroids in which the  $\beta$ -OH group is replaced by an oxo function do not form such sterol-rich dispersions. Electron microscopy and optical rotatory dispersion (ORD) show that sterols disperse with cerebrosides and gangliosides to form cylindrical structures with the regions around C atoms and 3 and 7 of the sterol in less polar environments than those they occupy in phospholipid liposomes. It is proposed that choline-containing phospholipids facilitate entry of sterol molecules into the outer leaflet of cell surface membranes but that the phospholipid composition itself will not give rise to an asymmetric distribution of sterol in membranes with a high cholesterol content.

$\Delta 9$  DESATURASE ACTIVITY IN NORMAL MOUSE LIVER AND HEPATOMA SS1K. O. Mercuri and M.E. De Tomas (Catedra de Bioquímica, Instituto de Fisiología, Facultad de Ciencias Médicas, Universidad Nacional, de La Plata, 1900 La Plata, Argentina) *Lipids* 31, 289-90 (1978). The activity of  $\Delta 9$  desaturase was determined in the microsomal fraction of normal mouse liver and hepatoma SS1K in the presence of the  $105,000 \times g$  supernatant. Neither hepatic nor hepatoma soluble fractions were able to modify the low desaturating capacity. Two enzymes from the microsomal electron transport chain associated with  $\Delta 9$  desaturase, namely NADH-cytochrome b<sub>5</sub> reductase and NADH-cytochrome C reductase were also measured. The results indicate that the low  $\Delta 9$  desaturase activity in hepatoma SS1K could be related to the reduced amount of desaturase.

EFFECTS OF STORAGE CONDITIONS ON RAT BRAIN ETHANOLAMINE GLYCEROPHOSPHOLIPIDS, CEREBROSIDES, AND CHOLESTEROL. E.A. Moscatelli and J.A. Duff (John M. Dalton Res. Center, Univ. of Missouri—Columbia, Res. Park, Columbia, Missouri) *Lipids* 13, 294-6 (1978). The effects of storage on rat brain lipid composition were studied in terms of ethanolamine glycerophospholipid, cerebrosides, and cholesterol. Rat brains were stored at several combinations of temperature and time. Storage conditions were: 2 hr at room temperature, 12 hr of refrigeration, and a sequence of both of these conditions. Two-dimensional thin layer chromatography followed by colorimetric analyses of eluted lipids were used to determine molar ratios of phosphatidylethanolamine, ethanolamine plasmalogen, lysophosphatidylethanolamine, and cerebrosides. Cholesterol was also determined. These studies revealed small but significant increases in lysophosphatidylethanolamine in all three cases. A slight increase was also noted in the apparent molar proportion of cholesterol.

REACTION BETWEEN PEROXIDIZED PHOSPHOLIPID AND PROTEIN: 1. COVALENT BINDING OF PEROXIDIZED CARDIOLIPIN TO ALBUMIN. H. Nielsen (Inst. of Med. Biochem., Univ. of Aarhus, Aarhus, Denmark) *Lipids* 13, 253-8 (1978). A system is described for study of the reaction of peroxidized cardiolipin (diphosphatidylglycerol) with albumin. Covalent binding of peroxidized cardiolipin to albumin occurs in this system as evidenced partly by a decrease in lipid-extractable P and partly by lipid P being inseparable from the albumin by gel filtration in the presence of a detergent (sodium deoxycholate) under conditions known to separate the lipid moiety and apoprotein of lipoproteins. Based on analyses of the decrease in lipid-extractable P, the average number of cardiolipin molecules bound covalently per molecule of albumin is about 5 when peroxidized cardiolipin (4 moles O<sub>2</sub>/mol cardiolipin) at about 10 times molar excess is allowed to react with albumin. However, the data of the gel filtration experiment indicate that the bound peroxidized cardiolipin molecules may not be evenly distributed on the albumin molecules. Therefore, the number of cardiolipin molecules bound per albumin molecule may actually vary over a range and be considerably higher for part of the albumin. The findings have been discussed in relation to peroxidation in vivo.

ETHANOL-INDUCED HYPERTRIGLYCERIDEMIA PREVALENCE AND CONTRIBUTING FACTORS. L. Lifton, and R. Scheig (Veterans Administration Hosp., Newington and the Div. of Gastroenterology, Dept. of Med., Univ. of Connecticut Health Center, Farmington, CN) *Am. J. Clin. Nutr.* 31, 614-8 (1978). Seventy-seven chronic alcoholic subjects admitted to two alcoholic detoxification centers were evaluated for lipid abnormalities. Nineteen (26%) of these male patients had serum triglyceride levels 150 mg/100 ml and six (9%) had serum cholesterol levels  $> 250$  mg/100 ml. Compared to 33 age-matched, nonalcoholic control subjects, there was a significantly greater incidence of hypertriglyceridemia in the alcoholic subjects. All patients with triglyceride abnormalities had type IV electrophoretic patterns. The triglyceride elevations were not related to serum amylase, lipase, liver function, obesity, and abnormal fasting glucose. We conclude that there is a significant increase in hypertriglyceridemia in chronic alcoholic patients.

LIPID PEROXIDATION: A MECHANISM INVOLVED IN ACUTE ETHANOL TOXICITY AS DEMONSTRATED BY IN VIVO PENTANE PRODUCTION IN THE RAT. R.E. Litov, D.H. Irving, J.E. Downey, and A.L. Tappel (Dept. of Food Science and Technology, Univ. of California, Davis, CA) *Lipids* 13, 305-7 (1978). The effect of a single dose of ethanol on lipid peroxidation in three groups of rats fed different amounts of vitamin E was determined by the measurement of pentane in the breath. All rats had increased pentane production above basal levels by 15 min following oral administration of 6 g ethanol/kg body wt. The increase in total pentane production during a 13-hr test period after intragastric administration of ethanol was greater in the rats fed the vitamin E-deficient diet than in the rats fed vitamin E-supplemented diets ( $\alpha = 2P = 0.02$ ). The results support the hypothesis that acute ethanol toxicity involves lipid peroxidation and further demonstrate the usefulness in toxicological studies of monitoring pentane as an index of lipid peroxidation in vivo.

ACCOMMODATION OF HYDROXYL GROUPS AND THEIR HYDROGEN BOND SYSTEM IN A HYDROCARBON MATRIX. Britt-Marie Lunden, H. Lofgren and I. Pascher (Dept. of Structural Chem., Inst.

of Med. Biochem., Univ. of Goteborg, Fack, S-400 33 Goteborg 33, Sweden) *Chem. Phys. Lipids* 20, 263-71 (1977). From data of a single crystal analysis of 12-D-hydroxyoctadecanoic acid methyl ester principles for the incorporation of hydroxyl groups into a hydrocarbon chain matrix can be deduced. In the crystalline compound infinite hydrogen bond systems are accommodated in an orthorhombic perpendicular ( $O_4$ ) chain arrangement. The  $O_4$  hydrocarbon subcell is expanded towards a hexagonal packing pattern, allowing more space and optimal geometry for the hydrogen bond system. The arrangement of the bond system in the  $O_4$  subcell requires that hydrogen bonded carbon chains carry alternatingly hydroxyl groups with opposite configuration. For the enantiomeric compound this requirement is met by a head to tail packing of molecules in a single layer arrangement. The corresponding racemates on the other hand pack head to head in double layers as confirmed by X-ray powder and IR studies. In monolayers both enantiomers and racemates behave identically. The hydrogen bonding of the hydroxyl groups apparently lead to the formation of lipid clusters, in which the geometric conditions for both a close packing of hydrocarbon chains and the formation of extensive hydrogen bond system do not exist.

THE EFFECTS OF CERTAIN ECDYSTEROIDS AND INHIBITORY AMINES AND AMIDES ON THE METABOLISM OF 22,25-DIDEOXY-ECDYSONE IN COCKROACH ORGAN CULTURES. E.P. Marks, W.E. Robbins, and M.J. Thompson (Metabosm and Radiation Res. Lab., Sci. and Education administration, U.S. Dept. of Agr., Fargo, North Dakota 58102) *Lipids* 13, 259-66 (1978). An organ culture assay system using cockroach leg regenerates and fat body has been developed in which compounds that either inhibit molting hormone metabolism or act as molting hormone antagonists can be tested. Representatives of three classes of compounds were tested in the system: ecdysteroids, azasteroids, and nonsteroidal amines and amides. Inhibitory compounds were found in all three of the classes. Certain of these inhibitors represent a new class of insect hormonal compounds with a novel mode of action—the disruption of molting hormone metabolism.

ADDED FAT, IPROPRAN, AND ROFENAID IN DIETS OF BREEDER TURKEYS. L.M. Potter, J.R. Shelton, and G.B. Meyer (Dept. of Poultry Sci, Virginia Polytechnic Inst. and State Univ., Blacksburg, Virginia 24061) *Poult. Sci.* 57, 485-8 (1978). Using 216 Large White breeder female turkeys, a 24-week experiment was conducted to evaluate the effects of adding 6% fat, .05% Ipropran and .025% Rofenaïd to their diets. The addition of 6% stabilized animal and vegetable fat to the diets reduced feed consumption 9.9%, decreased energy consumption 2.9%, slightly increased body weight gains, and did not significantly affect production, fertility or hatchability of eggs. The additions of Ipropran and Rofenaïd were observed to be safe as indicated by their non-effect on any of the parameters measured.

EFFECT OF PARTICLE SIZE OF WHEAT BRAN ON LIPID METABOLISM IN CHOLESTEROL-FED RATS. G.S. Rannhotra, R.J. Lowew and L.V. Puyat (Nutr. Lab., American Inst. of Baking, Chicago, Ill.) *J. Food Sci.* 42, 1587-9 (1977). In a 4-wk period, wheat bran, substituted for dietary sucrose (50%), caused, in cholesterol-fed young rats, an appreciable decrease in serum cholesterol, triglyceride, and phospholipid levels, and a substantial increase in fecal cholesterol and bile acid losses. Liver cholesterol and triglyceride levels also showed an appreciable decrease. Increasingly finer milling of bran caused a progressive decrease in diet, lipid and cholesterol intake of rats, and in their body and liver weights; fecal mass, as percent of diet consumed, however, remained unaffected. Serum lipid-lowering effect and fecal cholesterol and bile acid losses were accentuated somewhat with decrease in the particle size of bran. Serum chylomicron and beta lipoprotein fractions were substantially reduced in bran-fed rats.

INFLUENCE OF MEAL FREQUENCY ON BODY WEIGHT, PLASMA METABOLITES, AND GLUCOSE AND CHOLESTEROL METABOLISM IN THE DOG. D.R. Romsos, P.S. Belo, W.G. Leveille (Dept. of Food Sci. and Human Nutr. and Dept. of Animal Husbandry, Michigan State Univ., East Lansing, Mich) *J. Nutr.* 108, 238-47 (1978). Young adult female beagles were fed one 2 hour meal per 48 hours or were pair-fed twice daily for 246 days. The canned diet contained 36, 40, and 24% of metabolizable energy from protein, fat and carbohydrate, respectively. Both groups of dogs lost approximately 200 g body weight during the first days

and then maintained relatively constant body weight thereafter. Meal frequency did not influence body weight or body fat (estimated from body water). Intravenous and oral glucose tolerance tests were conducted. No differences in the ability of the two groups of dogs to clear glucose from the circulation were noted, provided both groups of dogs had been fed similar amounts of food prior to the test. A decrease in meal frequency did not influence body composition, glucose tolerance or glucose utilization and resulted in lower plasma cholesterol levels in adult dogs.

INFLUENCE OF DIETARY FAT AND CARBOHYDRATE ON FOOD INTAKE, BODY WEIGHT AND BODY FAT OF ADULT DOGS. D.R. Romsos, M.J. Hornshuh and G.A. Leveille (Dept. of Food Sci. and Human Nutr., Michigan State Univ., East Lansing, Michigan) *Proc. Soc. Exp. Biol. Med.* 157, 278-81 (1978). Adult female dogs were fed ad libitum for 24 week a high-fat diet (51% of energy from fat) or a high-carbohydrate diet (59% of energy from carbohydrate). Dogs fed the high-fat diet gained more body weight than did dogs fed the high-carbohydrate diet. In both groups of dogs 78-80% of the increase in body weight was fat. The high-fat diet may have been utilized more efficiently for body fat gain than the high-carbohydrate diet; alternatively, it is possible to explain the increased body fat accumulation in dogs fed the high-fat diet on the basis of the small observed difference in energy intake. Dogs fed the high-fat diet consumed slightly more energy (13%) which resulted in the accumulation of more than twice the amount of fat accumulated in dogs fed the high-carbohydrate diet during the 25 week study.

SEPARATION AND CHARACTERIZATION OF PLASMA LIPOPROTEINS OF RHESUS MONKEYS (MACACA MULATTA). L.L. Rudel, D.G. Greene, and R. Shah (Arteriosclerosis Res. Center, Bowman Gray Schl. of Med. of Wake Forest Univ., Winston-Salem, NC) *J. Lipid Res.* 18, 734-44 (1977). A group of 14 adult male rhesus monkeys was maintained on a low cholesterol-high fat diet. Periodically, animals were fasted and blood samples were taken for characterization of the plasma lipoproteins. Complete separation of individual plasma lipoprotein classes was not achieved by traditional sequential ultracentrifugation techniques. Rather, initial separation of lipoprotein classes according to size was effected and density centrifugation was used subsequently for further separation. At least six lipoprotein fractions were identified, each of which was unique as defined by the properties of size, density (d), and electrophoretic mobility. These lipoprotein fractions were characterized by determination of chemical compositions and apoprotein patterns. The lipoproteins present in highest concentration in these monkeys were designated as region IV lipoproteins. No fewer than three fractions were identified with densities that overlapped the 1.019 d 1.063 range. Of these, the fraction designated as region  $\beta$ -migration by agarose electrophoresis, a predominant B apoprotein, and a chemical composition and size characteristic of LDL. These results suggested the possibility that a  $\beta$ -migrating VLDL was present in these normal animals.

THE TRUE METABOLIZABLE ENERGY VALUES OF MIXTURES OF TALLOW WITH EITHER SOYBEAN OIL OR LARD. I.R. Sibbald (Animal Res. Inst., Agr. Canada, Central Experimental Farm, Ottawa, Ontario, Canada K1A 0C6) *Poult. Sci.* 57, 473-7 (1978). Two experiments were made to measure the effects of fat ratios on the true metabolizable energy (TME) values of two-component fat mixtures. When soybean oil was added to tallow the TME values of the mixtures were greater than the sum of the means of the component parts. As little as 2 parts of soybean oil, per 98 parts of tallow, were able to increase the TME value of the tallow. The data obtained suggest that the response per unit of soybean oil decreases as the amount in the fat mixture increases; this requires confirmation. When lard was combined with tallow the TME values were additive.

VITAMIN A DEFICIENCY IN THE PHILIPPINES: A STUDY OF XEROPHTHALMIA IN CEBU. F.S. Solon, B.M. Popkin, T.L. Fernandez, and M.C. Latham (Div. of Nutr. Unit, World Health Organization, Geneva) *Am. J. Clin. Nutr.* 31, 360-8 (1978). An investigation of xerophthalmia was undertaken in four ecological zones in Cebu in the Philippines. One thousand seven hundred fifteen children aged 1 to 16 years were examined in 12 barrios. Clinical, biochemical and anthropometric data were collected from the children. Dietary and socioeconomic information was obtained from the house-



holds. Multivariate statistical techniques were used to examine factors possibly associated with xerophthalmia. Of children 47% had deficient or low serum vitamin A levels and 4.5% had clinical signs of xerophthalmia. Approximately 2% had both low serum vitamin A levels and clinical eye signs and were then defined as having active xerophthalmia. Vitamin A deficiency was more prevalent in males than females. Xerophthalmia was most common in the 4 to 6 year old age group. The results of this study are being used to introduce three alternate intervention strategies to control xerophthalmia.

