ABSTRACTS

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• Fats and Oils

REPRODUCIBILITY OF MEASUREMENTS OF MELTING POINTS BY USING THE OPEN CAPILLARY METHOD. Ryoichi Uehara, Takeo Horii, Makoto Hiyamizu and Tadao Hata (Nikko Sci. & Chem. Ind. Co., Saitama, Japan). *Yukagaku* **15**, 644–7 (1966). Melting points of hydrogenated tallow, hydrogenated castor oil, mink fat, cetanol, hydrogenated spermaceti, bees wax, candelilla wax, bleached montan wax, paraffin wax and ceresin were determined. Reproducibilities were determined from five tests. The reproducibility depends primarily on complexity of the chemical nature of samples. The open capillary melting point is applicable to limited sorts of materials when the reproducibility of measurement must be in the range of ± 1C.

LIPIDS OF OKADANGOMUSHI, ARMADILLIDUM VULIGARE. Masakazu Yoshida and Tatsuo Mitsuhashi. *Yukagaku* **15**, 648–50 (1966). Ether extract showed d_4^{20} 0.9466, n_D^{20} 1.4739, sapon. no. 230, iodine no. 78.1, unsap. matter 10.0%, and acetone-insoluble matter 5.0%. The fatty acids were composed of 0.7% C-14:0, 20.6% C-16:0, 8.3% C-18:0, and 0.7% C-20:0, 53.7% C-18:1, 10.1% C-18:2, and 2.5% C-18:3. Unsaponifiable matter contained 41% cholesterol.

NEW, PARTIALLY HYDROLYZABLE SYNTHETIC ANALOGUES OF LECITHIN, PHOSPHATIDYL ETHANOLAMINE AND PHOSPHATIDIC ACID. A. F. Rosenthal (Dept. of Lab., Long Island Jewish Hosp., New Hyde Park, New York). *J. Lipid Res.* **7**, 779–85 (1966). The synthesis of two new synthetic analogues of lecithin, two of phosphatidyl ethanolamine ("cephalin") and one new phosphatidic acid analogue is described. They comprise one of each of the following types: the "isosteric" diether lecithin and cephalin analogues $ROCH_2CH(OR)CH_2CH_2P(O)(O^-)OCH_2CH_2N^+R'_3$ where $R = C_{18}H_{37}$ and $R' = H$ or CH_3; and the "hydrocarbon" analogues of phosphatidic acid, lecithin and cephalin, $C_{17}H_{35}CH_2CH(C_{18}H_{37})CH_2P(O)(R)=(R')$ where R=R'=OH or $R=O^-$,$R'=OCH_2CH_2N^+(CH_3)_2$ or $R=O^-$,$R'=OCH_2CH_2N^+H_3$. Infrared spectra and other properties of these compounds are described.

MAJOR FREE FATTY ACIDS OF FETA CHEESE. C. Efthymiou (Dept. of Biology., St. John's Univ., Jamaica, N.Y.). *J. Dairy Sci.* **50**, 20–4 (1967). The major free fatty acids (FFA) of representative variants of Teleme and also mild- and sharp-flavored Feta were analyzed, using liquid partition and gas-liquid chromatography. A low total FFA value characterized all Teleme samples. The dominant acid (25–46%) was acetic. In the mild-flavored Feta samples the FFA varied considerably, but their total value was generally low. Again, the acetic acid comprised a high portion of the total acids (28–43%). In the sharp-flavored samples, moderate to excessive amounts of FFA were detected. The acetic acid content did not change but its ratio to the total FFA showed a sharp decrease (5–12%). The butyric acid content inercased and its weight percentage was more than four times the reported average for the esterified acid.

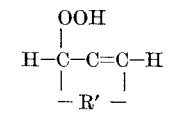
IDENTIFICATION OF STEROIDAL 5,8-PEROXIDES BY GAS-LIQUID CHROMATOGRAPHY. G. A. Blondin, B. D. Kulkarni, J. P. John, R. T. Van Aller, P. T. Russell and W. R. Nes (Depts. of Chem., Clark Univ., Worcester, Mass., and Univ. of Mississippi, University, Miss.). *Anal. Chem.* **39**, 36–40 (1966). The 5,8-peroxides of ergosterol and 7-dehydrocholesterol were found to give a characteristic pattern of pyrolysis products in contrast to the other sterols which give single peaks. Evidence obtained using radioactivity and effluent counting showed that C-4 of the peroxides was retained in the pyrolysis products. Other gas-liquid chromatographic evidence indicated that the side chain was also retained and that molecular oxygen was not eliminated. A second characteristic pattern of products was also obtained from the reduction of the peroxides using lithium aluminum hydride, but the reduction pattern does not offer as rapid a means of identification as does pyrolysis.

CALCIUM, PROTEIN, FAT AND MOISTURE OF COMMERCIALLY MADE COTTAGE CHEESE. B. M. Kennedy and M. Schelstraete (Univ. of Calif., Berkeley, Calif.). *J. Am. Dietetic Assoc.* **49**, 502–4 (1966). Moisture, protein, fat and calcium contents of commercially produced, large-curd creamed; small-curd creamed; and large-curd partially creamed cottage cheese were determined. The average calcium content was significantly lower than the value reported in the literature (66 vs. 92 mg./100 g.). The fat content of the creamed cheeses was 4.1–4.2 mg./100 g. There was no detectable difference in nutrient content between large- and small-curd cottage cheese.

• Fatty Acid Derivatives

ALKYLXYLENE CATIONICS IN SPECIALTIES. D. R. Napier, P. B. Hamilton and O. L. Riggs (Continental Oil Co., Ponca City, Okla.). *Soap Chem. Specialties* **42**, 117–42 (1966). The results of a preliminary evaluation of the antimicrobial and acid corrosion inhibiting properties of various alkylxylene cationics are reported, with the corresponding alkyl benzene products included for comparison and interpretation purposes. Screening tests revealed some exceptionally potent bactericides (bis thiuronium chlorides) and corrosion inhibitors (mono- and bis-quaternaries from aromatic amines). Further testing is in progress to determine the commercial usefulness of these materials.

DEHYDRATION OF HYDROPEROXIDES TO KETONES. W. J. Farrissey, Jr. (Esso Research). *U.S. 3,291,834.* A method is described for converting an unsaturated hydroperoxide of the general formula



R' being selected from the group consisting of C_2 to C_9 alkylene and a C_2 to C_9 olefin, to the corresponding unsaturated ketone. The method consists in treating the hydroperoxide with a mixture of an acid chloride (e.g. acetyl chloride, propionyl chloride, benzoyl chloride) and a nitrogen base which will trap hydrogen chloride at a temperature of less than 30C. The nitrogen base is washed from the reaction product with hydrochloric acid and the unsaturated ketone is then recovered.

POLYETHYLENE OXIDE ADDUCTS OF FATTY OILS AND FATTY AMINES AS ANTISTATIC COATING FOR POLYOLEFIN FIBERS. A. S. Keller and H. H. Hall (FMC Corp.). *U.S. 3,296,019.* An antistatic coating for polyolefin fibers consists of a polyethylene oxide modified fatty oil having an average of at least 15 ethylene oxide units per glyceride molecule admixed with a polyethylene oxide modified primary amine having an average of at least 10 ethylene oxide units per amine molecule and a fatty chain of 12 to 18 C atoms.

SOLID SHAPED STERILIZING, SANITIZING AND DISINFECTING COMPOSITIONS. X. Kowalski (Monsanto Co.). *U.S. 3,296,069.* A sterilizing, sanitizing and disinfecting composition, in solid shaped dosage unit form, consists of a mixture of (1) a solid chlorine-containing compound selected from the group consisting of dichloroisocyanuric acid, pentaisocyanurate and diisocyanurate, (2) about .25 to 2.0% by wt. of a metal salt of an aliphatic carboxylic acid having a carbon chain of at least 10 C atoms, the metal being selected from the group consisting of alkali metals, alkaline earth metals, zinc and magnesium and (3) an anhydrous metallic salt of copper or zinc, characterized by having a solubility of at least 10 grams per 100 ml. of water at 20C.

PRODUCTION OF CARBOXYLIC ACIDS. A. H. Wehe, Jr., *et al.* (Esso Research). *U.S. 3,296,286.* A process for synthesizing carboxylic acids is described. As a first step a complex is formed between carbon monoxide, an olefinic compound (either unsubstituted or carboxyl, ester and hydroxy substituted) and a hydrated boron fluoride catalyst. In the second step, the complex is introduced into at least one discrete hydrolysis stage where it becomes hydrolyzed by an aqueous medium into a crude carboxylic acid product and a reconstituted boron catalyst having a water to BF_3 mole ratio of less than 3 to 1. The mixture is introduced into another discrete stage where it is washed with an aqueous medium having a water to BF_3 ratio greater than 15 while maintaining the stage at an equilibrium ratio no higher than 3 to 1. The acid-catalyst mixture is finally washed in at least one other discrete stage, which is maintained at a water to BF_3 mole ratio greater than 15 to 1.

• Biochemistry and Nutrition

THE FOETAL AND MATERNAL LIPIDS OF ROMNEY SHEEP. I. THE COMPOSITION OF THE LIPIDS OF THE TOTAL TISSUES. D. R. Body, F. B. Shorland and J. P. Gass (Fats Research Div., Dept. of Scientific and Industrial Res., Wellington, New Zealand). *Biochem. Biophys. Acta* 125, 207–16 (1966). The lipids of the total tissues of five foetal lambs at near term or newly born and of four maternal ewes were compared. It was found that the foetal tissues contained only 2.8–4.0% total lipids as compared with 32.3–42.5% found in the ewe tissues. The range of values for the lipids of the foetal and ewe tissues was respectively as follows: percentage phospholipids 14.3–20.8 and 1.3–2.5, percentage unsaponifiable matter 6.3–8.5 and 0.7–1.2, iodine value 58.1–64–5 and 46.3–53.6 and percentage *trans* acids 0.1–0.9 and 12.0–13.5. The phospholipids of the foetus were found to consist of phosphatidyl choline 44.6%, lysophosphatidyl choline 4.7%, phosphatidyl ethanolamine 22.1%, phosphatidyl serine 7.5%, phosphatidyl inositol 3.9%, sphingomyelin 11.2% and unidentified 6.0%. The values for the corresponding phospholipids of the ewe were 41.7%, 3.2%, 28.2%, 6.7%, 3.3%, 11.2% and 5.7%. The close agreement in composition of the phospholipids of the foetus and the maternal ewe suggested that the tissues possess similar enzyme systems for phospholipid synthesis.

