# ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: N. E. Bednarcyk, J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, E. G. Perkins, T. H. Smouse, J. A. Thompson and R. W. Walker

## • Oils and Fats

FLAVOR PREFERENCES FOR BUTTER AND MARGARINE. I. A. Albin, T. J. Siek, L. A. Sather and R. C. Lindsay (Dept. of Food Science and Technol., Oregon State Univ., Corvallis, Ore.). *J. Dairy Sci.* **52**, 394–96 (1969). A significant preference for high-quality sweet-cream butter over several commercial brands of margarine was observed when evaluated by a large college student panel. Salt levels from 0.54 to 1.86% were preferred by the student panel. Significant flavor preferences were not found for butters prepared from aliquots of one lot of cream repasteurized at 76.6C for 1,800 sec and the other at about 96.0C for 7,2000 sec. The distribution of preference scores on a nine-point scale varied among the spreads tested.

TRITERPENE ALCOHOL ISOLATION FROM OIL SHALE. P. Albrecht and G. Ourisson (Lab. Associe au C.N.R.S., Institut de Chimie, 1, rue Blaise Pascal 67, Strasbourg, France). *Science* **163**, 1192–93 (1969). Isoarborinol, an intact pentacyclic unsaturated alcohol, was isolated from the Messel oil shale (about $50 \times 10^6$ years old). Complex organic substances, even those very sensitive to oxidation, reduction or acidic conditions, can thus survive without alteration for long periods.

PHYSICAL PROPERTIES OF MARGARINE AND SHORTENING. I. HARDNESS AND VISCOSITY OF HOUSEHOLD MARGARINE. Masao Imamura, Isao Niiya, Takenori Maruyama and Taro Matsumoto. *Yukagaku* **17**, 676–80 (1968). Forty-five brands of household margarine were submitted to measurement of hardness (I), plastic viscosity (II), apparent viscosity (III) at 20C and solid fat index (SFI). There was a linear relation between SFI and values of II and III. There was no special correlation between chemical and fatty acid composition because of complex nature of the fats used.

II. TEMPERATURE DEPENDENCE OF HOUSEHOLD MARGARINE. *Ibid.* **18**, 16–20 (1969). The result of the panel test showed that margarine having hardness index in the range of 150 ~ 300 were the best, while those with the index below 50 were too hard and those with index above 400 were too soft. Samples cut into a block of $5 \times 2 \times 2$ cm. were placed on filter paper for 48 hours to measure the oil-off and the results showed about the same tendency as the hardness. Solid fat index values of 25 ~ 15 were the most desirable.

MELTING POINT OF EDIBLE FATS. II. OPEN-TUBE MELTING POINT OF HARDENED OILS. Masao Imamura, Isao Niiya, Hiroshi Iizima, Masakazu Okada and Taro Matsumoto. *Yukagaku* **18**, 21–6 (1969). Open-tube melting point and polymorphism were measured with 5 kinds of soybean oil and 4 kinds of beef tallow of different degrees of hardening. These were allowed to stand at 0, 10, 20, 40 and 50C for 1.5, 15, 24, 120 and 480 hours. Correlation of these points with solid fat index (SFI) and composition of fatty acids was also investigated. In hardened soybean oil, polymorphism was slower with higher degree of hardening at low temperature. In case of extreme hardening (iodine number 0.4) polymorphism was absent at 0 and 20C with no change in melting point. In fats with an iodine number of 17.1 or 38.9, polymorphism was nearly absent when left at 0C, the $\beta$-form appeared when left 40C for 15 and 24 hours. Polymorphism was much faster in fats of iodine number 58.4 or 81.3. Hardened oil contained considerable amount of *trans* acid. Hardened beef tallow also showed the same tendency as hardened soybean oil. The amount of *trans* acid in beef tallow was smaller than in hardened soybean oil.

DETERIORATION OF OILS AND FATS OF HARDENED COCONUT OIL SERIES. III. DETERIORATION OF HARDENED PALM KERNEL OIL AND CRYSTAL GROWTH. Masao Imamura, Isao Niiya, Masakazu Okada and Taro Matsumoto. *Yukagaku* **17**, 681–4 (1968). Crude, refined and hardened palm kernel oils were kept at −20, 5, 15 and 30C for 6 months and the changes in acid value, peroxide value and carbonyl value were measured in

every month. The increase in acid value was greatest at 15 and 5C. The increase was more marked in the hardened oil. There was no change in those fats stored at −20 and 30C. Observations of crystal surfaces under electron microscope are described. Those having rough crystal surface showed more increase in acid value.

DETERMINATION OF OXIRANE OXYGEN BY IODOMETRY. Shunroku Kanno and Zengo Ninomiya (Yamagata Univ.). *Yukagaku* 17, 685–8 (1968). A mixture of 10 ml. 0.1 *N* HCl and 1:1 dioxane-$CCl_4$ was added into a solution of 0.1 ~ 0.2 g epoxystearic acid in 10 ml $CCl_4$, and stirred for 10 minutes. Ten ml of aqueous solution containing 0.5 g $KBrO_3$ and 0.5 KI was poured in above solution, shaken 1 minute and allowed to stand for 4 minutes. Librated iodine was titrated with 0.1 *N* $Na_2S_2O_3$ with 30 ml water. Anisaldehyde, benzoyl peroxide, ethyl and oleyl alcohols, caprylic, stearic and oleic acids showed no effect on the determination. Acetic acid, however, gave lower value of oxyrane oxygen content. The method was suitable for determination of less than 1% of oxyrane oxygen.

MONOLAYER CHARACTERISTICS OF 1,2-DIMYRISTIN, 1,2-DIMYRISTOYL-3-CEPHALIN AND 1,2-DIMYRISTOYL-3-LECITHIN AT THE AIR/WATER INTERFACE. D. A. Cadenhead, R. J. Demchak and M. C. Phillips. *Kolloid-Z.* 220, 59–64 (1967). Surface pressures and surface potentials have been obtained as a function of surface area per molecule for monomolecular films of 1,2-dimyristin, 1,2-dimyristoyl-3-cephalin (L-configuration) and 1,2-dimyristoyl-3-lecithin (L-configuration) at the air/water interface. The studies were carried out in the temp. range +1 to +37C. The results obtained are interpreted in terms of electrostatic repulsions between the polar groups increasing in the order dimyristin < cephalin < lecithin. (Rev. Current Lit. Paint Allied Ind. No. 317)

INVESTIGATION OF THE FATTY ACID COMPOSITION OF CERTAIN SEED OILS. A. J. Bridges and D. W. Poxon. *Loughborough Univ. of Technology, Project Work*, 1966–7, 8, 15–7. The object of the present investigation was to examine the fatty acids of a number of seed oils containing high proportions of conjugated trienoic acids to determine if small amounts of hydroxy conjugated dienoic acids were present. Of the six oils examined only *Catalpa bignonioides* and *Punica granatum* gave results suggesting the presence of vicinally unsaturated hydroxy acids. Results for *Punica granatum* also suggested that a small amount of an epoxy acid was present. (Rev. Current Lit. Paint Allied Ind. No. 318)

COOKERY WITH FATS AND OILS. Fumiko Matsumoto (Ochanomizu Women's Univ., Tokyo). *Yukagaku* 17, 657–64 (1968). A review.

STUDY ON THE BÖMER NUMBER. VII. DIFFERENTIAL THERMAL ANALYSIS OF CRYSTALLIZED GLYCERIDES. Masao Imamura, Isao Niiya, Takenori Maruyama and Taro Matsumoto. *Yukagaku* 17, 665–670 (1968). For detection of foreign fats in lard, differential thermal analysis (DTA) of crystallized glycerides from acetone by the Bömer method was carried out. The DTA curve of crystallized glyceride itself by the dilution method showed a fusion peak at 63–65C for lard, at 58–60C for beef tallow, at 60C for mutton tallow, and at 59C for hardened lard. It is impossible to judge the mixing ratio from this determination alone. The crystallized glyceride was melted, cooled rapidly, then reheated at 18C. In this treatment, lard showed 3 endothermic peaks at 48, 55 and 66C, and an exothermic peak at 58C. Beef tallow showed a large endothermic peak at 61C and a small exothermic peak at 47C. Mutton tallow showed a curve quite similar to that of beef tallow, and hardened lard showed two endothermic peaks in a gentle slope peak at 44C and a sharp one at 56C, and one exothermic peak at 47C. The presence of more than 10% beef in lard can be detected from changes in DTA curve and estimation of the mixing ratio is believed possible from the characteristics of the curve in the rough mixing range of 10 ~ 60%. Presence of 10 ~ 80% hardened lard in the lard makes difficult judgement.

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CULTURAL CHARACTERISTICS AND FATTY ACID COMPOSITION OF PROPIONIBACTERIA. C. W. Moss, V. R. Dowell Jr., D. Farshtchi, L. J. Raines and W. B. Cherry (Nat. Commun. Dis. Center, Atlanta, Ga. 30333). *J. Bacteriol.* **97**, 561–570 (1969). The cultural characteristics and cellular fatty acid composition of 40 strains from 7 species of *Propionibacterium* and 9 cultures of anaerobic corynebacteria were studied. Based on relative abundance of the *i*-C15 and *a*-C15 fatty acids the Propionibacteria were separable into 2 groups *P. freudenreichii* and *P. shermaii* (*a*-C15 predominant) and *P. arabinosum, P. jensenii, P. pentosaceum, P. thoenii* and *P. zeae* (*i*-C15 predominant).

