ABSTRACTS

R.A. REINERS, Editor. Abstractors: N.E. Bednarcyk, J.E. Covey, J.C. Harris, S.F. Herb, F.A. Kummerow, Biserka Matijasevic and E.G. Perkins

• Fats and Oils

GAS-LIQUID-SOLID CHROMATOGRAPHY OF FREE ACIDS. A. Di Corcia (Inst. of Chem., Univ. of Rome, 00185 Rome, Italy). *Anal. Chem.* 45, 492–6 (1973). Use of gas-liquid-solid chromatography has been extended to the elution of free acids. The coating of the graphitized carbon black, such as graphitized Sterling FT(FT-G), by means of a suitable amount of an involatile stationary phase (FFAP) makes possible the linear elution of free acids at the nanogram level. By varying the liquid/solid ratio, gas-liquid-solid (GLS) columns have been evaluated in terms of selectivity, efficiency and time of elution for acid compounds. On these bases, GLS columns have been compared with a GL column normally used for the analysis of acids. The results confirm that the surface of the carbon is very effective in separating molecules differing mainly in their geometric structure. In addition, GLS columns retain peak broadening also at high linear carrier gas velocities. On FT-G coated with 0.3% FFAP, the separation of C_2-C_5 fatty acids, including 2-methylbutyric and 3-methylbutyric acids, in a very dilute water solution (~40 ppm) has been obtained in about 1.5 minutes. The separation of the isomers of some aromatic acids has been also performed.

RAPID VOLTAMMETRIC METHOD FOR THE ESTIMATION OF TOCOPHEROLS AND ANTIOXIDANTS IN OILS AND FATS. H.D. McBride and D.H. Evans (Dept. of Chem., Univ. of Wis., Madison, Wis. 53706). *Anal. Chem.* 45, 446–9 (1973). Linear sweep voltammetry has been applied to the measurement of the tocopherol content of vegetable oils. Separate anodic voltammetric peaks are obtained for α-, γ- and δ-tocopherol. The β-tocopherol peak is superimposed on that of γ-tocopherol. Under the same conditions, butylated hydroxyanisole (BHA) may be determined in vegetable oil at concentrations exceeding 0.001%. However, δ-tocopherol interferes. Propyl gallate (PG) may be determined in lard at concentrations greater than about 0.001%. The procedures are quite rapid. The entire operation from sample weighing to acquisition of the voltammogram requires only about ten minutes.

PROTEIN, FAT AND MINERAL ANALYSIS OF FRANCHISE CHICKEN DINNERS. W.P. Donovan and H. Appledorf (Food Sci. Dept., Univ. of Florida, Gainesville, Fl. 32601). *J. Food Sci.* 38, 79–80 (1973). Today food service accounts for 30% of the American food dollar and this amount is expected to increase to 50% or higher by 1985. Franchise food outlets have shown the most rapid growth in the restaurant segment of this industry accounting for 30,000 out of the estimated 145,000 restaurants in the U.S. Although consumption of franchise foods is increasing rapidly, only sparse data exist on their nutrient value. Nutritional analyses of franchise chicken dinners are warranted in view of the rapid growth of this segment of the food service market, and the shift in national food habits toward more meals eaten away from home. Since food composition tables may not always give accurate estimates of nutrient value, chemical analyses were used to determine the nutrient composition of these meals.

STUDIES ON THE THERMAL DEGRADATION OF NATURALLY OCCURRING MATERIALS. II. PRODUCTS FROM THE PYROLYSIS OF TRIGLYCERIDES AT 400C. E.B. Higman, I. Schmeltz, H.C. Higman and O.T. Chortyk (R. B. Russell Agr. Res. Center, ARS, USDA, Athens, Ga. 30604). *J. Agr. Food Chem.* 21, 202–4 (1973). Tripalmitin, tristearin and soybean oil were selected as model triglycerides for pyrolysis. Pyrolyses were conducted at 400C under nitrogen. Products generated were identified using combined gas chromatography-mass spectrometry. In addition, some acids were individually isolated as their methyl esters by preparative gas chromatography and were identified by high-resolution mass spectrometry. Pyrolyzates produced fell into two general categories, hydrocarbons and carboxylic acids. Homologous series of alkanes, alkenes, saturated and mono-unsaturated carboxylic acids, and dicarboxylic acids were formed.

FLAVOR COMPOUNDS: VOLATILITIES IN VEGETABLE OIL AND OIL-WATER MIXTURES. ESTIMATION OF ODOR THRESHOLDS. R.G. Buttery, D.G. Guadagni and L.C. Ling (Western Reg. Res. Lab., ARS, USDA, Berkeley, Cal. 94710). *J. Agr. Food Chem.* 21, 198–201 (1973). Air to vegetable oil partition coefficients have been determined experimentally for a number of organic flavor compounds. These are shown to be, in general, of the same order as values calculated from solution-vapor theory, assuming that their activity coefficients in vegetable oil are equal to a simple method of calculating the volatilities (air to mixture partition coefficients) of compounds in vegetable oil-water mixtures is derived and shown to compare reasonably well with experimental results for such mixtures. A method is also developed for calculating odor thresholds for compounds in vegetable oil solutions from their known thresholds in water solutions. This is shown to give values which are of the same order as experimentally determined values.

LIPID CHANGES IN EGG YOLKS AND CAKES BAKED IN MICROWAVE OVENS. E.A. Schiller, D.E. Pratt and E.F. Reber (Dept. of Foods and Nutr., Purdue Univ., West Lafayette, Ind.). *J. Am. Dietetic Assoc.* 62, 529–33 (1973). Lipids were extracted from egg yolk samples heated to 80C by conventional and microwave heating at 915 MHz and 2450 MHz. No changes in fatty acid composition were found, and there was no measurable decrease in polyunsaturated fatty acids as a result of any of the three heat treatments. Samples heated by conventional means did show significantly higher levels of lipid oxidation as measured by TBA numbers. Oxidation levels were significantly higher for samples heated by microwaves at 2450 MHz as compared with those heated at 915 MHz. Cakes baked in conventional and microwave ovens were analyzed, and oxidation levels were significantly higher in cakes baked in the microwave oven operating at 915 MHz than in the conventional oven. There were no significant differences in TBA values for cakes baked in the two microwave ovens.

APPARATUS FOR CONTINUOUS RENDERING OF FAT-CONTAINING MATERIALS. G.C. Mason (The French Oil Mill Machinery Co.). *U.S. 3,730,344.* The material is passed in succession through a series of cookers. It is maintained in fluid form and is pumped from one cooker to another. After passage through other apparatus, it is discharged in the form of

• 1972 AOCS Committee Reports. . .

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densing it in a suitable form for publication in *JAOCS.*

Statistical Committee: James R. Trowbridge has undertaken the task of setting up a Statistical Committee. He would be pleased to hear from individuals in the Society who have an interest in working on the Statistical Committee, and also to hear from members of the Society on what problems in this area they feel the committee should undertake to provide help to the members. A revision of AOCS Method M 1-59 may be in order, and suggestions for changes are being solicited by Trowbridge. Please send any suggestions directly to Trowbridge, c/o Colgate-Palmolive Co., 909 River Rd., Piscataway, N.J. 07804.

There has been no activity on the part of the Specifications Committee during the past year.

Flavor Nomenclature and Standards Subcommittee
T.H. Smouse

INCLUDED IN FULL COMMITTEE REPORT.

Nomenclature Subcommittee
H.P. Dupuy

INCLUDED IN FULL COMMITTEE REPORT.

Specifications Subcommittee

INACTIVE.

Statistical Subcommittee
J.R. Trowbridge

INCLUDED IN FULL COMMITTEE REPORT. ■

liquid fat and solids, including crackling cake. This system replaces the batch cookers commonly used in rendering plants.

HYDROGENATION OF OILS. F.A. Dudrow (Chemetron Corp.). *U.S. 3,732,266.* A method and apparatus are provided for control of the temperature of a fluid reaction mass. Heat exchanger means in the reaction vessel contain a body of coolant which is vaporized to absorb heat. A closed coolant condensation system is connected with the heat exchanger to remove heat as it is generated.

N-SUBSTITUTED FATTY ACID AMIDE LUBRICANTS. F.C. Hagne, R.E. Mod, G. Sumrell and W.E. Parker (U.S. Secretary of Agriculture). *U.S. 3,733,275.* This invention relates to N-acylmorpholines and N-mono and N,N-disubstituted fatty acid amides and to similar derivatives of epithioamides which are useful as base and extreme pressure lubricants and additives.

CONTINUOUS PROCESS FOR THE SEPARATION OF MIXTURES OF FATTY ACID ESTERS OF DIFFERENT MELTING POINTS. H. Hartmann and W. Stein (Henkel & Cie). *U.S. 3,733,343.* This invention relates to an improvement in the detergent fractionation of fatty acid esters. In the known process, after separation of the suspension of solid fatty acid esters, the wetting agent solution is returned to the system. The improvement consists in withdrawing a part of the recycling wetting agent solution from the cycle and replacing it with fresh solution.

HOT OIL CIRCULATING COOKING SYSTEM. A.F. Pelster, E.C. Johns and N.C. Sullivan (Kentucky Fried Chicken Corp.). *U.S. 3,735,693.* A device for deep fat frying of food is provided with means for continuously circulating and filtering the cooking oil. The oil in the fryer is heated externally.

REAGENT FOR DETERMINING CHOLESTEROL. A.C. Parekh and D.H. Jung (Research Corp.). *U.S. 3,736,263.* The reagent comprises a mixture of ferrous sulfate and sulfuric acid and, optionally, acetic acid. It forms a color with solubilized cholesterol.

METHOD FOR THE QUANTITATIVE DETERMINATION OF CHOLESTEROL. A.C. Parekh and D.H. Jung (Research Corp.). *U.S. 3,736,340.* The method for the determination of total cholesterol in blood serum, plasma, or other cell-free body fluid involves adding a reagent comprising a mixture of ferric acetate and uranium acetate to the fluid in order to solubilize the total cholesterol content. Those chromogens which interfere with the determination are precipitated and separated from the solubilized cholesterol by filtration. The cholesterol content is then determined quantitatively.

• Biochemistry and Nutrition

GLYCOSPHINGOLIPIDS OF CLONAL LINES OF MOUSE NEUROBLASTOMA AND NEUROBLASTOMA X L CELL HYBRIDS. G. Yogeeswaran, R.K. Murray, M.L. Pearson, B.D. Sanwal, F.A. McMorris and F.H. Ruddle (Dept. of Biochem., Univ. of Toronto, Toronto, Ontario, Canada). *J. Biol. Chem.* 248, 1231–9 (1973). Glycosphingolipid analyses were performed on three clonal lines of the mouse C1300 neuroblastoma (N2A, NA, and NB41A) and on three neuroblastoma X L cell hybrid lines (NLI-15A, NLI-7A, and NLI-11A) differing in their membrane electrical activities. Striking variations of ganglioside but not of neutral glycosphingolipid patterns were observed in the neuroblastoma lines. No differences were observed between the glycosphingolipid patterns of neuroblastoma cells (N2A) grown in suspension as "undifferentiated" neuroblasts or in monolayer as "differentiated" neurons. The neuroblastoma X L cell hybrid lines exhibited neutral glycosphingolipid patterns similar to the sum of the parental neuroblastoma and L cell patterns, whereas their ganglioside patterns differed from those of the two parents. Despite their widely differing membrane electrical activities, the glycosphingolipid profiles of these three hybrid lines were generally similar.

EFFECT OF PROTEIN AND METHIONINE ON VITAMIN A LIVER STORAGE IN RATS FED DDT. M.L. Young, G.V. Mitchell and C.R. Seward (Div. of Nutr., Food and Drug Adm., Dept. of Health, Educ., and Welfare, Washington, D.C. 20204). *J. Nutr.* 103, 218–24 (1973). The interrelationships among dietary protein, DDT, vitamin A and DL-methionine were investigated in male weanling Holtman rats fed purified diets, with either casein or soybean isolate as the protein source, for 4 weeks. Each protein was fed in the basal diet at a level of 10 or 20% with the following variation: basal, basal + 0.4% DL-methionine, basal + 200 ppm DDT, and basal + 0.4% DL-methionine + 200 ppm DDT. At the level of either 10 or 20% soy protein, DDT decreased the storage of vitamin A in the liver by 32%; the addition of methionine did not counteract this effect. At the 20% level of casein, storage of vitamin A in the liver was decreased 42% in rats fed DDT; however, in rats fed methionine plus DDT, there was only a 16% decrease in liver vitamin A as compared with the control rats (basal diet A). Methionine caused a significant increase in the amount of DDT, DDE and DDD stored in the liver when given with either level of soy or with the 10% level of casein; at the 20% level of casein, methionine had no effect. These studies demonstrate that the degree of toxicological stress due to DDT exposure depends in large measure on the quality and quantity of dietary protein.