II. THE FATTY ACID COMPOSITION OF THE LIPIDS FROM THE TOTAL TISSUES. F. B. Shorland, D. R. Body and J. P. Gass. *Ibid.*, 217–225. The fatty acid composition of the triglycerides (neutral lipids) and the phospholipids of the total tissues of foetal and maternal sheep has been examined. Although the fatty acid compositions of the triglycerides of the foetus and the ewe were generally similar, the foetal triglycerides were lacking in n-C_{17} saturated, n-C_{17} unsaturated, branched-chain C_{15}, C_{16} and C_{17} acids, octadecadienoic, octadecatrienoic and especially in *trans* acids by comparison with the ewe triglycerides. The fatty acid composition of the foetal and maternal phospholipids were generally similar, the relatively high content of C_{20} and C_{22} highly unsaturated acids in the foetus together with the low content of C_{18} di- and tri-unsaturated acids suggested that the latter were more actively converted to C_{20} and C_{22} polyunsaturated acids by the foetal than by the maternal tissues. The phospholipids, while containing substantial amounts of C_{20} and C_{22} polyunsaturated fatty acids, did not conform in respect of their stearic and palmitic acid contents to the general pattern of differences between triglycerides and phospholipids of mammalian tissues. On the other hand the differences in fatty acid composition of the phosphadityl choline and phosphatidyl ethanolamine fractions were in keeping with the results of other investigators obtained for mammalian tissues.

PREPARATION AND PROPERTIES OF ISOLATED PLASMA MEMBRANES GUINEA-PIG TISSUES. R. Coleman and J. B. Finean (Dept. of Medical Biochem. and Pharmacology, Biology Bldg., The Univ. of Birmingham, Birmingham 15, Great Britain). *Biochem. Biophys. Acta* 125, 197–206 (1966). Some of the properties of plasma membrane preparations isolated from guinea-pig tissues by differential and density-gradient centrifugation of homogenates, are described. Liver, kidney, small intestinal mucosa and erythrocytes have been studied, together with a myelin preparation from brain. Examination of thin sections of centrifuged pellets of the isolated material by electron microscopy has demonstrated many of the morphological features associated with the plasma membrane in the intact tissue. A property common to all the plasma membrane preparations studied is a high molecular ratio of cholesterol to phospholipid. In all cases it is greater than the ratio in the other membrane systems of the tissue of origin, and in the preparations from small intestinal mucosa, erythrocytes and nerve myelin the proportion of cholesterol to phospholipid is approximately equimolar.

CHOLESTEROL BIOSYNTHESIS IN RABBIT BLOOD AND BONE MARROW: EFFECT OF HEMATOPOIETIC STIMULATION AND DIETARY CHOLESTEROL. N. Takeuchi, N. Iritani, W. W. Wells and M. P. Westerman (Biochem. Dept. and the Dept. of Med., Univ. of Pittsburgh, School of Med., Pittsburgh, Pa.). *Biochem. Biophys. Acta* 125, 375–88 (1966). The incorporation of significant amounts of acetate-1-^{14}C into cholesterol occurred in normal rabbit bone marrow, leucocytes, reticulocytes and platelets, *in vivo* and *in vitro*. Erythropoietic stimulation from phenylhydrazine injection and phlebotomy was associated with hyperlipemia and hypercholesterolemia. Increased hepatic cholesterol incorporation of ^{14}C from acetate-1-^{14}C was observed in phlebotomized rabbits, but not in those injected with phenylhydrazine. Under stimulation mixed marrow cells incorporated 2–3 times more acetate-1-^{14}C into cholesterol, *in vivo*, than those of control rabbits. Blood and bone marrow from rabbits previously stimulated hematopoietically were capable of incorporating, *in vitro*, significantly more acetate-1-^{14}C into cholesterol than controls. From *in vitro* experiments, leucocytes, reticulocytes and platelets were estimated to account for 65.7%, 26.9% and 7.4% of the cholesterol synthetic activity of normal rabbit blood.

CHOLESTEROL METABOLISM IN HAMSTERS REARED ON DIETS WITH DIFFERENT EFFECTS ON GALLSTONE FORMATION. B. Jensen and H. Dam (Dept. of Biochem. and Nutr., Polytechnic Inst., Copenhagen, Denmark). *Biochem. Biophys. Acta* 125, 367–74 (1966). The incorporation of labeled acetate into cholesterol and the elimination of labeled cholesterol from the body was studied in three groups of hamsters reared on diets with known effects on gallstone formation in young individuals of this species. The per cent incorporation of intraperitoneally injected acetate-1-^{14}C into cholesterol 70 ± 5 min after the injection was about 1.2% in the group given the glucose diet, about 0.15% in the group given the rice-starch diet, and about 0.4% in the group given the "curative" diet. The per cent incorporation remained higher in the group given the glucose diet than in the other two groups during the entire period during which measurements were made (up to 5 h).

FRACTIONATION OF LIPIDS BY SUCCESSIVE ADSORPTION AND ARGENTATION CHROMATOGRAPHY ON ADJACENT LAYERS. H. H. O. Schmid, W. J. Baumann, J. M. Cubero and H. K. Mangold (U. of Minn., The Hormel Inst., Austin, Minn.). *Biochem. Biophys. Acta* 125, 189–96 (1966). Two-dimensional chromatography on an adsorbent layer, part of which is impregnated with $AgNO_3$, provides a rapid and discriminating means of scanning complex mixtures of lipophilic substances. The usefulness of the method is illustrated by the fractionation of a mixture of chemically very similar synthetic compounds. The easy recognition of differences in the lipid patterns of the sera from various species and of the effects of diet on the composition of tissue lipids in one species is demonstrated. Changes in both patterns of lipid classes and the constituent compounds in each class can be examined.

INCORPORATION OF LABELED CHOLESTEROL ESTERS INTO CHYLOMICRONS IN VITRO. S. H. Quarfordt and D. S. Goodman (Dept. of Med., Columbia Univ. College of Physicians & Surgeons, N.Y.). *J. Lipid Res.* 7, 708–10 (1966). Labeled cholesterol esters were incorporated into chylomicrons *in vitro* by adding an acetone solution of the cholesterol ester to a suspension of washed chylomicrons. The physical and metabolic properties of the added labeled ester were the same as those of cholesterol esters incorporated into chylomicrons *in vivo*, except for the added ester being differently distributed in chylomicrons of different size.

SITES OF CONTROL OF HEPATIC CHOLESTEROL BIOSYNTHESIS. R. G. Gould and E. A. Swyryd (Dept. of Med., Stanford Med. School, Palo Alto, Calif.). *J. Lipid Res.* 7, 698–707 (1966). An inhibition in the conversion of mevalonate to cholesterol has been demonstrated in liver of cholesterol-fed rats by both *in vitro* and *in vivo* methods. Synthesis decreased to 30% of the control value after 1 week and 20% after 1 month on a 1% cholesterol diet. After a year, synthesis from mevalonate was almost completely inhibited. The rate of conversion of squalene to cholesterol was not consistently decreased but that of farnesyl pyrophosphate to cholesterol was decreased considerable. The rate of conversion of mevalonate to farnesyl pyrophosphate by a soluble liver enzyme preparation was also decreased in cholesterol-fed animals. Sites of inhibition of cholesterol synthesis were detected before mevalonate, between mevalonate and farnesyl pyrophosphate, and after farnesyl pyrophosphate, probably at the conversion of farnesyl pyrophosphate to squalene. The inhibition of mevalonate conversion to cholesterol developed more slowly that that of acetate and appeared to be secondary to it. The maximum capacities of normal liver homogenates and slices to synthesize cholesterol from mevalonate were shown to be far greater than from acetate. Sites of inhibition after mevalonate probably do not have a significant effect on the over-all rate of cholesterol synthesis in the animal.

EFFECTS OF DIETARY PHYTOL AND PHYTANIC ACID IN ANIMALS. D. Steinberg, J. Avigan, C. E. Mize, J. H. Baxter, J. Cammermeyer, H. M. Fales and Patricia F. Highet (Lab. of Metabolism, Nat'l Heart Institute, NIH, Bethesda, Md.). *J. Lipid Res.* 7, 684–91 (1966). Feeding of phytol in large doses (2–5% by weight in the diet) led to accumulation of phytanic acid in the mouse, rat, rabbit and chinchilla, the degree of

accumulation depending upon the level of dietary intake. The relative concentration of phytanic acid, expressed as a percentage of the total fatty acids, was as high as 20–60% in liver and 30–40% in serum. Phytenic acid, which may be an intermediate in the conversion of phytol to phytanic acid, also accumulated. When phytol was withdrawn from the diet, tissue and serum concentrations of phytanic acid fell rapidly, which indicates the ability of the normal animal to metabolize phytanic acid readily. At high dosages in the diet, phytol inhibited growth and caused death with 1–4 weeks. In the mouse, dietary phytanic acid and dietary phytol fed in equivalent amounts were of comparable toxicity. Accumulation of tissue phytanic acid occurred more rapidly when phytanic acid was fed than when phytol was fed in equal amounts.

METABOLISM OF PHYTOL-U-^{14}C AND PHYTANIC ACID-U-^{14}C IN THE RAT. C. E. Mize, J. Avigan, J. H. Baxter, H. M. Fales and D. Steinberg. *Ibid.*, 692–7. The metabolism of uniformly-labeled ^{14}C-phytanic acid was studied in the rat. Conversion of both phytol and phytenic acid to phytanic acid was demonstrated. Tracer doses of phytol-U-^{14}C given orally were well absorbed (30–66%), and approximately 30% of the absorbed dose was converted to $^{14}CO_2$ in 18 hr. After intravenous injection, 20% appears in $^{14}CO_2$ in 4 hr. Phytanic acid-U-^{14}C given intravenously was oxidized at a comparable rate (22–37% in 4 hr) and was as rapidly oxidized as palmitic acid-1-^{14}C (21% in 4 hr). Metabolism of these substrates was also studied in rats previously maintained on a diet containing 5% phytol by weight, which causes accumulation of phytanic acid, phytenic acid, and, to a lesser extent, phytol in blood and tissues. Despite the large body pools of preformed, unlabeled substrate in these animals, the fraction of an administered dose of phytol-U-^{14}C or phytanic acid-U-^{14}C converted to $^{14}CO_2$ was not significantly diminished. These studied indicate that the rat has an appreciable capacity to degrade the highly branched carbon skeleton of phytol and its derivatives.

ENZYMATIC SYNTHESIS OF CYTIDINE DIPHOSPHATE DIGLYCERIDE. J. R. Carter and E. P. Kennedy (Dept. of Biological Chem., Harvard Med. School, Boston, Mass.). *J. Lipid Res.* **7**, 678–83 (1966). Evidence is presented for the enzymatic formation of cytidine diphosphate diglyceride in microsomal preparations from guinea pig liver according to the reaction: CTP + phosphatidic acid $\rightleftharpoons$ CDP-diglyceride + P-O-P. Conditions have been found in which the incorporation of labeled CTP into CDP-diglyceride is almost entirely dependent upon added phosphatidic acid. The incorporation of CMP into lipid is very slight. A substantial net synthesis of CDP-diglyceride takes place under these conditions. Some properties of the enzyme system are described.