STRUCTURE AND MORPHOLOGY OF β-CRYSTALS OF GLYCERYL TRISTEARATE. W. Skoda *et al.* Kolloid-Z. **219**, 149–56 (1967). Measured cell dimensions of β-glyceryl tristearate differ slightly from calculated values for β-glyceryl trilaurate, indicating a slightly higher packing density. (Rev. Current Lit. Paint Allied Ind. No. 317)

AUTOXIDATION OF FATS. VI. INVESTIGATION ON THE PROCESSES OF OXIDATION IN FATS UNDER THERMAL CONDITIONS. S. A. Ivanov. *Nau. Tr. Vis. Ped. Inst. "Paisij Hilendarski"* **5** No. 1, 87–92 (1967). Investigations of oxidation processes in fats under thermal conditions show that the oxidation of sunflower seed oil at 130C with air (150 ml/min) in the course of 50 hr tends to follow, though not precisely, the theory of Farmer for the oxidation of fats under natural conditions. In this connection an increase of hydroperoxide, epoxy and hydroxylic bound O at the very beginning without an induction period is established. Changes in the manner of accumulation of the carbonyl and carboxyl O are not observed. The accumulation of polymeric bound O is rapid, which indicates a chain formation of oxygen polymers. (Rev. Current Lit. Paint Allied Ind. No. 319)

RETENTION BEHAVIOUR OF STEROIDS IN GAS CHROMATOGRAPHY WITH A SERIES OF COMBINATION COLUMNS. J. C. Touchstone, Chung-Hsiu Wu, A. Nikolski and T. Murawec (Dept. of Obstet. and Gynecol., Univ. of Pennsylvania, Philadelphia, U.S.A.). *J. Chromatog.* **29**, 235–8 (1967). The use of a series of columns to obtain structural information is described. Coiled glass columns (6 ft. × 4 mm i.d.) packed with Gas-Chrom Q supporting 5% of stationary phase (QF-1 and L-45, used singly or in mixtures) were used; the columns were operated at 240C, with argon as carrier gas and an argon ionization detector (Ra source). When retention times were plotted against substrate composition, the graph for predominantly ketonic steroids had a negative slope, whereas that for predominantly hydroxy-steroids had a positive slope; steroids with equal numbers of hydroxy- and oxo-groups gave graphs having little or no slope.

HIGH-MOLECULAR-WEIGHT ALCOHOLS OF HUMAN HAIR LIPIDS. E. J. Singh and L. L. Gershbein (Biochem. Res. Lab., Northwest Inst. for Med. Res., W. Addison St., Chicago, Ill., U.S.A.). *J. Chromatog.* **29**(1), 229–31 (1967). The mixed alcohols were separated from the other components of the unsaponifiable portion of the sample by column chromatography. The methanolic solution so obtained was shaken with 90% ethanol for 1 hr; this induced precipitation of the higher alcohols, which were then separated into saturated and olefinic fractions by TLC on 0.25-mm layers of Silica gel G, with 70% ethanol saturated with $AgNO_3$ as solvent. Components of original mixed-alcohol precipitate and of the olefinic fraction separated by TLC were then subjected to GLC, as their acetates, in U-shaped glass columns (0.6 in. o.d.) packed with 2.2% of SE-30 on Gas-Chrom P (60 to 80 mesh); the carrier gas He, the column temp. was programmed from 170C to 410C, and detection was by flame ionization. The effect of the length of the column on the separation is discussed.

SEPARATION AND DETERMINATION OF MONO-, DI- AND TRIGLYCERIDES IN FAT EMULSIONS BY FRACTIONAL ELUTION FROM SILICA GEL COLUMNS. P. Ingraito and A. Boari (Osp. Mil. Princ. Bologna, Italy). *Gazz. med. Milano* **117**(5), 567–75 (1967). In developing the method, glyceride mixtures of known composition, pre-treated by warm filtration and dehydration with anhydrous $Na_2SO_4$, were applied to a column (50 cm × 20 mm) containing 25 g of silica gel saturated with isopropyl ether. The eluents used were (A) 2,2,4-trimethylpentane-benzene (3:7), (B) 2,2,4-trimethylpentane-ethyl ether (3:7), and (C) ethanol-isopropyl ether (1:4). The sample solution (2 g of the fat dissolved in 10 ml of solvent A) was applied to the column, and solvent A was used as the first eluent; 20-ml fractions were collected (12 fractions with solvent A, 6 with B, and 8 with C). The solvent was evaporated, and the residue was dried at 50C for 1 hr, and placed in a desiccator. The triglycerides were found in the A fractions, the diglycerides in the B fractions and the monoglycerides in the C fractions. For satisfactory determination of monoglycerides, 2 g of fat was necessary.

STABILIZATION OF CHROMATOGRAPHIC PLATES FOR THIN-LAYER CHROMATOGRAPHY OF LIPIDS. I. Mitsev, J. Slavcheva and A. Popov (Inst. de Chim. org., Acad. Sci., Sofia, Bulgaria). *C. r. Acad. bulg. Sci.* **20**(7), 693–5 (1967). The effects of various antioxidants on the TLC of various lipids was investigated by spraying the silica gel (0.25-mm layer) plate with 1.5 ml of a 0.01% solution of the antioxidant and drying at 50C to 60C before use. Heptane-benzene (7:3), free from peroxides, was used as solvent. To detect peroxides at different stages of the chromatography, the plates were sprayed with a solution obtained by dissolving 7 g of $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$ in 50 ml of 10% aq. $NH_4SCN$ acidified with 0.5 ml of $H_2SO_4$, and adding 0.7 g of iron powder. After 24 hr. this solution is clear and colorless, and it is stable for 6 to 7 days. The most effective antioxidants were found to be the ethyl, propyl, octyl and lauryl esters of gallic acid; they did not affect the separation of the lipids, or their detection with Rhodamine B (C.I. Basic Violet 10).

EFFECT OF OUTER AND INNER SURFACE OF CATION EXCHANGE RESIN CATALYST ON THE ESTERIFICATION OF ETHYL ALCOHOL AND ACETIC ACID. Meng-Kun Lu, Shau-Zou Lu, and Mou-Ying Fu (Dept. of Chem. Eng., Cheng Kung Univ., Tainan, Taiwan). *J. Chinese Chem. Soc.* **1**, 7–14 (1968). Acid form cation-exchange resin, Dowex 50 W, was used as catalyst in the study of esterification of ethyl alcohol with acetic acid in batch process. The mole ratio of ethyl alcohol to acetic acid was two to one. The reactions proceeded under the following conditions: reaction temperatures 40–68C; amount of resin catalyst 1.48–11.03%; U.S. mesh number of resin 20–40. Results of experiments showed that the reaction was a second order reversible one. By graphical method, the reaction rate constant k can be separated into two parts, $k_o$ and $k_i$, which were affected by outer and inner surface of resins, respectively. The $k_o$ increased as the reaction temperature increased. It was proportional to the total surface area of resins and independent of the size of resin particles. The $k_i$ increased as the reaction temperature and the amount of resin catalyst increased, but decreased as the size of resin particle increased. The deviation of calculated k and experimental value was less than 7%.

CHROMATOGRAPHIC INVESTIGATIONS ON VOLATILE FATTY ACIDS IN OXIDISED FATS. S. A. Ivanov, C. Vasileva and L. Ilieva. *Nau. Tr. Vis. Ped. Inst. "Paisij Hilendarski"* **5** No. 1, 93–7 (1967). Chromatographic investigations were conducted on volatile fatty acids of sunflower seed oils oxidized under natural conditions in the course of 2–4 yr., of thermally oxidized sunflower seed oil at a temp. of 130C and of lard oxidized under natural conditions for 1–3 yr. It was established that the only volatile fatty acid in the investigated oxidized samples is caproic acid. (Rev. Current Lit. Paint Allied Ind. No. 319)

DETERMINATION OF ORGANOCHLORINE INSECTICIDES IN BUTTER AND MILK BY EXTRACTIVE DISTILLATION. R. Mestres, F. Barthes and M. Dudieuzere-Priu (Lab. Chim. appl. expert., Fac. Pharm., Montpellier, France). *Trav. Soc. Pharm. Montpellier* **27**(1), 47–52 (1967). To the sample of butter (5 g) or milk (10 ml) in the 250-ml flask of a Dean and Stark distillation apparatus are added glycerol (40 ml), $H_2O$ (5 ml), octane (5 ml), light petroleum (15 ml) and some glass beads. Light petroleum (20 ml) and sufficient $H_2O$ subsequently to fill the receiver are added, the apparatus is assembled and after distillation for 2 hr., the solvent phase of the distillate is separated; the aq. phase and the apparatus are washed with a further 20 ml of light petroleum. The insecticides are separated from the combined solvent phase by selective elution from a column of Florisil-anhydrous $Na_2SO_4$ and determined by gas chromatography with electron-capture detection. Aldrin and BHC can be determined in the range 0.05 to 0.20 ng and dieldrin in the range 0.1 to 2 ng.

DETERMINATION OF THE PENETRATION OF OILS INTO FRIED FOODS BY MEANS OF FLUORESCENCE. M. Monteoliva, J. D. Perez Soler, C. Ibanez and G. Varela (Univ., Granada, Spain). *Grasas Aceit.* **18**(4), 209–213 (1967). The penetration of oil into potatoes during frying is measured by examination of a 3-mm thick section of potato under a microscope, with illumination by reflected u.v. radiation. Differences between various oils were demonstrated much more clearly than by Soxhlet extraction. Soya-bean and arachis oils penetrated further than did olive or cottonseed oil.

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LESSER KNOWN NIGERIAN EDIBLE OILS AND FATS. I. CHARACTERISTICS OF MELON SEED OILS. P. Girgis and F. Said (Univ. of Ife, Ibadan, Nigeria). *J. Sci. Food Agr.* 19, 615–6 (1968). Melon seed oil is found to be a semi-drying oil, consisting mainly of the glycerides of oleic (19%) and linoleic (55%) acids. Because of its high content of unsaturated fatty acids, it should be a good substitute for maize oil for use in diets intended to reduce high levels of blood cholesterol.

ANTIOXIDANT PROPERTIES OF LUCERNE EXTRACTS. A. Ben Aziz, S. Grossman, P. Budowski, I. Ascarelli and A. Bondi (Hebrew Univ., Rehovot, Israel). *J. Sci. Food Agr.* 19, 605–8 (1968). Aqueous extracts of fresh and dehydrated lucerne were found to exhibit heat-stable antioxidant activity toward the autoxidation of linoleic acid, the lipoxidase-catalyzed oxidation of linoleic acid and the lipoxidase-induced carotene oxidation. EDTA increased the antioxidant activity of lucerne extract in all three systems. Alone, EDTA inhibited linoleate autoxidation, but not lipoxidase-catalyzed linoleate oxidation, and was only partly inhibitory toward lipoxidase-induced carotene oxidation. The presence of ferulic acid in the acid hydrolizate of lucerne extract could be demonstrated by chromatography. This acid, and the related coumaric and sinapic acids, were shown to inhibit lipoxidase activity. It is suggested that a ferulic acid derivative may play a role in the antioxidant effects observed with aqueous lucerne extracts.