INFLUENCE OF DIETARY PROTEIN LEVEL ON PLASMA CHOLESTEROL TURNOVER AND FECAL STEROID EXCRETION IN THE CHICK. Shu-Jen Chang Yeh and G.A. Leveille (Lab. of Nutr. Biochem., Dept. of Animal Sci., Univ. of Ill. at Urbana-Champaign, Urbana, Ill. 61801). *J. Nutr.* 103, 407–11 (1973). The turnover rate of plasma cholesterol in chicks fed 30% or 15% protein diets was investigated by administering cholesterol-4^{14}C and periodically determining the specific activity of plasma cholesterol. Fecal steroid excretion was also determined. The results indicate that the turn-over rate of plasma cholesterol is higher in chicks fed a high protein diet compared with those fed a low protein diet. It is concluded that the hypocholesterolemic effect of dietary protein is mediated in part through cholesterol and bile acids.

LIPOLYSIS IN ISOLATED COW ADIPOSE CELLS. Y.T. Yang and R.L. Baldwin (Dept. of Animal Sci., Univ. of Cal., Davis, Cal. 95616). *J. Dairy Sci.* 56, 366–74 (1973). In vitro, lipolytic activities of isolated adipose cells from dairy cows are sensitive to adrenalins. Glucose, insulin and nicotinic acid depressed and β-hydroxybutyrate increased fatty acid release rate stimulated by epinephrine. Long term insulin injection and high concentrate feeding depressed lipolytic activities of adipose cells from lactating cows. Lipolytic activities of adipose cells from lactating cows were higher than those from nonlactating cows. High free fatty acid: glycerol release ratios suggested that intense partial hydrolysis of triglycerides occurs in bovine adipose tissue.

THE EFFECT OF GLYCEROL AND DIHYDROXYACETONE ON HEPATIC ADENINE NUCLEOTIDES. H.F. Woods and H.A. Krebs (Metabolic Res. Lab., Nuffield Dept. of Clinical Med., and the Dept. of the Regius Prof. of Med., Radcliffe Infirmary, Oxford OX2 6HE, U.K.). *Biochem. J.* 132, 55–60 (1973). The changes in the metabolite content in the isolated perfused rat liver and in the perfusion medium were measured after loading the liver with glycerol or dihydroxyacetone. Glycerol was rapidly taken up by livers from fed and starved rats; glucose, lactate and pyruvate were discharged into the medium. The [lactate]/[pyruvate] ratio in the medium rose from 10 to 30 and in the tissue from 9.6 to 36.6. The most striking effects of glycerol loading were: the accumulation in the liver of α-glycerophosphate, which increased from 0.13 to 8.45 μmol/g at 40 min; the decrease in the concentration of adenine nucleotides to 70% of the control value at 40 min. The rate of removal of both glycerol and dihydroxyacetone was about 60% greater in the livers from fed than in those from starved animals.

HYPERVITAMINOSIS E IN THE CHICK. B.E. March, E. Wong, L. Seier, J. Sim and J. Biely (Dept. of Poultry Sci., Univ. British Columbia, Vancouver 8, B.C.). *J. Nutr.* 103, 371–7 (1973). The effects of feeding excessive amounts of vitamin E ranging from 220 to 2,200 IU per kilogram of diet were studied in relation to various metabolic parameters. Growth rate was not affected by a level of 1,000 IU, but was depressed

by 2,200 IU of vitamin E per kilogram of diet. Thyroidal hypertrophy in response to thiouracil was reduced when the diet supplied 220 IU·kg. This level of vitamin E also depressed thyroidal uptake and release of ^{131}I. The respiration rate of skeletal mitochondria isolated from chicks fed 2,200 IU of vitamin E for 55 days was only two-thirds that of mitochondria from control chicks. Bone calcification was depressed when excess vitamin E was administered to chicks fed either calcium-deficient or vitamin D-deficient diets. Bone calcification was affected by excess vitamin E administered through the diet or by injection. It was concluded that excess vitamin E increased the requirement for vitamin D. Vitamin E at a dietary level of 2,200 IU/kg induced reticulocytosis and lowered hematocrit values. A lengthening of prothrombin time occurred when excess vitamin E was fed which was rapidly reversed by injection of vitamin K indicating an increased dietary requirement for vitamin K in the presence of excess vitamin E. The above findings suggest that excess vitamin E, like the other fat-soluble vitamins, must be considered as potentially toxic.

FENTON'S REAGENT. II. REACTIONS OF CARBONYL COMPOUNDS AND α,β-UNSATURATED ACIDS. C. Walling and G.M. El-Taliawi (Dept. of Chem., Columbia Univ., New York, N.Y. 10027). *J. Amer. Chem. Soc.* 95, 844–7 (1973). Carbonyl compounds such as acetone are readily attacked by hydroxyl radicals generated by the reaction of Fe^{2+} and H_2O_2, but the resulting carbonyl conjugated radicals are reduced to starting material by additional Fe^{2+}. As hydroxyl radical traps, they thus retard the oxidation of methanol, and rate constants for hydroxyl radical reactions derived from the competitive inhibition are in good agreement with those from radiation chemistry. Hydroxyl radicals add readily to the double bonds of α,β-unsaturated acids, and the resulting radicals are also reduced with a net addition of water; e.g., maleic acid is converted to malic acid. The acids inhibit alcohol oxidation by trapping both hydroxy and α-hydroxyalkyl radicals, the latter process providing an interesting possible synthesis of lactones.

CHOLINE AND CARNITINE ACETYLTRANSFERASES OF HEART. H.L. White and J. Chen Wu (Pharmacol. Dept., Wellcome Res. Lab., Res. Triangle Park, N.C. 27709). *Biochemistry* 12, 841–6 (1973). Choline acetyltransferase (ChAc) and carnitine acetyltransferase (CarAc) were estimated in crude and partially purified extracts of rabbit and human heart and brain. Both enzymes were assayed by isotopic methods previously used for ChAc. Isoelectric focusing on acrylamide gel allowed a separation of the two enzymes and indicated that choline is an alternate substrate for CarAc of rabbit heart extracts. Further support for this conclusion was derived from kinetic studies and the finding that ChAc was inhibited approximately 90% by 50 μM (naphthylvinyl)pyridine, while CarAc, with either carnitine or choline as substrate, was not inhibited by this compound.

INTESTINAL ABSORPTION OF PHOSPHATE IN THE CHICK: EFFECT OF VITAMIN D_3 AND OTHER PARAMETERS. R.H. Wasserman and A.N. Taylor (Dept. of Physical Biol., N.Y. State Vet. College, Cornell Univ., Ithaca, N.Y. 14850). *J. Nutr.* 103, 586–99 (1973). The effect of various parameters, including vitamin D_3 on the intestinal absorption of ^{32}P-phosphate in the chick was investigated. Translocation was determined by the in situ ligated loop technique and measurements were made of radionuclide leaving the intestinal lumen (absorption), accumulation by scraped mucosa (in gut tissue) and that entering the blood (transferred to body). It was observed, initially, that ^{32}P was rapidly translocated across all segments of the small intestine (duodenum, jejunum, ileum) and vitamin D_3 positively affected the total process in each segment. Because of the ease of showing a responsiveness to vitamin D_3 by the ileum, the subsequently described results were obtained with this segment. In a time course experiment, it was noted that ^{32}P accumulation by mucosa proceeded at a more rapid rate than the release of radionuclide to blood, indicating that the latter was the limiting step. The absorptive process was saturable as shown by a study in which increasing levels of stable phosphate were present in the absorption fluid. An effect of vitamin D_3 on the transfer of ^{32}P from mucosa to body was evident, as well as an effect on the uptake phase.

CHARACTERIZATION OF BOVINE SERUM LIPOPROTEINS. R.M. Wendlandt and C.L. Davis (Dept. of Dairy Sci., Univ. of Ill., Urbana, Ill. 61801). *J. Dairy Sci.* 56, 337–9 (1973). Two experiments were conducted to separate and determine lipid content of bovine serum lipoproteins. The first experiment established virtual absence of very low-density lipoproteins ($1.005 < \text{density} < 1.019$) in serum of lactating dairy cows. Results of the second experiment indicated that chylomicrons (density < 1.005), low-density lipoproteins ($1.005 < \text{density} < 1.063$), and high-density lipoproteins ($1.063 < \text{density} < 1.21$) contained 2.0, 26.5, and 71.5% of total serum lipids.

EFFECTS OF CHEMICAL MODIFICATION ON THE ACTIVITY OF CROTALUS ADAMANTEUS PHOSPHOLIPASE A_2. EVIDENCE FOR AN ESSENTIAL AMINO GROUP. M.A. Wells (Dept. of Biochem., College of Med., Univ. of Arizona, Tucson, Arizona 85724). *Biochemistry* 12, 1086–93 (1973). Oxidation of *Crotalus adamanteus* phospholipase A_2 with N-bromosuccinimide leads to rapid destruction of two tryptophans. The resulting protein has no enzymatic activity and no longer exhibits anomalous solvent-induced spectral perturbations or cation-induced spectral perturbations. These data are interpreted to indicate that these tryptophans are located close to the active site of the enzyme. Ethoxyformic anhydride inactivates the enzyme by acylation of one lysine per dimer. The modified protein has no enzymatic activity, although one cation binding site is normal. The other cation binding site has been modified as determined by spectral studies. These data indicate that the lysine is near the cation binding site, and are tentatively interpreted to indicate that the lysine is responsible for the cation induced spectral perturbations. After acylation of one lysine per dimer, the stability of the dimer is reduced.

INFLUENCE OF DIETARY CHOLESTEROL AND CHOLIC ACID ON LIVER CARBOHYDRATE METABOLISM ENZYMES IN RATS. A.C. Tsai and I.A. Dyer (Washington State Univ., Pullman, Wash. 99163). *J. Nutr.* 103, 93–101 (1973). The effects of dietary cholesterol and cholic acid on the activity of several carbohydrate metabolism enzymes were examined in the liver or adipose tissue of rats. The activity of liver and adipose tissue glucose-6-phosphate dehydrogenase and NADP-malic enzyme, the activity of liver glucokinase, pyruvate kinase, phosphoglucomutase and NADP-isocitrate dehydrogenase and the rate of in vitro liver cholesterogenesis were determined. Cholesterol-cholic acid feeding significantly depressed the activity of glucose-6-phosphate dehydrogenase and NADP-malic enzyme in the liver but not in the adipose tissue. Liver glucokinase was also depressed, but to a lesser degree. The study shows that dietary cholesterol plays a role in the control of several hepatic carbohydrate metabolism enzymes probably through some mechanism secondary to elevation in the concentration of liver cholesterol or expansion of bile acid pool.

LIVER STORAGE OF VITAMIN A IN RATS FED CAROTENE STEREOISOMER. J.P. Sweeney and A.C. Marsh (USDA, Human Nutr. Res. Div., ARS, Beltsville, Md. 20705). *J. Nutr.* 103, 20–5 (1973). Provitamin A activity values were determined for the principal carotene stereoisomers present in vegetables, or produced by vegetable processing. Carotenes investigated were all-trans-β-carotene, neo-β-carotene B (9,13-di cis), neo-β-carotene U (9-mono cis), all-trans-α-carotene, neo-α-carotene B (13,9'-di cis), and neo-α-carotene U (9-mono cis). Assays of vitamin A were made by measurement of vitamin A storage in rats fed the isomers. Results showed consistently higher liver storage values for cis isomers than values obtained by others using growth response assays. The high values would indicate that formation of isomers at the expense of all-trans carotenes would result in small decreases in provitamin A activity than those calculated using the growth response values. For all-trans-α-carotene, liver storage values were lower than values that have been obtained by the growth assay. The amount of vitamin A stored in the kidneys was small compared to that stored in the liver. The weight of the rats at age 21 days, the beginning of depletion, appeared to be related to vitamin A liver storage. Rats heaviest in weight at 21 days usually had the greatest subsequent storage.