FATTY ACID SYNTHESIS IN CELL-FREE SYSTEM FROM RABBIT AORTA. A. F. Whereat (Depts. of Med. and Biochem., Univ. of Pa. School of Med., Phila., Pa.). *J. Lipid Res.* **7**, 671–7 (1966). The objectives of this study were to identify the subcellular fraction responsible for fatty acid synthesis in rabbit aorta and to determine the effect of cholesterol feeding on the system. A method for homogenization of aorta is described which permitted the isolation of subcellular components of aorta, including mitochondria that were morphologically and functionally intact. Mitochondria were identified as the major site of fatty acid synthesis in this tissue. Cofactor requirements and products showed that the synthetic system operates by chain elongation. Mitochondria from atherosclerotic aortas incorporated acetate into fatty acids faster than did mitochondria from control aortas. It is concluded that cholesterol feeding leads to alterations of aortic mitochondrial function and accelerates the fatty acid elongation pathway.

RELEASE OF FREE FATTY ACIDS FROM EHRLICH ASCITES TUMOR CELLS. A. A. Spector and D. Steinberg (Lab. of Metabolism, Nat'l Heart Institute, NIH, Bethesda, Maryland). *J. Lipid Res.* **7**, 649–56 (1966). Ehrlich ascites tumor cells release free fatty acids (FFA) during *in vitro* incubation in media that contain albumin. The released FFA are derived by lipolysis from endogenous lipid esters. Addition of glucose to the incubation medium greatly decreases the quantity of fatty acid released by the cells. Cyanide, which inhibits endogenous lipid oxidation but not lipolysis, increases the quantity of fatty acid released to media containing albumin and causes free fatty acid to accumulate in the cells in the absence of exogenous albumin. The release of fatty acid, either preformed or derived by lipolysis during prolonged incubations, occurs under conditions of net fatty acid uptake from the incubation medium. Net release of fatty acid from the cell occurs only when fatty acid-extracted albumin is present in the extracellular medium; extrapolation of the data suggests that net release will not occur under physiological conditions.

RELATIONSHIP BETWEEN FATTY ACID AND GLUCOSE UTILIZATION IN EHRLICH ASCITES TUMOR CELLS. *Ibid.*, 657–663. Glucose greatly increased total FFA esterification by Ehrlich ascites tumor cells. However, the FFA concentration of the cells was not altered. Less exogenous FFA was oxidized to CO_2 at any given extracellular FFA:albumin molar ratio when glucose was available, but increasing amounts of radioactive CO_2 were produced as the FFA:albumin molar ratio was raised, even in the presence of glucose. It is suggested that glucose, by providing either energy or an excess of triose acceptor for fatty acid esterification, stimulated FFA uptake only indirectly, by increasing the utilization of FFA subsequent to initial uptake from the medium, i.e., by increasing the turnover rate of the cellular FFA pool. Availability of glucose decreased the oxidation of endogenous lipid radioactivity and the depletion of endogenous lipid ester radioactivity. Most of the radioactivity utilized was derived from phospholipids, and depletion of phospholipid radioactivity was spared when glucose was available. Depletion of cellular total lipid ester also was spared in the presence of glucose.

ROLE OF PLASMA LECITHIN:CHOLESTEROL ACYLTRANSFERASE IN THE METABOLISM OF HIGH DENSITY LIPOPROTEINS. J. A. Glomset, E. T. Janssen, R. Kennedy and J. Dobbins (Dept. of Med., Univ. of Washington, Seattle, Washington). *J. Lipid Res.* **7**, 639–48 (1966). The role of the plasma lecithin:cholesterol acyltransferase reaction in the esterification of the cholesterol of human and baboon plasma high density lipoproteins has been studied. Human plasma was incubated *in vitro*, and the initial rate of cholesterol esterification in lipoprotein fractions obtained by chromatography on hydroxylapatite was determined. The rate of esterification was greater in the high density lipoprotein fraction than in the low density lipoprotein fraction. High density lipoproteins from human and baboon plasma were filtered through columns of Sephadex G 200, and the relative concentrations in the effluent of key lipids involved in the acyltransferase reaction were determined. The ratio of esterified to unesterified cholesterol varied across the lipoprotein peak obtained from either type of plasma. The relative concentration of lecithin compared to sphingomyelin also varied across the peaks obtained with human high density lipoproteins. The data suggest that the acyltransferase reaction is the major source of the esterified cholesterol of the high density lipoproteins.

PATHWAY OF CHOLESTEROL BIOSYNTHESIS IN THE BRAIN OF THE NEONATAL RAT. T. J. Holstein, W. A. Fish and W. M. Stokes (Med. Res. Lab., Providence College, Providence, R.I.). *J. Lipid Res.* **7**, 634–8 (1966). Suckling rats were killed at various intervals after intraperitoneal injection of acetate-1-^{14}C and their brain sterols were analyzed by column, thin-layer, paper and gas-liquid chromatography. The crude sterol (to which carrier zymosterol was added) was separated by column chromatography into cholesterol, desmosterol and zymosterol fractions, and the specific activities of the recovered digitonides were determined. The zymosterol fraction, mainly carrier, was not uniformly labeled in that the trailing half of the peak had a higher specific activity than the leading half. Evidence obtained suggests that this carbon activity was present in one or more sterols resembling zymosteol ($\Delta^{8,24}$-cholestadienol), $\Delta^{7,24}$-cholestadienol, and $\Delta^{7,5,24}$-cholestatrienol. The demonsterol and cholesterol were also carbon-labeled. The time course of the distribution of carbon activity among the above fractions indicated that the zymosterol fraction is a precursor of the desmosterol and that the desmosterol is, in turn, a precursor of the cholesterol.

PURIFICATION OF SEROLOGICALLY ACTIVE PHOSPHOINOSITIDES OF MYCOBACTERIUM TUBERCULOSIS. Mary C. Pangborn and J. A. McKinney (Div. of Lab. & Res., N.Y. State Dept. of Health, Albany, N.Y.). *J. Lipid Res.* **7**, 627–33 (1966). Glycolipids extracted with pyridine from three strains of *Mycobacterium tuberculosis* were fractionated. Phosphatidyl inositol, two phosphatidyl inositol dimannosides (A and M), and two phosphatidyl inositol pentamannosides (G and K) were separated and purified by a combination of solvent fractionations and chromatography on silicic acid. In each of these lipids, palmitic and tuberculostearic acids accounted for more than 90% of the total fatty acids. Mole ratios of fatty acid to P were: for phosphatidyl inositol, 2; for G and M, 3; for A and K, 4. Certain mixtures of A or M with G fixed complement with human sera from cases of tuberculosis. Two serologically inactive dimannosides, each containing two fatty acid ester groups per atom of P, were also present.

EFFECT OF KETONE BODIES ON LIPOLYSIS IN ADIPOSE TISSUE IN VITRO. Per Bjorntorp (First Med. Service, Sahlgrenska Sjukhuset, Univ. of Goteborg, Goteborg, Sweden). *J. Lipid Res.* **7**, 621–6 (1966). Norepinephrine-sensitive lipase activity was measured in rat epididymal fat pads by determining release either of free fatty acids or of glycerol. Stimulation of the lipase activity by norepinephrine *in vitro* could not be duplicated by injecting norepinephrine into the rats before sacrifice. A reliable method for assay of lipase deactivation rate was developed in which the tissue is incubated for 80 min, norepinephrine is added for a further incubation of 10 min in the absence of hormone. Of the ketone bodies tested, β-hydroxybutyrate and probably acetoacetate inhibited the activation of lipase by norepinephrine but had no effect on lipase deactivation rate, whereas acetone increased lipase activity stimulated by norepinephrine when tested at the concentration at which acetoacetate gave an inhibition.

PHOSPHOLIPASE ACTIVITY IN RAT LIVER MITOCHONDRIA STUDIED BY USE OF ENDOGENOUS SUBSTRATES. Pål Bjørnstad (Inst. of Clinical Biochem., Univ. of Oslo, Rikshospitalet, Oslo, Norway). *J. Lipid Res.* **7**, 612–20 (1966). The hydrolysis of endogenous phosphatidyl ethanolamine and lecithin in rat liver mitochondria has been studied by using mitochondria from rats injected with ethanolamine-1,2-^{14}C or choline-1,2-^{14}C. A phospholipase A-like enzyme has been demonstrated, which catalyzes the hydrolysis of one fatty acid ester linkage in phosphatidyl ethanolamine and lecithin. Phosphatidyl ethanolamine is hydrolyzed in preference to lecithin and the main reaction products are free fatty acids and lysophosphatidyl ethanolamine. The further breakdown of lysophospholipids appears to be limited in mitochondria, which indicates that lysophospholipase activity is mainly located extramitochondrially. The enzymic system is greatly stimulated by calcium ions, and also slightly by magnesium ions, while EDTA inhibits it almost completely. These findings are discussed in relation to previous observations on the effect of calcium and of EDTA on the functions of mitochondria.

OXIDATION OF 7-DEHYDROCHOLESTEROL BY A MOUSE LIVER MICROSOMAL SYSTEM DEPENDENT ON REDUCED PYRIDINE NUCLEOTIDES. A. A. Kandutsch (Jackson Lab., Bar Harbor, Maine). *J. Lipid Res.* **7**, 603–11 (1966). Aerobic incubation of 7-dehydrocholesterol with mouse liver microsomes in the presence of a detergent, an iron salt, and NADH or NADPH resulted in the conversion of the sterol to more polar products. In the presence of Fe^{3+} or low levels of Fe^{2+} the reaction was dependent upon reduced pyridine nucleotide and a microsomal enzyme system. At high levels of Fe^{2+} or in the presence of Fe^{2+} or Fe^{3+} and ascorbic acid, nonenzymatic oxidation of 7-dehydrocholesterol occurred in the absence of NADH or NADPH. Chromatograms of products resulting from the enzyme-dependent and enzyme-independent reactions were similar. The enzymatic reaction was inhibited by certain chelating agents, by antioxidants, and by menadione, phenazine methosulfate, and ferricyanide. Low concentrations of EDTA stimulated the reaction and high concentrations inhibited it. In the complete system sterol oxidation was correlated with the peroxidation of microsomal lipids, but peroxidation of microsomal lipids proceeded more rapidly when either the sterol, the detergent, or both were omitted. Ergosterol was resistant to oxidation under conditions that caused extensive loss of 7-dehydrocholesterol. Microsomes from tissues other than liver were relatively inactive.

ROLE OF LIPIDS IN THE STRUCTURE AND FUNCTION OF BIOLOGICAL MEMBRANES. D. E. Green and A. Tzagoloff (Univ. of Wis., Madison, Wis.). *J. Lipid Res.* **7**, 587–602 (1966). The concept of biological membranes as vesicular or tubular continua build up of nesting repeating units has been systematically explored and some of the relevant experimental work has been assembled. The bulk of the data have been drawn from studies on the mitochondrion, which is assumed to be a model for membranes generally. The repeating units of membranes are composite macromolecules containing both protein and lipid. The unit of the mitochondrial inner membrane is tripartite; the basepiece is the membrane-forming element. The four complexes of the electron transfer chain represent the different species of basepieces in the inner membrane. The repeating units of the outer mitochondrial membrane have a different form and size and a completely different set of enzymes (the enzymes of the citric and fatty acid oxidation cycles).