DISTRIBUTION OF FATTY ACIDS IN LIPIDS AS AN AID TO THE IDENTIFICATION OF ANIMAL TISSUES, I. A. W. Hubbard and W. D. Pocklington (Lab. of the Government Chemist, London, England). *J. Sci. Food Agr.* 19, 571–7 (1968). Fat was extracted from various cuts of meat, from domestic and foreign sources. The majority of the samples were from pork, beef and lamb, but specimens of rabbit, poultry and three African ruminants were also included. The fatty acid composition of the samples was determined by gas chromatography of their methyl esters, on polar and non-polar stationary phases. The use of such results both for the identification of the animal source of meat and of the purity of lard samples is discussed. It is suggested that the presence in lard of certain branched-chain fatty acids, characteristic of ruminant fat, provides evidence of adulteration with beef or mutton tallow.

ROSIN COMPOUNDS OF IMPROVED COLOR AND STABILITY. C. G. Wheelus (Arizona Chemical Co.). *U.S. 3,423,389.* The color and color retention of tall oils, tall oil fractions, rosins and rosin compounds are improved by adding about 0.01 to 1% of a phenol sulfide monomer or polymer and heating at 180–350C, preferably under a blanket of nitrogen, until products of better color characteristics are obtained.

PROCESS AND APPARATUS FOR IMPROVING FATS. F. Eichler, P. J. Seip and P. Czedik-Eysenberg (Lever Bros. Co.). *U.S. 3,423,442.* A liquid phase process for refining glyceride oils is described in which the liquid oil is treated with an aqueous liquid agent in a bed of chemically inert packing material of uniform depth under conditions providing numerous interfaces between the two liquids.

METHOD OF TREATMENT OF CRUDE ANIMAL FAT. A. Mayer. *U.S. 3,424,587.* A method is described for treating crude animal fats to produce animal feed concentrates by drying, comminuting, freezing and pulverizing such fats, followed by the addition of salt and other additives.

SOAPSTOCK ACIDULATION. F. M. Bloomberg and T. W. Hutchins (Arkansas Grain Corp.). *U.S. 3,425,938.* A method is described for acidulating a mixture of soapstock, water and mineral acid within a substantially confined area; transferring an overflow volume of the acidulated mixture to a confined settling area where the acid oil rises and the acid water settles; withdrawing an overflow volume of the acid oil from the settling area to storage and draining the acid water from the lower portion of the settling area to means where it may be neutralized and disposed of as waste. The method is operated continuously. Suitable mechanical equipment for operating the process is also described.



SAPONIFICATION GLYCERINE REFINING BY PLURAL STAGE FLASH DISTILLATION WITH LIVE STEAM. J. J. Graham (Badger Mfg. Co.). *U.S. 3,427,230.* A method for purifying crude saponification glycerine consists of mixing the crude glycerine with super-heated steam in a quantity and at a temperature and pressure suitable to flash the glycerine values and volatile impurities, separating the non-volatile impurities and separately condensing the glycerine from the vapors. The glycerine condensate is reflashed admixed with a second quantity of live steam to vaporize additional impurities from a liquid purified and concentrated glycerine bottoms product.

CONDITIONING POWDER FOR DRYCLEANING SOLVENT. R. G. Riede and C. W. Cain, Jr. (Johns-Manville Corp.). *U.S. 3,427,249.* The removal of fatty acid soil from an organic drycleaning solvent is improved by using as a sweetener hydrothermal calcium silicate having a lime to silica ratio of about 1.5 to 2.0:1. A combination of about 5–15% by wt. of calcium silicate and about 85–95% by wt. of filter aid is mixed with the drycleaning solvent, and fatty acid soil is removed from the system by filtering.

PROCESS FOR RECOVERING FATTY ACIDS AND TRIGLYCERIDE OIL FROM SOAPSTOCK. J. E. Morren (Baker Perkins Inc.). *U.S. 3,428,660.* A process for recovering fatty acids and triglyceride oil from soapstock comprises continuously mixing the soapstock at 175–300F, preferably 200-270F, with an aqueous mineral acid such as sulfuric acid to obtain an acidulated mixture with the soap converted to free fatty acid and salt. The mixture, comprising an aqueous phase with the salt and excess acid and an oil phase containing fatty acids and triglyceride oil, is continuously passed into a centrifugal force field whereby the oil phase flows inwardly and countercurrently to an outwardly flowing stream of wash water, also continuously introduced into the field. The oil phase is removed at the inward position and the aqueous phase, containing the wash water, is removed from an outward position of the force field.

## • Fatty Acid Derivatives

CHEESE, PHOSPHATE AND POLYGLYCERYL PARTIAL ESTER COMPOSITION. C. W. Tatter and P. P. Noznick (Beatrice Foods Co.). *U.S. 3,421,904.* Emulsified cheese compositions are prepared by admixing water, a water soluble non-toxic phosphate, a fermented type cheese and a polyglyceryl partial ester of a higher fatty acid. The product can be spray dried.

POLYURETHANE FOAMS UTILIZING AN OXYETHYLATED TALL OIL FOAM STABILIZER. W. R. Andrews and J. L. Meehan (Olin Mathieson Chemical Corp.). *U.S. 3,423,339.* Oxyethylated tall oil in an amount between about 0.3 and 3.0% by wt. of the foam reactants is employed as a foam stabilizer for polyurethane foams.

PROCESS FOR PREPARATION OF IODINATED LECITHIN. K. Makahe (Daiichi Yakuhin Sangyo Kabushiki Kaisha). *U.S. 3,423,441.* Iodinated lecithin is prepared by adding iodine and coarse particles of at least one of the metals magnesium, zinc, aluminum, titanium, manganese, nickel, cobalt, cadmium and copper to lecithin dissolved in glacial acetic acid and heating the resultant mixture with stirring. The product is useful as an iodine-containing medical preparation.

N-BENZYL HIGHER FATTY ALKYL DILOWERALKYL QUATERNARY AMMONIUM HALIDE HAIR RINSE. E. P. Birkelo and T. N. Johnson (Rayette-Faberge, Inc.). *U.S. 3,423,504.* A quaternary ammonium compound mixture comprises an aqueous solution of higher fatty alkyl dilower alkyl benzyl ammonium halide and from 1 to 20% by wt. of the quaternary compound of a higher fatty acid amide, each of the higher fatty components having 10 to 22 C atoms.

WATER-CONTAINING COATING COMPOSITION COMPRISING A SALT OF AN ANHYDRIDE COPOLYMER PARTIAL ESTER. M. Skoultchi and B. D. Jubilee (Nat. Starch and Chem. Corp.). *U.S. 3,425,977.* Novel water-soluble, surface coating compositions are characterized by their ability to crosslink upon being air-dried so as to yield solvent-resistant films with excellent adhesion to a variety of substrates. Such coating compositions are based upon novel polymeric derivatives resulting from the reaction between a vinyl polymer containing anhydride groups within its molecule and an ester-alcohol derived from an unsaturated fatty acid.

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ANTI-FOGGING FILM COMPRISING VINYL CHLORIDE POLYMER, GLYCEROL MONOSTEARATE AND INCOMPATIBLE PLASTICIZER. G. M. Adams and D. Tijunelis (Union Carbide Corp.). *U.S. 3,425,976.* An anti-fog vinyl chloride polymeric film is obtained by incorporating in a plasticized vinyl chloride polymer a monoglyceride of fat-forming fatty acids or mixtures of monoglycerides and diglycerides of fat-forming fatty acids in an amount sufficient to impart anti-fogging characteristics to the film. The plasticizer system employed consists of at least 25 parts of a plasticizer which is incompatible with the anti-fog additive. If both compatible and incompatible plasticizers are used, the ratio of the latter to the former should be at least 2.5 to 1.

DIBASIC ACIDS CONTAINING ETHER LINKAGE. I. PLASTICIZING ACTIVITIES OF ESTERS AND N-SUBSTITUTED AMIDES OF 1,2-BIS (CARBOXYALKOXY)-ETHANES AND -PROPANES. Yoshio Abe, Chihiro Kato, Daisaku Hiso, Tomoyuki Aoki and Hisao Miyagawa (Keio Univ., Tokyo). *Yukagaku* 18, 31–6 (1969). Three dibasic alkoxy acids, 1,2-bis(carboxymethoxy)-ethane, 1,2-bis(β-carboxyethoxy)-ethane, and 1,2-bis(β-carboxyethoxy)-propane were prepared by the cyanoethylation of ethylene and propyleneglycol, and by the oxidation of triethylene glycol with nitric acid. Reaction of these acids with octyl-, dodecyl-, benzoyl-, and 2-ethylhexyl alcohols gives diesters. Diamides were also obtained by the reaction of dimethyl esters of these dibasic acids with octyl-, dodecyl- and benzyl-amines. Diesters and diamides thus obtained were investigated for use of PVC plasticizer. They were excellent in low temperature performance. The diamides of the didodecyl ester of 1,2-bis (β-carboxyethoxy)-propane had good thermal stability with excellent low temperature characteristics.

HYDROLYSIS OF MONOESTERS OF DICARBOXYLIC ACIDS WITHOUT SPLITTING OF ESTERS OF MONOCARBOXYLIC OR DIESTERS OF DICARBOXYLIC ACIDS. R. Schöllner. *Plaste u. Kautschuk* 14, No. 8, 592 (1967). The esters are hydrolysed by passage through a column of a strongly basic anion exchange resin using dioxan as solvent. Monoesters of dicarboxylic acids (monooctadecyl succinate) are quantitatively hydrolysed, whereas diesters, or esters of monocarboxylic acids, are unchanged. (Rev. Current Lit. Paint Allied Ind. No. 317)

REACTION OF ESTERS OF STEARIC ACID WITH ETHYLENEDIAMINE IN ALCOHOLIC SOLUTION. Gaku Izumi and Masayoshi Kita (Gov. Ind., Research Inst., Nagoya). *Yukagaku* 18, 27–31 (1969). *Reaction of methyl* stearate or ethyl stearate and ethylenediamine in ethanol gave interestrication product and a part of substituted amino group but the reaction with chlorohydrin stearate gave largely substituted amidation product.