EFFECT OF FERTILIZATION AND AGE OF HEN ON THE CHOLESTEROL CONTENT OF CHICKEN EGG YOLK. J.V. Spencer, W.A. Becker, L.W. Mirosh and J.A. Verstrate (Dept. of Food Sci. and Technology and Dept. of Animal Sci., Washington State University, Pullman, Washington) *Poult. Sci.* 57, 261-4 (1978). The cholesterol content of infertile and fertile eggs from White Leghorn hens was compared. In Trials 1 and 2, infertile eggs were collected, a male was introduced, and fertile eggs then collected from the same hens. In Trial 3, two pens of hens were trapnested. The first pen contained hens only, and the second pen contained hens plus a male. After the desired number of eggs were collected from each hen, the male was moved to the other pen. Twenty-one days were allowed to elapse and eggs were again collected. The results from this study show that fertile eggs are not lower in cholesterol content than infertile eggs.

THE EFFECT OF DIETARY CARBOHYDRATE:FAT RATION ON ENERGY INTAKE BY ADULT WOMEN. P. van Stratum, R.N. Lussenburg, L.A. van Wezel, A.J. Vergroesen, and H.D. Cremer (Unilever Res., Olivier van Noortlaan 120, Vlaardingen, The Netherlands) *Am. J. Clin. Nutr.* 31, 206-12 (1978). The effect of the dietary carbohydrate:fat (C:F) ratio on the spontaneous energy intake by healthy adults was investigated by comparing a high-carbohydrate diet (fat 24%, carbohydrate 58%, protein 18% of energy) and a high-fat diet (fat 47%, carbohydrate 35%, protein 18% of energy) in a 2 x 2 week cross-over design. Subjects were 22 healthy nuns in a Trappist convent with very regular activities. The diets consisted of combinations of liquid formula (75%) and standardized snacks (25%). The difference in C:F ratio was concealed: energy density, taste and appearance were similar. Energy consumption was recorded continuously. The mean daily energy intakes remained constant: 8276 kJ (1978 kcal). The difference in mean daily energy intake between diets was 73 kJ ± 180 (SEM). Small changes in body weight were observed, but these are argued not to indicate definitive effects. It is concluded that changing the C:F ratio within commonly occurring ranges does not influence the spontaneous energy intake of healthy adults.

THE RELATIONSHIP BETWEEN VITAMIN D-STIMULATED CALCIUM TRANSPORT AND INTESTINAL CALCIUM-BINDING PROTEIN IN THE CHICKEN. R. Spencer, M. Charman, P.W. Wilson and D.E.M. Lawson (Dunn Nutr. Lab., Univ. of Cambridge and Med. Res. Council, Milton Road, Cambridge CB4 1XJ, U.K.) *Biochem. J.* 170, 93-101 (1978). The rapid stimulation of intestinal Ca<sup>2+</sup> transport observed in vitamin D-deficient chicks after receiving 1,25-dihydroxycholecalciferol has necessitated a re-evaluation of the correlation hitherto observed between this stimulation and the induction of calcium-binding protein synthesis. By 1h after a dose of 125ng of 1,25-dihydroxycholecalciferol, Ca<sup>2+</sup> transport is increased. This is at least 2h before calcium-binding protein can be detected immunologically and 1h before synthesis of the protein begins on polyribosomes, and thus the hormone stimulates Ca<sup>2+</sup> transport before calcium-binding protein bio-synthesis is induced. We propose that calcium-binding-protein synthesis is necessary for maintaining the stimulated rate of Ca<sup>2+</sup> transport, which is initiated by other factors.

EFFECT OF CHOLESTEROL FEEDING ON HEPATIC FATTY ACID SYNTHESIS AND SERUM AND TISSUE ENZYME ACTIVITIES IN RABBITS. A.C. Tsai and J.J. Kelley (Human Nutrition Program, Sch. of Public Health, The Univ. of Michigan, Ann Arbor, Mich) *J. Nutr.* 108, 226-31 (1978). Effects of cholesterol-feeding on hepatic fatty acid synthesis, tissue lipid peroxidation, and the activity of certain enzymes were examined in rabbits. Rabbits were fed a stock diet supplemented either with 2% soy bean oil or 2% soy bean oil and 1% cholesterol (dissolved in oil) for 102 days. The rate of lipid peroxidation was very low in the liver and aorta in both groups. Liver glutathione peroxidase, catalase, and superoxide dismutase

activities were significantly lower in cholesterol-fed rabbits when expressed on a per g liver basis, but not on a per mg protein or per liver basis. The study indicates that cholesterol-feeding enhances hepatic fatty acid synthesis and increases the total activities of liver NADPH-generating dehydrogenases, but had no effect on the total activity of other enzymes or microsomal parameters determined in rabbits.

THE RAT ARGININE-RICH APOPROTEIN AND ITS REDISTRIBUTION FOLLOWING INJECTION OF IODINATED LIPOPROTEINS INTO NORMAL AND HYPERCHOLESTEROLEMIC RATS. K.H. Weisgraber, R.W. Mahley and G. Assmann (Comparative Atherosclerosis and Arterial Metabolism Section, Lab. of Experimental Atherosclerosis, National Heart, Lung and Blood Institute, Bethesda, Md.) *Atherosclerosis* 28, 121-40 (1977). Normal rat plasma was fractionated into very low density (VLDL), low density (LDL), and high density (HDL) lipoproteins by a combination of ultracentrifugation and Geon-Pevikon block electrophoresis. In addition, a previously uncharacterized lipoprotein, referred to as HDL<sub>1</sub>, was separated from the LDL in the 1.02-1.063 density fraction. HDL<sub>1</sub> had α<sub>2</sub> mobility by electrophoresis, were cholesterol rich and contained the arginine-rich apoprotein (ARP) as its major protein component. Following cholesterol feeding, there was a marked increase in concentration of the lower density and α<sub>2</sub>-migrating lipoproteins (the α<sub>2</sub>-migrating lipoproteins are referred to as HDL<sub>c</sub> in hypercholesterolemic rats), presumably the HDL<sub>c</sub> represent an increase in the HDL<sub>1</sub> of normal rats. Associated with the various cholesterol-induced lipoproteins including HDL<sub>c</sub> there was the prominence of the arginine-rich apoprotein.

EFFECT OF DIETARY CYCLOPROPENE FATTY ACIDS ON THE OCTADECENOATES OF INDIVIDUAL LIPID CLASSES OF RAT LIVER AND HEPATOMA. R. Wood, F. Chumblor, and R.D. Wiegand (Dept. of Biochem. and Biophys., Texas Agr. Experiment Station, Texas A&M Univ. System, College Station Texas 77843) *Lipids* 13, 232-8 (1978). The effect of dietary cyclopropene fatty acids on the concentration of octadecenoate chain positional isomers in individual lipid classes of normal liver, host liver, and hepatoma 7288CTC has been determined. The data revealed the following: (a) Saturated and monoene fatty acid percentages of liver phosphatidylcholines and phosphatidylethanolamines were not affected, but the percentage of saturated fatty acids of the triglycerides and cholesteryl esters was increased while the monoene percentages decreased. (b) Oleate to vaccenate percentage ratios, previously shown to be characteristic of individual lipid classes, were completely disrupted. (c) Oleate concentrations of the two major liver phospholipids were elevated, and vaccenate levels were dramatically reduced. (d) The elevated concentrations of oleate indicate that an alternate route of oleate biosynthesis must exist if the Δ9 desaturation is inhibited by cyclopropene fatty acids as reported previously. (e) In contrast to liver, oleate and vaccenate concentrations in hepatoma were not affected by the dietary cyclopropene fatty acids.

EFFECTS OF LONG SUPPLEMENTATION WITH LIPIDS ON LACTATING DAIRY COWS. Y.T. Yang, R.L. Baldwin, and J. Russell (Dept. of Animal Sci., Univ. of California, Davis 95616) *J. Dairy Sci.* 61, 180-8 (1978). Effects of long term feeding of large amounts of an oil seed supplement treated with formalin upon metabolite patterns in blood of the dairy cow, milk composition, and general performance were studied. Cholesterol and cholesterol esters in plasma rose to 1,000 mg/100 ml at peak lactation when lipid intakes declined in later lactation. High concentrations of cholesterol did not induce hemolytic anemia. Concentrations of nonesterified fatty acid in serum peaked at 700 microequivalents per liter when lipid intakes were greatest and declined thereafter. The pattern of triacylglycerol concentrations in plasma seemed to reflect both lipid intake and mammary uptake. Changes in the fatty acid pattern in milk fat adjusted rapidly to the change in diet and remained constant thereafter. There was indication that the supplement increased lactational performance during early lactation. This apparent advantage was more than offset by a subsequent depression milk yields and shortening of lactation in several cows under the ad lib feeding regime. If high lipid supplements are to be used in practice, research on appropriate feeding regimes is required.

KETOGENICITY OF SOYBEAN OIL, COCONUT OIL AND THEIR RESPECTIVE FATTY ACIDS FOR THE CHICK. S.J. Young and R. Renner (Div. of Foods and Nutr., Faculty of Home Economics, Univ. of Alberta, Edmonton, Alberta T6G 2M8)

- J. Nutr.* 107, 2206-12 (1977). Experiments were conducted to compare rate of growth and levels of blood glucose, blood ketone bodies and liver glycogen in chicks fed "carbohydrate-free" diets in which non-protein energy was supplied by soybean oil, coconut oil and their respective fatty acids, with and without added glucose. Results showed that chicks fed diets containing soybean oil grew faster, had similar levels of blood glucose and blood ketone bodies but lower levels of liver glycogen than chicks fed diet containing coconut oil. The appetite and growth depressing property of coconut oil was accentuated when glycerol was deleted from the diet by substituting coconut fatty acids for coconut oil; in contrast to soybean fatty acids, the appetite and growth depressing property of coconut fatty acids was not overcome by the addition of glucose. Conclusions as to whether more carbohydrate precursors are formed in the oxidation of unsaturated fatty acids than in the oxidation of saturated fatty acids awaits further study.
- ACTION OF SURFACE-ACTIVE SUBSTANCES ON BIOLOGICAL MEMBRANES. II. HEMOLYTIC ACTIVITY OF NONIONIC SURFACTANTS. B.Y. Zaslavsky, N.N. Ossipov, V.S. Krivich, L.P. Baholdina and S.V. Rogozhin (Inst. of Elementoorganic compounds, Academy of Sciences of the U.S.S.R., Moscow, V-312, U.S.S.R.) *Biochim. Biophys. Acta* 507, 1-7 (1978). The hemolytic action of commercially available nonionic surfactants and synthesized polyoxyethylene fatty acids and mercaptans on human erythrocytes was measured. It is shown that the hemolytic power of the detergents depends on the mutual effect of the hydrophobic and hydrophilic fragments of the agent molecule and does not depend on the hydrophile-lipophile balance of the compounds. A graphical image of the structure-activity relationship obtained in the study is similar to the one found in the literature when studying the analgesic effect of imidazoline derivatives on rats in vivo. This fact is discussed on the basis of assumption that the mechanism of both processes in vivo and in vitro is related to influence of the agents on cellular membranes. It is concluded that when the correlation between the hydrophile-lipophile balance values and a membrane effect the capacity of the surfactants this indicates that the effect is caused not by destruction of the membrane but by some rearrangement of the membrane structure accompanying the surfactant adsorption.
- STUDIES ON SERUM LIPIDS, INSULIN, AND GLUCAGON AND ON MUSCLE TRIGLYCERIDE IN RATS ADAPTED TO HIGH-FAT AND HIGH-CARBOHYDRATE DIETS. N.A. Abumrad, S.B. Stearns, H.M. Tepperman, and J. Tepperman (Dept. of Pharmacology, State Univ. of New York, Upstate Medical Center, Syracuse, NY) *J. Lipid Res.* 19, 423-32 (1978). A comparison was made of lipid circulation, storage, and mobilization in rats adapted to lard or glucose diets. In the morning, lard-fed rats had higher blood triglyceride (TG) and free fatty acid (FFA) levels. In the evening TG was higher, but FFA was significantly lower in the lard vs. glucose group. Fasting did not produce the characteristic increase in blood FFA in the lard-fed rats but was associated with a severe drop in their serum TG.
- A CALCIUM-ACTIVATED POLYPHOSPHOINOSITIDE PHOSPHODIESTERASE IN THE PLASMA MEMBRANE OF HUMAN AND RABBIT ERYTHROCYTES. D. Allan and R.H. Michell (Dept. of Biochem., Univ. of Birmingham, P.O. Box 363, Birmingham B15 2TT, U.K.) *Biochim. Biophys. Acta* 508, 277-86 (1978). Haemoglobin-free human erythrocyte ghosts that were prepared in the presence of EDTA and were then exposed to  $Ca^{2+}$  showed a substantial loss of phosphatidylinositol phosphate and phosphatidylinositol diphosphate, measured either chemically or by loss of  $^{32}P$  from the lipids of prelabelled membranes. At the same time there was, as reported previously, an approximately equivalent rise in the diacylglycerol content of the membranes. It is concluded that human erythrocyte membranes contain at their cytoplasmic surface a  $Ca^{2+}$ -activated phosphodiesterase that is active against both phosphatidylinositol phosphate and phosphatidylinositol diphosphate. Rabbit erythrocytes also contained this enzyme, but in these cells there was also evidence for the presence of a  $Ca^{2+}$ -activated phosphatidate phosphomonoesterase.
- THE INFLUENCE OF DIETARY FAT LEVELS AND ENVIRONMENTAL TEMPERATURE ON DIGESTIBLE ENERGY AND ABSORBABILITY OF ANIMAL FAT IN CATFISH DIETS. J.W. Andrews, M.W. Murray and J.M. Davis (Univ. of Georgia, Agr. Exp. Station, P.O. Box 13687, Savannah, GA) *J. Nutr.* 108, 749-52 (1978). A study was conducted on the effects of three dietary levels of animal fat (5%, 10%, 15%) and two environmental temperatures (23 and 28°) on the digestible energy (DE) and apparent absorbability (AA) of animal fat in diets of 150 g catfish. Results obtained by the use of the chromic oxide indicator technique demonstrated that at 28° and substitution levels up to 10% of diet, animal fat had a DE value of 7,000 kcal/kg and an AA of 94%. At the 15% level of substitution, both DE and AA were substantially reduced. At each level of substitution, DE and AA values were considerably lower in fish reared at 23°. At supplemental levels up to 10% of diet, the DE and AA values for catfish at 23° were 6,130 kcal/kg and 70%, respectively. Results from this study reconfirmed previous growth data which indicated that animal fat is an excellent dietary energy source for catfish which are reared at optimum temperatures.
- THE HETEROGENEITY OF THE LIPOPROTEIN LIPASE OF RAT EPIDIDYMAL ADIPOSE TISSUE. P. Ashby, A.M. Tolson and D.S. Robinson (Dept. of Biochem., Univ. of Leeds, Leeds LS2 9LS, U.K.) *Biochem. J.* 171, 305-311 (1978). Lipoprotein lipase is heterogeneous, and it was suggested that the enzyme in adipose tissue is transformed from a species of mol. wt. approx. 120,000 to forms of much higher molecular weight as it is secreted from the fat-cell. This paper demonstrates that the forms of higher molecular weight are probably artifacts. The results indicate that the enzyme forms of mol. wt. greater than 120,000 result from an association of the enzyme with particulate material. It is therefore necessary to reconsider schemes that have recently been proposed for the synthesis and export of lipoprotein lipase.
- THE SYNTHESIS OF PHOSPHATIDYLCHOLINE BY ADULT RAT LUNG ALVEOLAR TYPE II EPITHELIAL CELLS IN PRIMARY CULTURE. J.J. Batenburg, W.J. Longmore and L.M.G. Van Golde (Lab. of Veterinary Biochem., State Univ. of Utrecht, Biltstraat 172, Utrecht, The Netherlands) *Biochim. Biophys. Acta* 529, 160-70 (1978). The formation of phosphatidylcholine from radioactive precursors was studied in adult rat lung alveolar type II epithelial cells in primary culture. The incorporation of (Me- $^{14}C$ )choline into total lipids and phosphatidylcholine was stimulated by addition of palmitate, whereas the incorporation of (U- $^{14}C$ )glucose into phosphatidylcholine and disaturated phosphatidylcholine was stimulated by addition of choline. Fatty acids stimulated the incorporation of (U- $^{14}C$ )glucose into the glycerol moiety of phosphatidylcholine. The degree of unsaturation of the added fatty acids was reflected in the distribution of (U- $^{14}C$ )glucose label among the different molecular species of phosphatidylcholine. It is suggested that the glucose concentration in the blood as related to amount of available fatty acids and their degree of unsaturation may be factors governing the synthesis of surfactant lipids.
- BILE ACIDS IN BILE OF GERMFREE AND CONVENTIONAL DOGS. M.H. Beaver, B.S. Wostmann, and D.C. Madsen (The Lobund Lab., Dept. of Microbiol., Univ. of Notre Dame, Notre Dame, IN) *Proc. Soc. Exp. Biol. Med.* 157, 386-9 (1978). The amount and composition of gallbladder bile acids of eight germfree and four conventional pure-bred Beagle dogs were determined. Unlike in other mammalian species, no major differences in bile acid composition were found between germfree and conventional dogs. Germfree dog bile contained on the average 94.9% cholic acid and 4.6% chenodeoxycholic acid. Conventional dog bile contained 83.6% cholic acid, 3.7% chenodeoxycholic acid and in addition, 12.1% deoxycholic acid. Bile from both germfree and conventional dogs contained traces of keto-bile acids. The average amounts of total bile acids in mg/ml bile were  $36.8 \pm 2.6$  (germfree) and  $28.5 \pm 2.9$  (conventional). Except for differences in conjugation, dog and human biliary bile acid patterns are qualitatively comparable, and differ from those in rats and mice in that muricholic and related bile acids are found only in the latter group.
- TURNOVER OF PHOSPHOLIPID LINOLEIC AND ARACHIDONIC ACIDS IN HUMAN PLATELETS FROM PLASMA LECITHINS. G. Bereziat, J. Chambaz, G. Trugnan, D. Pepin, and J. Polonovski (Lab. de Biochimie, Faculte de Medecine Saint-Antoine, 27 rue Chaligny, 75571-Paris Cedex 12, France) *J. Lipid Res.* 19, 495-500 (1978). Incubation of platelet-rich plasma with high density lipoproteins labeled either with 1-acyl-2-(1- $^{14}C$ )-arachidonoyl-sn-glycero-3-phosphocholine or 1-acyl-2-1- $^{14}C$  linoleoyl-sn-glycero-3-phosphocholine showed the existence of a pool of phosphatidylcholine in platelets, which rapidly exchanges with the phosphatidylcholine in plasma. The labeled linoleic and arachidonic acids from the respective labeled phos-