ISOLATION AND CHARACTERIZATION OF GLYCOSPHINGOLIPIDS WITH BLOOD GROUP H SPECIFICITY FROM MEMBRANES OF HUMAN ERYTHROCYTES. K. Stellner, K. Watanabe and Senitiroh Hakomori (Dept. of Pathol. and Microbiol., Schl. of Public Health and Schl. of Med., Univ. of Wash., Seattle, Wash. 98195). *Biochemistry* 12, 656–61 (1973). Three forms of blood group H-glycolipid (H_1, H_2, H_3 variants) were isolated from lipid extract of blood group O human erythrocyte membrane. The structure of one form of H-glycolipid (H_1-glycolipid) was determined as L-fucopyranosyl-α-(1 → 2)-galactopyranosyl-β-(1 → 4)-N-acetylglucosaminosyl-β-(1 → 3)-galactopyranosyl-β-(1 → 4)-glucopyranosyl-β-(1 → 1)-ceramide, i.e., "type 2" H-chain is linked to lipid. No "type 1" H chain was found as lipid bound in erythrocyte membrane.

The H activity was greatly diminished by mixing with globoside, and practically no H activity was detected when a pure H_1-glycolipid was mixed with 20 times (w/w) of globoside. This is probably the basis for the difficulty of demonstrating H activity, as the H_1-glycolipid was coeluted with globoside. The second and third H-active components (H_2- and H_3-glycolipid) were possibly ceramide octasaccharide and ceramide decasaccharide carrying the H-active terminal, L-fucopyranosyl-α-(1 → 2)-galactopyranosyl.

ASSOCIATION OF GLYCERALDEHYDE 3-PHOSPHATE DEHYDROGENASE WITH THE HUMAN ERYTHROCYTE MEMBRANE. EFFECT OF DETERGENTS, TRYPSIN AND ADENOSIN TRIPHOSPHATE. B.C. Shin and K.L. Carraway (Dept. of Biochem., Oklahoma Agr. Exp. Station, Oklahoma State Univ., Stillwater, Ok. 74074). *J. Biol. Chem.* 248, 1436–44 (1973). Glyceraldehyde 3-phosphate dehydrogenase is one of the major protein components associated with the erythrocyte membrane. This has been shown by activity studies of specific membrane extracts and by the specificity of iodoacetate inactivation and labeling of the enzyme. Studies on the association of the enzyme with the membrane are complicated by the tendency of the ghosts to seal under certain conditions, thus rendering the enzyme inaccessible to its substrates. This crypticity of the enzyme activity can be eliminated by detergent treatment. At 0C, solubilized glyceraldehyde 3-phosphate dehydrogenase is inactivated by ATP, a process that can be prevented if the enzyme is preincubated with NAD or if the incubation with ATP is performed at 25C. The ATP-promoted release of glyceraldehyde 3-phosphate dehydrogenase during hemolysis is not altered by preincubation with NAD or by raising the temperature to 25C. Therefore, the two phenomena (enzyme inactivation and release from the membrane) appear to be unrelated. It is postulated that the effect of ATP on enzyme is due to a direct action of ATP on the membrane.

WAX ESTERS IN FISH: ABSORPTION AND METABOLISM OF OLEYL ALCOHOL IN THE GOURAMI (TRICHOGASTER COSBY). D.M. Sand, C.H. Rahn and H. Schlenk (Hormel Inst., Univ. of Minn., Austin, Minn. 55912). *J. Nutr.* 103, 600–7 (1973). Absorption and subsequent metabolism of oleyl alcohol and oleic acid in the female gourami (*Trichogaster cosby*) were compared by feeding the 1-$^3H_2$- or U-^{14}C-labeled compounds. Lipids of intestine, blood, liver, body and roe were analyzed at time intervals over a period of 24 hours after ingestion. Absorption of both alcohol and acid was 60 to 70% of the amount offered. Alcohol was largely oxidized to acid in the intestinal tissue, but some of it was esterified to form wax ester. The relative extent to which these processes took place depended on the amount of alcohol fed. Dietary acid did not give rise to alcohol or wax esters in the intestines. Free alcohol did not enter the blood stream in any appreciable amount, but wax esters were found in the blood lipids. Some of these wax esters were deposited with body and roe lipids. Liver lipids, however, contained free alcohol besides wax ester which indicates that they are subject there to further metabolism probably involving oxidation of the alcohol moiety. The greater portion of roe wax esters is synthesized in the roe where the chains of the dietary oleyl alcohol or oleic acid are used equally efficiently in spite of the intermediary oxidation of the former.

VITAMIN E SUPPLEMENTATION DURING ACUTE HYPOVITAMINOSIS A OF THE CALF. J.E. Rousseau, Jr., K.C. Hayes, R.J. Cousins, H.D. Eaton, M.H. Burns and R.C. Hall, Jr. (Nutr. Sci. and Pathol. Depts., Univ. of Connecticut, Storrs, Conn. 06268). *J. Dairy Sci.* 56, 246-51 (1973). To study whether tocopherol supplementation would alleviate pathological lesions occurring in vitamin A deficiency, d,l-alphatocopheryl acetate was added to a group of six or withheld from a group of seven vitamin A deficient calves for 4 weeks. Plasma vitamin A, hematocrit, plasma and whole blood potassium, serum total protein and protein distribution, serum glutamic-oxalacetic and glutamic-pyruvic transaminase activities, and cerebrospinal fluid pressures were not significantly affected by vitamin E supplementation. Plasma tocopherol concentrations were markedly increased, and red blood cell hemolysis induced by hydrogen peroxide was decreased. Sodium and potassium content of the heart averaged essentially the same for both groups. Incidences of squamous metaplasia of the parotid gland and duct, papilledema, necrosis of the optic nerve and pituitary cysts were not significantly different.

EFFECT OF PROTEASES AND OF CRUDE PHOSPHOLIPASES ON STEROID GLYCOSYLTRANSFERASES FROM RABBIT LIVER. R.S. Labow, D.G. Williamson, and D.S. Layne (Dept. of Biochem., Univ. of Ottawa, Ottawa, Canada K1N 6N5). *Biochemistry* 12, 1548–51 (1973). The steroid N-acetylglucosaminyltransferase of rabbit liver microsomes was inactivated by a crude phospholipase C which had little effect on the steroid glucuronyltransferase. Protease treatment enhanced the solubilization of the glucuronyltransferase by Triton X-100, but destroyed the N-acetylglucosaminyltransferase activity. The glucuronyltransferase was rendered inactive by treatment with snake venom or with 6M urea, and the activity was partially restored by the addition of crude phospholipid preparations. Chromatography after treatment with 6M urea showed that partial fragmentation of the particle containing the glucuronyltransferase activity had been achieved. In general, steroid 3-glucosyltransferase activity resembled glucuronyltransferase, while the 17-glucosyltransferase resembled N-acetylglucosaminyltransferase in behavior toward the reagents used.

EFFECT OF ADIPOSE TISSUE SITE, ANIMAL WEIGHT, AND LONG-TERM FASTING ON LIPOGENESIS IN THE BOVINE. M.A. Pothoven and D.C. Beitz (Dept. of Animal Sci., Iowa State Univ., Ames, Iowa 50010). *J. Nutr.* 103, 468–74 (1973). The in vitro rate of acetate incorporation into long-chain fatty acids was used to measure the lipogenic capacity of adipose tissue taken from several sites of 278-, 385- and 528-kg Holstein steers fed ad libitum and from 368-kg Holstein steers that had been fasted for 3 weeks. Effects of site, animal weight and fasting on the rate of glucose oxidation and activities of glucose-6-phosphate (G-6-P) dehydrogenase and of NADP-isocitrate dehydrogenase also were determined. Subcutaneous adipose tissue (backfat) had a significantly higher lipogenic capacity than did internal (perirenal and omental) and intermuscular tissues which were smaller. The lipogenic capacity, expressed on a tissue-weight or cytosol-protein basis, increased linearly with increasing animal weight. Rate of fatty acid synthesis in fasted steers was less than 1% of that in the controls (385-kg steers). The rate of glucose oxidation to CO_2 was highly correlated with the rate of fatty acid synthesis. Activity of G-6-P dehydrogenase varied with adipose tissue site, but did not differ significantly with animal weight and was not significantly correlated with either glucose oxidation or fatty acid synthesis. Activity of G-6-P dehydrogenase in fasted steers was about 50% of that in the controls. NADP-isocitrate dehydrogenase activity was reduced 32% by fasting. These data indicate that activities of these NADPH-

generating enzymes do not seem rate-limiting for fatty acid synthesis in bovine adipose.

BODY COMPOSITION AND FAT DEPOT WEIGHTS OF RATS AS INFLUENCED BY RATION FED DAMS DURING LACTATION AND THAT FED RATS AFTER WEANING. R. Schemmel, O. Mickelsen and L. Fisher (Dept. of Food Sci. and Human Nutr., Mich. State Univ., East Lansing, Mich. 48823). *J. Nutr.* 103, 477–87 (1973). Litters of Osborne-Mendel (OM) pups were reduced to eight each at birth and suckled by OM dams; the latter were fed either a high fat (60% w/w) or a grain (3% fat, w/w) ration during lactation. The pups of these dams at 21 days of age are identified as F and G, respectively. F rats were heavier, had more body protein, water and fat and heavier subcataneous fat depots than G pups ($P < 0.01$). Half of the remaining F pups of both sexes and of weights similar to those killed were fed, after weaning, the high fat rations. They were designated FF; the other half were fed the grain ration and designated FG. Five or six rats of each sex from each of the four diet groups were killed at 42, 84 and 168 days of age, at which time fat depots were weighed and each carcass was analyzed for protein, fat, moisture and ash. These data suggest that in a strain of rats such as the OM which readily becomes obese when fed a high fat ration, the nature of the diet fed after weaning has a profound effect on the ultimate obesity of the animal which completely overshadows the effect of dietary intake during the first 3 weeks of age.

POTENTIAL ENERGY CALCULATIONS ON PHOSPHOLIPIDS. PREFERRED CONFORMATIONS WITH INTRAMOLECULAR STACKING AND MUTUALLY TILTED HYDROCARBON CHAIN PLANES. J. McAlister, N. Yathindra and M. Sundaralingam (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wisconsin, Madison, Wis. 53706). *Biochemistry* 12, 1189–95 (1973). The preferred conformations of phospholipids have been obtained by nonbonded potential energy calculations. The results indicate that intramolecular chain stacking not only stabilizes but also restricts the favored conformations of phospholipids to a limited number of possibilities. The glycerol "backbone" of the phospholipid exhibits two orientations leading to two conformations (A and B) where the β-chain folds onto the γ-chain to initiate chain stacking. It is found in both the conformations that although the hydrocarbon chain axes are parallel, the planes containing the carbon atoms beyond the ester group of the β and γ chains intersect at a dihedral angle of 72° in conformation A and 57° in conformation B. This tilt or inclination of the two hydrocarbon chain planes results to optimize the interactions between the two fatty acid tails and may also be important in the intermolecular packing of phospholipids in membranes. The α-chain of the phospholipid, however, can exhibit several conformations as a result of different energetically likely conformations for the phosphodiester and choline moieties. These different conformations may be influenced by the local metal ions and membrane-associated molecules.

NUTRITIONAL INTERRELATIONSHIPS AMONG VITAMIN E, SELENIUM, ANTIOXIDANTS AND ETHYL ALCOHOL IN THE RAT. O.A. Levander, V.C. Morris, D.J. Higgs and R.N. Varma (Nutr. Inst., ARS, USDA, Beltsville, Md. 20705). *J. Nutr.* 103, 536–42 (1973). Giving 20% alcohol as the sole drinking fluid delayed the onset of liver necrosis in rats fed a basal diet deficient in vitamin E and selenium. Addition of ethanol in vitro had no effect on the decline in respiration suffered by liver slices prepared from vitamin E- and Se-deficient rats. Determination of hepatic triglycerides in rats given alcohol for 5 to 6 weeks revealed that animals fed the basal vitamin E- and Se-deficient diet tended to have less fat in their livers than animals fed the same diet supplemented with either 500 ppm vitamin E or 0.3 ppm Se as Na_2SeO_3, or both. Certain fat-soluble antioxidants tended to diminish the hepatolipogenic action of ethanol, whereas vitamin E or Se did not. The fact that vitamin E and Se tended to enhance the development of alcoholic fatty liver, whereas certain fat-soluble antioxidants did not, seems inconsistent with an antioxidant role for these two nutrients.