## • Biochemistry and Nutrition

THE TRANSPORT OF RETINOL IN HUMAN PLASMA. S. Johannessen, J. O. Alvsaker and S. G. Laland (Dept. of Biochem., Univ. of Oslo, Blindern, Norway). *FEBS Letters* 2, 146–48 (1969). Evidence in support of the view that tryptophan-rich prealbumin may serve as the specific transport protein for retinol in human plasma has previously been reported. Since thyroxine is transported partly by this protein, thyroxine and retinol would then share the same transport protein. In order to investigate this further, the retinol-containing protein in human plasma was re-examined. The results obtained show that retinol in human plasma is not linked to tryptophan-rich prealbumin as previously suggested but to an immunologically related protein with an $S_{20,w}$ value of 1.85 (ultracentrifugation) as compared to 4.6 of tryptophan-rich prealbumin. In disc electrophoresis the retinol-binding protein was localized to the alpha$_1$ globulin position. *In vitro* experiments further revealed that it did not bind thyroxine in contrast to tryptophan-rich prealbumin.



LABELING OF MARROW CELLS OF VITAMIN E-DEFICIENT MONKEYS BY $^3$H-PRECURSORS OF NUCLEIC ACIDS AND PROTEIN. C. Hanna, O. Neufeld, and C. Fitch (Depts. of Pharm. and Med., Univ. of Arkansas School of Med., Little Rock, Ark. 72201). *Proc. Soc. Exp. Biol. Med.* 130, 167–71 (1969). The incorporation of $^3$H-labeled thymidine, deoxyuridine, uridine, and L-leucine into bone marrow cells of vitamin E-deficient and control monkeys was measured in autoradiographic sstudies. During vitamin E-deficiency there was an increase in the grain count per labeled cell of most cell types in the erythroid and myeloid series, while the percentage of $^3$H-labeled cells was not altered from control values. Multinucleated erythroid cells in the bone marrow of vitamin E-deficient monkeys were not labeled by thymidine-$^3$H. These findings are evidence that active erythropoiesis associated with premature death of erythroid cells occurs in the hypercellular bone marrow of anemic vitamin E-deficient monkeys.

THE EFFECTS OF INSULIN ON LIPOLYSIS EVOKED BY CYCLIC AMP AND ITS DIBUTYRYL ANALOG. H. Goodman (Dept. of Physio., Harvard Med. School, Boston, Mass.). *Proc. Soc. Exp. Biol. Med.* 130, 97–100 (1969). Glycerol production by segments of epididymal fat from normal rats was used as a measure of lipolysis. Theophylline (0.3 mg/ml) produced a striking increase in lipolysis. Further addition of cyclic adenosine 3',5'-monophosphate (CAMP) at a concentration of $10^{-2}$M caused an even greater increase in glycerol production. Insulin (1mU/ml) slightly reduced the lipolytic effects of theophylline and completely abolished lipolysis in response to CAMP. The dibutyryl analog of CAMP ($10^{-3}$M) also increased lipolysis and its effects were also potentiated by theophylline. Insulin failed to reduce and in some experiments even enhanced the lipolytic action of dibutyryl CAMP. Imidazole reduced lipolysis in response to both nucleotides. The findings indicate that CAMP and its dibutyryl analog may behave quite differently under some circumstances and underscore the need for caution in drawing physiological conclusions based on findings with DBCAMP alone.

DIGESTIVE ACTIVITY OF LYSOSOMES. III. THE DIGESTION OF LIPIDS BY EXTRACTS OF RAT LIVER LYSOSOMES. S. Fowler and C. De Duve (Rockefeller Univ., New York City 10021). *J. Biol. Chem.* 244, 471–481 (1969). The ability of rat liver lysosomes to digest various lipids has been investigated. The lysosomes were isolated from the livers of rats treated with Triton WR-1339 and were essentially free of other cell components. They were able to deacylate extensively phosphatidylcholine, phosphatidylethanolamine, phosphatidylserine, phosphatidylinositol, lysophosphatidylcholine, lysophosphatidylethanolamine, *phosphatidic acid, cardiolipin,* tripalmitin, 1,2-dipalmitin, 1,3-dipalmitin and 1-monopalmitin, when incubated with these substrates at 37C in 0.1 M acetate buffer, pH 4.3 to 4.6. Extensive digestion of the lipids and proteins of both microsomes and mitochondria occurs upon prolonged incubation of these cell components with purified lysosomes at pH 4.3. RNA appears to be broken down under these conditions. Thus it is clear that lysosomes can accomplish the important digestive functions with which they are credited. However, the manner in which some of the products of this process, especially the phosphodiesters, are cleared from the particles raises a problem of physiological importance.

ADRENAL CHOLESTEROL: LOCALIZATION BY ELECTRON-MICROSCOPE AUTORADIOGRAPHY. H. L. Moses, W. W. Davis, A. S. Rosenthal and L. D. Garren (N.I.H., Bethesda, Md. 20218). *Science* 163, 1203–05 (1969). As determined by electron-microscope autoradiography of adrenal glands containing tritiated cholesterol and by modified differential centrifugation techniques, 70 to 80% of adrenal cholesterol is contained within lipid droplets of rat adrenal cortical cells.

ANALOGUES OF GERANYL PYROPHOSPHATE AS INHIBITORS OF PRENYLTRANSFERASE. G. Popjak, P. W. Holloway, R. P. M. Bond and M. Roberts (Shell Research Ltd., Milstead Lab., Chem. Enzymology and Woodstock Agr. Res. Centre, Sittingbourne, Kent, England). *Biochem. J.* 111, 333–43 (1969). Six analogues of geranyl pyrophosphate (the monophosphates of geraniol and tetrahydrogeraniol, and the pyrophosphates of nerol, octan-1-ol, tetrahydrogeraniol and citronellol) were synthesized, and were found to be inhibitors of pig liver prenyl-(geranyl-)transferase. The effects of each analogue were analysed in kinetic experiments, which showed the pyrophosphates of citronellol, tetrahydrogeraniol and octanol-1-ol to be the most potent inhibitors. The results are interpreted to support a previous hypothesis that the main forces in the binding of substrates to prenyltransferase are non-specific lipophilic forces and a pyrophosphate-binding force.

SEPARATION AND IDENTIFICATION OF CERAMIDES DERIVED FROM HUMAN PLASMA SPHINGOMYELINS. *Ibid.*, 47–55. Sphingomyelins from human blood plasma have been converted into ceramides by enzymatic hydrolysis with phospholipase C. After acetylation the ceramides were fractionated by thin-layer chromatography on silica gel containing silver nitrate. Four main fractions obtained by this method were subsequently converted to di-O-trimethylsilyl ether derivatives and separated by gas-liquid chromatography on 1% OV-1. 2-11 components could be distinguished in each of the four fractions. The major fractions emerging from the gas chromatograph were analyzed by mass spectrometry and their main molecular species were identified. Two of the gas chromatographic fractions contained essentially pure molecular species, namely N-tetracosenoyl sphingosine and N-tetracosenoylsphinga-4,14-dienine.

BINDING OF LONG-CHAIN FATTY ACIDS TO BOVINE SERUM ALBUMIN. A. A. Spector, K. John, and J. E. Fletcher (Lab. of Metabolism, National Heart Inst., Bethesda, Md. 20014). *J. Lipid Res.* 10, 56–67 (1969). We have studied the binding of long-chain free fatty acids (FFA) to crystalline bovine serum albumin (BSA) that had been extracted with charcoal to remove endogenous fatty acids. The data were analyzed in terms of a model consisting of six high-energy binding sites and a large number of weak binding sites. The high-energy sites were resolved into two distinct classes, each containing three sites. At 37C and pH 7.4,k'1 (the apparent association constant of a class of binding sites) was about $10^6M^{-1}$ for binding to the three primary sites, and k'2 was about $10^5M^{-1}$ for binding to the three secondary sites. The number of weak (tertiary) sites was estimated to be 63 with a k'3 of $10^3M^{-1}$. In general, palmitate and palmitoleate were bound more tightly than oleate, linoleate, stearate, or myristate, and much more tightly than laurate. The association of palmitate with human and rabbit albumin also was analyzed in terms of this model. Palmitate was bound less firmly by human or rabbit albumin than by BSA. Palmitate binding to BSA was dependent upon the pH and temperature of the incubation medium. Long-chain hydrocarbons that did not contain a free carboxyl group (methyl palmitate, cetyl alcohol and hexadecane) were bound to a limited extent and weakly.

PARTICLE SIZE AND PROTEIN CONTENT OF SIX FRACTIONS OF THE $S_f$ 20 PLASMS LIPOPROTEINS ISOLATED BY DENSITY GRADIENT CENTRIFUGATION. W. J. Lossow, F. T. Lindgren, J. C. Murchio, G. R. Stevens and L. C. Jensen (Donner Lab., Lawrence Radiation Lab., Univ. of California, Berkeley, Calif. 94720). *J. Lipid Res.* 10, 68–76 (1969). A procedure is described for the separation of plasma $S_f$ 400 and $S_f$ 20–400 lipoproteins each into three fractions. Serum samples are overlayered with a sodium chloride density gradient in a preparative ultracentrifuge tube and thin layers are removed at the top of the tube after successive centrifugations at different speeds in a swinging bucket rotor. The procedure was evaluated by electron microscopy of the $S_f$ 400 lipoprotein fractions and schlieren analysis of the $S_f$ 20–400 lipoprotein fractions. Protein content of each fraction was measured by elemental N, C, H, and lipid-P analysis. Protein coverage was calculated for all fractions on the assumption that there is a surface layer 20 A thick. For the entire $S_f$ 400 lipoprotein spectrum and for a part of the $S_f$ 20–400 lipoprotein distribution the proportion of surface covered by protein was constant (approximately 20% coverage). Therefore, for these portions of the lipoprotein spectrum, the increase in surface:volume ratio as particle size decreases is approximately compensated for by an increase in the concentration of protein.