phatidylcholines were found in the other glycerophospholipids. These transacylation processes were much more active with the arachidonoyl-labeled dylcholine. Arachidonic acid was mainly found in the phosphatidylinositol.

**PHOSPHOLIPID DEPENDENCE OF UDP-GLUCURONYLTRANSFERASE.** C. Berry, J. Allistone and T. Hallinan (Dept. of Biochem., and Chem., Royal Free Hosp. Schl. of Med., 8 Hunter Street, London WC1N LBP, U.K.) *Biochim. Biophys. Acta* 507, 198-206 (1978). Very extensive hydrolysis of phospholipids with pure *Bacillus cereus* phospholipase C at 5°C greatly inhibited the maximum demonstrable rate of glucuronidation of *p*-nitrophenol by UDPglucuronyltransferase in guinea pig liver microsomes. Lysophosphatidylcholine restored much of the inhibited activity but non-phospholipid surfactants or hydrolysis of diglycerides failed to reactivate. Phospholipid depletion likewise inhibited *o*-aminophenol glucuronidation and phospholipids restored activity. It is concluded that glucuronyltransferase specifically requires phospholipids for optimum activity. It seems unlikely that these phospholipids only serve to dissolve aglycones, or that they are direct physiological regulators of the transferase. Instead, a permissive role is ascribed to phospholipids, allowing glucuronyltransferase to be regulated by other means.

**EFFECT OF DIETARY POLYUNSATURATED FATTY ACIDS ON TISSUE VITAMIN E STATUS.** J.G. Bieri, S.L. Thorp and T.J. Tolliver (Lab. of Nutr. and Endocrinology, National Inst. of Arthritis, Metabolism, and Digestive Diseases, National Inst. of Health, Bethesda, MD) *J. Nutr.* 108, 392-8 (1978). The purpose of this study was to determine if feeding increasing dietary levels of polyunsaturated fatty acids (PUFA) over the relatively long period of 2 months affects the tissue content of  $\alpha$ -tocopherol, and to determine how increasing the intake of dietary PUFA changes the tissue ratio of  $\alpha$ -tocopherol:PUFA. Weanling rats were fed a purified diet with 16% fat composed of a mixture of stripped lard and stripped corn oil to give three levels of linoleic acid ranging from 2% to 9% of the diet.  $\alpha$ -Tocopherol was kept at a constant dietary level, 30 to 50 mg/kg in different experiments. After 8 to 10 weeks, tissues were analyzed for  $\alpha$ -tocopherol and total PUFA. It is concluded that dietary PUFA has a variable but small effect in lowering the tissue content of  $\alpha$ -tocopherol, and that the change in vitamin E status as judged by the tissue ratio of  $\alpha$ -tocopherol:PUFA is primarily a result of increased tissue deposition of PUFA.

**EFFECTS OF BILE SALTS ON HUMAN ERYTHROCYTES. PLASMA MEMBRANE VESICULATION, PHOSPHOLIPID SOLUBILIZATION AND THEIR POSSIBLE RELATIONSHIPS TO BILE SECRETION.** D. Billing-ton and R. Coleman (Dept. of Biochem., Univ. of Birmingham, P.O. Box 363, Birmingham B15 2TT U.K.) *Biochim. Biophys. Acta* 509, 33-47 (1978). Glycocholate removed approximately 25% of the membrane acetylcholinesterase and 10% of the membrane phospholipid from intact human erythrocytes prior to the onset of cell lysis. At low concentration (up to 6mM), glycocholate caused human erythrocytes to become echinocytic and to pinch off microvesicles, whereas at higher concentrations glycocholate also specifically released components from the outer leaflet of the plasma membrane in a 'soluble' form (as defined by their presence in a 150,000  $\times$  g/60 min supernatant) and caused the cells to become stomatocytic. Whilst the phospholipid profile of the soluble material differed from that of the whole membrane, the profile of the microvesicle fraction was similar. The microvesicles were depleted in several membrane proteins with respect to phospholipids. These obs. are discussed in relation to the possible role of bile salts in the origins of biliary phospholipid and protein.

**INTRAVENOUS FEEDING OF THE RAT WITH SHORT CHAIN FATTY ACID ESTERS. II MONOACETOACETIN.** R.H. Birkhahn, and J.R. Border (Dept. of Surgery and Biochem., State Univ. of NY at Buffalo, Buffalo, NY) *Am. J. Clin. Nutr.* 31, 436-41 (1978). Acetoacetic acid is oxidized independent of carnitine transport into the cell mitochondria and its monoglyceride is a water soluble compound. The latter was examined as an intravenous nutrient. The monoglyceride of acetoacetic acid was prepared from the acid anhydride, diketene, and glycerol and was found to be totally miscible with water. The nutritional properties of monoacetoacetin were investigated by continuous intravenous infusion of 25 or 50 g/kg body weight per day into ad libitum fed rats. The response of these animals was compared to normal and food restricted rats. All experimental animals survived the 7 day

study period in good health and were free of detectable physiological and behavioral abnormalities. It was concluded from these results that monoacetoacetin might be an asset for intravenous nutrition.

**EFFECT OF DIFFERENT DIETARY TRIGLYCERIDES ON 7 $\alpha$ -HYDROXYLATION OF CHOLESTEROL AND OTHER MIXED-FUNCTION OXIDATIONS.** I. Bjorkhem, R. Blomstrand, and L. Svensson (Dept. of Clinical Chem., Huddinge Univ. Hosp., Karolinska Inst., Stockholm, Sweden) *J. Lipid Res.* 19, 359-69 (1978). The effect of a diet containing triglycerides of different fatty acid composition on hepatic 7 $\alpha$ -hydroxylation of cholesterol was studied. 7 $\alpha$ -Hydroxylation of exogenous as well as endogenous cholesterol was significantly lower in the liver of rats fed trilinolein and triolein than in those fed tripalmitin and trierucin. The concentration of cytochrome P-450 in liver microsomes was significantly lower in the rats fed tripalmitin and trierucin than in those fed triolein and trilinolein. The inhibitory effect of triolein and trilinolein on 7 $\alpha$ -hydroxylation of cholesterol and stimulatory effect of these triglycerides on the concentration of cytochrome P-450 was not due to the small amounts of peroxides present in the unsaturated triglycerides. The level of cholesterol 7 $\alpha$ -hydroxylase activity was found to be better related to the degree of absorption of fat than to total amount of absorbed fat or degree of unsaturation of the fat. The results are discussed in relation to previous knowledge concerning mechanisms regulating biosynthesis of bile acid.

**ISOLATION AND CHARACTERIZATION OF CELLS FROM RAT ADIPOSE TISSUE DEVELOPING INTO ADIPOCYTES.** P. Bjorntorp, M. Karlsson, H. Pertoft, P. Pettersson, L. Sjostrom, and U. Smith (Clinical Metabolic Lab. of Dept. of Med. I and II, Sahlgren's Hosp., Univ. of Goteborg, Goteborg, Sweden) *J. Lipid Res.* 19, 316-24 (1978). To identify cells developing into adipocytes by accumulation of triglyceride, rat epididymal fat pad cells from small rats were exposed to  $^3$ H-labeled chylomicron fatty acids in vivo and then liberated with collagenase. Tissue remnants were removed by filtration and mature fat cells by flotation. Aggregating cells were then removed by filtration through a 25- $\mu$ m nylon screen. Further purification of cells labeled in vivo was obtained by removing floating cells from those adhering to the bottom of a culture dish. The adhering cells multiplied to a confluent monolayer when cultured in Medium 199 containing serum, glucose, insulin, and a triglyceride emulsion. It was concluded that cells from the epididymal fat pad from small rats can be isolated in a homogenous fraction that develops in culture into cells of identical morphology and function as adipocytes formed in vivo. The differentiation of these cells into adipocytes may be manipulated in vitro.

**EFFECTS OF SATURATED AND UNSATURATED FATS GIVEN WITH AND WITHOUT DIETARY CHOLESTEROL ON HEPATIC CHOLESTEROL SYNTHESIS AND HEPATIC LIPID METABOLISM.** W. Bochenek and J.B. Rodgers (Dept. of Med., Albany Med. College, Albany, NY) *Biochim. Biophys. Acta* 528, 1-16 (1978). Hepatic cholesterol synthesis was studied in rats after consuming diets of varying neutral lipid and cholesterol content. Cholesterol synthesis was evaluated by measuring 3-hydroxy-3-methylglutaryl-CoA reductase and by determining the rate of  $^3$ H-labeled sterol production from [ $^3$ H]mevalonate. Results were correlated with sterol balance data and hepatic lipid content. Hepatic cholesterol synthesis was relatively great when cholesterol was excluded from the diet. The source of neutral dietary lipids, saturated vs. unsaturated, produced no change in hepatic sterol synthesis. Values for fecal sterol outputs and hepatic cholesterol levels were also similar in rats consuming either saturated or unsaturated fats. It is concluded that dietary cholesterol alters cholesterol and fatty acid metabolism in the liver and that this effect is enhanced by dietary unsaturated fats.

**OXYGEN CONSUMPTION AND BODY FAT CONTENT OF YOUNG LEAN AND OBESE (OB/OB) MICE.** G.A. Boissoneault, M.J. Hornshuh, J.W. Simons, D.R. Romsos and G.A. Leveille (Dept. F.S. and Human Nutr., Michigan State Univ., East Lansing, Mich. 48824) *Proc. Soc. Exp. Biol. Med.* 157, 402-6 (1978). Rates of oxygen consumption were determined daily from birth to 19 days of age and weekly thereafter until 16 weeks of age in lean and obese mice. As early as 5 days after birth obese mice consumed less oxygen than lean mice. Obese mice weighed more than lean mice by 6 days of age and contained 38% more fat than lean mice at 7 days of

age. At 14 days of age obese mice contained 53% more fat than lean mice. Beyond 3 weeks of age oxygen consumption of obese mice was less than observed in lean mice when the results were expressed per g body weight, but the values for obese and lean mice were similar when expressed per animal. These results demonstrate that alterations in energy metabolism occur very early in the life of obese mice.

REGULATION OF CHOLESTEROL SYNTHESIS IN THE HYPERLIPO-PROTEINAEMIAS. POLYMORPHONUCLEAR LEUCOCYTE ABNORMALITY SPECIFIC TO FAMILIAL TYPE II HYPERCHOLESTEROLAEMIA. W.F. Bremner, J.H.C. Third, B. Clark, C. Corstorphine and T.D.V. Lawrie (Univ. Dept. of Med. Cardiology, Royal Infirmary, Glasgow G4 0SF, UK) *Atherosclerosis* 29, 291-9 (1978). A simple procedure has been devised to give virtually pure preparations of polymorphonuclear leucocytes. This has permitted study of the regulation of cholesterol biosynthesis at cell level. Freshly isolated cells from donors with various forms of hyperlipoproteinaemia have been shown to have very low levels of cholesterol synthesis, presumably due to high circulating levels of apoprotein-B in donor plasma. The activity of the rate-limiting enzyme for cholesterol biosynthesis, 3-hydroxy-3-methylglutaryl coenzyme A reductase, rapidly increases as the cells are incubated in lipoprotein-deficient medium, until, by 12h, cells from patients heterozygous for familial type IIa hypercholesterolaemia are clearly distinguished from other hyperlipoproteinaemias. The possible significance of this finding is discussed in relation to the causation and treatment of atherosclerotic disease.