EFFECT OF VARIOUS SUGARS ON HEPATIC GLUCOSE-6-PHOSPHATE DEHYDROGENASE, MALIC ENZYME AND TOTAL LIVER LIPID OF THE RAT. O.E. Michaelis IV and B. Szepesi (Nutr. Inst., ARS, USDA, Beltsville, Md. 20705). *J. Nutr.* 103, 697–705 (1973). The responses of hepatic glucose-6-phosphate dehydrogenase (C6PD, EC 1.1.1.49), malic enzyme (ME, EC 1.1.1.40) and total liver lipid to ad libitum feeding or to starvation-refeeding of different levels of glucose, fructose, sucrose, galactose or lactose were studied in male Wistar rats. Ad libitum feeding of 50% fructose or sucrose diets increased enzyme activities and total liver lipid compared to rats fed glucose, whereas feeding galactose or lactose diets markedly reduced enzyme activities. In the starvation-refeeding regimen the capacity of the diet to cause an overshoot in enzyme activities and total liver lipid was tested in relation to the type and content of carbohydrate in the diet. It was found that enzyme overshoot could be induced with less carbohydrate in the case of G6PD than with ME. The effect of sucrose on enzyme activities and total liver lipid was found to be greater than the effect of either glucose or fructose. Neither galactose nor lactose caused overshoots of enzyme activities or total liver lipid. The response in total liver lipid appeared to be correlated more with ME than with G6PD activity.

ABSORBABILITY BY RATS OF COMPOUNDS CONTAINING FROM ONE TO EIGHT ESTER GROUPS. F.H. Mattson and G.A. Nolen (Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio 45239). *J. Nutr.* 102, 1171–6 (1972). The absorbability of the fatty acid moiety of the complete, oleate esters of alcohols containing from one to six hydroxyl groups was determined by the fat balance technique in adult rats. Similarly, the absorbability of sucrose octaoleate and sucrose monooleate was determined. The fatty acids of the compounds containing less than four ester groups, methyl oleate, ethylene glycol dioleate, glycerol trioleate and sucrose monooleate, were almost completely absorbed. As the number of ester groups was increased—erythritol and penta-erythritol tetraoleate and xylitol pentaoleate—the absorbability decreased. The fatty acids of sorbitol hexaoleate and sucrose octaoleate were not absorbed. These differences in absorbability are related to the activity and specificity of the lipolytic enzymes in the lumen of the intestinal tract.

PROSTANOIC ACID CHEMISTRY. II. HYDROGENATION STUDIES AND PREPARATION OF 11-DEOXYPROSTAGLANDINS. F.H. Lincoln, W.P. Schneider and J.E. Pike (Exp. Chem. Res., Upjohn Co., Kalamazoo, Mich. 49001). *J. Org. Chem.* 38, 951–6 (1973). Selective hydrogenations, mainly by the homogeneous Wilkinson catalyst, were shown to convert PGE_2 to PGE_1, $PGF_{2\alpha}$ to $PGF_{1\alpha}$, and 5,6-trans-PGE_2 to PGE_1. In the same way, 11β-PGE_1, 15β-PGE_1 and 11β,15β-PGE_1 were also prepared from their 5,6-cis unsaturated precursors. Hydrogenation of PGA_1 and PGA_2 gave a number of 11-deoxyprostaglandins, including 11-deoxy-PGE_1, 11-deoxy-PGE_2, and 13,14-dihydroanalogs. Sodium borohydride reduces the cyclopentenone system of PGA_1 and PGA_2 completely, to give pairs of epimeric alcohols 18, 19 and 26, 27. Other reduction by-products and cyclization products of some prostaglandins are described.

A MEMBRANE-BOUND ACTIVITY CATALYSING PHOSPHATIDYLINOSITOL BREAKDOWN TO 1,2-DIACYLGLYCEROL, D-MYOINOSITOL 1:2-CYCLIC PHOSPHATE AND D-MYOINOSITOL 1-PHOSPHATE. PROPERTIES AND SUBCELLULAR DISTRIBUTION IN RAT CEREBRAL CORTEX. E.G. Lapetina and R.H. Michell (Dept. of Biochem., Univ. of Birmingham, P.O. Box 363, Edgbaston, Birmingham B15 2TT, U.K.). *Biochem. J.* 131, 433–42 (1973). Breakdown of phosphatidylinositol was studied in homogenates and subcellular fractions of rat cerebral cortex by using both membrane-bound and externally added [^{32}P]phosphatidylinositol as substrate. In the presence of deoxycholate, breakdown followed first-order kinetics at low substrate concentrations (<1mM) and zero-order kinetics at higher concentrations (6–9mM). Maximum breakdown by cerebral-cortex homogenates was approximately 0.5 μmol/h per mg of protein and occurred at pH 7.0 in the presence of 8mM-phosphatidylinositol, 2mM-$CaCl_2$ and 2mg of deoxycholate·ml. Activity was abolished by 1 mM-ethanedioxybis(ethylamine)tetra-acetate. The products of phosphatidylinositol breakdown were 1,2-diacylglycerol and a mixture of D-myoinositol 1:2-cyclic phosphate (55%) and D-myoinositol 1-phosphate (45%). The two phosphate esters appeared to be produced together and in constant proportions. Some 51% of the activity was particle-bound, with the highest activities in small nerve endings, microsomal material and two synaptic membrane fractions (fractions Mic_{20}, Mic_{100}, M_1 1.0 and M_1 0.9, respectively), all of which were also rich in acetylcholinesterase and which have been shown to be rich in other surface-membrane enzymes.

CHOLESTEROL HYDROPEROXIDE FORMATION IN RED CELL MEMBRANES AND PHOTOHEMOLYSIS IN ERYTHROPOIETIC PROTOPORPHYRIA. A.A. Lamola, T. Yamane and A.M. Trozzolo (Bell Lab., Murray Hill, N.J. 07974). *Science* 179, 1131–3 (1973). 3β-Hydroxy-5α-hydroperoxy-Δ^6-cholestene is produced in protoporphyrin-containing red blood cell ghosts irradiated with approximately 400 nm light in the presence of oxygen. Incorporation of this cholesterol photooxidation product into

normal red blood cells leads to increased osmotic fragility and eventual hemolysis. These results may be relevant to photohemolysis associated with erythropoietic protoporphyria.

STRUCTURAL STUDIES ON THE GLYCOLIPIDS FROM THE ENVELOPE OF THE HETEROCYST OF ANABAENA CYLINDRICA. F. Lambein and C.P. Wolk (MSU/AEC Plant Res. Lab., Michigan State Univ., East Lansing, Mich. 48823). *Biochemistry* 12, 791–8 (1973). Four glycolipids were isolated and purified from heterocysts of *Anabaena cylindrica*. The structures of these lipids have been studied by mass spectrometry, infrared spectroscopy and nuclear magnetic resonance spectrometry. The position of the bond between the sugar and the aglycone was determined by permethylation of the intact lipid, followed by hydrolysis, trimethylsilylation and mass spectrometry. A C-26 and a C-28 polyhydroxy alcohol are glycosylated at their terminal hydroxyl. A C-26 and probably a C-28 hydroxy fatty acid are glycosylated at their carboxylic group.

4-SPHINGENINE DERIVATIVES IN WHEAT FLOUR LIPIDS. R. Laine and O. Renkonen (Dept. of Biochem., Univ. of Helsinki, Helsinki, Finland). *Biochemistry* 12, 1106–11 (1973). *erythro*-4-Sphingenine and *erythro*-sphinganine were isolated from hydrolysates of wheat flour cerebrosides. Derivatives of both these bases, containing cis or trans double bonds at C_8, were also isolated. Argentation chromatography, gas-liquid chromatography, infrared spectroscopy, partial hydrazine reduction, ozonolysis and hydrogenolysis were used for identification of the new bases. The presence of a trans double bond at C_4 is typical of animal long-chain bases, but has not previously been described in plant systems.

α,β-METHYLENE-ADENOSINE 5′-TRIPHOSPHATE. A COMPETITIVE INHIBITOR OF ADENYLATE CYCLASE IN FAT AND LIVER CELL MEMBRANES. F. Krug, I. Parikh, G. Illiano and P. Cuatrecasas (Dept. of Med. and Dept. of Pharmacol. and Exp. Therapeutics, Johns Hopkins Univ. Schl. of Med., Baltimore, Md. 21205). *J. Biol. Chem.* 248, 1203–6 (1973). The ATP analog, α,β-methylene-adenosine 5′-triphosphate ($Ap(CH_2)pp$), competitively inhibits the basal as well as the glucagon- and NaF-stimulated activity of adenylate cyclase in isolated liver membrane preparations. The dissociation constant (K_I) of the inhibitor, 0.5 mM, is independent of the concentration of glucagon or NaF and is somewhat lower than the apparent K_m for ATP. The phosphonic acid analog of ATP also inhibits competitively (K_I, 1.2 mM) the epinephrine-stimulated adenylate cyclase activity of membranes prepared from homogenates of isolated fat cells. The enzyme activity stimulated by NaF in these membranes is also inhibited by $Ap(CH_2)pp$. The ADP analog, α,β-methylene-adenosine 5′-diphosphate does not significantly inhibit the activity of adenylate cyclase of liver cell membranes.

ADRENAL GLAND IN VITAMIN E DEFICIENCY. III. INHIBITION OF ADRENOCORTICOTROPIC HORMONE-INDUCED STEROIDOGENESIS IN ISOLATED ADRENAL CELLS BY ASCORBIC ACID. A.E. Kitabchi, A.H. Nathans and C.L. Kitchell and L.D. Currie (Lab. of Endocrinol. and Metabolism Res. Service, Vet. Adm. Hosp. and Depts. of Med. and Biochem., Univ. of Tennessee Med. Units, Memphis, Tenn. 38104). *J. Biol. Chem.* 248, 835–40 (1973). Isolated adrenal cells from vitamin E-deficient and control rats were prepared by a trypsin digestion method. Corticosterone formation and lipid peroxidation in vitro were measured in these cells in response to adrenocorticotropin (ACTH) and dibutyryl cyclic adenosine 3′,5′-monophosphate ($(bt)_2cAMP$) in the presence and absence of ascorbate. The addition of ascorbate to adrenal cells of vitamin E-deficient rats stimulated lipid peroxidation in the presence and absence of ACTH or $(bt)_2cAMP$. Ascorbate inhibited ACTH-induced steroidogenesis in adrenal cells of vitamin E-deficient rats, but not in the control group. Based on these studies, we suggest that tocopherol deficiency in the presence of ascorbic acid may affect steroidogenesis through interaction of ACTH with the cell membrane prior to the formation of the second messenger.

IDENTIFICATION OF GANGLIOSIDES AS CONSTITUENTS OF EGG YOLK. T.W. Keenan and L. Berridge (Dept. of Animal Sci., Purdue Univ., Lafayette, Ind. 47907). *J. Food Sci.* 38, 43–4 (1973). Ceramide and both glucosyl and galactosyl cerebrosides have recently been identified in sphingolipid fractions from hen's egg yolk. These results led us to believe that gangliosides may also be present in egg yolk, particularly since ceramide and cerebrosides are known precursors for enzymatic synthesis of the gangliosides. Ganglioside is a generic term given to glycosphingolipids which contain sialic acid. These complex glycolipids were first identified in brain and have since been found to be ubiquitous among mammalian tissues. Gangliosides are implicated in cellular recognition and in cell-cell adhesion. In addition to these physiological roles, gangliosides are potent surfactants and thus their presence could influence several properties of egg yolks. This paper describes the identification and partial characterization of gangliosides in egg yolk. These glycolipids have not heretofore been reported as constituents of eggs.

EFFECT OF DIETARY PROTEIN ON THE INTESTINAL BIOSYNTHESIS OF RETINOL FROM ^{14}C-β-CAROTENE IN RATS. S.K. Kamath and L. Arnrich (Dept. of Food and Nutr., Iowa State Univ., Ames, Iowa 50010). *J. Nutr.* 103, 202–6 (1973). The influence of dietary protein on intestinal biosynthesis of retinol from ^{14}C-β-carotene in rats was investigated. During the digestive phase, a dose of 20 μg of biosynthetically labeled ^{14}C-β-carotene was injected into the unligated upper intestine. After 2.5 hours, radioactivity incorporated into the retinyl ester fraction of the intestine was 2.7% of the injected dose in animals fed a 10% protein diet. With a 40% protein diet, the comparable value was 5.9%. There was more newly deposited hepatic retinol at higher levels of dietary protein. The data support indirect evidence, obtained in previous experiments, that the intestinal wall is an important site for the carotene-protein interaction.