EFFECT OF GLUCOSE FEEDING ON NET TRANSPORT OF PLASMA FREE FATTY ACIDS. N. Baker and J. Rostami (Radioisotope Res., Veterans Admin. Center, Los Angeles, Calif. 90073). *J. Lipid Res.* 10, 83–90 (1969). The effect of a single glucose feeding upon the net inflow and outflow transport of plasma free fatty acids (FFA) has been studied in 75 unanesthetized rats. The animals were fasted for 22 ± 2 hr; then 50 rats were refed 2 ml of 50% glucose by gastric intubation. At 0, 10–15, and 30–35 min after glucose refeeding, the rats were injected with palmitate-1-$^{14}$C complexed to rat serum. The tracer dose included $^{131}$I-labeled albumin. Plasma FFA concentration, $^{131}$I concentration, and FFA-$^{14}$C were measured at five time intervals after injection of the tracer dose. From these data the irreversible disposal rate, or net outflow transport, and the net inflow transport of plasma FFA were calculated. Estimations were based upon a special case of a general solution for measuring net inflow and outflow transport of a circulating metabolite. The general solution is independent of the number of compartments, how they are interconnected, the number of nonradioactive inflows, and where the inflows enter the system. Net inflow = net outflow transport = 7.6 μeg/min in the fasted state and 3.5 μeq/min in the new steady state that is reached 30–40 min after glucose refeeding. A very slight imbalance between the rates of net inflow and outflow transport could account for the rapid fall in plasma FFA concentrations that results from a single glucose feeding.

CELLULARITY OF RAT ADIPOSE TISSUE: EFFECTS OF GROWTH, STARVATION, AND OBESITY. J. Hirsch and P. W. Han (Rockefeller Univ., New York 10021). *J. Lipid Res.* 10, 77–82 (1969). The size, number and rate of formation of mature adipocytes were studied in the epididymal pads and retroperitoneal adipose depots of the Sprague-Dawley rat. Early growth of these depots was accompanied by progressive enlargement of adipose cells as well as by increases in number. Beyond the 15th week of life, the depot grew exclusively by the process of cellular enlargement, with no further change in cell number. Severe starvation during the 6th wk of life followed by normal feeding had no lasting effect on cell size or cell number; prolonged semistarvation beginning in the 15th week greatly reduced cell size while cell number was unaffected. Likewise, extreme increases in depot size produced by hypothalamic lesions did not change cell number, but only cell size. The concept of a fixed number of mature adipocytes in the adult organism may be of central importance in caloric and metabolic equilibrium.

MEASUREMENTS OF CHOLESTEROL TURNOVER, SYSTHESIS AND ABSORPTION IN MAN, CARRIED OUT BY ISOTOPE KINETIC AND STEROL BALANCE METHODS. S. M. Grundy and E. H. Ahrens, Jr. (Rockefeller Univ., New York 10021). *J. Lipid Res.* 10, 91–107 (1969). We have estimated the daily synthesis of cholesterol in man by measuring the excretion of cholesterol and its conversion products during periods of controlled sterol intake (sterol balance method), using isotopic or chromatographic procedures (or a combination of the two). Estimates of daily synthesis by this method are based on the premise that the subject is in the metabolic steady state; i.e., the synthesis of cholesterol is equal to the balance (or difference) between the intake of cholesterol and the excretion of cholesterol and its products. To test this premise, we carried out sterol balances in 11 patients; simultaneously, after administration of isotopic cholesterol, turnover was calculated according to previously described models (one-pool, two-pool, or isotopid steady state models for the distribution of radioactive cholesterol within the various pools of the body). With calculations based on the one-pool model, turnover rates were considerably higher that estimates based on all other models, and reasons are given for considering these to be overestimates. Good agreement was obtained between results calculated from the two pool model and those based on sterol balance data; neither method is theoretically preferable.

LIPID COMPOSITION OF SUBCELLULAR PARTICLES OF HUMAN BLOOD PLATELETS. A. J. Marcus, H. L. Ullman and L. B. Safier (Hematology Sect., Veterans Admin. Hosp., New York 10010). *J. Lipid Res.* 10, 108–14 (1969). Human platelets can be fractionated into three main subcellular components: granules, membranes and a soluble fraction. In this study we determined the phospholipid and neutral lipid content of the granules and membranes. Quantitative relationships between lipids and protein were examined. The fatty acid and aldehyde composition of individual phospholipids and neutral lipids was also determined. Whole platelets had a lower lipid to protein ratio than did the subcellular particles, but the basic lipid composition of the granules, membranes and platelets was similar. The phospholipid composition of platelets and subcellular fractions was found to differ only in that granules had a lower percentage of lecithin. Each of the phospholipid classes displayed a distinctive fatty acid pattern which was the same in all fractions and in whole platelets. The major neutral lipid was free cholesterol. Cholesteryl esters, triglycerides and free fatty acids were minor components. The molar ratio of cholesterol to phospholipid in the platelet membranes was lower than that of brain myelin and erythrocyte ghosts. Some differences in fatty acid composition of the neutral lipids of platelet fractions were found.

DETECTION OF MONOHYDROXY "BILE" ACIDS IN THE BRAINS OF GUINEA PIGS AFFLICTED WITH EXPERIMENTAL ALLERGIC ENCEPHALOMYELITIS. S. H. M. Naqvi, B. L. Herndon, M. T. Kelley, V. Bleisch, R. T. Aexel and H. J. Nicholas (Dept. of Biochem., St. Louis Univ. School of Med., St. Louis, Mo. 63104). *J. Lipid Res.* 10, 115–20 (1969). 3α-Hydroxy-5β-cholanoic acid (lithocholic acid) and some unidentified acids (one of them perhaps 3β-hydroxy-cholest-t-en-26-oic acid) have

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been detected in the brains of guinea pigs afflicted with experimental "allergic" encephalomyelitis. None of the acids could be identified in comparable amounts of brain tissue from normal guinea pigs. Thin-layer chromatography of the free acids, and thin-layer and gas-liquid chromatography combined with mass spectrometry of the methyl esters were used for identification. The occurrence of these acids may possibly be the result of cholesterol oxidation in the brain. The acids, or compounds related to them, may play a role in development of demyelination in experimental allergic encephalomyelitis.

ISOLATION AND CHEMICAL CHARACTERIZATION OF $\Delta^{5,7,24}$-CHOLESTATRIEN-3$\beta$-OL FROM PIG TISSUES. T. J. Scallen, W. J. Dean, E. D. Loughran and B. V. Vora (Dept. of Biochem., School of Med., Univ. of New Mexico, Albuquerque, N.M. 87106). *J. Lipid Res.* 10, 121–27 (1969). Although indirect evidence has implicated $\Delta^{5,7,24}$-cholestatrien-3$\beta$-ol as a possible intermediate in cholesterol biosynthesis, this sterol has not previously been isolated from tissues. Administration of two inhibitors of cholesterol biosynthesis to pigs led to the accumulation of $\Delta^{5,7,24}$-cholestatrien-3$\beta$-ol in the tissues, and this sterol was isolated from the lung. Proof of its chemical identity was based upon UV, IR, NMR, circular dichrosism and mass spectra, as well as comparison with synthetic $\Delta^{5,7,24}$-cholestatrien-3$\beta$-ol. A fragment at m/e 143 is particularly prominent in the mass spectrum of $\Delta^{5,7}$-sterols, and this fact may prove useful for the detection of this functional group. It is proposed that $\Delta^{5,7,24}$-cholestatrien-3$\beta$-ol may be an intermediate in sterol biosynthesis in both animals and plants.

PHOSPHOLIPID METABOLISM DURING CHANGES IN THE PROPORTIONS OF MEMBRANE-BOUND RESPIRATORY PIGMENTS IN HAEMOPHILUS PARAINFLUENZAE. D. C. White and A. N. Tucker (Biochem. Dept., Univ. Kentucky Med. Center, Lexington, Kentucky 40506). *J. Bacteriol.* 97, 199–209 (1969). After a transition from high to low $O_2$ tension there was a 2X to 50X increase in the content of membrane-bound respiratory pigments in *Haemophilus parainfluenzae*. Concurrent changes in metabolism of membrane phospholipids were: a 2X decrease in P turnover in all phospholipids; a shift from one-phase linear to a complex bi-phase incorporation of phosphate into phospholipids; an increase in the total phospholipids with a slight increase in the proportion of phophatidyl glycerol and a slight decrease in the proportion of phosphatidyl ethanolamine. All through an incorporation experiment of 1.5 divisions the specific activity of the phosphate of PG was twice that of phosphatidic acid (PA). The phosphate of PG turned over 1.2 to 1.5 times more rapidly as the phosphate in PA in cells with high and low cytochrome levels. The results suggest that exchange reactions, in addition to synthesis from PA, were involved in phospholipid metabolism. These reactions were more sensitive to changes in oxygen concentration than to growth rate.

CONVERSION OF GLUCOSE-U-$^{14}$C INTO CARBON DIOXIDE, GLYCOGEN, CHOLESTEROL AND FATTY ACIDS IN LIVER SLICES FROM EMBRYONIC AND GROWING CHICKS. A. G. Goodridge (Univ. of Kansas Med. Center, Kansas City, Kans.). *Biochem. J.* 108, 665–61 (1968). Incorporation of glucose-U-$^{14}$C into carbon dioxide, glycogen, cholesterol and fatty acids and of $^3H_2O$ into cholesterol and fatty acids was measured in liver slices from embryos and growing chicks. During the embryonic period, rates of incorporation were low and stable for all pathways. Fatty acid synthesis and glucose oxidation increased promptly when the chicks were fed, reaching plateau levels within six days. Cholesterol and glycogen synthesis increased only slightly when the birds were fed. After 5 and 11 days, respectively, cholesterol and glycogen synthesis began to increase rapidly. The rate of glucose oxidation in liver slices from 4-week-old chicks was 20-fold greater than in slices of embryonic liver; glycogen, cholesterol and fatty acid synthesis had increased approximately 100-, 300- and 1000-fold respectively. The increase in the metabolism of glucose-U-$^{14}$C that occurred after hatching was probably due to the change from a high-fat non-carbohydrate diet (yolk) to a high-carbohydrate low-fat diet (mash).

CLEARING-FACTOR LIPASE IN ADIPOSE TISSUE. D. R. Wing and D. S. Robinson (Univ. of Oxford, England). *Biochem. J.* 109, 841–9 (1968). The rise in clearing-factor lipase activity that occurs when epididymal fat bodies from starved rats are incubated in appropriate media *in vitro* is inhibited by the presence of 6-N-2'-O-dibutyryl-3',5'-(cyclic)-AMP (1 mM). Inhibition occurs at a glucose concentration of 1.3 mg/ml or less, but not at a concentration of 2.4 mg/ml, unless caffeine is present. The concentration of free fatty acids in the epididymal fat bodies normally falls during incubation *in vitro* as the rise in clearing-factor lipase activity occurs. In the presence of 3',5'-(cyclic)-AMP, however, either the tissue free fatty acid concentration is increased or it does not fall to the same extent. The concentration of glucose in the incubation medium is important in determining the direction and extent of the changes in tissue free fatty acid concentration that occur in the presence of 3',5'-(cyclic)-AMP. The possibility that the concentration of this inhibitor in adipose tissue may regulate clearing-factor lipase activity, and that the regulation may occur through effects of the nucleotide on tissue free fatty acid concentration, is discussed.