TRANSFER OF PHOSPHATIDYLCHOLINE FACILITATED BY A COMPONENT OF HUMAN PLASMA. M.E. Brewster, J. Ihm, J.R. Brainard and J.A.K. Harmony (Chem. Dept., Indiana Univ., Bloomington, Ind.) *Biochim. Biophys. Acta* 529, 147-59 (1978). A constituent of lipoprotein-free ( $p > 1.21$ ) human plasma from normolipemic donors facilitates the transfer of diacyl phosphatidylcholine from unilamellar egg yolk phosphatidylcholine liposomes to liver mitochondria. The active component is heat labile, has a hydrated density greater than 1.25 and an apparent molecular weight of more than 100,000. The presence of this protein in plasma may facilitate movement of diacylphospholipids between the surfaces of lipid-containing particles such as lipoproteins and erythrocytes. Knowledge of the properties and behavior of this protein are important in designing methods of drug therapy based on encapsulation in biodegradable lipid vesicles.

EFFECT OF DIETARY AFLATOXIN ON VITAMIN D<sub>3</sub> METABOLISM IN CHICKS. W.M. Britton and R.D. Wyatt (Dept. of Poultry Sci., Univ. of Georgia, Athens, GA) *Poult. Sci.* 57, 163-5 (1978). Male broiler chicks were fed diets containing either 0 (control) or 2.5 p.p.m. aflatoxin (toxin) for four weeks. A group of eight birds fed each diet was injected intravenously with radioactive vitamin D<sub>3</sub> and a second group with radioactive 25-hydroxy vitamin D<sub>3</sub> (25-OH D<sub>3</sub>). Plasma was obtained 24 hr. after dosing with D<sub>3</sub> and 6 hr. after dosing with 25-OH D<sub>3</sub>. The vitamin D metabolites were extracted from the plasma and chromatographed on Sephadex LH-20 for separation. The only significant differences between the control and toxin groups were in D<sub>3</sub> and 24,25-(OH)<sub>2</sub> D<sub>3</sub> in chicks given D<sub>3</sub>. Even these changes were small and the data would suggest that feeding 2.5 p.p.m. aflatoxin for four weeks does not greatly alter vitamin D metabolism.

A SPECTROPHOTOMETRIC METHOD FOR THE ASSAY OF CYTIDINE 5'-DIPHOSPHO-1,2-DIACYL-SN-GLYCEROL-DEPENDENT ENZYMES OF PHOSPHOLIPID METABOLISM. G.M. Carman and W. Dowhan (Dept. of Biochem. and Molecular Biol., Univ. of Texas Med. Schl., Houston, TX) *J. Lipid Res.* 19, 519-22 (1978). Cytidine 5'-diphospho-1,2-diacyl-sn-glycerol-(CDP-diglyceride) hydrolase, CDP-diglyceride:L-serine 0-phosphatidyltransferase, and CDP-diglyceride:sn-glycerol-3-phosphate phosphatidyltransferase all release CMP from their liponucleotide substrate, CDP-diglyceride. We have developed a spectrophotometric assay for these enzymes using CMP kinase, pyruvate kinase, and lactate dehydrogenase to couple the release of CMP with the oxidation of NADH. Since several enzymes and substrates are used in the coupled assay system, the method is limited to analysis of partially purified preparations lacking competing activities.

COMBINED EFFECTS OF CLOFIBRATE AND DIOSGENIN ON CHOLESTEROL METABOLISM IN RATS. M.N. Cayen and D. Dvornik (Dept. of Biochem., Ayerst Res. Lab., Montreal H3C 3J1, P.Q., Canada) *Atherosclerosis* 29, 317-27 (1978). Groups of male rats were fed various doses of clofibrate and diosgenin, both alone and in combination for 1 week. Clofibrate suppressed the diosgenin-induced increase in hepatic cholesterol synthesis but did not alter the effectiveness of diosgenin in reducing cholesterol absorption. Diosgenin did not affect the bioavailability of CIPB. Clofibrate reduced the diosgenin induced increase in biliary levels of cholesterol; none of the regimens altered biliary bile acids. The combination produced greater decreases in LDL cholesterol than did either compound alone; the diosgenin-induced elevation in HDL cholesterol was partially reversed by clofibrate. The data provide a basis for the combined use of clofibrate and diosgenin in the control of hyperlipoproteinemia.

INCORPORATION OF LABELLED GLUCOSE AND GLYCEROL INTO PHOSPHOLIPIDS AND TRIGLYCERIDES BY RAT AND RABBIT AORTA. A.C. Chung (Adolescent Med., Res. Foun. of Children's Hosp. and Dept. of Surgery, Georgetown Univ. Med. Schl., Washington, D.C.) *Atherosclerosis* 29, 277-90 (1978). [<sup>14</sup>C]Glycerol and [U-<sup>14</sup>C]glucose were incorporated into aortic phospholipids and triglycerides by isolated rat and rabbit aorta. The major portion of radioactivity was found in the glycerol moiety of triglycerides and phospholipids. Within the range of concentrations studied the rate of incorporation of [<sup>14</sup>C]glycerol was dependent on substrate concentration, whereas the rate of incorporation of [U-<sup>14</sup>C]glucose was not. The distribution of radioactivity in the glycerophosphatides was found mainly in phosphatidylserine and phosphatidic acid when [<sup>14</sup>C]glycerol was used as substrate. On the other hand, the major portion of radioactivity was found in phosphatidylcholine when [U-<sup>14</sup>C]glucose was the substrate. The incorporation of [<sup>14</sup>C]glycerol and [U-<sup>14</sup>C]glucose into aortic triglycerides and phospholipids was markedly increased by aorta obtained from rabbits fed an atherogenic diet as compared to aorta from control animals. Results from double-labeled glycerol containing both [<sup>3</sup>H]glycerol and [<sup>14</sup>C]glycerol indicated that the biosynthesis of triglycerides and phospholipids in the rat aorta did not use phosphatidic acid from the same pool.

ENHANCED DEGRADATION OF TRYPSIN-TREATED LOW DENSITY LIPOPROTEIN BY FIBROBLASTS FROM A PATIENT WITH HOMOZYGOUS FAMILIAL HYPERCHOLESTEROLEMIA. T.E. Carew, M.J. Chapman, S. Goldstein and D. Steinberg (Div. of Metabolic Disease, Dept. of Med., Univ. of California San Diego, La Jolla, CA) *Biochim. Biophys. Acta* 529, 171-5 (1978). When [<sup>125</sup>I]-labeled native low density lipoprotein was incubated with skin fibroblasts from a patient with homozygous familial hypercholesterolemia, the observed rate of degradation of the protein moiety was less than 5% the rate observed with normal fibroblasts, in agreement with previous studies. The results show that the structural modifications induced by trypsin do not interfere with binding of low density lipoprotein to its normal high affinity receptor nor its degradation by normal cells. However, the modified lipoprotein is much more readily internalized and degraded by cells from the patient with homozygous familial hypercholesterolemia.

ABSOLUTE CONFIGURATION OF PENTAHYDROXY BILE ALCOHOLS EXCRETED BY PATIENTS WITH CEREBROTENDINOUS XANTHOMATOSIS: A CIRCULAR DICHROISM STUDY. B. Dayal, G. Salen, G.S. Tint, V. Toome, S. Shefer, and E.H. Mosbach (Dept. of Med., College of Med. and Dentistry of New Jersey, New Jersey Med. Schl. Newark, NJ) *J. Lipid Res.* 19, 187-90 (1978). The absolute configurations of the C<sub>27</sub> pentahydroxy bile alcohols present in bile and feces of two patients with cerebrotendinous xanthomatosis (CTX) were determined by circular dichroism (CD) spectroscopy. The CD spectra of 5 $\beta$ -cholestane-3 $\alpha$ , 7 $\alpha$ , 12 $\alpha$ , 24 $\alpha$ , 25-pentol in the presence of Eu(fod)<sub>3</sub> [tris(1,1,1,2,2,3,3-heptafluoro-7,7-dimethyloctane-4,6-dionato) europium (III)] exhibited a negative Cotton effect and was assigned the 24R absolute configuration. Conversely, 5 $\beta$ -cholestane-3 $\alpha$ , 7 $\alpha$ , 12 $\alpha$ , 24 $\beta$ , 25-pentol showed a strong positive Cotton effect and was assigned the 24S configuration. These assignments were based upon comparison with a model compound, 5-cholestene-3 $\beta$ , 24(R), 25-triol, whose single-crystal X-ray structure has been determined. The importance of these data is to establish a structural mechanism for the conversion of 5 $\beta$ -cholestane-3 $\alpha$ , 7 $\alpha$ , 12 $\alpha$ , 24S, 25-pentol rather than 5 $\beta$ -cholestane-3 $\alpha$ , 7 $\alpha$ , 12 $\alpha$ , 24R, 25-pentol into cholic acid in man as well as in animals.

STUDIES ON THE MECHANISM OF FAT-FREE DIET (FFD) PROTECTION AGAINST INDOMETHACIN-INDUCED INTESTINAL ULCERS. P. Del Soldato and A. Mclii (Pharmacology Dept., Res. Lab., A. Menarini Pharmaceuticals, 50131 Florence, Italy) *Proc. Soc. Exp. Biol. Med.* 158, 19-22 (1978). The possible relationship between bile flow and/or composition as well as  $\beta$  glucuronidase activity of the intestinal content and indomethacin-induced intestinal lesions has been investigated. In general, the following conclusions can be drawn: (i) The lower incidence of intestinal lesions in fat free (FFD) as compared to regular (RD) diet rats, must be attributed to factor(s) other than reduction in bile flow and/or composition. (ii) Intestinal  $\beta$  glucuronidase activity is markedly reduced in indomethacin-treated FFD and D-glucaro 1,4 lactone medicated RD rats. (iii) In agreement with data in the literature, our results indicate that there is a relationship between the decrease in intestinal  $\beta$  glucuronidase activity and the reduction in intestinal lesions. These findings are discussed.

ROLE OF NEGATIVELY CHARGED PHOSPHOLIPIDS IN HIGHLY PURIFIED ( $\text{Na}^+ + \text{K}^+$ )-ATPASE FROM RABBIT KIDNEY OUTER MEDULLA. STUDIES ON ( $\text{Na}^+ + \text{K}^+$ )-ACTIVATED ATPASE, XXXIX. J.J.H.H.M. De Pont, A. Van Prooijen-Van Eeden and S.L. Bonting (Dept. of Biochem., Univ. of Nijmegen, Nijmegen, The Netherlands) *Biochim. Biophys. Acta* 508, 464-477 (1978). The requirement for specific polar head groups of phospholipids for activity of purified ( $\text{Na}^+ + \text{K}^+$ ) ATPase from rabbit kidney outer medulla has been investigated. Comparison of content and composition of phospholipids in microsomes and the purified enzyme indicates that purification leads to an increase in the phospholipid/protein ratio and in phosphatidylserine content. Combination of the phospholipid-converting enzymes has the same effect as can be calculated from the effects of the enzymes separately. Only complete conversion of both phosphatidylserine and phosphatidylinositol results in a loss of 44% of the ( $\text{Na}^+ + \text{K}^+$ )ATPase activity and 36% of the potassium 4-nitrophenylphosphatase activity.

THE CATABOLISM OF HUMAN AND RAT VERY LOW DENSITY LIPOPROTEINS BY PERFUSED RAT HEARTS. L. Dory, D. Pocock and D. Rubinstein (Dept. of Biochem., McGill Univ., Montreal, Quebec, Canada) *Biochim. Biophys. Acta* 528, 161-75 (1978). The catabolism of human and rat  $^{125}\text{I}$ -labelled very low density lipoproteins (VLDL) was compared by perfusing the lipoproteins through beating rat hearts. Triacylglycerol was removed from the VLDL to a greater extent than the protein moiety, leaving remnants containing relatively more apo-B and less apo-C. The change in apo-C content of the remnants correlated with the loss of triacylglycerol. The extent of removal of triacylglycerol from the rat and human VLDL was similar and in most cases appeared to saturate the heart lipoprotein lipase. The remnants were slightly smaller in size than the VLDL, and included particles which appeared to be partially emptied. These data suggest that at normal concentrations rat VLDL are almost completely catabolised and taken up by the heart without the formation of LDL, while LDL is produced from human VLDL at all concentrations.

VITAMIN D METABOLISM AND EXPRESSION IN RATS FED ON LOW-CALCIUM AND LOW-PHOSPHORUS DIETS. S. Edelstein, D. Noff, L. Sinai, A. Harell, J.B. Puschett, E.E. Golub and F. Bronner (Dept. of Endocrinology, Municipal-Govt. Med. Center, Ichilov Hosp. and Sackler Schl. of Med., Univ. of Tel Aviv, Tel-Aviv-Jaffa, Israel) *Biochem. J.* 170, 227-33 (1978). Cholecalciferol, radioactively labelled with both  $^{14}\text{C}$  and  $^3\text{H}$ , was administered weekly for 7 weeks to rats that had been depleted of vitamin D for 4 weeks before repletion with the radioactive vitamin. This permitted measurement of the steady-state effect on vitamin D metabolism of low-calcium and low-phosphorus regimens, as compared with a normal mineral intake. These dietary manoeuvres were carried out during the last 3 weeks of repletion. It is concluded that in the rat, unlike the chick, hypophosphataemia is not associated with a stimulation of the production of 1,25-dihydroxycholecalciferol or its expression in the synthesis of  $\text{Ca}^{2+}$ -binding protein. Therefore the plasma phosphate concentration does not appear to be directly involved in the regulation of the functional metabolism of vitamin D.

EFFECTS OF AGE, DIET AND LACTATION ON LIPOGENESIS IN RAT ADIPOSE, LIVER AND MAMMARY TISSUES. M. Farid, R.L.

Baldwin, Y.T. Yang, E. Osborne and G. Grichting (Dept. of Animal Sci., Univ. of Calif., Davis, CA) *J. Nutr.* 108, 514-24 (1978). Four diets varying in safflower oil content from zero to 20% were used in a study of interactions among diet and physiological state. Increasing fat in the diet did not alter food intakes but decreased digestibility coefficients. Increasing safflower oil intake did not alter milk fat content in lactating rats but increased relative amounts of unsaturated fatty acids in milk fat. Reduced glyceride glycerol synthesis in lactating as compared to non-lactating rat adipose coupled with reduced fatty acid synthesis and in increased lipolysis indicated a shift in adipose function in the direction of increased fat mobilization as would be supportive of lactation. Only minor diet effects upon mammary enzyme patterns and rates of in vitro lipogenesis were observed.

METABOLIC HETEROGENEITY IN THE FORMATION OF LOW DENSITY LIPOPROTEIN FROM VERY LOW DENSITY LIPOPROTEIN IN THE RAT: EVIDENCE FOR THE INDEPENDENT PRODUCTION OF A LOW DENSITY LIPOPROTEIN SUBFRACTION. N.H. Fidge and P. Poulis (Dept. of Clinical Sci., John Curtin Schl. of Med. Res., Australian National Univ., Canberra, Australia) *J. Lipid Res.* 19, 342-9 (1978). The formation of low density lipoprotein (LDL) from very low density lipoprotein (VLDL) was studied after injecting  $^{14}\text{C}$ -radiomethylated or  $^{125}\text{I}$ -radioiodinated VLDL into rats. VLDL and LDL B apoprotein specific radioactivity time curves were obtained after tetramethylurea extraction of the lipoproteins. In all experiments the specific activity of LDL B apoprotein did not intercept the VLDL curve at maximal heights, suggesting that not all LDL B apoprotein is derived from VLDL B apoprotein. These results contrasted strikingly with similar data obtained for normal humans in which all LDL is derived from VLDL. In the rat, it appears that most of the B apoprotein in the  $\text{S}_r$  0-5 range, which contains 65% of the total LDL B apoprotein, enters the plasma independently of VLDL secretion.