RELEASE OF CARBOHYDRATES FROM SPHINGOGLYCOLIPID BY OSMIUM-CATALYZED PERIODATE OXIDATION FOLLOWED BY TREATMENT WITH MILD ALKALI. Sen-Itiroh Hakomori (Lab for Carbohydrate Res., Dept. of Biological Chem. & Med., Harvard Med.

School, Boston, Mass.). *J. Lipid Res.* 7, 789–92 (1966). The carbohydrate moiety of sphingoglycolipid, after preliminary acetylation, can be released by periodate oxidation catalyzed by a trace amount of osmium tetroxide, followed by alkaline treatment. Cerebroside, lactosyl ceramide, hematoside, globoside, and gangliosides were degraded to yield, respectively, galactose, lactose, sialyl lactose, a tetrasaccharide, and various oligosaccharides containing sialic acid. Oligosaccharides were separated by paper chromatography and paper electrophoresis. The procedure is useful for characterizing micromolar amounts of sphingoglycolipids.

EFFECT OF INGESTION OF SALINE, GLUCOSE AND ETHANOL ON MOBILIZATION AND HEPATIC INCORPORATION OF EPIDIDYMAL PAD PALMITATE-1-^{14}C IN RATS. J. I. Kessler and S. Yalovsky-Mishkin (Div. of Gastroenterology, Dept. of Med., Jewish General Hosp., Montreal, Canada). *J. Lipid Res.* 7, 772–8 (1966). The effect of ingestion of saline, glucose and ethanol on the mobilization of radiopalmitate from epididymal fat prelabeled *in vivo* and the incorporation of the mobilized label into liver lipids was investigated in rats. The mobilization of radiopalmitate from epididymal fat and the incorporation of the mobilized label into liver triglyceride were most markedly elevated by ingestion of ethanol. Increased mobilization and diversion of epididymal adipose tissue fatty acids to liver lipids of ethanol-treated rats were shown also by the close resemblance of the fatty acids of liver triglyceride to the fatty acids of epididymal fat. The amount of radiopalmitate mobilized by the saline-treated rats, comprising approximately a third of that mobilized by the ethanol-treated animals, was larger than the amount mobilized into the liver fats.

BIOSYNTHESIS OF CHOLESTANOL: 5α-CHOLESTAN-3-ONE REDUCTASE OF RAT LIVER. Sarah Shefer, Susan Hauser and E. H. Mosbach (Dept. Lab. Diagnosis, Public Health Res. Inst. of City of N.Y., N.Y. City Dept. of Health, N.Y., N.Y.). *J. Lipid Res.* 7, 763–71 (1966). The 3-β-hydroxysteroid dehydrogenase of rat liver which catalyzes the conversion of 5α-cholestan-3-one to 5α-cholestan-3β-ol is localized mainly in the microsomal fraction. The enzyme required NADPH as hydrogen donor and differed from the known 3-β-hydroxysteroid dehydrogenases of the C_{19} series in being inactive in the presence of NADH. The microsomal preparations did not reduce the 3-keto groups of cholest-4-en-3-one, cholest-5-en-3-one, or 5β-cholestan-3-one to the corresponding 3β-hydroxy compounds. The conversion of 5α-cholestan-3-one to 5α-cholestan-3β-ol was only slightly inhibited by the reaction product or by other monohydroxy steroids, but a strong inhibitory effect was noted with cholest-5-en-3-one, 5α-cholestane-3β,7α-diol and 5α-cholestan-7-on-3β-ol.

INTERACTIONS IN THE METABOLISM OF POLYUNSATURATED FATTY ACIDS: ANALYSIS BY A SIMPLE MATHEMATICAL MODEL. T. Lindstrom and I. J. Tinsley (Dept. of Mathematic and Agr. Chem., Oregon State Univ., Corvallis, Oregon). *J. Lipid Res.* 7, 758–62 (1966). Interactions in the metabolism of polyunsaturated fatty acids have been simulated in a simple model system. In the development of this system it was assumed that simple competitive inhibition occurs between parent acids as they are transformed (via dehydrogenation and chain lengthening) to their derivative acids. Numerical solutions of this model system give the composition of the tissue pool of polyunsaturated acids as a function of the proportion of the parent acids in the diet. Experimental data have been analyzed in the light of relations generated by the model system and the parallels observed substantiate the assumptions postulated in the development of the model system.

AUTOMATIC TITRATION OF PLASMA FATTY ACIDS BY PHOTOCOLORIMETRY. R. P. Noble (Sharon Res. Inst., Sharon Hosp., Sharon, Conn.). *J. Lipid Res.* 7, 745–9 (1966). A photocolorimeter for rapid automatic titration of free fatty acids is described. The solvents, absolute ethanol and hexane, form a single-phase titration mixture containing Nile blue indicator. The titrant, NaOH in 60% ethanol, is delivered by a motor-driven microsyringe; as alkali is added and the titration mixture turns pink, the intensity of light reaching a photocell through a 600 mμ interference filter increases. Increased current is generated until at a preselected number of microamperes a cut-off switch is activated which halts the drive motor. Titrations of FFA in the range 150–1500 μeq/liter of palmitic acid standard are accomplished in approximately 1 min with a standard error of the mean of ±1.3–6.5 μeq/liter. The titration end point is independent of the operator. The solutions are stable and the daily titration blank and calibration remain constant.

(Continued on page 126A)

Cottonseed Clinic Considers Research Trends

The Cottonseed Processing Clinic, sponsored annually by the Southern Utilization Research and Development Division in cooperation with the Mississippi Valley Oilseed Processors Association, was held Feb. 13–14 at the Roosevelt Hotel in New Orleans. The meeting's purpose was to acquaint representatives of the cottonseed industry with current developments in utilization research and to provide for an exchange of information beneficial to industry and future research.

Among the subjects on the program were advances in the development of glandless cottonseed with acceptable quantities of good-quality lint; the trend to move oilseed cake, including that from cottonseed, out of the feed market into food for human consumption; the problem of pesticide residues in oils and meals; and the broadening of mill operations from the processing of one oilseed to several.

R. C. Woodruff, of the Delta Products Company, Wilson, Ark., was general chairman for the conference, with B. H. Wojcik, an assistant director of the Southern Division, as co-chairman.

Helping to organize the clinic were AOCS members C. H. Fisher (1951), R. C. Woodruff (1962), Henry L. E. Vix (1946), and L. A. Goldblatt (1952). Contributing papers were Vix and fellow AOCS members F. G. Dollear (1939), G. A. Harper (1959). S. P. Clark (1949). R. A. Phelps (1961) and Allen Smith (1929).

New Food Science Facilities Dedicated at MSU

The dedication of Michigan State University's Food Science Building will be marked by a scientific symposium on food research developments March 23–24 in East Lansing.

B. S. Schweigert (1958), chairman of MSU's Department of Food Science, said that scientific leaders in the food and allied industries, universities and governmental agencies are invited to attend both the symposium and the dedication. Tours of the new research facility will include views of the underground cobalt-60 chamber for radiation studies, some of the 22 controlled environment cubicles for measuring effects of food storage, and special rooms for nutritional studies with small animals. The symposium will begin in the morning of Thursday, March 23, and conclude at noon on Friday.

• *Industry Items*

L. A. SALOMON & BRO., INC., is celebrating the completion of a century in business by moving their office and laboratory to Port Washington, Long Island, N. Y. Begun as an importing firm for paints and dyes, they today supply activated carbon, clay adsorbents, waxes, and talc. They will maintain their Brooklyn warehouse.

New warehousing facilities totaling 24,000 square feet are being built adjacent to the Louisville plant of the GIRDLER CATALYSTS department of the Chemetron Chemicals divisoin of Chemetron Corporation.

DOTY LABORATORIES, INC., of Kansas City has purchased the A. D. Wilhoit Laboratories of Minneapolis; the combined operation will be known as the Doty Wilhoit Laboratories, a Division of Doty Laboratories of Kansas City. The laboratory, directed by J. M. Doty (1949), specializes in cereal analysis, fats and oils and feed analysis.

WITCO CHEMICAL COMPANY'S INTERNATIONAL DIVISION has established new headquarters in Brussels, Belgium. It will be headed by R. A. Saunders, vice president and general manager of Witco's International Division. The new facility will coordinate operations in France, England, Holland, Italy, and Belgium.

(Continued from page 125A)

BIOSYNTHESIS OF Δ^7-CHOLESTEN-3β-OL, $\Delta^{5,7}$-CHOLESTADIEN-3β-OL and Δ^5-CHOLESTEN-3β-OL BY GUINEA PIG INTESTINAL MUCOSA IN VITRO. R. K. Ockner and L. Laster (Section on Gastroenterology, Metabolic Diseases Branch, Nat'l Inst. of Arthritis and Metabolic Disease, Bethesda, Maryland). *J. Lipid Res.* **7**, 750–7 (1966). Methods were developed for the separation and determination of the various 27-carbon sterols of intestinal mucosa by means of thin-layer chromatography. Scrapings of the mucosa of the small intestine of guinea pig and rat were shown to incorporate ^{14}C-labeled acetate and mevalonate into sterols *in vitro*. For each substrate this activity was lowest in mucosa from the proximal third of the small intestine and greatest in mucosa from the more distal regions of the small intestine. The total 27-carbon sterol content of guinea pig mucosa varied only slightly along the length of the small intestine, but the concentration of cholesterol was highest distally. More than 95% of the radioactivity incorporated from acetate-2-^{14}C into 27-carbon sterols by guinea pig mucosa in 4 hr was recovered as lathosterol and 7-dehydrocholesterol; less than 5% was in cholesterol. The specific activities of the 27-carbon sterols were consistent with the concept that synthesis proceeds from lathosterol to 7-dehydrocholesterol to cholesterol.

BIOLOGICALLY ACTIVE METABOLITE OF VITAMIN D_3 FROM BONE, LIVER AND BLOOD SERUM. Judith Lund and H. F. DeLuca (Dept. of Biochem., Univ. of Wis., Madison, Wis.). *J. Lipid Res.* **7**, 739–44 (1966). Radioactive metabolites present in bone, blood, liver and feces of rats given ^{3}H vitamin D_3 have been isolated. Of these the aqueous soluble metabolite(s) from tissue and all those isolated from feces did not cure rickets in rats, while all the others were at least partially active in this regard. One of the metabolites proved to be as active as the parent vitamin in curing rickets and was found in large amounts in liver, blood and bone. From 50–80% of the radioactivity in bone was found in this metabolite after a 500 IU oral dose of ^{3}H vitamin D_3. With 10 IU doses of 1,2-^{3}H vitamin D_3, most of the radioactivity of the organs examined was found in this metabolite fraction. This metabolite appears to be more polar than vitamin D and is not an esterified form of the vitamin nor a complex of the vitamin with tissue lipids.