THE REGULATION OF FATTY ACID BIOSYNTHESIS IN HUMAN SKIN FIBROBLASTS. R.A. Jacobs, W.S. Sly and P.W. Majerus (Depts. of Internal Med., Pediatrics and Biol. Chem., Washington Univ. Schl. of Med., St. Louis, Mo. 63110). *J. Biol. Chem.* 248, 1268–76 (1973). Fatty acid biosynthesis has been studied using primary cultures of human skin fibroblasts. Acetyl coenzyme A carboxylase activity of cells incubated in medium containing 15% fetal calf serum was 0.17 $\pm$ 0.01 nmole of malonyl coenzyme A formed per mg of protein per min whereas in cells incubated for 2 to 3 days in a medium with 15% lipid-deficient fetal calf serum acetyl-CoA carboxylase activity increased to a level of 0.29 $\pm$ 0.02 nmole of malonyl-CoA formed per mg of protein per min. When cells originally incubated in medium containing normal fetal calf serum were switched to medium containing lipid-deficient fetal calf serum, an 8-fold increase in the rate of acetate incorporation into lipid was observed in the first 7 hours, whereas cells switched from lipid-deficient to normal serum-containing medium or medium supplemented with free fatty acids showed an almost immediate decrease in the rate of acetate incorporation. The changes in acetate incorporation occurred before any change in enzyme activity was seen, indicating that two types of control are exerted on fatty acid biosynthesis in these cells.

EFFECT OF S-METHYLCYSTEINE SULFOXIDE, S-ALLYLCYSTEINE SULFOXIDE AND RELATED SULFUR-CONTAINING AMINO ACIDS ON LIPID METABOLISM OF EXPERIMENTAL HYPERCHOLESTEROLEMIC RATS. Y. Itokawa, K. Inque, S. Sasagawa and M. Fujiwara (Dept. of Hygiene, Faculty of Med., Kyoto Univ., Kyoto, Japan). *J. Nutr.* 103, 88–92 (1973). S-Methylcysteine sulfoxide (SMCS) and S-allylcysteine sulfoxide (SACS) are distributed abundantly in Lilliaceae and Cruciferae plants and may be one of the largest sources of sulfur-containing nonessential amino acids in the Japanese diet. The present paper describes the antihypercholesterolemic effect of these amino acids and other related sulfur-containing amino acids on experimental hypercholesterolemia of rats. Rats fed a hypercholesterolemic diet containing 10% hydrogenated coconut oil, 1% cholesterol and 0.2% cholic acid had high cholesterol levels in plasma and liver. Among sulfur-containing amino acids tested, addition of SMCS and SACS to this diet markedly depressed the increase of plasma and liver cholesterol level. Methionine and S-methylcysteine (SMC) showed a smaller hypocholesterolemic effect. On the other hand, cysteine, S-methylcysteine sulfon (SMC sulfon) and S-methylmethionine sulfonium chloride (SMMSC) had little effect on hypercholesterolemia.

ABSORPTION AND SECRETION OF FATTY ACIDS AND BILE ACIDS IN THE INTESTINE OF THE LAYING FOWL. S. Hurwitz, A. Bar, M. Katz, D. Sklan and P. Budowski (Inst. of Animal Sci., Agr. Res. Organization, Volcani Center, Bet Dagan; Packard Instruments Inc., Jerusalem, Israel). *J. Nutr.* 103, 543–7 (1973). Individual fatty acids and bile acids absorption has been assessed in the laying hen, through the use of ^{91}Y as a reference substance and microdeterminations of these compounds. A heavy secretion of lipid material containing mainly linoleic, palmitic and stearic acids occurred in the duodenum. Absorption followed throughout the entire intestine but the rate in the jejunum was greater than in the iluem. The overall absorption of the individual fatty acids ranged between

82 and 94%. Dihydroxycholanic bile acids were secreted into the duodenum at a rate of about 8 g/day. Close to 93% of the secreted bile acids was absorbed by both jejunum and ileum. The concentration of these bile acids reached 70 mmoles/liter in the contents of the upper jejunum.

RAPID UPTAKE OF DIETARY CHOLESTEROL BY HYPERPLASTIC LIVER NODULES AND PRIMARY HEPATOMAS. B.J. Horton, G.E. Mott, H.C. Pitot and S. Goldfarb (Depts. of Oncology and Pathol., McArdic Lab. for Cancer Res., Univ. of Wis., Madison, Wis. 53706). *Cancer Res.* 33, 460–4 (1973). Hyperplastic liver nodules and primary hepatomas induced by 2-acetylaminoflourene take up cholesterol-^{3}H, given p.o., at a rate only slightly less than that in normal liver, and 10- to 30-fold greater than that reported for transplantable hepatomas. In the case of primary hepatomas, the rate of uptake appeared to be related to the degree of differentiation and hence a function of tumor progression. Previous studies on regulation of cholesterol synthesis in primary hepatomas and cholesterol uptake studies in transplantable hepatomas may need to be reinterpreted in view of these results.

PHOTOSELECTION AND LINEAR DICHROISM OF RETINALS. A METHOD FOR IDENTIFICATION AND MEASUREMENT OF VARIOUS GEOMETRICAL ISOMERS. J. Horwitz and J. Heller (J. Stein Eye Inst., USLA Schl. of Med., Los Angeles, Cal. 90024). *J. Biol. Chem.* 248, 1051–5 (1973). Illumination of frozen solutions (glasses) of retinal isomers at 77K with monochromatic, linearly polarized light creates stable photoproducts with a new absorption spectrum. The photoproducts are oriented since they are produced by linearly polarized light, and the illuminated samples of the retinal isomers are consequently linearly dichroic. Measurements of the linear dichroism spectra of illuminated 9-cis, 11-cis, 13-cis, and all-trans retinal show that each isomer exhibits a unique spectrum. The shape of the particular spectrum is dependent on the wave length of the illuminating light. The magnitude of the linear dichroism signal is dependent on the time of illumination. The relative proportions of all-trans and 13-cis retinal obtained from rhodopsin are unaffected by the wave length of the illuminating light between 440 and 700 nm.

EFFECTS OF DIETARY PROTEIN CONTENT AND RATIO OF FAT TO CARBOHYDRATE CALORIES ON ENERGY METABOLISM AND BODY COMPOSITION OF GROWING RATS. E.W. Hartsook, T.V. Hershberger and J.C.M. Nee (Nutr. Lab., Dept. of Animal Sci., Penn. State Univ., Univ. Park, Pa. 16802). *J. Nutr.* 103, 167–78 (1973). Relationships among dietary protein, fat and carbohydrate were investigated in a modeling experiment using male rats and isocaloric diets factorially arranged to describe outcome responses of diets varying in protein content from 6 to 70% and in fat to carbohydrate calories ("ratio") from 0.2 to 1.4. Regression of body weight, weight gain and carcass dry matter, nitrogen and ash gain on protein and "ratio" was described by linear and quadratic coefficients for protein. Energy gain was optimal at 37.3% protein. Maximum quantities of heat of basal metabolism occurred at a dietary composition of 38.5% protein, 42.6% carbohydrate and 12.9% fat. Fecal and urinary nitrogen increased as dietary protein increased, but decreased as "ratio" increased. Body nitrogen gain, unaffected by "ratio," was maximal at 44% dietary protein. Digested energy and metabolized energy were unaffected by "ratio" at 40% protein, but at low and high protein, the effect of "ratio" was negative and positive, respectively. Heat production was constant at a "ratio" of 1.4; below and above 36% protein it was increased and decreased, respectively, by lower "ratios." Heat increment, unaffected by "ratio," was minimal at 46% dietary protein. Significance of this model to human and animal nutrition is discussed.

IMMEDIATE AND LATE EFFECTS OF PREMATURE WEANING AND OF FEEDING A HIGH FAT OR HIGH CARBOHYDRATE DIET TO WEANLING RATS. P. Hahn and L. Kirby (Depts. of Pediatrics and Obstetrics and Gynecol., Univ. of British Columbia, Vancouver, B.C.). *J. Nutr.* 103, 690–6 (1973). Male infant rats were weaned to a normal laboratory diet or to a high fat (HF) or high carbohydrate (HC) diet when aged 15 days (premature weaning, PW) or to a normal diet when aged 30 days (normal weaning, NW). They were killed when aged 30, 57, 215 or 254 days, having all been fed the laboratory diet from day 30. The immediate effects of the HF and HC diets were also determined. Within 24 hours, the activity of phosphoenolpyruvate carboxykinase was elevated by more than 400% in brown adipose tissue after feeding a HF diet. The rise in activity in the liver was less pronounced and slower. In liver a HF diet resulted in an elevation of carnitine acetyltransferase activity. Other enzymes related to glycolysis and lipogenesis reacted in the expected manner. In rats aged 30 and 57 days premature weaning, particularly to a HF diet, caused a significant decrease in the length of the large intestine, but this effect was no longer apparent in older animals. The blood cholesterol level was found to be elevated in rats aged 215 or 254 days weaned prematurely to a HC diet or to laboratory stock diet. Feeding a HF diet to PW rats, however, prevented this elevation. In younger animals this was not observed. It is concluded that the early nutritional regime has long lasting effects that may appear only much later in life.

DEVELOPMENT OF DERMAL SYMPTOMS RESEMBLING THOSE ON AN ESSENTIAL FATTY ACID DEFICIENCY IN IMMATURE HYPOPHYSECTOMIZED RATS. E.W. Haeffner and O.S. Privett (Hormel Inst., Univ. of Minn., Austin, Minn. 55912). *J. Nutr.* 103, 74–9 (1973). Studies are reported of the development of scaly tails and feet similar of those of an essential fatty acid deficiency in immature hypophysectomized rats. Normal and hypophysectomized weanling rats of the Sprague-Dawley strain were fed a semipurified fat-free diet supplemented with 10% of hydrogenated coconut oil, corn oil, linseed oil or concentrates of arachidonic or 20:5 and 22:6 acids as ethyl esters for 8 to 12 weeks. The hypophysectomized rats developed scaly tails and feet characteristic of the dermal symptoms of an essential fatty acid (EFA) deficiency. The caudal necrosis often developed in animals fed the more highly unsaturated fat to such an extent that part of the tails dropped off after about 8 weeks. Interconversion of fatty acids was not impaired in the livers of hypophysectomized animals. However, there was a small but significantly higher concentration of eicosatrienoic acid in the livers of the hypophysectomized animals, compared to those of normal animals. The percentages of cholesterol and cholesterol esters in the liver were higher, and those of the phospholipids lower, in the hypophysectomized animals.

BINDING OF TESTOSTERONE TO UTERINE COMPONENTS OF THE IMMATURE RAT. G. Giannopoulos (Dept. of Exp. Med., McGill Univ., and the Univ. Clinic, Royal Victoria Hosp., Montreal, Canada). *J. Biol. Chem.* 248, 1004–10 (1973). These results demonstrate that the immature rat uterus contains cytoplasmic and nuclear binding components ("receptors") with high affinity and specificity for testosterone. Thus the uterotrophic and antiuterotrophic action of testosterone appears to be a direct action of the hormone by a mechanism distinct from that of estradiol-17β. The data also demonstrate that the uterine androgen-binding components are different from those found in the rat prostate with regard to their relative affinity for testosterone and 5α-dihydrotestosterone. Therefore the intracellular active form of androgen may vary from tissue to tissue. Whereas 5α-dihydrotestosterone appears to be the major active androgen in the rat prostate, in other tissues such as the uterus the predominant active androgen may be testosterone itself.