STIMULATION OF LIVER CHOLESTEROL SYNTHESIS BY ACTINOMYCIN D. F. De Matteis (Med. Res. Council Labs., Carshalton, England). *Biochem. J.* 109, 775–85 (1968). An eightfold increase in the incorporation of acetate-2-$^{14}$C into liver cholesterol *in vivo* was observed 24 hours after starved rats had been given actinomycin D (0.5 mg/Kg of body wt.). Liver cholesterol radioactivity declined faster in the treated animals, suggesting a greater rate of cholesterol turnover. Liver slices from treated animals showed a tenfold increase in the incorporation of acetate-2-$^{14}$C into cholesterol; conversion into $CO_2$ and into fatty acids was less markedly increased, and conversion into ketone bodies was not significantly affected.

COMPARATIVE STUDIES OF THE RAT AND PIGEON LIVER FATTY ACID SYNTHETASES. D. N. Burton, A. G. Haavik and J. W. Porter (Univ. of Wisconsin, Madison, Wis.). *Arch. Biochem. Biophys.* 126, 141–54 (1968). The fatty acid synthetase of rat liver has been prepared in an essentially homogeneous state by a procedure similar to that used for the purification of the pigeon liver fatty acid synthetase. Both of these complexes synthesize free palmitic acid from acetyl- and malonyl-CoA in the presence of NADPH. Enzymic activities for the decarboxylation of malonyl-CoA and the synthesis of HMG-CoA and triacetic acid lactone are also associated with both fatty acid synthetases. The properties of the rat liver fatty acid synthetase have been investigated and compared to those of the pigeon liver enzyme. Close similarities were observed in molecular weight, thiol dependency, binding stoichiometry

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for acetyl- and malonyl-CoA, 4'-phosphopantetheine content, sulfhydryl and flavin content, inhibition by sulfhydryl binding reagents, pH optimum and amino acid composition. It is suggested, therefore, that the complexes have very similar structures. However, marked differences in the case of dissociation in phosphate buffers below 0.5 M were observed, together with differences in stability of the enzymes on electrophoresis and DEAE-cellulose chromatography. These results indicate that some differences exist in the binding of subunits in the two complexes.

EFFECT OF HEATED SOYBEAN OIL ON TISSUE LIPIDS. M. N. Perry and A. M. Campbell (Univ. of Tennessee, Knoxville, Tenn.). *J. Am. Dietetic Assoc.* 53, 575–8 (1968). Tissue lipid concentrations and growth were studied in rats fed unheated, commercially-used, and laboratory-heated oil. The oil was a lightly hydrogenated, fractionated soybean oil containing, prior to heating, 8, 70 and 23% palmitic, oleic and linoleic acid, respectively. Commercial use resulted in corresponding concentrations of 21, 61 and 14%, as compared with 7, 76 and 16% for the laboratory-heated sample. Serum, liver and muscle tissue were analyzed for total lipid, total phospholipid, phospholipid classes and fatty acid composition; adipose tissue was analyzed for fatty acid content. Growth, feed efficiencies and liver weights were not affected by the heated oils. Effects on tissue lipids appeared to depend on the manner in which the oil was heated and to differ among the tissues studied. Liver and adipose tissue lipids tended to reflect the dietary fatty acids. While the serum fatty acids were relatively unaffected by the dietary oils, the liver and adipose tissue lipids reflected the increase in palmitate and decrease in oleate and linoleate in the commercially-used oil. Livers of the three groups did not differ in total lipids, phospholipids or major phospholipid classes. Serum total lipids were affected more than were fatty acids. Laboratory-heated oil had a greater effect than did commercially-used oil, and the effects did not appear to be related to viscosity, fatty acid content or hydroxy acid content of the oil. Detection of serum lysolecithin only in the animals fed laboratory-heated oil also could not be related to any known factor in the oil. Differences in muscle lipids were not observed.

APPRAISING AND REVISING EDUCATIONAL HEALTH MATERIALS. M. C. Zukel (U.S. Dept. of Health, Education and Welfare, Arlington, Va.). *J. Am. Dietetic Assoc.* 54, 25–8 (1969). Steps taken before revising the patient teaching booklets, "Planning fat-controlled meals for 1200 and 1800 calories" and "Planning fat-controlled meals for unrestricted calories" and the changes made in these booklets are reported. It is concluded that patients following the diets prescribed in these booklets are experiencing lower serum cholesterol levels and weight reduction.

REVISING BOOKLETS ON FAT-CONTROLLED MEALS. M. C. Zukel (U.S. Dept. of Health, Education and Welfare, Arlington, Va.). *J. Am. Dietetic Assoc.* 54, 20–4 (1969). Two booklets on fat-controlled diets, published by the American Heart Association, have recently been revised. Background information, including data on nutrient composition of foods included in diets at four caloric levels is presented.

BIOSYNTHESIS OF FATTY ACIDS IN THE FREE-LIVING NEMATODE, TURBATRIX ACETI. M. Rothstein and P. Götz (State Univ. of New York, Buffalo, N.Y.). *Arch. Biochem. Biophys.* 126, 131–40 (1968). The free-living nematode, *Turbatrix aceti*, in axenic culture, has the ability to synthesize polyunsaturated fatty acids *de novo*. Experiments with labelled fatty acids have provided some insight into the metabolic pathways involved. Of particular interest is the synthesis of 8,11,14,17-eicosatetraenoic acid in greater quantities than the more common 5,8,11,14 isomer (arachidonic acid).

A DIETARY PROGRAM TO LOWER SERUM CHOLESTEROL. P. S. Remmell, M. P. Casey, R. B. McGandy and F. J. Stare (Harvard Univ. School of Public Health, Boston). *J. Am. Dietetic Assoc.* 54, 13–19 (1969). Observations on the serum cholesterol-lowering response of individuals who formerly participated in the National Diet-Heart study were made in a two-year follow-up program in which dietary advice was given to decrease moderately the consumption of saturated fat and cholesterol and moderately increase polyunsaturated fat intake. This study demonstrates that dietary change is acceptable to a group of healthy middle-aged men who receive proper nutritional information. Dietary change was successfully accomplished by altering patterns of consumption of foods readily and currently found on the market. A modification of dietary fat and cholesterol was beneficial in lowering serum cholesterol levels.

THE EFFECT OF CARNITINE, FATTY ACYL CARNITINE AND FATTY ACYL COENZYME A ON MITOCHONDRIAL CONTRACTION. J. Kuttis, M. Nakatani and W. C. McMurray (Univ. of Western Ontario, London, Ontario). *Arch. Biochem. Biophys.* 126, 634–46 (1968). The addition of fatty acid, ATP, $Mg^{++}$ and CoA to a rat liver mitochondrial suspension promoted swelling of the mitochondria which was reversed by the addition of carnitine. The carnitine-mediated contraction was blocked by respiratory inhibitors and was accompanied by an increased formation of mitochondrial fatty acyl carnitine. When palmityl(L)carnitine or palmityl CoA in the presence of carnitine were used as swelling agents, a spontaneous contraction of the mitochondria was observed which was independent of added ATP. Under these conditions the contraction was insensitive to oligomycin, but was inhibited by dinitrophenol or respiratory inhibitors. The results suggest that reversal of fatty acid-induced swelling may be linked to the transfer of fatty acyl groups across mitochondrial permeability barriers, and that the energy requirement for contraction may be derived from reactions coupled to fatty acid oxidation.

THE OXIDATION OF α-TOCOPHEROL DURING THE AUTOXIDATION OF ETHYL OLEATE, LINOLEATE, LINOLENATE AND ARACHIDONATE. L. A. Witting (Univ. of Illinois College of Medicine, Chicago, Ill.). *Arch. Biochem. Biophys.* 129, 142–51 (1969). The effect of α-tocopherol on the autoxidation of ethyl oleate, linoleate, linolenate and arachidonate *in vitro*, at 37C, was studied. At comparable concentrations, the efficiency of the antioxidant corresponded to the ratios 40:1:0.5:0.25 for oleate, linoleate, linolenate and arachidonate, respectively. The transition from slow to rapid autoxidation was dependent on the accumulation of a critical level of hydroperoxide which was approximately 4, 160, 320 and 640 times the residual level of α-tocopherol for the four fatty acid esters, respectively. When new free radicals were generated by the bimolecular breakdown of hydroperoxides, the rate of oxidation of α-tocopherol was affected by fatty ester structure. At low initial levels of α-tocopherol, $\leqslant$ 0.2 μ moles/g. ester, the transition from slow to rapid autoxidation occurred prior to formation of sufficient quantities of hydroperoxide to support the bimolecular reaction. When new free radicals were generated by the unimolecular breakdown of hydroperoxides, the rate of oxidation of α-tocopherol appeared to be independent of fatty ester structure. Failure to properly evaluate the effect of α-tocopherol concentration on the kinetics of α-tocopherol oxidation may lead to erroneous conclusions in experiments designed to determine the biochemical function of α-tocopherol.

THE HYPOLIPEMIC PROPERTIES OF 5 β-CHOLANIC ACID IN THE MOUSE AND RAT. E. E. Howe, D. K. Bosshardt, J. Gilfillan, V. M. Hunt and J. W. Huff (Merck Inst. for Therapeutic Research, Rahway, N.J.). *Arch. Biochem. Biophys.* 129, 264–72 (1969). Dietary 5 β-cholanic acid in the mouse caused a marked reduction of plasma cholesterol, an increase in rate of excretion of intraperitoneally administered $^{14}$C-labelled cholic and chenodeoxycholic acids and an increase in rate of excretion of orally administered $^{14}$C-labelled cholesterol. In this species it also caused a reduction in plasma triglycerides and an increase in liver size. Dietary 5 β-cholanic acid did not greatly influence the rate of synthesis of cholesterol by liver increase enates of normally fed mice, but did cause a striking increase in this parameter in mice in which liver cholesterol synthesis had been suppressed by feeding cholesterol. In the rat 5 β-cholanic acid caused a striking reduction in plasma triglycerides, but in sharp contrast to the effect observed in the mouse, a mild elevation of plasma cholesterol. In *in vitro* and *in vivo* experiments, in the presence of depressed cholesterol synthesis by dietary cholesterol, 5 β-cholanic acid caused a marked increase in rate of cholesterol synthesis by rat liver homogenates. Finally, in the rat, 5 β-cholanic acid caused a sharp increase in plasma post heparin lipoprotein lipase activity.