MONOGALACTOSYL AND DIGALACTOSYL DIGLYCERIDES FROM HETEROTROPHIC, HETERO-AUTOTROPHIC AND PHOTOBIOTIC EUGLENA GRACILIS. A. Rosenberg, June Gouaux, and P. Milch (Depts. of Biochem. and Med., Columbia Univ., Goldwater Memorial Hosp., New York, N. Y.). *J. Lipid Res.* **7**, 733–38 (1966). The lipid of *Euglena gracilis*, dark-grown in a complete medium, contained 2% galactose. The lipid of *Euglena gracilis*, light-grown in either a complete or an inorganic medium, contained 13–14% galactose. Pure monogalactosyl and digalactosyl diglyceride fractions, isolated by column plus thin-layer chromatography, containing 50% of the lipid-bound galactose of dark-grown cells, and 80% of that of light-grown cells. Molar ratios of monogalactosyl to digalactosyl compounds ranged from 2 to 3. The results show that galactosyl diglycerides, stored in large amount in light-grown cells, persist in small amount in the dark-grown cells. Fatty acids in both the monogalactosyl and the digalactosyl diglycerides were mainly of the 16- and 18-carbon varieties, with high proportions of trienes.

FATTY ACIDS OF GLYCEROPHOSPHATIDES IN DEVELOPING CHICK EMBRYONIC BRAIN AND LIVER. Kanji Miyamoto, L. M. Stephanides and J. Bernsohn (Neuropsychiatric Res. Lab., Veterans Admin. Hosp., Hines, Ill.). *J. Lipid Res.* **7**, 664–70 (1966). Fatty acid compositions of glycerophosphatides of developing chick embryonic brain and liver were compared. In brain, ethanolamine and serine glycerophosphatides contained 30–40% polyunsaturated fatty acids, lecithin almost none (except for arachidonic). In the liver, these acids were equally distributed in the phospholipid fractions. The principal polyunsaturated fatty acids of the ethanolamine and serine glycerophosphatides in brain, liver and yolk were 22:6, 20:4, and 18:2, respectively. During embryonic development of brain from the 8th day of incubation to hatching, the fatty acid composition of individual glycerophosphatide fractions remained constant. Because of the relative increase of ethanolamine glycerophosphatides and decrease of lecithin, total glycerophosphatides showed a decrease in 16:0 and an increase in 18:0. Substantial amounts of palmitaldehyde and stearaldehyde were present on the 8th day of incubation in the brain ethanolamine glycerophosphatide fraction.

CORRELATION OF ARACHIDONIC ACID OF STEROL ESTERS WITH SUSCEPTIBILITY TO NATURALLY-OCCURRING ATHEROSCLEROSIS IN PIGEONS. F. Young and C. C. Middleton (Depts. of Preventive Med. and Genetics and Lab. Animal Med., Bowman Gray School of Med., Wake Forest College, Winston-Salem, N.C.). *Proc. Soc. Expt. Biol. Med.* **123**, 816 (1966). The levels of arachidonic acid in cholesterol esters of both serum and liver from atherosclerosis-susceptible White Carneau pigeons are significantly lower than those of the atherosclerosis-resistant Show Racer pigeons. This finding, together with that of others, suggests that the susceptibility to atherosclerosis may be inversely related to the level of arachidonic acid of sterol esters of serum and liver. In addition, it was found that the differences in the proportions of other fatty acids of cholesterol esters of liver between the two breeds of pigeons correspond with changes found in serum cholesterol esters in patients with atherosclerosis and healthy humans.

PLASMA AMINO ACID LEVELS IN SUBJECTS FED ISONITROGENOUS DIETS CONTAINING DIFFERENT PROPORTIONS OF FAT AND CARBOHYDRATE. M. E. Swendseid, C. Yamada, E. Vinyard, W. G. Figueroa and E. J. Drenick (School of Public Health and Dept. of Med., Univ. of Calif. Center for Health Sciences). *Am. J. Clin. Nutr.* **20**, 52–5 (1967). Six subjects were fed either high carbohydrate or high fat diets each containing 21.5 g of N/day during alternate periods of study. When the subjects were receiving the high fat diet, they excreted more urinary N than when they were given the high carbohydrate diet. The plasma amino acid levels as measured during postabsorption did not change significantly during the 6-day period of ingesting the high carbohydrate diet. When the high fat diet was fed, the concentration of each of the three branched chain amino acids in plasma was elevated significantly, the alanine value decreased slightly and the amount of α-aminobutyric acid was increased. It is suggested that an elevated level of branched chain amino acids in plasma during postabsorption might be a useful indicator of enhanced gluconeogenesis.

CHOLESTEROL ESTERIFICATION BY THE MITOCHONDRIA-RICH FRACTION OF THE SNELL ADRENAL CORTICAL TUMOR 494-H AND THE NORMAL ADRENAL GLAND. G. Shyamala, W. Losslow and I. Chaikoff (Dept. of Physiol., Univ. of Calif., Berkeley, Calif.). *Cancer Res.* **26**, 2485–7 (1966). The esterification of cholesterol-4-^{14}C was compared in mitochondria-rich fractions prepared from homogenates of the Snell transplantable adrenal cortical tumors 494-H and normal adrenal glands of rats. The esterification was negligible in unfortified mitochondrial preparations of both tissues, but in the preparations of the tumor, in distinct contrast to those of the normal gland, the addition of either cell sap of the same tissue, cell sap of the normal gland (heated for 1 hr to destroy enzyme activity), or a mixture of cholesterol and oleic acid failed to bring about a pronounced increase in the esterification. The observation that the protein (in both the whole homogenate and the mitochondrial fraction) but not the DNA concentration, was lower in the tumor than in the normal adrenal gland suggests that the low capacity of the mitochondria-rich fraction of the tumor to esterify cholesterol may have been due to a below normal level of the cholesterol-esterifying enzyme in that fraction of the neoplastic cell.

INFLUENCE OF THE TYPE OF DIETARY SATURATED FATTY ACID OF LIPEMIA, COAGULATION AND THE PRODUCTION OF THROMBOSIS IN THE RAT. S. Renaud, C. Allard and J. Latour (Lab. of Expt. Pathol. and Metabolic Res., Inst. de Cardiologie de Montreal, Montreal, Canada). *J. Nutr.* **90**, 433–40 (1966). The degree of saturation of a dietary fat in a low protein diet and the resulting hypercholesterolemia or hypertriglyceridemia could not be correlated, in the rat, with the incidence of phlebothrombosis as initiated by a *Salmonella typhosa* endotoxin, nor to the recalcification plasma clotting time. To determine whether in a fat, it is the type of the saturated fatty acid rather than its degree of saturation that predisposes to thrombosis, various saturated fatty acids or their methyl esters were added to lard in the diet of the rat. Only the palmitic or stearic acid feeding resulted in a high incidence of thrombosis and a shortened clotting time, although the triglyceride levels in serum were approximately the same whichever fatty acid was fed. Under the present conditions, it appears therefore, that the thrombogenic capacity of a dietary fat depends primarily on the type of saturated fatty acids it contains. This thrombogenicity does not appear to be related to the concentration of cholesterol or triglycerides in serum, but possibly to the type of proteins these parameters were bound to. The plasma clotting time gave a good indication of the thrombotic tendency on a group basis.

TISSUE CHOLESTEROL TRANSPORT AS MODIFIED BY DIET CHOLESTEROL AND THE NATURE OF DIET FAT. R. Reiser, D. A. Clark, M. F. Sorrels, B. S. Gibson, M. C. Williams and F. H. Wilson (Dept. of iBochem. and Nutr., Texas A. & M. Univ., College Station, Texas). *J. Atheroscler. Res.* 6, 565 (1966). Groups of rats were fed three diets which contained no fat, 20% safflower oil or 20% stripped tallow, respectively. Three corresponding diets contained 1% cholesterol in addition. Diet cholesterol and fat each play roles in the transport of cholesterol in serum and other tissues. The roles, however, are different. Diet cholesterol decreases the concentration of high-density lipoproteins and S_f 0–12 low-density lipoproteins but increases the concentration of the S_f 12–20 and S_f 20–400 fractions. Diet fat has no direct effect on serum cholesterol levels but enhances the responses to diet cholesterol, probably by increasing its degree of absorption. In addition, however, diet fat also decreases the time required for exogenous cholesterol to reach maximum levels in tissues, unsaturated fat being more effective than saturated. Diet fat also affects tissue cholesterol half-life, unsaturated fat reducing it and saturated fat increasing it.

SUBSTITUTION OF DIETARY STARCH FOR DEXTROSE IN HYPERLIPEMIC SUBJECTS. D. Porte, Jr., E. L. Bierman and J. D. Bagdade (Dept. of Med., Veterans Admin. Hosp. and Univ. of Washington School of Med., Seattle). *Proc. Soc. Expt. Biol. Med.* 123, 814–6 (1966). The comparative effects of dietary starch and dextrose on plasma triglyceride levels were studied on a metabolic ward in 2 lipemic patients. Plasma triglycerides were elevated when these subjects ingested a virtually fat free diet. Substitution of starch for the high dextrose formula produced no further change in plasma triglycerides. Caloric restriction in one patient resulted in a marked decrease in triglyceride even though he continued to eat an 85% carbohydrate, 15% protein formula. Both patients complained of a feeling of fullness and had trouble finishing an isocaloric high starch diet. These observations show that isocaloric starch diets did not decrease plasma triglycerides but that caloric restriction while a high carbohydrate diet is fed, will result in lower plasma triglyceride levels. They suggest that, unless careful supervision of dietary intake is maintained, the effects of carbohydrate substitutions in diet may be related to changes in caloric balance rather than to the type of carbohydrate ingested.

INHIBITION OF CORONARY ATHEROSCLEROSIS IN THE X-IRRADIATED, CHOLESTEROL-FED RAT BY CHONDROITIN SULFATE A. L. M. Morrison, S. Bernick, Roslyn B. Alfin-Slater, P. R. Patek and B. H. Ershoff (Inst. for Atherosclerosis Res., Loma Linda Univ. School of Med., Univ. of S. Calif. School of Med., Los Angeles). *Proc. Soc. Expt. Biol. Med.* 123, 904–11 (1966). Lipid-containing atherosclerotic coronary lesions were produced in rats exposed to a single dose of 600 r total body X-irradiation and subsequently fed a cholesterol-containing diet. Non-irradiated rats fed a similar diet did not develop such lesions nor did X-irradiated rats fed a cholesterol-free diet. The incidence and extent of lipid deposition in the coronary arteries of X-irradiated, cholesterol-fed rats was significantly reduced by the oral administration of chondroitin sulfate A at a 0.4% level in the diet. Exposure to total body X-irradiation significantly reduced the increment in liver cholesterol and liver total lipid and to a lesser extent plasma cholesterol levels induced by cholesterol feeding in the fat. No significant differences in plasma and liver total lipid levels were observed between X-irradiated, cholesterol-fed rats administered chondroitin sulfate A and X-irradiated, cholesterol-fed rats not administered this supplement.