HYDROGEN EXCHANGE IN THE SYNTHESIS OF GLYCERYL ETHER AND IN THE FORMATION OF DIHYDROXYACETONE IN TETRAHYMENA PYRIFORMIS. S.J. Friedberg and A. Heifetz (Dept. of Med., Univ. of Texas Med. Schl. at San Antonio, San Antonio, Tx.). *Biochemistry* 12, 1100–6 (1973). We have previously shown that [1,3-^{3}H]dihydroxyacetone phosphate is incorporated enzymatically into O-alkyl lipids with the loss of one tritium from C-3. Further evidence for a tritium exchange has been presented in this investigation by showing, in a microsomal system from *Tetrahymena pyriformis*, that tritiated 0-alkyl lipids are formed in the presence of tritiated water from dihydroxyacetone phosphate and hexadecanol. In another series of experiments we have shown that tritiated dihydroxyacetone phosphate yields tritiated acyldihydroxy-acetone (via acyldihydroxyacetone phosphate) in the absence of hexadecanol and in the presence of ATP Mg^{2+}, and CoA. Acyldihydroxyacetone is formed without a tritium exchange. Dihydroxyacetone is also formed and has lost one tritium. When hexadecanol is added to the system, the amount of dihydroxyacetone is reduced but 0-alkyl lipids are formed instead. The 0-alkyl lipids formed have undergone a tritium exchange. It is concluded that acyldihydroxyacetone phosphate yields acyldihydroxyacetone and dihydroxyacetone, unless hexadecanol is present in which case it yields 0-alkyl lipids.

FAT VERSUS SUCROSE AS THE NONPROTEIN CALORIE PORTION OF THE DIET OF RATS. Y. Dror, H.F. Sassoon, J.J. Watson, D.O. Mack and B.C. Johnson (Biochem. Section, Oklahoma Med. Res. Foundation, Dept. of Biochem. and Molecular Biol., College of Med., Univ. of Oklahoma Health Sci. Center,

Oklahoma City, Oklahoma 73104). *J. Nutr.* 103, 342-5 (1973). Diets with a uniform ratio of protein to nonprotein calories of 1:4, have been used to study the comparative effects of sucrose and lard on protein retention. In a nitrogen balance study on rats, the lard diet gave better N economy than did the sucrose diet. Liver glucose-6-phosphate dehydrogenase enzyme levels were found to be relatively high in the case of rats fed the sucrose diet, but when the lard diet was fed the liver levels of these enzymes were as low as those of starved rats. Short-term in vivo protein synthesis, as measured by labeled amino acid incorporation into liver protein, indicated increased arginine incorporation when the fat diet was fed. The observations indicate an improved protein utilization and nutritional status when the high fat, carbohydrate-free diet was fed.

INFLUENCE OF FEEDING DEAE SEPHADEX ON GROWTH, LACTATION AND LIPID UTILIZATION IN THE RAT. L.P. Dryden, J. Bitman, T.R. Wrenn and J. Weyant (U.S. Dept. of Agr. ARS, Animal Sci. Res. Div., Beltsville, Md. 20705). *J. Nutr.* 103, 36-42 (1973). The effects on the rat of incorporating in the ration DEAE Sephadex, a bile acid sequestrant which is not absorbed from or degraded in the intestinal tract, were studied. Diets containing 0.9% or 15% fat, as well as a hypercholesterolemic diet, were employed. The fecal fat (ether extract) was doubled on the 0.9% fat diet and the hypercholesterolemic diet and increased by 4 to 5 times on the 15% fat diet. The serum cholesterol levels were not affected on the normal diets but DEAE Sephadex prevented the elevated levels observed on the hypercholesterolemic control diet. In none of the diets did DEAE Sephadex affect 4-week weight gains of weanling young significantly but weight gain per calorie consumed was lowered in males fed the 15% fat ration, presumably due to a loss of dietary calories in the feces. The body weights of young of mothers fed DEAE Sephadex in the 0.9% fat ration were depressed about 7 to 8% by 15 days of age. The young from control mothers contained about 25% more fat and about 10% more nonfat solids in their bodies.

AN ESTIMATE OF THE MINIMUM AMOUNT OF UNSATURATED FATTY ACID REQUIRED FOR GROWTH OF ESCHERICHIA COLI. J.E. Cronan, Jr. and E.P. Gelmann (Dept. of Molecular Biophysics and Biochem., Yale Univ., New Haven, Conn. 06510). *J. Biol. Chem.* 248, 1188-95 (1973). A temperature-sensitive unsaturated fatty acid auxotroph was used to demonstrate that the *fabA* gene of *Escherichia coli* is the structual gene for the β-hydroxydecanoyl thioester dehydrase studied by Bloch and co-workers. This mutant, which requires an exogenous source of unsaturated fatty acid for growth at temperatures above 36C, possesses a dehydrase activity of greatly increased thermolability. Analysis of fab^+ and fab^- transductants and of fab^+ revertants indicate that the temperature-sensitive dehydrase activity is responsible for the growth phenotype of this strain. This mutant was then used for an estimation of the minimum amount of unsaturated fatty acid needed for growth. These results are discussed in terms of the role of unsaturated fatty acids in membrane structure and function and also in terms of the control of fatty acid synthesis.

MICROVISCOSITY AND ORDER IN THE HYDROCARBON REGION OF PHOSPHOLIPID AND PHOSPHOLIPID-CHOLESTEROL DISPERSIONS DETERMINED WITH FLUORESCENT PROBES. U. Cogan, M. Shinitzky, G. Weber and T. Nishida (Burnsides Res. Lab., Dept. of Food Sci. and Biochem., Univ. of Ill., Urbana, Ill. 61801). *Biochemistry* 12, 251-8 (1973). Microviscosity, existence of phase transitions, and structural organization in the hydrocarbon region of lipid dispersions of biological importance were investigated by means of fluorescence polarization techniques. Dispersions of egg lecithin, dipalmitoyllecithin and lecithin cholesterol mixtures as well as egg lysolecithin micelles were labeled with perylene, 2-methylanthracene or 9-vinylanthracene and the microviscosities which represent the harmonic mean of the internal viscosities opposing the inplane and out-of-plane the degree of the fluorescence depolarization. Egg lecithin and lysolecithin were found to possess a largely isotropic hydrocarbon interior. The incorporation of cholesterol into egg lecithin transformed the disordered interior into an ordered structure. The cholesterol effect appeared to be an additive phenomenon, i.e., the anisotropic character of the interior increased with the increase in the level of incorporated cholesterol.

EFFECT OF DIETARY VITAMIN E ON THE ACTIVITIES OF THE GLUTATHIONE PEROXIDASE SYSTEM IN RAT TISSUES. C.K. Chow, K. Reddy and A.L. Tappel (Dept. of Food Sci. and Technol., Univ. of California, Davis, Cal. 95616). *J. Nutr.* 103, 618-24 (1973). The effect of dietary α-tocopherol on activities of enzymes important in protection against lipid peroxidation was studied in tissues of rats. The activities of glutathione (GSH) peroxidase, GSH reductase and glucose-6-phosphate (G-6-P) dehydrogenase were significantly increased in perirenal adipose (PRA), paraepididymal adipose (PEA) and muscle, but not in liver, lung and kidney of animals fed a 15.7% tocopherol-stripped corn oil diet. The activities of GSH reductase and G-6P dehydrogenase, but not GSH peroxidase, were also significantly increased in testes of rats fed the corn oil diets. Accumulation of fluorescent products (FP) in PEA and PRA of these animals was also increased. There are close linear relationships among these measurements. The increases in activities of the GSH peroxidase system in PEA, PRA, muscle and testes of rats fed the corn oil diets appear to be in response to the lipid peroxidation which occurred in these tissues. Except for muscle and testes, similar increases in the activities of GSH peroxidase and GSH reductase were found in tissues of rats fed a diet that contained 15.7% cod-liver oil.

EFFECT OF VITAMIN E AND SELENIUM ON TISSUE ANTIOXIDANT STATUS OF RATS. L.H. Chen (Dept. of Nutr. and Food Sci., Univ. of Kentucky, Lexington, Ky. 40506). *J. Nutr.* 103, 503-8 (1973). Two animal experiments were performed with weanling, male, Sprague-Dawley rats to study the relationship of vitamin E and selenium on tissue antioxidant status. In experiment 1, 60 rats were fed basal diets supplemented with gradient levels of vitamin E. Sodium selenite (Se 1 ppm) was added to the diets of half the rats. In experiment 2, 48 rats received diets containing selenium (1 ppm) as sodium selenite, selenomethionine or selenocystine, with or without supplementation of vitamin E. After 4 weeks, liver peroxidation was determined by thiobarbituric acid (TBA) assay. Dietary selenium compounds as well as vitamin E lowered TBA values ($p < 0.01$). Sodium selenite at 1 ppm was as effective as 15 IU/kg diet of vitamin E in decreasing the peroxidation of liver lipids. The three selenium compounds were not significantly different in their effect. Vitamin E, sodium selenite, glutathione, ascorbic acid and butylhydroxyanisole added in vitro lowered TBA values of vitamin E-deficient rat liver homogenate, whereas methionine, selenomethionine and selenocystine added in vitro increased the TBA values. It is suggested that metabolites of dietary selenomethionine, selenocystine and methionine improved tissue antioxidant status of rats.

TRANSPORT OF ^{14}C-4-CHOLESTEROL BETWEEN SERUM AND WALL IN THE PERFUSED DOG COMMON CAROTID ARTERY. C.G. Caro and R.M. Nerem (Physiol. Flow Studies Unit, Imperial College, London, S.W.7., England). *Circulation Res.* 32, 187-205 (1973). The transport of certain materials between the blood and the wall in arteries appears to be dependent on wall shear rate with shear rate-enhancing flux; however, the *mechanism is unclear. If the transport is diffusional, it must* involve three steps: diffusion across a boundary layer, uptake at the blood-wall interface and transport within the wall. If the first step is rate controlling, if wall shear rate is spatially uniform and if a diffusion boundary layer commences upstream at the junction between the vessel and an impermeable tube, then flux will be proportional to the cube root of wall shear rate divided by distance and will depend on the species diffusion coefficient. A dog's common carotid artery was perfused with serum containing ^{14}C-4-cholesterol linked with lipoprotein; the fluid mechanics resembled those described above. In 20 experiments, there was no spatial dependence of uptake of the label, flux was lower by a factor of about a hundred than that predicted and there was a suggestion (statistically nonsignificant) of shear dependence. The first two findings are inconsistent with transport controlled by the diffusion boundary layer. An uptake-controlled transport could be shear dependent.

HYPERLIPOPROTEINEMIA. PREVALENCE IN A FREE-LIVING POPULATION IN ALBANY, NEW YORK. D.F. Brown, K. Daudiss (Dept. of Med. (Cardiology), Albany Med. College, Albany, New York.). *Circulation* 47, 558-66 (1973). The prevalence of five types of hyperlipoproteinemia identified by Fredrickson, Levy and Lees has been identified in 1301 male and female blood donors, aged 18-64 years. No patients with type 1 or V hyperlipoproteinemia were encountered, and only three patients with type III hyperlipoproteinemia were discovered. Type IV hyperlipoproteinemia was the most prevalent disorder in this population and was significantly more prevalent in males than females-261/1000 vs 81/1000, respectively. The prevalence rate of type II hyperlipoproteinemia in male

and female subjects was 87/1000 and 104/1000, respectively. Subjects with type IV, but not those with type II hyperlipoproteinemia, were significantly more obese than normal. High-density lipoprotein levels were lower than normal in patients with type IV and with type II hyperlipoproteinemia irrespective of sex, while in normal subjects high-density lipoproteins were significantly higher in females. Densitometry of stained electrophoretically separated lipoproteins correlated highly with lipid content of these fractions but was not considered sufficiently accurate for use as a quantitative technic.

THE USE OF TRIMETHYLSILYL ETHERS IN THE CHARACTERIZATION OF NATURAL STEROLS AND STEROID DIOLS BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY. C.J.W. Brooks, W. Henderson and G. Steel (Chem. Dept., Univ. of Glasgow, Glasgow G12 8QQ, Great Britain). *Biochim. Biophys. Acta* 296, 431–45 (1973). Trimethylsilyl ethers of 16 sterols, six cholestanediols, six cholestenediols and a cholestanetriol have been examined by combined gas chromatography-mass spectrometry. Characteristic features of the data are discussed in relation to previous work, and examples are given of the use of the technique in the identification of naturally-occurring steroids.

CARBONYL AND FATTY ACID ANALYSIS OF ANTELOPE AND BEEF FAT. A. Booren, R.A. Field and J.E. Kunsman Jr. (Div. of Animal Sci., Univ. of Wyoming, Laramie, Wy. 82070). *J. Food Sci.* 38, 63–5 (1973). Flavor is one of the most important characteristic of meat. Most reviewers have indicated that meat aroma and flavor are related to low molecular weight, volatile compounds. Volatile components have been isolated from beef during roasting. Carbonyls were found among the major constituents. A more comprehensive study indicated that carbonyls varied between species and may be responsible for specie flavor variation. Components of lamb flavor from cooked roasts were associated with carbonyl constituents. Hornstein and Crowe (1963) worked with objectionable lamb flavor and found that the odor could be obtained from the fat during heating. It was concluded that lamb flavor was due to carbonyl compounds or other polar lipid constituents. Fat has also been directly implicated as the site of objectionable lamb flavor in recent studies. These groups propose that fat is a storage depot for small quantities of lipid soluble compounds that contribute to meat flavor, particularly undesirable flavor.