ISOMERIZATION OF LINOLENIC ACID BY RUMEN MICRO-ORGANISMS. P. Kemp and R. M. C. Dawson (Agric. Research Council Institute, Babraham, Cambridge). *Biochem. J.* 109, 477–8 (1968). The main fatty acid in the natural pasture diet of the ruminant is α-linolenic acid (*cis-cis-cis*-octadeca-9,12,15-trienoic acid) esterified in a number of complex lipids. After ingestion the linolenic acid is released in the rumen by the action of bacterial lipases and also hydrogenated with the eventual formation of stearic acid. It has been shown that the first stage of the metabolic sequence was a migration of the double bond in the 12-position to either the 11- or 13-

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position so that it forms a conjugated system with the 9- or 15-double bonds. The isomer formed is identified as *cis-trans-cis*-octadeca-9,11,15-trienoic acid.

BIOSYNTHESIS OF CYCLOPROPYL LONG-CHAIN FATTY ACIDS FROM CYCLOPROPANECARBOXYLIC ACID BY MAMMALIAN TISSUES IN VITRO. W. G. Duncombe and T. J. Rising (The Wellcome Res. Labs., Beckenham, Kent). *Biochem. J.* 109, 449–55 (1968). Radioactivity from cyclopropane[$^{14}$C]carboxylic acid is incorporated into fatty acids *in vitro* by rat and guinea-pig adipose tissue, by rat liver slices and by the supernatant fraction of rat liver homogenate. The labelled acids are different from endogenous straight-chain fatty acids, and evidence is produced that they consist a cyclopropyl ring in the $\omega$-position, the remainder of the chain being built up from $C_2$ units (not derived from cyclopropanecarboxylic acid) in the normal way via the malonate pathway. It is suggested that these unnatural acids have some metabolic effect related to the hypoglycaemic action of cyclopropanecarboxylic acid.

THE MECHANISM OF THYROTROPHIN ACTION IN RELATION TO LIPID METABOLISM IN THYROID TISSUE. T. W. Scott, S. C. Mills and N. Freinkel (Harvard Medical School, Boston, Mass.). *Biochem. J.* 109, 325–32 (1968). The effects of thyrotrophin *in vitro* on the incorporation of glucose, glycerol, palmitate and oleate labeled with $^{14}$C into the lipids of thyroid tissue were examined. Thyrotrophin increased the incorporation of these $^{14}$C-labelled precursors into phosphatidylinositol specifically. Thyrotrophin also increased the proportion of $^{14}$C radioactivity from labelled glucose, glycerol, palmitate and oleate incorporated into the 1,2-diglycerides. The addition of thyrotrophin to thyroid slices for 10 min., after 2 hours of prelabelling with $^{14}$C glycerol, also increased the proportion of radioactivity incorporated into the 1,2-diglyceride fraction. After incubation of thyroid tissue with 1-$^{14}$C palmitate, thyrotrophin caused a two- to three-fold increase in the radioactivity of palmitate isolated from phosphatidylinositol and 1,2-diglycerides. In contrast, the specific radioactivity of palmitate isolated from the choline and ethanolamine phosphoglycerides, 1,3-diglycerides and triglycerides was not increased by thyrotrophin.

LIPID COMPOSITION OF THE ISOLATED RAT INTESTINAL MICROVILLUS MEMBRANE. G. G. Forstner, K. Tanaka and K. J. Isselbacher (Harvard Med. School). *Biochem. J.* 109, 51–9 (1968). Rat intestinal microvillus plasma membranes were prepared from previously isolated brush borders and the lipid composition was analyzed. The molar ratio of cholesterol to phospholipid was greatest in the membranes and closely resembled that reported for myelin. Unesterified cholesterol was the major neutral lipid, with 30% of the neutral lipid fraction accounted for by glycerides and fatty acids. Five phospholipid components were identified and measured, including phosphatidyl- ethanolamine, choline and serine, sphingomyelin and lysophosphatidylcholine. No plasmalogen was detected. In contrast with other plasma membranes in the rat, the polar lipids of the microvillus membrane are rich in glycolipid, the cholesterol: polar lipid ratio being about 1:3. This ratio resembles that of the liver plasma membrane more closely than myelin or the erythrocyte membrane. The fatty acid composition of membrane lipids was altered markedly by a single feeding of safflower oil. Membrane polar lipids did not contain significantly more saturated fatty acids than cellular polar lipids. Differences in the proportion of some fatty acids in membrane and cellular glycerides were noted, reflecting perhaps the presence of specific membrane glycerides.

METABOLISM OF PHOSPHOLIPIDS BY SPERMATOZOA AND SEMINAL PLASMA. T. W. Scott and R. M. C. Dawson (Commonwealth Scientific and Indus. Res. Organization, Prospect, N. S. W., Australia). *Biochem. J.* 108, 457–63 (1968). The hydrolysis of added $^{32}$P-labelled phospholipids by whole ram and bull semen and the separated spermatozoal and plasma components was examined. The ethanolamine phosphoglycerides were rapidly attacked by washed spermatozoa, forming predominantly glycerylphosphorylethanolamine, but with whole semen and seminal plasma a lysophosphatidylethanolamine was also detected. The hydrolysis of lecithin by spermatozoa and plasma was very slow, and glycerylphosphorylcholine was the sole product detected. Ram testicular spermatozoa were comparatively inactive in metabolizing both phospholipids, but ampulla contents showed the same activity as ejaculated semen. Phosphatidylinositol was metabolized by spermatozoa obtained from any portion of the ram reproductive tract and also by seminal plasma. With testicular components, ampulla contents and washed ejaculated spermatozoa, inositol monophosphate, an unidentified phosphate ester and inorganic phosphate were the main products. In contrast, with whole semen and seminal plasma, glycerylphosphorylinositol was the predominant water-soluble phosphate ester. Accessory-gland secretion obtained from vasectomized rams showed a pronounced phospholipase A activity towards ethanolamine phosphoglyceride. On aerobic incubation of whole ram semen there was a decrease in the concentration of all phospholipid classes, although cardiolipin showed the greatest percentage decrease. In the choline phosphoglyceride fraction, this loss was confined to the plasmalogen component. This breakdown of phospholipids was decreased considerably when the spermatozoa were washed, and was not observed when whole bull semen was incubated under similar conditions.

THE FUNCTIONAL STATUS OF LIPOPROTEIN LIPASE IN RAT LIVER. P. A. Mayes and J. M. Felts (Royal Veterinary College, London). *Biochem. J.* 108, 483–7 (1968). Acetone-dried powders of liver and heart tissues from rats given a high-carbohydrate diet or a fat meal were assayed for lipoprotein lipase activity. Heart tissue showed typical lipoprotein lipase activity, whereas none was detected in liver by the usual assay procedures. When mixed acetone-dried powders were prepared from heart plus liver, there was a marked suppression of the expected activity, indicating that an inhibitor was present. This inhibition was partially overcome in the presence of relatively large amounts of heparin. Lipoprotein lipase was also detected in liver alone when large quantities of heparin were added to the assay system. No increase in lipoprotein lipase activity in either liver or heart was detected when rats were given a fat meal. It is concluded that the liver of rats contains lipoprotein lipase that is normally present in an inactive state. The results imply that heparinase is the agent responsible for the inactivation. The significance of the non-functional status of lipoprotein lipase in the liver is discussed. The results support the view that direct hydrolysis of plasma triglycerides by the liver is not a significant physiological process.

ENZYMATIC REGULATION OF 3-SN-PHOSPHATIDYLCHOLINE AND TRIACYLGLYCEROL SYNTHESIS IN STATES OF ALTERED LIPID METABOLISM. D. L. Young and F. Lynen (Dept. of Medicine, Duke Univ. Med. Center, Durham, N.C. 27706). *J. Biol. Chem.* 244, 377–83 (1969). Specific activities of phosphorylcholine-glyceride transferase and diglyceride acyltransferase, which catalyze the biosynthesis of 3-*sn*-phosphatidylcholine and triacylglycerol, respectively, from the common substrate 1,2-diacyl-*sn*-glycerol, were measured in liver microsomal preparations from alloxan-diabetic rats and from rats treated with triiodothyronine and propylthiouracil. Diglyceride acyltransferase was induced in both the ketotic diabetic and the triiodothyronine-treated animals but was repressed in the propylthiouracil-treated group. Phosphorylcholine-glyceride transferase specific activity was unchanged by propylthiouracil treatment. In the ketotic diabetic and triiodothyronine-treated animals the magnitude of changes in phosphorylcholine-glyceride transferase activity differed from that of diglyceride acyltransferase. The direction and magnitude of changes in the specific activity of these enzymes are compatible with their acting as regulators of 3-*sn*-phosphatidylcholine and triacylglcerol synthesis at the 1,2-diacyl-*sn*-glycerol branch point in the complex lipid biosynthetic pathway. The data

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are compatible with a possible association between the regulation of synthesis *de novo* of 3-*sn*-phosphatidylcholine and the assembly and release of lipoproteins from the liver. Methods for the chemical synthesis of phosphorylcholine and palmityl coenzyme A are described which are suitable for preparation of radioactively labeled substrates.

HYPOCHOLESTEROLEMIC EFFECT OF POLYSACCHARIDES AND POLYSACCHARIDE-RICH FOODSTUFFS IN CHOLESTEROL-FED RATS. S. Kiriuama, Y. Okagaki and A. Yoshida (Dept. of Nutr., School of Med., Tokusjima Univ., Tokushima, Japan). *J. Nutr.* 97, 382–88 (1969). The hypocholesterolemic effect of cellulose, sodium carboxymethylcellulose (CMC), pectin, alginic acid (free) agar-agar, gum arabic, konnyaku powder (prepared from the tubers of *Amorphophalus konjac*), konbu (*Laminaria japonica*), hijki (*Hijikia fusiformis*) and aonori (*Enteromorpha prolifera*) was examined in rat fed hypercholesterolemic diets. The hypocholesterolemic effect was reconfirmed for pectin and a new demonstration of the plasma- and liver cholesterol-depressing activity was achieved for CMC and konnyaku powder. Absorption of cholesterol was significantly depressed in rats fed pectina and konnyaku powder, but rats fed CMC showed no alteration in cholesterol absorption as compared with the control group. The activity of konnyaku powder, which is known to be hydrolyzed by intestinal microorganisms, did not increase by the combined administration of antibiotics. From these facts, it appears that the mechanisms depressing plasma cholesterol differ appreciably in these three substances.