THE ACTIVATOR OF CEREBROSIDE-SULPHATASE: A MODEL OF THE ACTIVATION. G. Fischer and H. Jatzkewitz (Max-Planck-Institut für Psychiatrie, Neurochemische Abteilung, Kraepelinstr. 2, D-8000, München 40, G.F.R.) *Biochim. Biophys. Acta* 528, 69-76 (1978). The activator of cerebroside-sulphatase (cerebroside-3-sulphate-3-sulpho-hydrolase, EC 3.1.6.8) is necessary for the enzymic hydrolysis of sulphatides (cerebroside sulphates) at ionic concentrations in the physiological range. The pH optimum of the reaction is 4.5-4.8. Under similar incubation conditions, a complex is formed between activator and sulphatides which is partially inhibited, due to competitive binding in the presence of cerebroside or phosphatidylserine. Inhibition depends upon the concentration of the lipids and is of the same order of magnitude as the inhibition (by these lipids) of enzymic sulphatide hydrolysis in the presence of activator. Complex formation between activator and sulphatides is reversible since the complex dissociates partially when certain concentrations of phosphatidylserine are added. Moreover, the rate of sulphatide hydrolysis increases with the concentration of the activator sulphatide complex in the reaction mixture. This indicates that the activator sulphatide complex is the substrate for the enzyme and a model for this activation is presented.

LABELING OF PHOSPHOLIPIDS IN THE SURFACTANT AND SUBCELLULAR FRACTIONS OF RABBIT LUNG. A. Jobe, E. Kirkpatrick, and L. Gluck (Div. of Perinatal Med., Dept. of Pediatrics, Schl. of Med., Univ. of California, San Diego, La Jolla, CA) *J. Biol. Chem.* 253, 3810-6 (1978). The principal lung phospholipids were studied following pulse labeling of rabbit lung *in vivo* with phospholipid precursors ( $^3\text{H}$ )-glycerol and ( $^{14}\text{C}$ )palmitic acid. Alveolar wash, microsome, and lamellar body fractions subsequently were isolated. The phospholipids and the fatty acid compositions of each phospholipid in each lung fraction were quantified. The appearance of labeled phosphatidylethanolamine, phosphatidylglycerol, phosphatidylinositol, and phosphatidylethanolamine plus phosphatidylserine in each lung fraction was measured. Phosphatidylglycerol is a unique phospholipid in surfactant, and thus, may be as good a biochemical marker for the study of surfactant metabolism as is disaturated phosphatidylcholine.

SIMILAR CONTENT OF PHOSPHOLIPIDS AND GANGLIOSIDES IN NORMAL AND HOMOZYGOUS FAMILIAL HYPERCHOLESTEROLEMIA FIBROBLASTS. P.H. Fishman, R.M. Bradley, M.S. Brown, J.R. Faust, and J.L. Goldstein (Developmental and Metabolic



Neurology Branch, National Inst. of Neurological and Communicative Disorders and Stroke, National Inst. of Health, Bethesda, MD) *J. Lipid Res.* 19, 304-8 (1978). The cellular content of total and individual phospholipids and gangliosides was measured in fibroblasts cultured from four normal subjects, three patients with lysosomal lipid storage diseases, and two subjects with homozygous familial hypercholesterolemia. Measurements were made on cells grown in medium containing fetal calf serum under conditions in which normal cells derive cholesterol for cell growth from low density lipoprotein present in the fetal calf serum, whereas familial hypercholesterolemia homozygote cells, which lack cell surface low density lipoprotein receptors, derive cholesterol from endogenous synthesis. No difference was observed in the cellular content of total or individual phospholipids and gangliosides in the normal and familial hypercholesterolemia homozygote cells. In contrast, cells from a patient with Niemann-Pick disease and a patient with Sandhoff disease showed elevations in the content of sphingomyelin and complex gangliosides, respectively.

THE ROLE OF HOLOTRICHS IN THE METABOLISM OF DIETARY LINOLEIC ACID IN THE RUMEN. V. Girard and J.C. Hawke (Dept. of Chem., Biochem. and Biophys., Massey Univ., Palmerston North, New Zealand) *Biochim. Biophys. Acta* 528, 17-27 (1978). The uptake and metabolism of linoleic acid by rumen holotrichs (mainly *Isotricha prostoma* and *I. intestinalis*) has been examined in *in vitro* infusion experiments. Maximum absorption and metabolism of [ $^{14}\text{C}$ ] linoleate by  $2 \cdot 10^6$  *Isotricha* suspended in 100 ml buffer was obtained using an infusion rate of 1.6 mg. linoleate/h. After 90 min, 84% of the added substrate was recovered within the cells, mainly as free fatty acid or phospholipid. There was a rapid incorporation of radioactivity into phospholipid, mainly phosphatidylcholine, at the commencement of linoleate infusion but no further incorporation after about 40 min. The *Isotricha* population was  $3 \cdot 10^3$ - $2 \cdot 10^4$ /ml rumen fluid and it contributed about 23% of the linoleic acid in the rumen of a cow on a hay diet.

RAPID INCREASE IN HEPATIC HMG CoA REDUCTASE ACTIVITY AND *IN VIVO* CHOLESTEROL SYNTHESIS AFTER TRITON WR 1339 INJECTION. S. Goldfarb (Dept. of Pathology, Univ. of Wisconsin Schl. of Med., Madison, WI) *J. Lipid Res.* 19, 489-94 (1978). Triton WR 1339, injected intravenously into rats, caused a 12% decrease in hepatic cholesterol within 30 minutes and a 34% decrease after 2 hours. An early and progressive increase in plasma cholesterol and triglycerides was also confirmed. Although hepatic HMG CoA reductase activity was unchanged after 30 minutes, it had increased seven-fold after 105 minutes. These findings strongly suggest that Triton WR 1339 stimulates hepatic cholesterol synthesis by depleting hepatic cholesterol and trapping it in the blood compartment. The rapidity with which the drug acts supports the hypothesis that hepatocellular flux of cholesterol or its derivatized product could mediate the diurnal and hormonally induced fluctuations of cholesterol synthesis.

1-(3'-O-ACYL)- $\beta$ -GLUCOSYL-N-DIHYDROXY-PENTATRIACONTADIENOYL-SPHINGOSINE, A MAJOR COMPONENT OF THE GLUCOSYL-CERAMIDES OF PIG AND HUMAN EPIDERMIS. G.M. Gray, R.J. White and J.R. Majer (MRC Unit on Exp. Pathology of Skin, The Med. Schl. and Chem. Dept., Univ., Birmingham 15 U.K.) *Biochim. Biophys. Acta* 528, 127-37 (1978). The least polar of four chromatographically distinct glucosylceramides in both pig and human epidermis, was identified from its infrared spectrum and degradation products as O-acylglucosylceramide. Permethylated studies indicated that the acyl group was attached predominantly (80%) to the C-3 of glucose in the pig and only to the C-3 of glucose in the human O-acylglucosylceramide. Octadecadienoic acid was the major acid esterified to glucose in both pig and human O-acylglucosylceramides and sphinganine, sphinganine and heptadecaspheganine accounted for most of the long chain bases (87% in pig, 80% in humans). The evidence indicated that the O-acylglucosylceramide in pig epidermis and, by the close similarity of its properties, probably that in human epidermis also was 1-(3'-O-acyl)- $\beta$ -glucosyl-N-dihydroxypentatriacontadienoylsphingosine.

UTILIZATION OF EXOGENOUSLY ADDED AND ENDOGENOUSLY SYNTHESIZED FATTY ACIDS FOR GLYCEROLIPIDS SYNTHESIS IN ISOLATED RAT HEPATOCYTES. J.E.M. Groener and L.M.G. Van Golde (Lab. of Veterinary Biochem., State Univ. of Utrecht,

Biltstraat 172, Utrecht, The Netherlands) *Biochim. Biophys. Acta* 529, 88-95 (1978). Isolated hepatocytes were used to investigate the utilization of exogenously added palmitic acid versus that of endogenously synthesized fatty acids in the synthesis of triacylglycerols, phosphatidylcholines and phosphatidylethanolamines. From the distribution pattern of exogenously added and endogenously synthesized fatty acids among the various glycerolipids it is concluded that exogenous and endogenous fatty acids do not mix completely. It is suggested that the relative contributions of endogenously synthesized fatty acids and exogenous fatty acids available to the liver play a role in the regulation of the synthesis of triacylglycerols, phosphatidylcholines and phosphatidylethanolamines.

PHOSPHATIDYLCHOLINE SYNTHESIS IN NEWBORN RABBIT LUNG. DEVELOPMENT PATTERN AND THE INFLUENCE OF NUTRITION. I. Gross, C.M. Wilson and S.A. Rooney (The Div. of Perinatal Med., Dept. of Pediatrics, Yale Univ. Schl. of Med., New Haven, Conn.) *Biochim. Biophys. Acta* 528, 190-8 (1978). Newborn rabbits were fasted for 72 h. Pulmonary phospholipid content, synthesis and turnover in these rabbits was compared to that in littermate controls fed a balanced diet by gavage. Choline incorporation into phosphatidylcholine and disaturated phosphatidylcholine in lung slices was slightly decreased after 48 h of fasting. By 72 h there was a 36% decrease in the rate of choline incorporation into phosphatidylcholine in the fasted animals ( $P < 0.01$ ). The failure to observe a change in lung lavage phosphatidylcholine content after 72 h of fasting probably relates to the fact that a decreased rate of synthesis only occurs after 48-72 h of fasting and there is then a further delay before newly synthesized phosphatidylcholine appears in lung lavage. Since the rabbits could not survive a longer period of food deprivation it is unlikely that fasting results in decreased alveolar surfactant content in the newborn rabbit.

LIPID OXIDATION BY HEART MITOCHONDRIA FROM YOUNG ADULT AND SENESCENT RATS. R.G. Hansford (Lab. of Mol. Aging, Gerontology Res. Center, Nat. Inst. on Aging, Nat. Inst. of Health, Baltimore City Hosp., Baltimore, MD) *Biochem. J.* 170, 285-95 (1978). State-3 (i.e. ADP-stimulated) rates of  $\text{O}_2$  uptake with palmitoylcarnitine, palmitoyl-CoA plus carnitine, pyruvate plus malonate plus carnitine and octanoate as respiratory substrate were all diminished in heart mitochondria isolated from senescent (24-month-old) rats compared with mitochondria from young adults (6 months old). By contrast, State-3 rates of  $\text{O}_2$  uptake with pyruvate plus malate or glutamate plus malate were the same for mitochondria from each age group. Measurements of enzyme activities in disrupted mitochondria showed a decline with senescence in the activity of acyl-CoA synthetase (EC 6.2.1.2 and 6.2.1.3), carnitine acetyltransferase (EC 2.3.1.7) and 3-hydroxy-acyl-CoA dehydrogenase (EC 1.1.1.35), but no change in the activity of carnitine palmitoyltransferase (EC 2.3.1.21) or acyl-CoA dehydrogenase (EC 1.3.99.3). The mechanism of the diminished rate of  $\text{O}_2$  uptake with palmitoylcarnitine in senescence is discussed.

THE EFFECT *IN VITRO* OF IONIZING IRRADIATION AND SMALL RISES IN TEMPERATURE ON THE UPTAKE AND RELEASE OF LABELLED LIPIDS BY THE HUMAN ERYTHROCYTE MEMBRANE. H.J.M. Hansen, H. Karle and S. Stender (Riso National Lab., Roskilde, Denmark) *Biochim. Biophys. Acta* 528, 230-8 (1978). The effect of X-irradiation (50,000 rad) and an increase in temperature from 37 to 42°C on the synthesis, uptake and release of labelled lipids by erythrocytes was studied in plasma incubations *in vitro*. Both irradiation and a rise in temperature resulted in an enhanced synthesis of ( $^{32}\text{P}$ )phosphatidic acid in the erythrocytes. The uptake by the erythrocytes of  $^{14}\text{C}$ - and  $^3\text{H}$ -labelled cholesterol, ( $^{14}\text{C}$ ,  $^{32}\text{P}$ ) phosphatidylethanolamine and ( $^{14}\text{C}$ ,  $^{32}\text{P}$ ) phosphatidylcholine from plasma lipoproteins was increased by a rise in temperature but not by irradiation. These labelled lipids were apparently taken up in the ratio in which they were found in plasma. They were not released from the erythrocytes in the same manner.

THE ANTIHYPERCHOLESTEROLEMIC ACTIVITY OF CANDICIDIN AS A FUNCTION OF DIETARY CHOLESTEROL IN COCKERELS. W.C. Hausheer and H. Fisher (Dept. of Nutr., Rutgers Univ., New Brunswick, NJ) *J. Nutr.* 108, 712-8 (1978). In hypercholesterolemic diets, oral candicidin reduced plasma cholesterol concentration in a dose-dependent manner. Within the limits of detection, oral candicidin did not appear to be

absorbed from the intestine and appeared to be rapidly and quantitatively eliminated from the body in the feces. Chronic provision of candicidin appeared to increase transit time through the gastrointestinal tract.

EFFECTS OF VARIED ZINC/COPPER RATIOS ON EGG AND PLASMA CHOLESTEROL LEVEL IN WHITE LEGHORN HENS. L.R. Helwig, Jr., E.J. Mulnix and J.M. Regenstein (Dept. of Poultry Sci., Cornell Univ., Ithaca, NY) *J. Food Sci.* 43, 666-9 (1978). In order to test the hypothesis that the zinc to copper ratio is an important factor in determining the plasma level of cholesterol, White Leghorn laying hens were fed normal energy (2764 kcal/kg) and low energy (2470 kcal/kg) practical diets containing varied ratios of zinc to copper. The levels of zinc and copper used were selected such that neither was nutritionally limiting nor toxic. No significant differences were observed between the control diet (fed for 4 wk before commencing the actual experiment) or any of the experimental diets with the cholesterol levels averaging 13.3 mg/g for egg yolk and 84.1 mg% for the plasma samples.

LIPYOXYGENATION ACTIVITY OF PURIFIED PROSTAGLANDIN-FORMING CYCLOOXYGENASE. M.E. Hemler, C.G. Crawford, and W.E.M. Lands (Dept. of Biol. Chem., Univ. of Michigan, Ann Arbor, Mich.) *Biochemistry* 17, 1772-9 (1978). Purified cyclooxygenase, a single enzyme which catalyzes the formation of endoperoxide from arachidonic acid (20:4) in a bis (dioxygenase) reaction, is capable of oxygenating eicosadienoic acid (20:2) at C-11 in a single dioxygenase reaction. The partial oxygenation of 20:2 resembles the formation of prostaglandin from 20:4, with both oxygenation reactions exhibiting similar pH optima, substrate  $K_m$  values, and co-factor effects including a need for peroxide and an absolute requirement for heme. In addition, those processes known to destroy 20:4 oxygenase activity, such as heat inactivation, inactivation with anti-inflammatory drugs, and turnover-mediated inactivation, have equally destructive effects on 20:2 oxygenase activity. Thus, both oxygenations are catalyzed by one enzyme. All of the above similarities for 20:2 and 20:4 oxygenation demonstrate that C-11 oxygenation is an integral rate-limiting step of cyclooxygenase action rather than a separate reaction resembling that of plant lipoxygenase.