PALMITOYL-COENZYME A SYNTHETASE. MECHANISM OF REACTION. J. Bar-tana, G. Rose, R. Brandes and B. Shapiro (Dept. of Biochem., The Hebrew Univ., Hadassah Med. Schl., Jerusalem, Israel). *Biochem. J.* 131, 199–209 (1973). The mechanism of long-chain fatty acid activation catalysed by highly purified microsomal palmitoyl-CoA synthetase was investigated. The kinetics of the overall reaction were found to conform to the Bi Uni Uni Bi Ping Pong mechanism. ^{18}O was transferred from [^{18}O]palmitate to AMP and palmitoyl-CoA exclusively. The enzyme intermediate formed appeared to consist of enzyme-bound palmitate; this formation occurred only in the presence of ATP. However, the involvement of palmitoyl-AMP in the reaction catalysed by the purified enzyme has proved difficult to establish.

INFLUENCE OF FOOD INTAKE FREQUENCY ON 26-^{14}C-CHOLESTEROL TURNOVER IN PULLETS FED A BASAL AND CHOLESTEROL-ENRICHED DIET. P. Bobek, E. Ginter, J. Babala, J. Cerven, V. Peter and V. Chrappa (Inst. of Human Nutr. Res., Bratislava, Inst. for Poultry Res., Ivanka pri Dunaji and Dept. of Pathol. Anat., Faculty of Med., J.A. Komensky's Univ., Bratislava). *J. Nutr.* 103, 706–12 (1973). The influence of a meal-feeding regimen (two 1-hour periods daily) on pool and kinetic parameters of cholesterol metabolism was studied in pullets (ROSS 1) fed a basal or a 0.5% cholesterol-enriched diet. For this purpose, the plasma cholesterol turnover curves 1 to 50 days after the intravenous administration of a single dose of 26-^{14}C-cholesterol were subjected to a kinetic analysis in a two-pool model. In chickens fed the basal diet meal-feeding shortened the plasma cholesterol half-time and raised fractional cholesterol turnover in the rapidly turning-over pool. In chickens fed the cholesterol-enriched diet, the plasma cholesterol half-time was longer and fractional cholesterol turnover was smaller, while the size of the rapidly turning-over cholesterol pool increased. The feeding frequency did not influence cholesterol catabolism or the plasma cholesterol level in either group (basal or cholesterol-enriched diet). Accordingly, the incidence and severity of atherosclerotic lesions in the aorta and myocardial coronary arteries of chickens fed ad libitum or 2 hours daily the cholesterol-enriched diet were only nonsignificantly greater.

RAT LIVER MICROSOMAL PALMITOYL-COENZYME A SYNTHETASE. STRUCTURAL PROPERTIES. J. Bar-tana and G. Rose (Dept. Biochem., Hebrew Univ.-Hadassah Med. Schl., Jerusalem, Israel). *Biochem. J.* 131, 443–9 (1973). The structural properties of purified palmitoyl-CoA synthetase from rat liver microsomal material were investigated. The active enzyme has a molecular weight of 168,000 and contains about 8.2 mol of phospholipid bound/mol of enzyme protein, as well as bound fatty acids. Association of the active enzyme was shown to occur without impairment of catalytic activity. The lowest molecular weight species obtained under denaturing conditions was 27,000 daltons.

LIPID METABOLISM IN CULTURED CELLS. XI. UTILIZATION OF SERUM TRIGLYCERIDES. J.M. Bailey, B.V. Howard and S.F. Tillman (Biochem. Dept., G. Washington Univ. Schl. of Med., Washington, D.C. 20005). *J. Biol. Chem.* 248, 1240–7 (1973). Utilization of serum triglycerides by cells in tissue culture has been studied in order to determine their importance as a source of cell lipids and to obtain information on the cellular mechanisms of triglyceride uptake. L strain mouse fibroblasts incorporated serum triglycerides from the growth medium, but the rates of uptake were up to 10-fold less than that of free fatty acids or monoglycerides under the same culture conditions. When cells were grown under conditions of limited supply of serum lipids, however, only about 7% of the cell lipid came from serum free fatty acids and up to 28% was provided by the serum triglycerides. The major portion of the cell lipid under these conditions was derived by de novo synthesis from glucose. The results indicate that L cells in tissue culture can utilize serum triglycerides and suggest that the predominant mechanism of uptake involves the intact molecule and does not require prior hydrolysis.

EFFECT OF METHIONINE ON LIVER LIPID CONTENT AND LIPID METABOLISM OF RATS FED A PROTEIN-FREE DIET. Yoritaka Aoyama, M. Nakanishi and K. Ashida (Lab. of Nutr. Biochem., Dept. of Agr. Chem., Nagoya Univ., Chikusa, Nagoya, Japan). *J. Nutr.* 103, 54–60 (1973). Feeding a protein-free diet supplemented with methionine caused an accumulation of lipids in the liver, but no lipid accumulation was observed in the liver of rats fed a protein-free diet with or without threonine. Experiments were conducted to examine the mechanism of liver lipid accumulation induced by the addition of methionine to the protein-free diet. The liver lipid content of rats fed the protein-free diet supplemented with methionine was higher when sucrose rather than glucose was used as a carbohydrate source. The fat level of the diet had no effect on the accumulation of the liver lipids. Urinary nitrogen content in rats fed either the protein-free diet or the protein-free diet supplemented with methionine was almost the same. Therefore, it is probable that there is no relationship between the protein sparing action of methionine and the formation of this fatty liver. It would appear that both the action of sucrose and methionine may be attributed to some interference with lipid transport. However, lipid transport was assessed only with respect to the methionine effect.

EFFECT OF VARIOUS CARBOHYDRATES IN A REPLETION DIET AFTER PROTEIN DEPLETION ON LIVER LIPID CONTENT OF RATS. Yoritaka Aoyama and K. Ashida (Lab. of Nutr. Biochem., Dept. of Agr. Chem., Nagoya Univ., Furo-cho, Chikusa, Nagoya, Japan). *J. Nutr.* 103, 225–30 (1973). The effects of shifting from a protein-free diet to a protein repletion diet containing various types of carbohydrates on the liver lipid content were studied. Feeding a protein-free diet for 14 days followed by the feeding of a protein-repletion diet containing sucrose or fructose, but not starch, dextrin or glucose as the sole carbohydrate source caused the accumulation of liver lipids, although the amount of food consumed by rats fed repletion diets containing various types of carbohydrates for 3 or 6 days was similar except when starch was fed. Furthermore, the liver lipid level of rats fed the repletion diet containing sucrose tended to be lower than when fructose was fed, whereas liver lipid content of rats fed a diet containing fructose was higher than that of rats fed a diet containing glucose without previously feeding a protein-free diet. However, its levels were not so high as to produce fatty liver as observed in the case of feeding a protein repletion diet containing sucrose or fructose after protein depletion. Thus, it seemed reasonable to assume that at least two factors are responsible for the accumulation of lipids in the liver: pretreatment of rats with a protein-free diet and the presence of fructose in the protein repletion diet.

INTER-RELATIONSHIPS BETWEEN PLATELET RESPONSE TO ADENOSINE DIPHOSPHATE, BLOOD COAGULATION AND SERUM LIPIDS IN PATIENTS WITH PERIPHERAL OCCLUSIVE ATHEROSCLEROSIS. R.C. Cotton, K. Bloor and G. Archibald (Univ. Dept. of Surgery, Manchester Royal Infirmary, Manchester, Great Britain). *Atherosclerosis* 16, 337–48 (1972). The sensitivity of platelets to adenosine diphosphate (ADP) was measured in a group of patients with occlusive peripheral atherosclerosis and the results were compared with those from apparently healthy normal subjects. Coagulation and lipoprotein measurements were also carried out in the two groups. In the patient group significantly higher values were obtained for the platelet response to ADP(PAFP), the heparin-precipitable fraction of fibrinogen, plasma anti-heparin activity, plasma viscosity, ESR and partial thromboplastin clotting times as compared with the normal subjects. The mean value for the cholesterol-rich S_f0-20 lipoproteins and the S_f20-400 lipoproteins did not differ significantly between the groups. Analysis of the correlations between PAFP and the other parameters investigated suggested that in this type of patient PAFP was being influenced by similar factors to those producing disturbances in the blood coagulation mechanism.

• Edible Proteins

RECOVERY OF SEED MEAT FROM THIOGLUCOSIDE-CONTAINING OILSEED. K.E. Eapen, N.W. Tape, and R.P.A. Sims (Canadian Patent and Development Ltd.). *U.S. 3,732,108.* There is described a process for obtaining protein-rich, substantially non-toxic, oilseed flour by subjecting certain oilseeds to myrinosinase-inactivating temperatures in the presence of water. The water treated seeds are decorticated so as to expose the seed meat, and thioglucoside is removed by extracting the seed meat with hot or cold water. The extracted material is dried and the oil recovered. When rapeseeds are subjected to this process, there results a flour containing 56–62% protein and suitable for human consumption, rapeseed oil, and a seed coat-rich meal useful for animal feeds.

PREPARATION OF A SOY PROTEIN FRACTION. E.M. McCabe (Societe d'Assistance Technique pour Produits Nestle S.A.). *U.S. 3,733,207.* A protein fraction particularly suitable for incorporation in carbonated beverages is recovered from soy protein by reaction of the soy with phytase, removal of matter insoluble at pH 4.6, and recovery of the fraction insoluble at pH 5.0–5.4.

DEFATTED SOYBEAN FRACTIONATION BY SOLVENT EXTRACTION. L.P. Hayes and R.P. Simms (A.E. Staley Mfg. Co.). *U.S. 3,734,901.* Soya protein concentrates are prepared by removing residual lipid and water soluble constituents from defatted soybean flakes. The residual lipids are initially extracted with a hydrocarbon/monohydric alcohol solvent followed by aqueous extraction. A high lecithin-containing oil is obtained by admixing the resultant lipid miscella and aqueous miscella and then separating the oil phase from the admixture.

PROCESS FOR PREPARING PROTEIN PRODUCTS. G.A. Iacobucci, D.v.B. Myers and K. Okubo (The Coca-Cola Co. and Kikkoman Shoyu Co., Ltd.). *U.S. 3,736,147.* A process is provided for preparing plant protein products having low phytic acid content by subjecting protein isolates to ultracentrifugation in the presence of a suitable chemical reagent.

MEAT FOOD ANALOGS RESISTANT TO MICROBIAL SPOILAGE. M.H. Katz (The Pillsbury Co.). *U.S. 3,736,148.* The analogs are comprised of vegetable protein, water and food solids other than vegetable protein dissolved or colloidally dispersed in the water to reduce the water activity to below 0.95. Sufficient acid is added to adjust the pH to the range of 3.0 to 5.4.

• Drying Oils and Paints

GEL PERMEATION CHROMATOGRAPHY OF ALKYD RESINS. G. Christensen and P.H. Fink-Jensen (A/S Sadolin & Holmblad, Copenhagen, Denmark). *Farbe u. Lack* 79(4), 301–6 (1973). Gel permeation chromatographic examinations of tall oil alkyds has shown that most of the peaks in the tetra- and pentamodal GPC-curves normally found for alkyds are artifacts. The width of the distribution of different alkyd resins turns out to be a linear function of the weight average molecular size. It has been demonstrated that there is no obvious correlation between the molecular size distribution of tall oil alkyds and their drying times.

WASTE WATER PURIFICATION IN THE METAL INDUSTRY. K-H. Adams (Lackfabriken W. L. Schwaab, Baden). *Seifen-Öle-Fette-Wachse* 99(9), 239–43 (1973). The waste water problem in lacquering and plastic mass coating plants is considered. Cited are orders, standards and laws. Detoxification of waste waters containing chrome, nitrites and cyanides is reviewed as is the neutralization and precipitation of metals. Also considered is the removal of fats, phosphates, wetting agents and colors.