METABOLISM OF ^{14}C-MENADIONE. R. Losito, C. A. Owen, Jr. and E. V. Flock (Mayo Clinic and Mayo Foundation, Section of Biochem., Rochester, Minn.). *Biochemistry* 6, 63–8 (1967). The metabolism of 2-(^{14}C)methyl-1,4-naphthoquinone (^{14}C-menadione) by the liver has been studied in the isolated perfused rat liver, and the metabolites which were excreted in the bile have been compared with those excreted in the urine by rats with biliary fistulas. The amount of radioactivity present in the blood, bile, and liver at the end of 5 hr of perfusion was 53, 33, and 15% of the dose, respectively. Approximately 93% of the naphthoquinone in this system was metabolized. The major product identified in the bile was the glucuronide of reduced menadionee (19% of the ^{14}C dose). The glucuronide was not present in the perfusate, but the sulfate of reduced menadione in the plasma accounted for 9.3% of the ^{14}C dose.

GLYCOGEN METABOLISM IN MEAL-FED RATS AND CHICKS AND THE TIME SEQUENCE OF LIPOGENIC AND ENZYMATIC ADAPTIVE CHANGES. F. A. Leveille (U.S. Army Med. Res. and Nutr. Lab., Fitzsimons General Hospital, Denver, Colorado). *J. Nutr.* 90, 449–60 (1966). The time course of the lipogenic and enzymatic adaptations to meal-feeding (access to food for a single daily 2-hour period) in rat adipose tissue and in rat and chick liver were investigated. The incorporation of acetate-1-^{14}C into fatty acid had increased in rat adipose tissue after 5 to 7 days of meal-feeding, and in chick liver after 7 days. The activities of glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase and NADP-malic dehydrogenase did not increase in rat adipose until after 9 days of meal-feeding and did not increase over control values in liver of meal-fed chicks. The data are interpreted as demonstrating that the hyperlipogenesis induced by meal-feeding is not dependent upon increased activities of the dehydrogenase enzymes studied.

INDIVIDUAL TRENDS IN THE TOTAL SERUM CHOLESTEROL OF CHILDREN AND ADOLESCENTS OVER A TEN-YEAR PERIOD. Virginia A. Lee (Child Res. Council, Dept. of Pediatrics, Univ. of Colorado School of Med., Denver). *Am. J. Clin. Nutr.* 20, 5–12 (1967). The total serum cholesterol of 35 boys and 28 girls has been determined at 6 month intervals over a period of 10 years. The age at which determinations were started on each child was varied. For purposes of presentation the group was divided into three age periods covering the years from 4 to 18. These data illustrate the changes which take place in the cholesterol levels of children and adolescents. It is evident that such changes make the process of relating the total cholesterol of one individual to another, of the same individual to himself, and of cholesterol to other variables during this age period more complex than is apparent from cross-sectional studies.

EFFECT OF VARIOUS MUSHROOM PREPARATIONS ON CHOLESTEROL LEVELS IN RATS. R. Kaneda and S. Tokuda Dept. of Food Chem., Faculty of Agr., Tohoku Univ., Sendai, Japan). *J. Nutr.* 90, 731–6 (1966). To evaluate the effect of mushrooms on cholesterol metabolism, rats were fed, *ad libitum*, for 10 weeks a diet containing 5% of ground dried mushrooms (*Lentinus edodes*, Kohshin) with or without exogenous cholesterol. The results indicate that the dried mushroom preparation markedly reduced plasma cholesterol levels. In further experiments, some other species of mushrooms were screened. All the caps and the stem of mushrooms used for feed experiments were effective in various degrees in lowering the plasma cholesterols levels: *Lentinus edodes*, Donko was more effective, while *Auricularia polytricha* (Jew-ear) and *Flammulia velutipes* less effective, than *L. edodes*, Kohshin or *Agaricus bisporus* (champignon). To determine the nature of the substances responsible for the effect, mushrooms of the species *L. edodes*, Kohshin were extracted with ether, water or ethanol. The results showed that the ether-soluble fraction was ineffective, but both the water-soluble fraction and the 30% ethanol-soluble fraction were effective in lowering the plasma cholesterol.

FATTY ACID COMPOSITION OF HUMAN ADIPOSE TISSUE RELATED TO AGE, SEX, AND RACE. W. Insull, Jr. and G. E. Bartsch (Dept. of Med. and Div. of Biometry, Univ. of Hospitals and Western Reserve Univ., Cleveland, Ohio). *Am. J. Clin. Nutr.* 20, 13–23 (1967). The fatty acid composition of subcutaneous adipose tissue of the anterior abdominal wall has been determined in 107 Negro and Caucasian individuals evenly distributed regarding sex, race, and age, 11–78 years. The urban American individuals died unexpectedly and at necropsy showed a spectrum of degenerative disease and sepis. The patterns of fatty acids were remarkably similar in all groups. Minor effects due to sex, race, age, and relative body weight were observed. Men had more stearic acid than women. Caucasians had more lauric, myristic, myristoleic, palmitoleic, and four trace acids, and less stearic acid than Negroes. The proportion of palmitic acid was maximal in the 5th and 6th decades. Oleic acid increased approximately linearly with age. Greater body weight was associated with lower proportions of myristic and stearic acids. Diet appears to be the dominant factor determining the fatty acid pattern.

(Continued on page 130A)

(Continued from page 128A)

LIPID VARIATIONS CAUSED BY PTERIDINE DEFICIENCIES IN CRITHIDIA FASCICULATA. H. N. Gutman and M. J. Pine (Dept. of Biol., N.Y. Univ., Bronx, N.Y.). *Proc. Soc. Expt. Biol. Med.* 123, 869–71 (1966). Alteration in ^{14}C-acetate incorporation into lipid fractions occurs during pteridine deficiencies in *C. fasciculata*. The most obvious change appears as an alteration in the chromatographic profile of acetate incorporation into the lipid fractions concomitant with these deficiences, i.e., the disappearance of label from the cardiolipin fraction and appearance of label into new fractions whose nature depends upon whether the deficiency is of conjugated or unconjugated pteridines.

FAT METABOLISM IN HIGHER PLANTS. XXX. ENZYMATIC SYNTHESIS OF RICINOLEIC ACID BY A MICROSOMAL PREPARATION FROM DEVELOPING RICANUS COMMUNIS SEEDS. T. Galliard and P. K. Stumpf (Dept. of Biochem. and Biophysics, Univ. of Calif., Davis, Calif.). *J. Biol. Chem.* 241, 5806–12 (1966). A microsomal fraction from developing seeds of castor bean (*Ricinus communis* L.) catalyzes the hydroxylation of oleyl coenzyme A to ricinoleic acid and has the properties of a "mixed function oxidase." Only preparations from seeds at a certain stage of development have hydroxylating activity. Oxygen and reduced nicotinamide adenine dinucleotide are obligatory cofactors (reduced nicotinamide adenine dinucleotide phosphate is relatively inactive), and an activated form of oleic acid, i.e. the CoA thioester, is required as substrate. Enzyme-bound iron is presumably involved in the hydroxylation, which is inhibited by thiol reagents, cyanide, azide and chelating agents, but not by carbon monoxide. The hydroxylating enzyme shows a marked substrate specificity for oleic acid. Stearic, linoleic, vaccenic and elaidic acids are not hydroxylated. Linoleic acid is not an intermediate in the conversion of oleic acid to ricinoleic acid.

FATTY ACID COMPOSITION OF BOVINE MILK FAT AS INFLUENCED BY INTRAVENOUS INFUSION OF PROPIONATE OR GLUCOSE. L. J. Fisher, J. M. Elliot and D. A. Corse (Dept. of Animal Science, Cornell Univ., Ithaca, N.Y.). *J. Dairy Sci.* 50, 53–6 (1967). The intravenous infusion of propionate in 6 Jersey cows resulted in decreased synthesis of all major milk fatty acids measured except 16:0, whereas infusion of glucose increased the secretion of 10:0 and 12:0, decreased that of 18:0, 18:1, and 18:2, and had little effect on 14:0 and 16:0. The data suggest that propionate and glucose did not reduce milk fat secretion through the same mechanism. Comparison of changes in the fatty acid pattern with those associated with ration-induced milk fat depression indicates that the latter cannot be fully explained by the glucogenic effect of propionate.

TRANSFER OF CHOLESTEROL AND CHOLESTEROL ESTERS INTO WALL OF RAT AORTA IN VITRO. S. Hashimoto and S. Dayton (Dept. of Med., UCLA Center for Health Sci., Los Angeles, Calif.). *J. Atheroscler. Res.* 6, 580–90 (1966). Rat thoracic aortas were incubated with their intimal surfaces in contact with solutions containing labeled cholesterol bound to lipoprotein. Incorporation of labeled cholesterol was not significantly influenced by boiling the tissue. The ratio of the rate of entry of unesterified cholesterol to the rate of entry of cholesteryl esters was approximately unity, a value three times as large as the ratio of their concentrations in serum. It is concluded that most of the incorporation of cholesterol and its esters under these conditions does not require cellular activity or enzymic activity and cannot be accounted for by simple diffusion of intact lipoproteins.

MOVEMENT OF LABELED CHOLESTEROL BETWEEN PLASMA LIPOPROTEIN AND NORMAL ARTERIAL WALL ACROSS THE INTIMAL SURFACE. S. Dayton and S. Hashimoto (Dept. of Med., School of Med., Univ. of California at Los Angeles, Calif.). *Circulation Res.* 19, 1041–9 (1966). Normal rat aortas were incubated with their intimal surfaces in contact with a lipoprotein solution containing isotopically labeled free cholesterol. Uptake of cholesterol by the tissue increased with increasing concentration toward a plateau level. Maximum uptake of free cholesterol was estimated to be 13 $\mu g/cm^2$ per 24 hours, and uptake at physiological cholesterol concentration was 7.9 $\mu g/cm^2$ per 24 hours. Aortas containing labeled cholesterol were prepared by intragastric administration of cholesterol-7α-^{3}H to normal rats. Experiments *in vitro* with these aortas demonstrated that efflux across the intimal surface was dependent upon presence of lipoprotein in the medium. This efflux was not retarded by prior boiling of the tissue. These results support suggestions that movement of labeled free cholesterol from plasma into the arterial wall may be largely the result of a physicochemical exchange between lipoprotein and endothelium.