CHOLESTEROL AND HORMONE LEVELS IN SERA OF JUVENILE FEMALE RHESUS MONKEYS. P. Hill, S.A. Tepper, and D. Kritevsky (American Health Foundation, Valhalla, New York 10595) *Proc. Soc. Exp. Biol. Med.* 157, 231-4 (1978). Juvenile female rhesus monkeys were treated with either 17 $\beta$ -estradiol or testosterone propionate (by implantation) and the hormonal levels were kept elevated to puberty. There was no effect on weight gain in either group. Estradiol lowered plasma cholesterol and phospholipid levels significantly. Neither treatment has a significant effect on plasma  $\alpha/\beta$  lipoprotein cholesterol ratios or on the weights of liver, ovaries, or adrenals.

COMPARATIVE STUDY ON GLYCOLIPID COMPOSITION BETWEEN TWO CELL TYPES OF RAT ASCITES HEPATOMA CELLS. Y. Hirabayashi, T. Taki, M. Matsumoto and K. Kojima (Dept. of Biochem., Shizuoka College of Pharmacy, Oshika, Shizuoka-shi 422 Japan) *Biochim. Biophys. Acta* 529, 96-105 (1978). Hexose content in glycolipids derived from AH 7974F (free cell type) was about 3.6-fold as much as that from AH 7974 (island-forming cell type) on the basis of dry cell weight. The glycolipids in the cells of AH 7974 were tentatively identified as glucosylceramide, lactosylceramide, galactosylgalactosylglucosylceramide, globoside and hematocide (GM<sub>2</sub>) by both thin-layer and gas-liquid chromatography. On the other hand, the glycolipids in AH 7974F cells were glucosylceramide, lactosylceramide and at least four unknown lipids. Structure of one of these unknown lipids was shown to be asialo-GM<sub>2</sub> by methylation and enzymatic degradation studies. Moreover, the presence of asialo-GM<sub>1</sub> was suggested by immunoprecipitation test with anti-asialo-GM<sub>1</sub> serum. Glucosylceramide and lactosylceramide from AH 7974F cells were found to possess hydroxy fatty acids as major fatty acids components, which were rare in these glycolipids from AH 7974 cells.

FECAL STEROIDS IN DIARRHEA II. TRAVELLERS' DIARRHEA. C.T.L. Huang, J.N. Udall, M. Merson, and B.L. Nichols (Sec. of Nutr. and Gastroenterology, Dept. of Pediatrics, Baylor College of Med., Houston, TX) *Am. J. Clin. Nutr.* 31, 626-32 (1978). Fecal bile acid and neutral sterol patterns of five

healthy adult volunteers from the United States who contracted travellers' diarrhea in Mexico City in 1974 were studied. The only pathogen in four of these patients was the heat-stable-only enterotoxin producing strain of *Escherichia coli*. Stool culture for pathogens was negative in the fifth subject. There was an apparent increase in bacterial alteration of fecal steroids in the subject who showed no pathogens in stool culture, despite a decrease in total steroid concentrations of a magnitude similar to those observed in diarrhea associated with *E. coli* heat-stable. The results from this study are in striking contrast to the changes in gastrointestinal steroid metabolism previously observed in acute shigellosis.

FIBER, INTESTINAL STEROLS, AND COLON CANCER. C.T.L. Huang, G.S. Gopalakrishna, and B.L. Nichols (Sec. of Nutr. and Gastroenterology, Dept. of Pediatrics, Baylor Coll. of Med., Houston, Texas) *Am. J. Clin. Nutr.* 31, 516-26 (1978). It has been postulated that dietary fiber's protective effect against the development of colon cancer, diverticular disease, and atherosclerosis may be due to the absorption and/or dilution of intestinal sterols such as bile acids and neutral sterols and their bacterial metabolites by component(s) of fiber. Dietary fiber is made up of four major components—cellulose, hemicellulose, lignin, and pectin. There is evidence that hemicellulose and pectin may induce an increase in fecal bile acid excretion in man which may be accompanied by a decrease in serum cholesterol. Natural fibers, such as rolled oats, alfalfa, guar gum, and Bengal gram have been shown to have hypocholesterolemic properties and alfalfa, wheat straw, and some other fibers bound considerable amounts of bile acids in vitro. On the other hand, wheat bran, oat hulls, and all the synthetic fibers tested bound only negligible amounts of bile acids under the same conditions. Although some progress is being made, the data are often contradictory and confusing, probably due to lack of adequate documentation of fiber intake and/or the absence of detailed information on the chemistry of the fiber itself.

REGULATION BY DIETARY FATS OF 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE IN RAT LIVER. T. Ide, H. Okamoto and M. Sugano (Lab. of Nutr. Chem., Dept. of Food Sci. and Technology, Kyushu Univ. Schl. of Agr., Fukuoka 812, Japan) *J. Nutr.* 108, 601-12 (1978). The effects of various dietary fats on the activity of 3-hydroxy-3-methylglutaryl-Coenzyme A (HMG-CoA) reductase in rat liver microsomes, the rate-limiting enzyme in cholesterologenesis, were examined. A series of experiments demonstrated the dependency of the HMG-CoA reductase activity on the nature of dietary fats. When saturated fats with chain length of 12 to 18 were the dietary sources and were fed at the 10% level for 19 days, feeding fats with shorter chain fatty acids caused a lower enzyme activity compared to those with longer chain fatty acids. No consistent correlation between the HMG-CoA reductase activity and the content of microsomal cholesterol or cholesteryl ester and the fatty acid composition of microsomal lipids was observed.

ENHANCED BINDING BY CULTURED HUMAN FIBROBLASTS OF APO-E-CONTAINING LIPOPROTEINS AS COMPARED WITH LOW DENSITY LIPOPROTEINS. T.L. Innerarity and R.W. Mahley (Lab. of Exp. Atherosclerosis, Nat. Heart, Lung, and Blood Inst., Nat. Inst. of Health, Bethesda, Md) *Biochemistry* 17, 1440-7 (1978). Specificity for lipoprotein binding to the high affinity cell surface receptors of fibroblasts has been shown to be mediated by the B or arginine-rich (apo-E) apoproteins. The occurrence of a lipoprotein (the HDL<sub>c</sub>) in cholesterol-fed dogs, distinguished by the presence of the apo-E as the only detectable protein constituent but with other characteristics similar to those of the apo-B-containing low density lipoproteins (LDL), allowed for a direct comparison of the binding activity of the B vs. E apoproteins. The enhanced binding activity of the E apoprotein could modulate HDL binding and competitive displacement of LDL from the cell receptors with relatively minor changes in the E apoprotein content of these plasma lipoproteins.

THE ROLE OF DIETARY POLYUNSATURATED FAT IN LOWERING BLOOD CHOLESTEROL IN MAN. R.L. Jackson, O.D. Taunton, J.D. Morrisett, and A.M. Gotto, Jr. (Div. of Atherosclerosis and Lipoprotein Res., Dept. of Med., Baylor College of Med., Houston, TX) *Circ. Res.* 42, 447-53 (1978). In general, the diet rich in polyunsaturated fat produced lipoproteins which had a preponderance of linoleic acid, fatty acid which has

a lower transition temperature and is more "fluid" than palmitic and oleic acids. Morrisett et al. reasoned that the fatty acid differences in the lipoproteins produced in the two diets should be reflected by different thermotropic properties. Using pyrene excimer fluorescence and electron paramagnetic resonance methods, these authors have shown that the lipoproteins from the polyunsaturated diet had thermotropic transitions at lower temperatures than the lipoproteins from the saturated diet. The greatest difference in the transition temperature or fluidity of the lipoproteins was observed in the VLDL and is consistent with the fatty acid composition of the VLDL triglycerides. The importance of the altered lipoprotein composition and fluidity may be reflected in the catabolism of lipoproteins and may account for the hypocholesterolemic effect of polyunsaturated fat feeding.

**INCORPORATION OF EXCESS CHOLESTEROL BY HIGH DENSITY SERUM LIPOPROTEINS.** A. Jonas, L.K. Hesterberg, and S.M. Dregler (Dept. of Biochem., Schl. of Basic Med. Sci., Univ. of Ill., Urbana, IL) *Biochim. Biophys. Acta* 528, 47-57 (1978). Excess cholesterol was added to human HDL<sub>3</sub> and to bovine mammalian high density serum lipoprotein (HDL) by incubating aqueous lipoprotein solutions with solid dispersions of (<sup>14</sup>C)cholesterol on Celite. Lipoprotein cholesterol complexes were isolated by centrifugation and filtration through a Sepharose 4B column. The pure complexes were analyzed for protein and lipid content and composition and were subsequently investigated by physical methods (analytical ultracentrifugation, circular dichroism, and fluorescence spectroscopy), in order to detect any structural changes induced by added cholesterol. At maximum levels of added cholesterol both lipoproteins had increased molecular weights and sedimentation velocity coefficients corresponding to the increased mass of the particles. No major changes in the hydrodynamic properties were observed. At the molecular level, the protein components only showed a 15-20% decrease in fluorescence intensity, possibly a consequence of a modified environment of the aromatic amino acid residues. In the human HDL<sub>3</sub>, added cholesterol increased the microviscosity of the lipid domains by 1.2 P at 25°C (from 3.4 to 4.6 P), but did not affect the fluidity of bovine HDL lipids (5.9 P).

**HORMONAL REGULATION OF HEPATIC FATTY ACID SYNTHETASE IN CHICK EMBRYO.** V.C. Joshi and S.J. Wakil (Marrs McLean Dept. of Biochem., Baylor College of Med., Houston, TX) *J. Biol. Chem.* 253, 2120-5 (1978). Hepatic fatty acid synthetase activity is low in chick embryo and precociously increases 16-, 20-, and 12-fold upon administration of insulin, glucagon, and dibutyl adenosine 3':5'-monophosphate (Bt:cAMP), respectively. Immunotitrations of different enzyme preparations from induced and uninduced embryos against anti-synthetase  $\gamma$ -globulin gave identical equivalence points, indicating that the changes in enzyme activity after hormonal induction are due to changes in the amount of enzyme protein. The increase in hepatic synthetase content after administration of insulin, glucagon, and Bt:cAMP can be accounted for by a maximal increase in the rate of synthetase synthesis of 19-, 34-, and 16-fold, respectively.

**EFFECT OF HYPERVITAMINOSIS A ON HEMOLYSIS AND LIPID PEROXIDATION IN THE RAT.** V.N.R. Kartha and S. Krishnamurthy (Dept. of Biochem., T.D. Medical College, Alleppey-688005, Kerala, India) *J. Lipid Res.* 19, 332-4 (1978). Erythrocytes from rats fed large doses of vitamin A alone, or large doses of vitamin A and vitamin E or diphenyl-phenylene diamine (DPPD) were studied for H<sub>2</sub>O<sub>2</sub>-induced hemolysis. The vitamin A-dosed rats were more susceptible than normal rats to H<sub>2</sub>O<sub>2</sub>-induced hemolysis. Hemolysis was not accompanied by lipid peroxidation. Nevertheless, the antioxidants vitamin E and DPPD inhibited hemolysis in erythrocytes from vitamin A-dosed rats. These antioxidants had the same inhibitory effect when they were included in the diet or added to erythrocyte suspensions *in vitro*. These studies show that oxidative hemolysis occurs when the erythrocyte membrane is modified. Furthermore, this oxidative hemolysis is unrelated to lipid peroxidation.

**EFFECT OF PECTIN, GUM ARABIC AND AGAR ON CHOLESTEROL ABSORPTION, SYNTHESIS, AND TURNOVER IN RATS.** J.J. Kelley and A.C. Tsai (Univ. of Michigan, Human Nutr. Program, School of Public Health, Ann Arbor, Mich.) *J. Nutr.* 108, 630-9 (1978). A series of five experiments was conducted to

determine the effect of pectin, gum arabic and agar (5%) on cholesterol absorption, biosynthesis and turnover in rats. In the study of cholesterol absorption, a tracer dose of labeled cholesterol was included in the last meal. The rats were killed 12 hours later. The proportion of labeled cholesterol recovered in the whole body was used as an estimation of the efficiency of absorption of dietary cholesterol. This work supports the hypothesis that pectin lowers cholesterol levels by interfering with cholesterol absorption and by increasing cholesterol turnover. The study also suggested that complex carbohydrates differ in their effects on cholesterol metabolism. The reason for these differences remains to be determined.

**BLOOD SERUM FATTY ACID PATTERNS OF ADOLESCENT BOYS AS INFLUENCED BY SOURCE OF DIETARY FAT: CORN OIL/BUTTER OIL, SAFFLOWER OIL/BEEF TALLOW.** C. Kies, Li-Shine Lin, H.N. Fox and M. Korslund (Dept. of Food and Nutr., Univ. of Nebraska, Lincoln, NE 68583) *J. Food Sci.* 43, 598-602 (1978). The influence of type of dietary fat in low fat diets fed to adolescent boys on fatty acid patterns of selected blood serum lipid fractions was investigated in 2 studies. In pre-study investigations over a 2-yr period, fat intakes of subjects were studied while subjects consumed self-selected diets. Calculations were based on 3-day dietary diaries at monthly intervals kept by the subjects. Mean energy intake from fat was estimated to be 38% and mean intake of linoleic fatty acid was estimated to be 8.4 g per day. Palmitoleic acid, oleic acid and linoleic acid showed statistically significant differences in blood serum lipids of subjects fed safflower oil and beef tallow. In the butter oil/corn oil comparison, statistically significant differences in blood serum lipid fraction levels of oleic acid and linoleic acid were found. Safflower oil and corn oil showed linoleic acid elevating effects while beef tallow and butter oil had a depressing effect.

**RAT INTESTINAL 25-HYDROXYVITAMIN D<sub>3</sub> AND 1 $\alpha$ ,25-DIHYDROXY-VITAMIN D<sub>3</sub>-24-HYDROXYLASE.** R. Kumar, H.K. Schoes, and H.F. DeLuca (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wisconsin, Madison, Wis.) *J. Biol. Chem.* 253, 3804-9 (1978). The 24-hydroxylation of 25-hydroxyvitamin D<sub>3</sub> and 1 $\alpha$ ,25-dihydroxyvitamin D<sub>3</sub> occurs *in vitro* in rat intestinal homogenates. 1 $\alpha$ ,24,25-Trihydroxyvitamin D<sub>3</sub> obtained by incubating 1 $\alpha$ ,25-dihydroxyvitamin D<sub>3</sub> with rat intestinal homogenates was isolated and then identified by co-chromatography of the biologically generated material with synthetic 1 $\alpha$ ,24R,25-trihydroxyvitamin D<sub>3</sub> on a high pressure liquid chromatography system and by ultraviolet spectroscopy, periodate cleavage, and mass spectroscopy. Tissue distribution studies indicate that the process occurs in rat intestinal homogenates but not in rat muscle, liver, or fetal calvaria homogenates.