CRITICAL PATH THROUGH DESIGN OF MEMBRANE EXTRACTION PROCESS IN COLLOIDAL SYSTEMS. E.G. Bobalek, J.R. Hart and W.A. Olmsted (U. of Maine, Orono, Me. 04473). *J. Paint Technol.* 45(578), 45–55 (1973). The problem of how to extract less-desirable soaps from latex while replacing them with preferred tensides that preserve colloidal stability required more than ten years of research by several investigators. This record is reviewed to show how practical problems can steer a continuously critical appraisal of research results to define the practical state of the art.

PHOTODEGRADATION OF ESTER GROUPS IN TRIGLYCERIDES. G.V. Rudnaya and A.N. Pravednikov. *Lakokras. Mat.* 1972, No. 3, 18–22. The photodegradation process occurring in alkyds were studied using glycerol triacetate as a model substance. I.R. spectroscopy and gas chromatography were used and the mechanisms of photolysis, photooxidation and CO, CO_2, CH_4 and acid formation are discussed. Although the reaction mechanisms are different, both photolysis and photooxidation give the same products. (World Surface Coatings Abs. No. 368)

• Detergents

THE CURRENT STATE OF FATTY ACID SYNTHESIS BY AIR OXIDATION OF PARAFFINS WITH SPECIAL REGARD TO ITS EVOLUTION IN THE COMECON-COUNTRIES. H. Stage (Köln). *Seifen-Öle-Fette-Wachse* 99(6,7), 143–8 (1973). In the first section the state of paraffin oxidation in Germany is given before and during the war, and comparisons with modern yields are given. The next section is a general summary the problems of the modern synthesis, the reprocessing methods and the multifarious use possibilities of the produced acids and by-products. The third part treats the various problems of the synthesis with regard to chemical, methodical, technical and equipment questions. The last section presents modern trends with regard to recovery of acids from oxidized matter.

REMOVAL OF PHOSPHATE CONTENT IN COMMUNAL WASTE WATERS. E. Fischer (Farbwerke Hoechst AG), K. Merkenich and J. Kandler (Knapsack AG). *Seifen-Öle-Fette-Wachse* 99(9), 211–7 (1973). Eutrophication by increased admission of nutritive matter for aquatic plants, particularly seaweed, has resulted in the investigation of phosphate removal by chemical precipitation with aluminum sulfate. Testing simultaneously whether chemical purification could complete the classical combination of preliminary mechanical clearing with biological purification or the alternative of the total saving of the biological stage. From 98 to 99% elimination of phosphates were found in two cases. Material costs and processing are considered.

POLARITY INDEX OF SURFACE-ACTIVE AGENTS. J. Broniarz, M. Wisniewski and J. Szymanowski (Politechnika Poznánska Inst. Chem. Technol. Poznan, Poland). *Tenside* 10(2), 75–8 (1973). The polarity index as well as the ratio of the retention time of polar agents to that of nonpolar ones enables determination of the polarity of the liquid phase by reverse gas chromatography. Using the relative time scale considerably limits the influence of chromatographic parameters on the value of polarity index of surfactants. Several advantages exist for using the polarity index derived from Huebner's formula compared with that obtained from the relative time ratio, especially when additivity and independence with temperature are considered. The additivity of the polar index and the accuracy and reproducibility of determination make it possible to use this method in analysis to determine the chemical constitution of solid and liquid binary mixtures. The polarity index may also be used as a measure of hydrophilic equilibrium of the surfactant determined by means of the ideal HLB value.

DETERMINATION OF TEMPERATURE OPTIMA FOR PROTEASES FOR

WASHING AGENTS. W. Schreiber (Henkel & Cie GmbH, Düsseldorf). *Tenside* 10(2), 69–74 (1973). Alkaline bacillopeptidases are inactivated by phenylmethane sulfonylfluoride (PMSF) directly in the washing bath at concentrations used in laundering. This permits laundering tests to be run without the action of the enzyme. By raising the temperature of the washing bath during the enzyme action from test to test and measuring the optical density and the protein content in the bath, one obtains maxima of the detergency caused by the enzyme. These maxima are interpreted as temperature optima, which are characteristic for the enzyme examined. The absolute position of these optima is a function of the quality of the testing fabric, hence these optima should be rated only in a comparative manner.

TENSIDE RESEARCH THROUGH PYROLYTIC GAS CHROMATOGRAPHY. I. NONIONIC AND ANION ACTIVE TENSIDES. R. Denig (Badische Anilin- & Soda-Farbik AG, Ludwigshafen am Rhein). *Tenside* 10(2), 59–63 (1973). Described is a modified pyrolysis-gas chromatographic technique for the identification of nonionic and anionic surfactants. Besides qualitative determination, the test is capable of providing quantitative information about alkyl chain distribution and the alkyl-aryl basic skeleton of the starting products, as well as about the structure of the polyether chains in EO/PO adducts.

A NEW METHOD FOR DETERMINATION OF POLYETHYLENE GLYCOL IN FATTY ALCOHOL- AND ALKYLPHENYLPOLYGLYCOL ETHERS. G. Riesewijk and J. Leeferink (Analytical Lab. of the Chemische Fabriek Serveo, B. V. Delden, Holland). *Tenside* 10(2), 57–9 (1973). A quick and accurate method is described for the determination of the polyethylene glycol content in fatty alcohol- and alkylphenylpolyglycol ethers. The material is dissolved in ethyl acetate and extracted once with a measured quantity sodium chloride solution. In the extract the polyethylene glycol content is determined via the carbon content by means of a carbon analyser.

WATER AND THE SKIN. B. Idson (Hoffmann-La Roche Inc., Nutley, N.J. 07110). *J. Soc. Cosmet. Chem.* 24, 197–212 (1973). Problems of dry skin are those of inadequate hydration of the stratum corneum. Water is continually diffusing outward from sweat glands and by transepidermal diffusion as long as the relative humidity remains less than 100%. Hydration dramatically increases the permeability of the skin. Yet, even the hydrated stratum corneum is an affective barrier against water loss. Diseased skin is more permeable to water loss. The whole stratum corneum is probably the principal skin barrier to water. Agents that increase the permeability of the skin, such as DMSO or surfactants, damage or alter the nature of the stratum corneum, reducing the diffusional resistance. Diffusion through the stratum corneum is passive, influenced chiefly by the water vapor pressure gradient. Much of the water-binding capacity of the corneum is due to the presence of hygroscopic water-soluble substances, which appear to be protected by lipid material which must be removed with solvents before they can be extracted by water. The osmotic properties of the horny layer suggest there is a semipermeable membrane system which prevents the water-soluble substances from being washed out when the corneum is immersed in water but does not prevent the hygroscopic substances from holding water in humid atmospheres. The membrance system may be the corneum cell wall.

This Issue's Index to Advertisers

CITRATE DISHWASH DETERGENT. Anon. *Soap/Cosmetics/Chemical Specialties* 49(5), 98–100 (1973). A phosphate-free dishwashing detergent based on trisodium citrate has been developed. The formulation is listed and preparation directions are given. In a consumer evaluation test, the new detergent was rated as good as a typical phosphate-containing detergent in terms of performance. In laboratory tests on glasses, the citrate-containing detergent was rated as good as or better than five mechanical dishwashing detergents on the market. No corrosion of china overglaze was detectable, and aluminum corrosion was only about 28% of that found with a conventional product.

BLUE BOOK ISSUE. Anon. *Soap/Cosmetics/Chemical Specialties* 49(4A), (1973). Section 1 of this annual volume lists the leading sources of supply of raw materials, equipment, containers, accessories and services used by manufacturers and converters in the industries served by this publication. Section 2 contains the following parts: Hard Water Areas in the Continental U.S.; Directory of Trademarks of Manufacturers of Raw Materials and Equipment for the Soap, Detergent, Cosmetic, and Chemical Specialty Industries; Directory of Trademarks of Soaps, Detergents, Cosmetics, and Chemical Specialties Registered with the U.S. Patent Office in 1972; Trade Association Officials; Specifications of Waxes of the American Wax Importers and Refiners Association; and an Index to articles in *Soap/Cosmetics/Chemical Specialties* for 1972, 1971 and 1970.

DETERGENT BUILDER COMPOSITION. H.A. Bruson and H. Gould (Milchem Inc.). *U.S. 3,729,432.* The composition has the formula $R_3C\text{-}CO\text{-}CYR_2$ where R is $-CH_2\text{-}CH_2\text{-}COOX$, X is hydrogen, alkali metal, ammonium, or substituted ammonium, and Y is either hydrogen or $-CH_2CH_2\text{-}COOX$, X being one of the same groups mentioned above.

WETTING AGENTS FOR ALKALINE BATHS. F. Landauer, C. Beermann, M. Reuter, K.H. Lebkucher and H. Kiesling (Farbwerke Hoechst). *U.S. 3,730,903.* Detergent mixtures consisting of (a) an alkylsulfonic acid containing a sulfonic acid group per 7 carbon atoms at most, (b) a low molecular oxalkylation product of a lower alkyl amine, and (c) a phosphate of alkanols of 4–8 carbon atoms are useful as surface active agents for alkaline baths.

TERNARY FOAM CONTROL SYSTEMS AND DETERGENT COMPOSITIONS CONTAINING THEM. J.T. Inamorato (Colgate-Palmolive). *U.S. 3,730,912.* An inverse foam to temperature relationship is provided by a synergistic mixture of a fatty acid, a polyethoxylated quaternary ammonium salt, and a high molecular weight amide or a primary, secondary, or tertiary amine.

SYNTHETIC DETERGENT COMPOSITIONS. Y. Oba, C. Kato, T. Tsunoda, S. Fujiki and H. Tsukuni (Hitachi Chem. Co.). *U.S. 3,730,913.* The compositions comprise an anionic or nonionic surface active agent and a water soluble salt of a copolymer of 3a,4,5,6,7,7a-hexahydro-4,7-methanoindene and maleic anhydride as a builder.

BIO-SOAKING PERFORMANCES. Y. Demangeon (Colgate-Palmolive). *U.S. 3,732,170.* There is claimed a biological cleaning composition containing an enzyme and, as an oxidizing agent, an alkali metal monopersulfate triple salt. Preferred enzymes are proteolytic subtilisin enzymes. A preferred monosulfate triple salt is $(2KHSO_5 \cdot KHSO_4 \cdot K_2SO_4)$.

DETERGENT SLURRY PROCESS. E.W. Vessey (Philadelphia Quartz Co.). *U.S. 3,733,278.* A method is described for increasing the alkali metal silicate content of spray dried detergents without decreasing the spray dryer production and without changing the solubility characteristics of the detergent. The method involves the preparation of detergent slurries in a crutcher with high alkali metal silicate content by adding alkali metal silicate glass to the slurries in such a manner that it readily dissolves. The glass is added through a jet nozzle with steam pressure. Thus the amount of water which must be removed by spray drying can be reduced or remain the same while the silicate solids of the slurry and subsequently the detergent can be increased substantially.

POLYMERS DERIVED FROM CHLOROMALEIC ANHYDRIDE AS DETERGENT BUILDERS. P.M. Chakrabarti and G.P. Volpp (FMC Corp.). *U.S. 3,733,280.* Detergent compositions are described comprising a detergent surfactant and a water soluble salt of a polymeric builder of the formula $(X_{(1-m-n)}Y_mZ_n)_p$; m and n are positive numbers whose sum is less than one.

(Continued on page 362A)

• Abstracts. . .

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p is an integer greater than 3 and less than a value which is determined by the solubility of the salt in an aqueous system. X is derived from the monomer monochloromaleic acid. Y is derived from the monomer maleic acid and Z is derived from a monoethylenically unsaturated monomer containing 1 to 3 substituents. Some of the carboxy oups in the polymer can be esterified with a lower aliphatic radical.

UNSATURATED CARBOXYLIC ESTERS. F. Smeets (N. V. La Citrique Belge). *U.S. 3,733,315.* Unsaturated ester materials are prepared by heating an alkaline earth metal salt of citric acid, hydrolyzing the reaction product to form the corresponding organic acid material and esterifying the acid. The compounds are sulfonated to produce surface active agents, ion exchange materials and detergents.

SODIUM EXO-CIS-1,4-ENDOXO-1-SUBSTITUTED CYCLOHEX-5-ENE-2,3-DICARBOXYLATE COMPOUNDS. V. Lamberti and R. Reardon (Lever Bros. Co.). *U.S. 3,736,339.* These compounds are useful as builders in detergent compositions. ■