LINOLEIC ACID REQUIREMENT OF THE CHICK. J. Bieri and E. Prival (Lab. of Nutr. and Endocrinol., National Inst. of Arthritis and Metabolic Diseases, NIH, Bethesda, Md.). *J. Nutr.* 90, 428–32 (1966). The linoleic acid requirement of young male chicks was determined during 4- to 6-week periods on the basis of growth response and also the triene-to-tetraene ratio of fatty acids in liver and erythrocytes. Dietary fat levels in different experiments ranged from 3 to 8% and the dietary content of linoleic acid varied from 0.18 to 4.3% of calories. Maximal body weight was obtained with 0.9 to 1.1% of calories as linoleic acid, and these supplements also resulted in triene-to-tetraene ratios of 0.4 or less in liver. In erythrocytes, 1.3 to 1.8% of dietary calories as linoleic acid were required to produce triene-to-tetraene ratios of 0.4. The latter criterion indicates a maximal linoleic acid requirement under the conditions of these experiments of 1.8% of calories, whereas the criteria of growth and liver triene-to-tetraene ratio gave a requirement of 1%.

EFFECT OF VITAMIN D ON ^{65}ZN ABSORPTION, DISTRIBUTION AND TURNOVER IN RATS. W. M. Becker and W. G. Hoekstra (Dept. of Biochem., Univ. of Wisconsin, Madison, Wisc.). *J. Nutr.* 90, 301–9 (1966). Experiments were designed to study the effect of dietary vitamin D on the absorption, distribution and turnover of ^{65}Zn in growing rats. The increased absorption of dietary zinc attributed to vitamin D probably results, not from direct effect of the vitamin, but from a homeostatic response to the increased need for zinc which accompanies enhanced skeletal growth and calcification.

EFFECT OF HIGH LIPID DIETS ON NORMAL AND TRAUMATIZED RATS. Elizabeth L. Beard and J. K. Hampton, Jr. (Dept. of Physiol., Tulane Univ. School of Med., New Orleans, La.). *Proc. Soc. Expt. Biol. Med.* 123, 683–6 (1966). Rats were maintained on 40% butter, 40% corn oil or control diets for 2, 4 and 6 weeks. Rats from each diet were traumatized in the Nobel-Collip Drum so as to compare plasminogen activation. Serum proteolytic activity and cholesterol levels were determined. Differences in weights of the comparable dieted animals were negligible. Serum cholesterol levels were markedly higher in those fed high fat diets with 5% cholesterol than in rats on control diets. Trauma caused significantly increased serum proteolytic activity and serum cholesterol levels in all groups. The diet administered produced moderate hypercholesterolemia which did not significantly alter the serum proteolytic activator or plasmin activity of normal or traumatized rats.

ISOLATION, CHARACTERIZATION, AND SYNTHESIS OF LINATINE, A VITAMIN B_6 ANTAGONIST FROM FLAXSEED (LINUM USITATISSIMUM). H. J. Klosterman, G. L. Lamoureux and J. L. Parsons (Depts. of Agr. Biochem. and Bacteriology, North Dakota State Univ., Fargo, N.D.). *Biochemistry* 6, 170–7 (1967). The name linatine (I) was assigned to a vitamin B_6 antagonist isolated from linseed meal. Compound I inhibited the growth of chickens and *Azotobacter vinelandii* O, the assay organism. An LD_{50} of 2 mg per week-old chick was counteracted by simultaneous injection of 1 mg of pyridoxine. Acid hydrolysis of I yielded l-glutamic acid and a toxic substance (II), LD_{50} = 0.5 mg in 1-week-old chicks, which was characterized as 1-amino-D-proline.

FISH OIL AND FISHY FLAVOR OF EGGS AND CARCASSES OF HENS. A. Holdas and K. N. May (Poultry Sci. and Food Sci. Depts., Univ. of Georgia, Athens, Georgia). *Poultry Sci.* 45, 1405–7 (1966). Laying hens were fed four rations which contained 0.25, 1.25, 2.50 or 5.00% total oil (supplemental fish oil was 0, 1.00, 2.25 and 4.75%, respectively). After 1 month of feeding no significant off-flavor was detectable in the eggs at any fish oil level. Some individual panel members noted definitely fishy flavor after 23 days of the experiment in the group receiving 5% total oil. It was concluded that laying hens can be fed up to 2.50% fish oil or fish meal with an equivalent quantity of oil without affecting flavor. However, when broth, dark meat and skin of hens were tested it was found that the fishy flavor in the carcasses appeared earlier (after 15 days of the experiment) and at lower levels (2.50% total fish oil) than in the eggs of the same hens. Levels of 1.25% total fish oil was used without any significant fishy flavor occurrence in the meat or eggs.

BIOLOGIC BEHAVIOR OF FATTY ACIDS CONTAINING TRIPLE BONDS. H. Wagner, G. Ritzel and K. Bernhard (Univ. of Basel, Basel, Switzerland). *Helv. Chim. Acta* 49, 436–40 (1966). Triglycerides of stearolic acid, a C_{18} acid with one triple bond, were fed to young rats in small doses in their normal diet. They were well assimilated and in no way harmful to the animals. After five weeks on the diet, the liver lipids contained 1–2%

and the depot fats 12–20% stearolic acid, this fatty acid having replaced an approximately equal amount of oleic acid. Decyne-dicarboxylic acid was isolated from the rats' urine during the test. The existence of this metabolite is considered as proof that stearolic acid can be metabolized via ω and β-oxidation without the triple bond being affected.

EFFECT OF ENTRÉE ON FAT AND PROTEIN QUALITY OF DIETS. A. Sanchez, G. G. Porter and U. D. Register (Loma Linda Univ., Loma Linda, Cal.). *J. Am. Dietetic Assoc.* 49, 492–6 (1966). The nutritive value of various diets were tested by the rat growth method. Two cafeteria diets, a hospital diet and a selected vegetable diet were evaluated for protein quality. When meats were served as the entrée, weight gains were 27–33 g./wk. The addition of milk (1 cc. per meal) to the basal diets produced weight gains of 33–37 g./wk. Growth was not further increased by other supplements. The results from the cafeteria diets and the selected vegetable diet indicate that those containing some milk resulted in the best growth rate (35–39 g./wk.). The hospital diet which contained milk, eggs and vegetable entrées compared favorably with the same diet in which meats replaced the vegetable entrées (37 and 39 g./wk., respectively). The diets used in this study were composed of locally available foods. These common diets, when properly selected, contained protein of good quality, and their fat composition was within the limits of the recommended dietary fat intake.

STUDIES ON THE METABOLISM OF ODD C NUMBER FATTY ACIDS AND THE SYNTHESIS OF FATTY ACIDS FROM PROPIONIC ACID. P. Favarger and J. Gerlach (Univ. of Geneva, Geneva, Switzerland). *Helv. Chim. Acta* 49, 506–9 (1966). Feeding experiments conducted on mice show that odd-numbered fatty acids (pentadecanoic and margaric) build up rapidly in the animals' total fat content when they are included in the animals' diet. On the other hand, a diet rich in propionic acid, a precursor of odd-numbered acids, does not build up the odd-numbered acid content quite as rapidly. This led to a study of the mechanism by which odd-numbered fatty acids are produced from propionic acid. A group of mice were fed 250 μC of propionate-1-^{14}C intravenously and killed 12 minutes after the injection. All the major fatty acids from C_{14} to C_{18} were separated and their activity measured. The results showed that 89% of the propionate-1-^{14}C recovered in the total fatty acids was incorporated in odd-numbered fatty acids, with 11% of the radioactivity incorporated in even-numbered fatty acids, probably after demethylation.

SOLUBLE DRY MILK PRODUCT AND A METHOD OF PRODUCING THE SAME. L. Tumerman, B. Shore and W. Y. Maddock (National Dairy Products Corp.). *U.S. 3,291,614.* A powder is described comprising water-soluble milk components, a fat and a surface active agent, the particle size of the powder being at least 100 microns and the amount of surface active agent being at least 0.2% based on the weight of the powder. The surface active agent should have a hydrophile-lipophile balance within the range of greater than 2.1 to less than 16.7, such that the powder disperses rapidly in water at a temperature below the melting point of the fat. A process is claimed for producing such a milk product, consisting of coating the surface of the solid particles with the surface active agent in such a way that substantially all of the fat adjacent to the particle surfaces is covered with said agent.

BETA-CAROTENE PRODUCTION AND COMPOSITION THEREFOR. R. C. Fulde (Swift & Co.). *U.S. 3,291,701.* A process for producing beta-carotene comprises cultivating beta-carotene producing microorganisms of the family *Choanephoraceae* in the presence of a nutrient medium assimilable by the microorganisms (such as citrus peel materials) and incubating the microorganisms under aerobic conditions conducive to active growth. A composition suitable for the production of beta-carotene comprises beta-carotene producing microorganisms of the family *Choanephoraceae*, carbohydrates, proteins, fatty materials and citrus peel material. The pH of this composition is between 5 and 7.

PROCESS FOR THE PRODUCTION OF SUBSTANTIALLY FAT FREE AND FLAVOR FREE PROTEINACEOUS FOODSTUFFS. J. C. Cavanagh. *U.S. 3,295,985.* A process is claimed for the removal of fats and other components from relatively dry proteinaceous materials having a moisture content no higher than about 20%. In the initial step of the process, the material is brought to a temperature capable of substantially rendering the entrained fat and sufficient water is added to cause the resultant liquor to exist in two phases and also to substantially dissolve the flavor components of the starting material. The material then proceeds to a second stage where it is alternately agitated with solvent and separated from it and lastly to a final stage where it is subjected to countercurrent solvent extraction with a solvent having a boiling point above the melting point of the fat but below the boiling point of water. A substantially fat free and flavor free proteinaceous material is obtained after solvent removal.

POWDERED FAT COMPOSITIONS AND PROCESS FOR MANUFACTURE. I.M. Saslaw and J. J. Brady (General Foods Corp.). *U.S. 3,295,986.* A dried emulsion is described, consisting of a fat phase of discrete fat particles containing an emulsifying agent and a non-fat phase of edible encapsulating solids (such as carbohydrate and/or proteinaceous materials). The fat phase has a solids content of not less than 19.6% at 86F and not more than 12% at 104F and has a crystalline structure both below and above body temperature.

MICROBIOLOGICAL CONVERSION OF UNSATURATED FATTY ACIDS. P. F. Beal III *et al.* (The Upjohn Co.). *U.S. 3,296,091.* A process is described for aerobically incubating an unsaturated fatty acid having the formula:

$$HOOC—(CH_2)_n—(CH=CH—CH_2)_a—CH=CH—CH_2—CH=CH—(CH_2—CH=CH)_b—(CH_2)_m—CH_3$$

where n is an integer from 1 to 8, inclusive, a and b are integers from 0 to 2, inclusive, and m is an integer from 1 to 12, inclusive, provided the sum $3a+n$ is from 1 to 8, inclusive, and the sum $3b+m$ is from 1 to 12, inclusive. The fatty acid is treated with comminuted mammalian gland tissue in a substantially aqueous medium. From the incubation reaction mixture a material is recovered having prostaglandin-like activity.