**CATABOLISM OF VERY LOW DENSITY LIPOPROTEINS IN THE RABBIT. EFFECT OF CHANGING COMPOSITION AND POOL SIZE.** R.S. Kushwaha and W.R. Hazzard (Northwest Lipid Res. Clinic, Harborview Med. Center, Univ. of Washington, Seattle, Wash.) *Biochim. Biophys. Acta* 528, 176-89 (1978). To determine the metabolic mechanism of hypercholesterolemia in rabbits produced by feeding cholesterol-rich diets, control and hypercholesterolemic rabbits were injected with I-labelled very low density lipoproteins (VLDL, d 1.006 g/ml) from control and/or hypercholesterolemic donors. Apolipoprotein B in VLDL decayed biphasically. The first phase occurred much more rapid than the second. The apolipoprotein B from hypercholesterolemic VLDL in the normal recipient disappeared at a similar rate as from normal VLDL via phase I; however, it was incompletely converted to IDL and LDL. Apolipoprotein B from normal VLDL in cholesterol-fed rabbits disappeared at a normal rate via phase I, but only 82% was catabolized by this phase. Hypercholesterolemic VLDL injected into the hypercholesterolemic recipient was less rapidly catabolized via phase I ( $t_{1/2} = 2.5 \pm 0.89$  h) and only a small fraction was converted to IDL and LDL.

**LEARNING BEHAVIOR AND BRAIN LIPID COMPOSITION IN RATS SUBJECTED TO ESSENTIAL FATTY ACID DEFICIENCY DURING GESTATION, LACTATION AND GROWTH.** M.S. Lamptey and B.L. Walker (Dept. of Nutr., College of Biol. Sci., Univ. of Guelph, Guelph, Ontario, N1G 2W1, Canada) *J. Nutr.* 108, 358-367 (1978). Female Wistar rats, fed a purified diet containing 10% corn oil for approximately 2 weeks prior to mating and during the first 14 days of gestation, were fed the same

diet or one containing 10% hydrogenated coconut oil (EFA-deficient) in place of corn oil, until parturition. After parturition, the females were fed the same diet or transferred to the alternate diet and progeny were weaned to the corn oil or coconut oil diet at 21 days of age. Brain lipids of the progeny were analyzed at 0, 21, and 225 days of age and the maze learning ability of adult progeny assessed. A relationship exists between prenatal exposure to EFA deficiency and learning potential of the progeny. Whether this is a direct result of the observed changes in brain fatty acid profiles in the newborn has still to be determined.

PHYSICAL AND NEUROLOGICAL DEVELOPMENT OF THE PROGENY OF FEMALE RATS FED AN ESSENTIAL FATTY ACID-DEFICIENT DIET DURING PREGNANCY AND/OR LACTATION. M.S. Lamptey and B.L. Walker (Dept. of Nutr., College of Biol. Sci., Univ. of Guelph, Guelph, Ontario N1G 2W1, Canada) *J. Nutr.* 108, 351-7 (1978). Female Wistar rats, fed ad libitum a purified diet containing 10% corn oil for approximately 2 weeks prior to mating and during the first 14 days of gestation, were fed the same diet or transferred to one containing hydrogenated coconut oil (essential fatty acid (EFA)-deficient) in place of the corn oil, for the last 7 days of gestation. At parturition, females from each group were fed either the same diet or the alternate diet. Physical, neuro-motor and reflexologic development of the progeny was determined during lactation. Lack of polyunsaturated fatty acids from the maternal diet during the final week of pregnancy and/or throughout lactation appeared to be less detrimental to the physical, reflexological and neuromotor development of the progeny than did lack of energy, protein or pyridoxine, nutrients previously investigated by other workers.

EFFECT OF MEDIUM CHAIN TRIGLYCERIDE ON LIPOGENESIS AND BODY FAT IN THE RAT. M.M. Lavau and S.A. Hashim (Dept. of Med., St. Luke's Hosp. Center, Inst. of Human Nutr., Columbia Univ., College of Physicians and Surgeons, Amsterdam Ave and 114th St., New York, NY) *J. Nutr.* 108, 613-20 (1978). Body weight, epididymal and perirenal adipose tissue weights, plasma insulin, ( $^{14}\text{C}$ )glucose incorporation into  $\text{CO}_2$  and lipid in epididymal and perirenal, and activity of lipogenesis-related enzymes in epididymal, perirenal and liver were measured in rats fed a low-fat diet (LF), a 55% (by energy) medium chain triglyceride diet (MCT), or a diet containing 60% corn oil, a long chain triglyceride (LCT). The data show that, unlike LCT, MCT has a reductive effect on fat stores, and like LCT, has a depressive effect on lipogenesis, suggesting possible application of MCT in obesity control.

CALCULATION OF PHASE DIAGRAMS FOR NON-IDEAL MIXTURES OF LIPIDS, AND A POSSIBLE NON-RANDOM DISTRIBUTION OF LIPIDS IN LIPID MIXTURES IN THE LIQUID CRYSTALLINE PHASE. A.G. Lee (Dept. of Biochem., Schl. of Biochem. and Physiol. Sci., Univ. of Southampton, Southampton, SO9 3TU U.K.) *Biochim. Biophys. Acta* 507, 433-44 (1978). An approach is presented which can simulate phase diagrams for binary mixtures of lipid molecules showing close agreement with experimental data and using a single parameter to describe the non-ideality of mixing in each phase. It is suggested that lipid mixtures form non-ideal mixtures in the liquid crystalline phase. Application of the theory of athermal solutions allows an estimate to be made of the relative distribution of like and unlike lipid molecules about a central lipid molecule.

CHOLESTEROL SYNTHESIS IN RUMINATING AND NONRUMINATING GOATS. G.U. Liepa, D.C. Beitz and J.R. Linder (Dept. of Animal Sci., Iowa State Univ., Ames, Iowa) *J. Nutr.* 108, 535-43 (1978). Cholesterol synthetic rates were determined in several tissues of ruminating (R) and nonruminating (NR) goats. The R goats were fed an amount of goat milk equivalent to 15% of body weight per day for 1 month and a non-purified hay-grain diet for the next 3 months. The NR goats were fed an amount of goat milk equivalent to 15% of body weight per day for 4 months. Rates of cholesterol synthesis from acetate and glucose were determined for adipose tissue, brain, liver, and small intestine. These studies have shown that liver is only a minor contributor and that adipose tissue and small intestine are major contributors of cholesterol synthesized by the young goat.

THE STEROIDS OF 2000-YEAR-OLD HUMAN COPROLITES. D.S. Lin, W.E. Connor, L.K. Napton, and R.F. Heizer (Dept. of Med.

and Clinical Res. Center, Univ. of Oregon Health Sci. Center, Portland, OR) *J. Lipid Res.* 19, 215-21 (1978). Six samples of human coprolites, some more than 2,000 years old, were analyzed for fecal steroid composition. Despite this very lengthy period of storage, the fecal steroids of coprolites were remarkably similar to those of stool samples collected today. The sterol nucleus was clearly rather stable under the dry environmental conditions of the Nevada Caves. The steroid content (g/g dried weight) of coprolite was low in comparison to that of modern man. The bile acid/cholesterol and plant sterol/cholesterol ratios of the coprolite, however, were similar to these ratios of the stools of modern man. In the six coprolites, an average 73% of the neutral steroids was digitonin-precipitable. This precipitate was composed of cholesterol and three plant sterols (campesterol, stigmasterol, and  $\beta$ -sitosterol) and their bacteria-modified products. A portion of the neutral steroids had been converted to products tentatively identified as epimers of these steroids. Individual bile acids were identified in the coprolite. The bile acid composition of the coprolite was similar to that of the stool of modern man.

DETERMINATION OF LIPOPROTEIN-LIPASE ACTIVITY IN HUMAN SKELETAL MUSCLE TISSUE. H. Lithell and J. Boberg (Dept. of Geriatrics, Univ. of Uppsala, Box 641, S-751 27 Uppsala, Sweden) *Biochim. Biophys. Acta* 528, 58-68 (1978). An in vitro assay system was developed for the determination of lipoprotein-lipase activity in 10-30 mg specimens of human skeletal muscle tissue. The reaction medium of the assay was based on a glycine buffer of pH 8.3 (at 37°C) with a heparin concentration of 1.5 g/l (about 180 IU/ml). The enzyme activity was measured as the release of ( $^3\text{H}$ )-oleic acid from a serum-activated, triglyceride emulsion, in which ( $^3\text{H}$ ) trioleate was used as trace substance. The enzyme activity studied had the characteristic properties of lipoprotein-lipase activity, i.e. it was activated by the addition of serum or apolipoprotein C-II and inhibited in the presence of high ionic strength, protamine sulphate or apolipoprotein C-III. A mean  $K_m$  of  $0.40 \pm 0.13$  (S.D.) mmol/l for triglyceride substrate was found in tissue samples that had very different concentrations of lipoprotein-lipase activity. This  $K_m$  was similar to the low fasting concentrations of very low density lipoprotein triglycerides often found in healthy individuals.

A SPIN-LABEL STUDY OF PHOSPHATIDYLCHOLINE EXCHANGE PROTEIN. REGULATION OF THE ACTIVITY BY PHOSPHATIDYL SERINE AND CALCIUM ION. K. Machida and S.I. Ohmishi (Dept. of Biophys., Faculty of Sci., Kyoto Univ., Kyoto 606, Japan) *Biochim. Biophys. Acta* 507, 156-64 (1978). Exchange of phosphatidylcholine catalyzed by exchange protein has been studied by a new technique using spin-labeled phosphatidylcholine (PC\*). The exchange activity was assayed by the change in electron spin resonance (ESR) spectrum when PC\* vesicles were incubated with unlabeled phospholipid vesicles. The method utilizes decrease in the spin-spin exchange interaction and does not require separation of the donor and acceptor vesicles. The inhibitory effect of the anionic lipid vesicles can be explained by their binding to the protein and incapability of exchange of the endogenous phosphatidylcholine with phosphatidylserine in the anionic membranes. The restoration by  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  may be due to binding of these cations to the anionic lipids, making the protein free from the vesicles. The divalent cations thus act regulatorily for the exchange reaction.

THE EFFECT OF VITAMIN A AND PROTEIN DEFICIENCY ON COMPLEMENT LEVELS IN RATS. B. Madjid, S. Sirisinha, and A.J. Lamb (Depts. of Microbiol. and Biochem., Faculty of Sci., Mahidol Univ., Bangkok, Thailand) *Proc. Soc. Exp. Biol. Med.* 158, 92-5 (1978). The role of protein and vitamin A in the maintenance of serum complement levels was studied using rats reared by a novel system enabling the synchronous induction of vitamin A deficiency and the stringent control of both the caloric and dietary protein input. Protein deficiency leads to a decrease in serum complement levels, whereas vitamin A deficiency enhances complement levels. Additional experiments to determine the relative rates of synthesis and catabolism of complement components in protein and vitamin A deficiency are required if the overall function(s) of these nutrients in determining serum hemolytic activities are to be fully understood.

PHOSPHATIDYLINOSITOL AS THE ENDOGENOUS ACTIVATOR OF THE ( $\text{Na}^+ + \text{K}^+$ )-ATPASE IN MICROSOMES OF RABBIT KIDNEY. J.G. Mandersloot, B. Roelofsen and J. De Gier (Lab. of Biochem.,

Univ. of Utrecht, Univ. Centre "De Uithof" Padualaan 8, Utrecht, Netherlands) *Biochim. Biophys. Acta* 508, 478-85 (1978). Incubation of rabbit kidney microsomes with pig pancreatic phospholipase A<sub>2</sub> produced residual membrane preparations with very low (Na<sup>+</sup>+K<sup>+</sup>)-ATPase activity. The activity could be restored by recombination with lipid vesicles of negatively-charged glycerophospholipids. Vesicles of pure phosphatidylcholine and phosphatidylethanolamine were virtually inactive in this respect, but could reactivate in the presence of cholate. Incubation of the microsomes with a combination of phospholipase C (*Bacillus cereus*) and sphingomyelinase C (*Staphylococcus aureus*) resulted in 90-95% release of the phospholipids. The residual membrane contained only phosphatidylinositol and still showed 50-100% of the (Na<sup>+</sup>+K<sup>+</sup>)-ATPase activity.

EFFECTS OF DIETARY FAT COMPOSITION ON THE EHRlich ASCITES TUMOR FLUID LIPOPROTEINS. S.N. Mathur and A.A. Spector (Dept. of Biochem. and Med., Univ. of Iowa, Iowa City IA) *J. Lipid Res.* 19, 457-66 (1978). Mice bearing the Ehrlich ascites tumor were fed diets rich in either coconut oil or sunflower oil. From 20 to 40% less lipid was present in the ascites tumor fluid when the mice were fed the sunflower oil diet. This was associated with a reduction in the amount of very low density lipoproteins (VLDL) and high density lipoproteins (HDL), the main lipoprotein fractions present in the ascites tumor fluid. These results indicate that the amount, composition, and physical properties of certain of the lipoproteins contained in the ascites tumor fluid can be modified by changing the composition of the dietary fat fed to mice bearing the Ehrlich ascites tumor.

INDUCTION OF LOW DENSITY LIPOPROTEIN RECEPTOR SYNTHESIS BY HIGH DENSITY LIPOPROTEIN IN CULTURES OF HUMAN SKIN FIBROBLASTS. N.E. Miller (Unit of Cardiovascular Metabolism and Nutr. Res., Baker Med. Res. Inst., Melbourne, Australia) *Biochim. Biophys. Acta* 529, 131-7 (1978). Further studies have been made of the effects of high density lipoprotein (HDL) on the surface binding, internalization and degradation of <sup>125</sup>I-labeled low density lipoprotein (<sup>125</sup>I-labeled LDL) by cultured normal human fibroblasts. In agreement with earlier studies, during short incubations HDL inhibited the surface binding of <sup>125</sup>I-labeled LDL. In contrast, following prolonged incubations <sup>125</sup>I-labeled LDL binding was consistently greater in the presence of HDL. The increment in <sup>125</sup>I-labeled LDL binding induced by HDL was: (a) associated with a decrease in cell cholesterol content; (b) inhibited by the addition of cholesterol or cycloheximide to the incubation medium; and (c) accompanied by similar increments in <sup>125</sup>I-labeled LDL internalization and degradation. It is concluded that HDL induces the synthesis of high affinity LDL receptors in human fibroblasts by promoting the efflux of cholesterol from the cells.

AROMATIZATION OF STEROIDS BY MITOCHONDRIAL PREPARATIONS FROM HUMAN TERM PLACENTA. K.B. Moorthy and R.A. Meigs (Dept. of Reproductive Biol., Schl. of Med., Case Western Reserve Univ., Cleveland, Ohio) *Biochim. Biophys. Acta* 528, 222-9 (1978). Structural and functional aspects of the association of aromatizing activity with placental mitochondrial preparations were examined. Total mitochondrial preparations, previously characterized with respect to their capacity for oxidative phosphorylation and for progesterone synthesis, converted androst-4-ene-3,17-dione to estrogens with specific activities averaging one-half those of corresponding microsomal fractions. Heavy mitochondria separated by differential centrifugation showed specific activities 16% of microsomal activities. Metabolically active mitochondria, selectively isolated by calcium phosphate loading combined with sucrose density gradient fractionation, also displayed significant aromatizing activity despite considerable inactivation by the experimental procedures.

LIPID AND LIPOPROTEIN SECRETION FOLLOWING PORTACAVAL SHUNT IN SWINE. A.C. Nestruck, M. Bergseth, M. Bidalliet, J. Davignon, and Y.L. Marcel (Inst. de Recherches Cliniques de Montreal, 110 ave. des Pins ouest, Montreal H2W 1R7, Canada) *Atherosclerosis* 29, 355-62 (1978). Lipid and lipoprotein secretion were studied over 24h in normal and portacaval shunted (PGS) fasting miniature swine after an infusion of Triton WR-1339 and [<sup>3</sup>H]amino acid mixture. The plasma triglyceride secretion rate and the secretion of triglyceride, total cholesterol and protein in the very low density lipoprotein fraction (VLDL) were linear for about 9 h after

Triton. No net catabolism of the VLDL appeared to take place over the 24 h. Due to large variation, differences in the absolute secretion rates of plasma triglyceride and of the VLDL constituents could not be shown. However, the secretion of VLDL cholesterol in the PCS group appeared to be lower than that of the sham group when corrected for metabolic body size and plasma volume.

BIOCHEMICAL ASPECTS OF THE VISUAL PROCESS. XXXVII. EVIDENCE FOR LATERAL AGGREGATION OF RHODOPSIN MOLECULES IN PHOSPHOLIPASE C-TREATED BOVINE PHOTORECEPTOR MEMBRANES. J. Olive, E.L. Benedetti, P.J.G.M. Van Breugel, F.J.M. Daemen, and S.L. Bonting (Institut de Biologie Moleculaire, Lab. de Microscopie Electronique, I.R.B.M. Tour 43, Univ. Paris VII, Paris, France) *Biochim. Biophys. Acta* 509, 129-35 (1978). Photoreceptor membranes derived from isolated bovine rod outer segments, are subjected to treatment with phospholipase C (*Bacillus cereus*). This results in varying degrees of hydrolysis of the membrane phospholipids into diglycerides and water soluble phosphate esters without loss of rhodopsin. Electron microscopic observations of thin sections and freeze-fractured preparations indicate extrusion of diglycerides from the membranes and their coalescence to lipid droplets, beginning at 20% hydrolysis of phospholipids. After 90% hydrolysis of phospholipids membranous structures are still present. The rhodopsin is located in these structures, presumably in the form of two-dimensional lateral aggregates. This explains the cross-fracturing of the phospholipase-treated photoreceptor membranes.

ISOLATION AND PARTIAL CHARACTERIZATION OF A NEW ACIDIC APOLIPOPROTEIN (APOLIPOPROTEIN F) FROM HIGH DENSITY LIPOPROTEINS OF HUMAN PLASMA. S.O. Olofsson, W.J. McConathy and P. Alaupovic (Lab. of Lipid and Lipoprotein Studies, Oklahoma Med. Res. Found., Univ. of Oklahoma Health Sci. Center, Oklahoma City, Oklahoma) *Biochemistry* 17, 1032-6 (1978). This report describes the isolation and partial characterization of a minor polypeptide from human plasma high density lipoproteins. To isolate this polypeptide, a combination of gel permeation and carboxymethylcellulose column chromatography was utilized. This procedure resulted in the isolation of a homogeneous polypeptide designated carboxymethylcellulose:unretained polypeptide (CM:U). These results suggest that the CM:U represents a new minor apolipoprotein designated according to the ABC nomenclature, apolipoprotein F (ApoF), and its corresponding lipoprotein family, lipoprotein F (LP-F).

PROSTAGLANDIN BIOSYNTHESIS AND CATABOLISM IN THE LAMB DUCTUS ARTERIOSUS, AORTA AND PULMONARY ARTERY. C.R. Pace-asciak and G. Rangaraj (Res. Inst., Hosp. for Sick Children, 555 Univ. Avenue, Toronto, M5G 1X8, Canada) *Biochim. Biophys. Acta* 529, 13-20 (1978). Homogenates of tissues from fetal and neonatal lamb ductus arteriosus, aorta and pulmonary artery have the capacity to convert arachidonic acid as well as the intermediate prostaglandin endoperoxide, prostaglandin H<sub>2</sub>, into three products: prostaglandins E<sub>2</sub>, F<sub>2α</sub> and a major product 6-ketoprostaglandin F<sub>1α</sub>. The three tissues also displayed prostaglandin 15-hydroxydehydrogenase and 13-reductase catabolic activities. The catabolising system showed considerable substrate specificity: prostaglandin E<sub>1</sub> was a good substrate whereas prostaglandins F<sub>1α</sub> and F<sub>2α</sub> were completely devoid of catabolism. The complete system was observed in immature as well as mature arterial vessels, in the fetus as well as the neonate (up to 7 days old). These experiments demonstrate the presence of several components of the prostaglandin system in these tissues and offer biochemical evidence for the implication of prostaglandins E<sub>2</sub> and I<sub>2</sub> in the maintenance of the ductus and neighboring vessels in a relaxed state in the fetus.

POSSIBLE INTERRELATIONSHIP BETWEEN VITAMINS E AND B<sub>12</sub> IN THE DISTURBANCE IN METHYLMALONATE METABOLISM IN VITAMIN E DEFICIENCY. A.S. Pappu, P. Patterpaker and A. Sreenivasan (Biochem. and Food Technology Div., Bhabha Atomic Res. Centre, Bombay 400 085, India) *Biochem. J.* 172, 115-21 (1978). The disturbance in 2-methyl-malonate metabolism resulting in its increased urinary excretion observed in vitamin E deficiency is not caused by increased formation of methyl-malonate from propionate as is evident from the activity of the enzyme propionyl-CoA carboxylase (EC 6.4.1.3), but can be traced to an impairment in the conversion of methyl-malonate into succinate by the vitamin B<sub>12</sub>-requiring enzyme, methylmalonyl-CoA mutase (EC 5.4.99.2) in rat liver. It is shown that the decrease in the activity



of methylmalonyl-CoA mutase in vitamin E deficiency is not a consequence of a secondary vitamin B<sub>12</sub> deficiency. Peroxidative destruction of the coenzyme in vitamin E deficiency was also ruled out. The results suggest a defect in the conversion of cyanocobalamin into its coenzyme form.

**MITOCHONDRIAL PHOSPHOLIPASE A<sub>2</sub> ACTIVITY AND MITOCHONDRIAL AGING.** J.W. Parce, Carol C. Cunningham, and M. Waite (Dept. of Biochem., Bowman Gray Schl. of Med., Wake Forest Univ., Winston-Salem, NC) *Biochemistry* 17, 1634-9 (1978). The changes in mitochondrial phospholipid metabolism and energy-linked functions have been followed as coupled mitochondria are allowed to age in isotonic sucrose at 18°C. Analysis of the aging process has provided an approach for studying the structure-function relationships within the mitochondrion without adding external agents to perturb the membrane structure. The initial event observed in this process of deterioration is a loss of respiratory control which is paralleled by diminishing levels of ATP. Furthermore, this study demonstrates that mitochondria which are only slightly damaged have the potential to effect membrane repair through reacylation of monoacyl phospholipids.

**THE TURNOVER OF HUMAN PLASMA VERY LOW DENSITY LIPOPROTEIN PROTEIN.** S.H. Quarfordt (Dept. of Med., Div. of Gastroenterology, Duke Univ. Med. Center, Durham, N.C.) *Biochim. Biophys. Acta* 489, 477-85 (1977). The plasma decay of three groups of iodinated apoproteins on human very low density lipoproteins were evaluated in two normals, two subjects with endogenous hypertriglyceridemia and another two with dysbetalipoproteinemia. The apo beta decay was more rapid than that of the C apoproteins in all patients. The apo beta decay was more rapid for the normals than for either the subjects with hypertriglyceridemia or dysbetalipoproteinemia. The apo C protein had an irregular decay in the normals but decayed less irregularly for the hypertriglyceridemics. The arginine rich apoprotein had a decay somewhat similar to apo C protein in the normals. The apo beta protein of the α<sub>2</sub> very low density lipoprotein of a dysbetalipoproteinemic was consistent with a precursor relationship to the apo beta very low density lipoprotein of this subject, but the arginine rich apoprotein was not.

**KINETICS OF LIPID-PROTEIN INTERACTIONS: INTERACTION OF APOLIPOPROTEIN A-I FROM HUMAN PLASMA HIGH DENSITY LIPOPROTEINS WITH PHOSPHATIDYLCHOLINES.** H.J. Pownall, J.B. Massey, S.K. Kusserow and A.M. Gotto, Jr. (Dept. of Med., Baylor College of Med., Houston, TX) *Biochemistry* 17, 1183-8 (1978). We have studied the interaction of liposomes of dipalmitoyl- and dimyristoylphosphatidylcholine (DPPC and DMPC, respectively) with apolipoprotein A-I (apoA-I) from human plasma high density lipoproteins (HDL) by chromatography on Sepharose 4B and kinetic turbidimetric methods. The incubation and chromatography of apoA-I and highly turbid DMPC mixtures at the phospholipid gel → liquid crystalline transition temperature, T<sub>c</sub>, revealed the complete incorporation of DMPC into a lipid-protein complex which scattered very little light. Similar experiments conducted above (30° C) and below (22° C) T<sub>c</sub> showed much less complex formation even when incubated for much longer times. Over similar time periods DPPC failed to associate completely with apoA-I even at its T<sub>c</sub> (41.5° C). These results were suggested to be important in predicting the rate of transfer of apoA-I from HDL to phospholipids and may be important in regulating the activity of the enzyme, lecithin:cholesterol acyltransferase.

**THE PRESENCE OF FATTY ACIDS IN HUMAN α-FETOPROTEIN.** D.C. Parmelee, M.A. Evenson, and H.F. Deutsch (Dept. of Physiological Chem. and Med., Univ. of Wis. Med. Center, Madison, Wis.) *J. Biol. Chem.* 253, 2114-9 (1978). α-Fetoprotein has been prepared from human fetal tissue by procedures utilizing DEAE-Sephadex, concanavalin A-Sepharose, and isoelectric focusing. A major and a minor component with isoelectric points of 4.7 and 5.3, respectively, have been isolated and are similar to those prepared under various conditions by other investigators. The 4.7 material contains 2.4 mol of fatty acids/mol of protein, whereas the minor component is fat-free. The relative amounts of fatty acid vary somewhat with different preparations. The ranges found in three isolates were as follows: palmitic acid (8 to 11%), stearic acid (2 to 5%), oleic acid (10 to 28%), linoleic acid (7 to 15%), arachidonic acid (12 to 39%), and 4,7,10,13,16,19-docosa-

hexaenoic acid (16 to 42%). Human fetal serum albumin contained 0.7 mol of fatty acid/mol of protein, with arachidonic acid and the docosahexaenoic acid comprising only 11.4% of the total. Removal of fatty acids by treatment with charcoal converted α-fetoprotein into material with an isoelectric point of pH 5.3. Addition of arachidonic acid to the lipid free-protein restored it to protein with a pH 4.7 isoelectric point, typical of the major native component. The possible role of the fatty acids in α-fetoprotein on the inhibition of various lymphocyte functions is projected.

**LIPID COMPOSITION AND BIOSYNTHESIS OF HUMAN OMENTAL TISSUE.** J.I. Rabinowitz, S.E. Askins, F.E. Luddy (Veterans Administration Hosp.-Univ. of Pennsylvania, Philadelphia, Penn) *Lipid* 13, 317-22 (1978). Two groups of five males each were selected for total lipid analyses of their omental tissue. One of these groups had been subjected to a severe caloric restriction and had undergone total weight reduction of about 20%. The other group served as control. Both of these groups of patients required elective surgical procedures during which it was possible to obtain small samples of omental tissue, adipose pad, and/or mesenteric tissue. Total lipid analyses were performed on all of the materials. A distinctive positional distribution of the acyl groups was maintained in the triglycerides of omental tissue for all the patients regardless of dietary state. Patients under caloric restriction showed a reduction in their total triglyceride content, a reduction in their content of unsaturated fatty acyl groups, and a relative increase in phospholipid content. The de novo lipid biosynthetic capacity of omental tissues, as determined by 1-<sup>14</sup>C-acetate incorporation, showed a versatile material capable of yielding rapidly many types of fatty acids. This ability, among others, could account for the usefulness of omental tissue as a supporting base in many types of restorative surgery.

**NEUTRAL LIPID ACCUMULATION IN THE MEMBRANES OF ESCHERICHIA COLI MUTANTS LACKING DIGLYCERIDE KINASE.** C.R.H. Raetz and K.F. Newman (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wisconsin, Madison, Wis.) *J. Biol. Chem.* 253, 3882-7 (1978). We have developed a rapid autoradiographic screening assay for detecting diglyceride kinase in colonies of *Escherichia coli* and have isolated four strains lacking this enzyme. The gene (designated dgk) which is altered in these mutants is cotransducible with the malB locus, near minute 90 on the chromosome. These results suggest that 1,2-diglyceride is the true substrate for the kinase *in vivo* and that the kinase functions as a minor route for phosphatidic acid synthesis. Genetic modification of the diglyceride content of the *E. coli* membrane has not been reported previously.

**AGE-RELATED CHANGES IN THE CONCENTRATION OF PLASMA CHOLESTEROL AND TRIGLYCERIDES IN TWO GROUPS OF RATS WITH INHERITED WIDELY DIFFERENT LEVELS OF SPONTANEOUS PHYSICAL ACTIVITY.** E.W. Rasmussen and A.T. Hostmark (Work Res. Inst. and Inst. of Hygiene, Univ. of Oslo, Oslo, Norway) *Circ. Res.* 42, 598-603 (1978). The plasma concentration of cholesterol and triglycerides was determined in two groups of rats with inherited widely different levels of spontaneous physical activity. Active as well as passive rats of each sex were divided into two subgroups, one with free access to wheel running activity (exercising group), and another for which admittance to the drum was closed (non-exercising group). Plasma concentrations of cholesterol and triglycerides were followed from the age of 3-8 months in females and 3 months to 1 year in males. A pronounced increase with age in the plasma concentration of these lipids was observed in the active male rats. In the passive male rats and in all females, there were no major changes in plasma levels of cholesterol and triglycerides. Corresponding groups of exercising and nonexercising rats had similar plasma levels of these components. The data for male rats show a age-related increase in plasma lipids. However, running activity per se does not seem to have any influence on the level of plasma cholesterol and triglycerides in these rats.

**THE EFFECTS OF DIBUTYRYL CYCLIC ADENOSINE 3':5'-MONOPHOSPHATE ON CONCANAVALIN A-STIMULATED STEROL AND FATTY ACID SYNTHESIS IN MOUSE SPLEEN LYMPHOCYTES.** J.G. Respass, J.D. Stubbs and D.A. Chambers (Dept. of Cell and Molecular Biol, San Francisco State Univ., San Francisco, Calif.)

*Biochim. Biophys. Acta* 529, 38-43 (1978). Substantial increases in both  $3\beta$ -OH sterol and fatty acid synthesis were observed after concanavalin A addition to mouse spleen lymphocytes cultured in serum-free media. The rate of sterol synthesis increased linearly up to 60 h. The rate of fatty acid synthesis increased up to 20 h, reaching a plateau in synthetic activity which was the maintained.  $CO_2$  production from acetate was slightly stimulated by concanavalin A. In contrast to sterol and fatty acid synthesis, the rate of  $CO_2$  production in both mitogen-stimulated and resting cultures declined with time. Dibutyryl cyclic AMP had a strong inhibitory effect on concanavalin A-stimulated sterol and fatty acid synthesis from acetate, but only a slight effect on  $CO_2$  production. Delayed addition of dibutyryl cyclic AMP resulted in reduced inhibition. The data suggest a sequence of initiation for fatty acid and sterol synthesis prior to DNA synthesis and a possible regulatory role of cyclic AMP in this initiation. The results support the hypothesis that lymphocyte activation is sequential within the spleen cell population and is accompanied by fatty acid and sterol synthesis.

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