• Drying Oils and Paints

DEGRADATION OF PAINT FILMS. III—YELLOWING OF DRYING OIL FILMS. T. Takeshita, N. Miyauchi and R. Imai. *J. Jap. Soc. Col. Mat.* 38, No. 11, 472–6 (1965). Oils such as linseed, soya, dehydrated castor and a urethane type were tested for yellowing in the presence of 0.4% Pb and 0.05% Co driers under dark and light conditions at room temp. Yellowing was worse in the dark than in the light. Yellowing as assessed by means of the absorption at 440 mμ and 720 mμ showed that polymerised tung oil and a urethane oil film yellowed less than soyabean oil over a period of 10 months. (Rev. Current Lit. Paint Allied Ind., No. 291)

THE ROLES OF FATTY ACIDS AND THEIR DERIVATIVES IN COATING. Kazuhiko Yoshitomi and Minoru Nagakura (Nisshin Oil Mills Ltd., Yokohama). *Yukagaku* 15, 392–405 (1966). A review with 218 references.

• Detergents

THE BIODEGRADATION OF SURFACTANTS BASED ON SUCROSE FATTY ACIDS ESTERS. H. Kulovana and P. Pitter (Chem. Eng. School, Prague, Czechoslovakia). *Tenside* 3, 322–6 (1966). Sucrose fatty acid esters are easily biodegradable surfactants, with more than 90% of the original chemical demand for oxygen being removed in 5 days and more than 50% of the material being oxidized. The presence of as much as 2% detergent, based on the total solids in a slurry, does not affect the decomposition process and is subject to breakdown under anaerobic conditions. Concentrations of 50 mg/l of sucrose fatty acid esters cause no problems in effluent purification, while small amounts of foam are observed at 150 mg/l. At 200 mg/l foam formation is considerable. The cleaning and nitrifying processes occurring during sewage treatment are not affected. From the standpoint of hygiene and water supply, the use of surfactants based on sucrose fatty acid esters is considered more favorable than the use of biodegradable linear ABS.

FOAM. AN APPLICATIONAL PROBLEM. II. *Ibid.*, 359–65. Several methods of foam determination are reviewed and examples are

given of practical applications of the foaming characteristics of surface active agents. The results of experiments correlating the foaming power of various types of surfactants with water hardness are reported.

ADDITIVES FOR IMPROVING THE STORAGE PROPERTIES OF WASHING POWDERS BASED ON SODIUM ALKYL BENZENE SULFONATES. H. Stache (Hüls A. G., Marl, Germany). *Tenside* 3, 355–9 (1966). The change from tetrapropylene benzene sulfonates to biodegradable, straight chain alkyl benzene sulfonates has posed new problems to the manufacturers and users of detergent raw materials. For example, the straight chain, soft, linear ABS has generally poorer behavior on storage, as shown by a larger number of lumps formed on exposure to humid atmosphere, even though only small differences are observed in the amount of water absorbed under the same conditions. Experiments have shown that the addition of sodium toluene sulfonate significantly improves the storage properties of linear ABS products, which may be further improved by the addition of polymers. A PVC dispersion and a copolymer with 40% butadiene have proved to be best suited for this purpose. The effect of these additives is smaller in products containing sodium silicate. Another difficulty which was experimentally confirmed, concerns the greater sensitivity of linear ABS to heat degradation. A mechanism for decomposition is proposed and the beneficial effect of including antioxidants in the detergent formula is demonstrated by experimental results.

RELATIONSHIP BETWEEN DETERGENCY AND COMPOSITION OF LINEAR ALKYL BENZENES. II. A. Zanella and P. Peri (Montecatini-Edison S.p.A., Milan, Italy). *Riv. Ital. Sostanze Grasse* 43, 369–81 (1966). In an earlier work the effect of linear alkyl benzene mean molecular weight, on detergency had been examined. The effect of the molecular distribution of the LAS homologues (in terms of standard deviation and degree of skewness) has now been investigated. The detergent power of an LAS product depends not only on its mean molecular weight (as already shown) but also, in a complex way, on its standard deviation and, to a minor extent, on the coefficient of skewness. If the mean molecular weight is kept constant at 260 and the washing temperature at 50C, it appears advantageous to limit as much as possible the dispersion of isomers around this mean. On the other hand, for lower mean molecular weights, an appropriate degree of dispersion around the mean, assuring the presence of a certain amount of the heavier components, appears to be necessary for optimum results. At the washing temperature specified (50C), if the number of terms in the distribution is kept constant, there seems to exist an optimum value for the mean molecular weight above which no further increase appears to be advantageous. For the LAS samples used in this work, containing an average of five components, a mean molecular weight in the neighborhood of 260 gives optimum performance.

ADSORPTION EXPERIMENTS WITH NEW DETERGENT MATERIALS. L. Hartmann and H. Mosebach (Bio-Engineering School, Karlsruhe, Germany). *Tenside* 3, 349–54 (1966). Previous studies on the biological degradation of surfactants have overlooked the possibility that the reduction of surfactant concentration occurring during sewage treatment may be largely due to adsorption onto biological matter rather than to real biochemical degradation. Experiments have shown that adsorption does take place and that it plays an important role in sewage treatment. The adsorption phenomenon can be understood and described by the Freundlich equation: $A = A_0 C^{1/n}$. Gram positive bacteria exhibit a generally more marked adsorption behavior than gram negative forms. The pH at which the operation is performed is of considerable importance, at least for gram positive bacteria, with optimum points in the medium acid (pH = 3–5) and medium alkaline (pH = 9) regions. An inverse relationship has been found to exist between the values of A_0 and 1/n in the Freundlich equation, suggesting that adsorbents with high values of A_0 (amount adsorbed for C = 1) are more nearly saturated and therefore are able to adsorb proportionately less as the equilibrium concentration in the liquid phase is increased.

ANTISTATIC AGENTS. XX. INTERNAL ANTISTATIC TREATMENT OF POLYPROPYLENE WITH METAL SALTS OF AMPHOTERIC SURFACE-ACTIVE AGENTS. Hideo Marumo, Makoto Takai, Minoru Saito and Morio Ninomiya (Lion Fat & Oil Co., Tokyo). *Yukagaku* 15, 637–43 (1966). Metal salts of new type amphoteric surface-active agents were incorporated into sheets, inflation films and monofilaments of polypropylene by extruding and other molding methods. Metal salts of amphoteric surface-active agents did not bleed out on the surface of molded polypropylene and these metal salts showed excellent properties as internal antistatic agents for polypropylene. Antistatic property of sheets and films was decreased by washing but soon recovered to the original. Dyeability of polypropylene containing the metal salts was increased in acidic dyeing. The dyed polypropylene showed high resistance to light, rubbing and washing.

REACTIVE SURFACTANTS. I. HYDROXAMIC ACIDS AND THEIR DERIVATIVES. Hideo Takahashi, Hiroshi Kashiwase and Tsunehiko Kuwamura. *Yukagaku* 15, 633–7 (1966). Some higher hydroxamic acids and their acetyl derivatives were prepared from methyl esters of various fatty acids, and cotton clothes were treated with aqueous dispersion or solution of these reactive surfactants. Acetylated hydroxamic acids, except that from perfluoro fatty acid, were found to be reacted with cotton in the presence of alkali and that treated with homologues higher than C_{16} showed durable water repellency and excellent softness. Inactivity of perfluoro dihydroxamate was probably due to the difficulty of its Lossen rearrangement.

ANALYSIS OF HOUSEHOLD DETERGENTS. XI. X-RAY DIFFRACTION METHOD FOR DELIQUESCENT AND EFFLORESCENT MATTERS. Kaname Abe and Maomi Tobari (Lion Fat & Oil Co., Tokyo). *Yukagaku* 15, 629–32 (1966). The X-ray diffraction patterns of deliquescent and efflorescent matters could be successfully measured by grinding with about the same amount of liquid paraffin. Stability of this method was proved by use of $Na_2SO_4 \cdot 10H_2O$. A propoesd method is given for determining the X-ray diffraction pattern of $K_4P_2O_7$.

PREPARATION OF STANDARD CARBON BLACK FOR THE ARTIFICIALLY SOILED CLOTHS. II. PREPARATION METHOD AND PROPERTIES OF CARBON BLACK. Chiyo Tada and Miwa Sato (Niigata Women's College). *Yukagaku* 15, 623–8 (1966). Preparation of carbon black with ample amount of oily matter and uniformity of quality was always successful when naphthalene was burnt in a specially constructed furnace at 400–500C by the adjustment of ventilator. The carbon black was extracted with acetone for 40 hours to adjust the amount of oily matter on the particle surface.

ROLE OF WAXES IN DETERGENT RESISTANT POLISHES. F. A. Martin and W. Kapfer (Am. Hoechst Corp., Mountainside, N.J.). *Soap Chem. Specialities* 42, 70–7 (1966). A review of the criteria used in formulating detergent resistant polishes.

AOS, NEW BIODEGRADABLE DETERGENT. B. P. Webb (Chevron Chem. Co., San Francisco). *Soap Chem. Specialties* 42, 61–2 (1966). The properties of C_{15}–C_{18} alpha olefin sulfonates, a newly developed biodegradable surfactant, are described.

TALLOW USE IN SOAP AND FATTY ACIDS. E. S. Pattison (Soap and Deterg. Assoc., New York). *Soap Chem. Specialties* 42, 83–7 (1966). A review.

GERMICIDAL COMPOSITIONS CONTAINING COMPLEXES OF IODINE. J. C. Hagerty (W. R. Grace & Co.). *U.S. 3,291,692.* A germicidal complex of iodine with an anionic surface active agent of the formula: $RCH_2O(CH_2CH_2O)_nSO_3X$ is claimed, wherein R is a hydrocarbon alkyl group containing from about 7 to about 19 C atoms, n is a positive number from about 2 to about 30 and X is a cation selected from the group consisting of alkali metal ion, ammonium ion, triethanolamine ion and mixtures thereof. The complex contains from about 0.1 to about 30% (by wt.) iodine based on the weight of the surface active agent.

DETERGENT BAR. J. C. Bohrer (Colgate-Palmolive Co.). *U.S. 3,291,744.* A milled and plodded synthetic detergent bar consisting essentially of water-soluble synthetic anionic organic non-soap detergent and 5 to 15% (by wt.) water is described. A major proportion (up to 90%) of the anionic detergent is a water soluble normal higher alkyl sulfonate in which the normal alkyl group contains from 15 to 20 carbon atoms and a minor proportion (5 to 30% by wt.) is a water soluble straight chain alkyl aryl sulfonate in which the straight chain alkyl group contains from 8 to 20 carbon atoms, with an average chain length of 12 to 16. This combination of detergents forms a cohesive milled and plodded toilet bar having soap-like physical characteristics in the absence of the plasticizer.