STEREOSPECIFIC HYDROXYLATION OF LONG CHAIN COMPOUNDS BY A SPECIES OF TORULOPSIS. E. Heinz, A. P. Tulloch and J. F. T. Spencer (Nat. Res. Council of Canada, Prairie Regional Lab., Saskatoon, Saskatchewan, Canada). *J. Biol. Chem.* 224, 882–88 (1969). A species of yeast of the genus *Torulopsis* hydroxylates long chain $C_{18}$ compounds and then converts them to glycosides of 17-L-hydroxy $C_{18}$ fatty acids. Incubation of methyl (17-$^{18}$O)hydroxyoleate with whole cells and of methyl oleate in the presence of $^{18}O_2$ or $H_2{}^{18}O$ showed that the oxygen atom, introduced on hydroxylation, is not lost on glycoside formation and that it is derived from molecular oxygen and not from water. Esters of (18-$^2H_3$), (16,18-$^2H_5$), (17-$^2H_2$), (17-D-$^2$H), and (17-L-$^2$H)octadecanoates have been synthesized. On incubation of these compounds no deuterium atoms at C-16 and C-18 are removed by the 17-L-deuterium atoms is lost. Unsaturated intermediates are, therefore, most probably not involved and 17-L-hydroxy acid is produced by displacement of and L-hydrogen atom (retention of configuration). The rate of formation of glycoside from L-deuterostearate was less than half of that from D-deuterostearate or from unlabeled stearate, suggesting the operation of primary isotope effect.

PLASMA LEVELS OF FFA, GLYCEROL, β-HYDROXYBUTYRATE AND BLOOD GLUCOSE DURING THE POSTNATAL DEVELOPMENT OF THE PIG. G. Bengtsson, J. Gentz, J. Hakkarainen, R. Hellstrom and B. Persson (Dept. of Pediatrics, Karolinska Inst., Kronprinsessam Lovisas Barnsjakhus, Stockholm). *J. Nutr.* 97, 311–15 (1969). Levels of plasma free fatty acids (FFA), glycerol, β-hydroxybutyrate and blood glucose were determined in 175 sow-nursed piglets ranging in age from newborn to 9 weeks old, and in 22 newborn piglets starved up to 24 hours after birth. At birth, the concentrations of FFA and glycerol are very low. Animals starved for 6 to 24 hours from birth show a very moderate increase in FFA and unchanged or decreased concentrations of glycerol and β-hydroxybutyrate. These results are probably related to the low content of body fat in the newborn pig. During the first hours of suckling there is a significant rise in FFA and glycerol. A significant positive correlation between these parameters was found in two groups, aged 16 to 24 hours and 9 weeks. β-Hydroxybutyrate is extremely low in cord blood. A slight but significant increase is seen after birth with the peak value occurring between 8 and 12 hours. The blood glucose level is low at birth and there is a significant increase after the first nursing. The same glucose level persists throughout the first weeks of life. No correlation was found between glucose and FFA levels.

BIOCHEMISTRY OF THE SPHINGOLIPIDS. XVIII. COMPLETE STRUCTURE OF TETRASACCHARIDE PHYTOGLYCOLIPID. H. E. Carter, D. R. Strobach and J. N. Hawthorne (Div. of Biochem., Dept. of Chem., Univ. of Illinois, Urbana, Ill.). *Biochemistry* 8, 383–388 (1969). The tetrasaccharide (2-mannosido-6-(D-glucosamido-(1–4)-D-glucuronido) inositrol (obtained from the hydrolysis of phytoglycolipid has been oxidized with periodate and the products reduced with sodium borohydride. Isolation of D-arabitol as one of the polyol products shows that in the tetrasaccharide the inositol is 2,6-disubstituted. Proton magnetic resonance studies on the derived glucosylinositol and carboxyl-reduced N-acetyl trisaccharide showed that the glucuronic acid moiety was attached to the 6 position of inositol. The mannose, therefore, must be attached to the 2 position of inositol. Also deduced from proton magnetic resonance spectra was the all-D-configuration of the tetrasaccharide. Confirmation of this came from the time of half-hydrolysis of the N-acetyl trisaccharide. The point of attachment of the phosphate to the inositol in phytoglycolipid was shown to be through the 1 position by oxidation studies on the intact phytoglycolipid. The latter point was substantiated by mild acid hydrolysis of phosphorylated oligosaccharide to afford only inositol 1-phosphate.

XIX. STUDIES ON AN EPIMERIZATION PHENOMENON IN THE OLIGOSACCHARIDE OF PHYTOGLYCOLIPID. H. E. Carter, A. Kisic, J. L. Koob and J. A. Martin. *Ibid.*, 389–393. Phytoglycolipids from various plant seeds yield on alkaline hydrolysis a mixture of oligosaccharides which on further acid hydrolysis give a common trisaccharide, glucosamidoglucuronidoinositol. In a more detailed study of the trisaccharide fraction from corn a relatively water-insoluble material was isolated amounting to 15% of the total. This material has now been identified as glucosamidoiduronidoinositol. In a study of the possible origin of the insoluble trisaccharide it was discovered that glucosamidoglucuronidoinositol and glucuronidoinositol are partially epimerized to the corresponding iduronido derivatives in yields of 15 and 27%, respectively, by treatment with hot $Ba(OH)_2$ solution. These findings are in accord with the facile 50% epimerization of unsubstituted glucuronic acid to iduronic acid. Phytoglycolipid (tri- and tetrasaccharide mixture) was esterified and reduced thus converting the hexuronic acid moiety to hexose. Hydrolysis of the reduced material yielded glucose but no idosan. Nitrous acid degradation of the tri- and tetrasaccharide mixture (obtained by alkaline hydrolysis) gave glucosylinositol but no idosylinositol was obtained. Therefore it can be concluded that iduronic acid is not present in phytoglycolipids but is an artifact produced by the alkaline treatment used in hydrolysis of the glycolipid. The facile eperimization of glucuronido derivatives under alkaline conditions is a matter of concern in dealing with various glucuronic acid containing polymers.

BILE ACIDS. XXVI. THE METABOLISM OF 12α-HYDROXYCHOLANOIC ACID-24-$^{14}$C IN THE RAT. R. C. Sonders, S. L. Hsia, E. A. Doisy, Jr., J. T. Matschiner and W. H. Elliott (Dept. of Biochem., St. Louis Univ., School of Med., St. Louis, Mo. 63104). *Biochemistry* 8, 405–413 (1969). 12α-Hydroxycholanoic acid-24-$^{14}$C was administered intraperitoneally to each of three rats with bile fistulas. Within 24 hr most of the administered $^{14}$C was recovered in bile. After alkaline hydrolysis of the conjugated bile acids, the free bile acids were separated

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## *AOCS-AACC Joint Short Course . . .*

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production of imitations and production of new food products and others will be examined. The potential marketing problems for each alternate and the relative costs of gaining consumer acceptance will be discussed. In conclusion, the potential market for new protein products will be analyzed.

Registration forms have been sent to all society (association) members in a separate mailing. If you have misplaced the forms or need extras, send your requests to: Oilseed Protein Short Course, American Oil Chemists Society, 35 E. Wacker Drive, Chicago, Illinois 60601.

The Short Course is being offered at a complete cost of $160. Students will be charged $80. Accompanying spouse will be charged $65. Lodging for three nights and nine meals are included.

Ample facilities will be available to keep your family entertained while you are learning about proteins. Then too, you will have an afternoon free to join your family or friends in a game of golf or other recreation, if you do not choose to attend informal sessions on the short course subject matter which will also be scheduled during this "free" afternoon.

To be certain of a confirmed reservation, your completed registration form and check covering the full cost of the Short Course should be in the AOCS office by June 27.

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by partition chromatography. Of the chromatographed $^{14}C$, 12% was identified as unchanged 12α-hydroxycholanoic acid, 26% as 7α,12α-dihydroxycholanoic acid, 18% as deoxycholic acid, 15% as cholic acid and a small amount of 6β,12α-dihydroxycholanoic acid, a new bile acid. Methods of preparation and data for characterization of the new acid are provided. These results extend earlier observations on the ability of the rat to oxygenate the nucleus of cholanoic acid at position 7 in the absence of a 3α-hydroxyl group and suggest a limited ability to oxygenate 12α-hydroxycholanoic acid in the 6β position.

ALKYL AND ALK-1-ETHERS OF GLYCEROL IN LIPIDS FROM NORMAL AND NEOPLASTIC HUMAN TISSUES. F. Snyder and R. Wood (Med. Div., Oak Ridge Assoc. Univ., Oak Ridge, Tenn. 37830). *Cancer Res.* 29, 251–57 (1969). The alkyl and alk-1-enyl glyceryl ether content of the neutral glyceride and phosphoglyceride fractions of 17 different human tumors and 19 normal human tissues was quantitatively determined. Neoplastic tissues generally contained much higher quantities of ether-linked neutral glycerides (primarily the alkyl type) than most normal tissues. Alkyl ethers in the phosphoglyceride fraction were also higher in most neoplasms, although the difference from normal tissues was not so pronounced as that observed for the glyceryl ethers present in the neutral glyceride fraction. The data obtained in this investigation of human tissues agree with previous observations from animal experiments, i.e., high levels of glyceryl ethers are a characteristic biochemical feature of neoplasia. The data have also shown the relative proportions of alkyl and alk-1-enyl ethers of glycerol in a variety of healthy human tissues. The highest quantities of glyceryl ethers were found in the neutral glyceride fraction of heart and kidney and in the phosphoglyceride fraction of lung, brain, spleen, larynx, heart, colon and testes.

COMPOSITION AND PREPARATION OF EXPERIMENTAL INTRAVENOUS FAT EMULSIONS. P. Schurr (Cardiovascular Diseases Res., The Upjohn Co., Kalamazoo, Mich. 49001). *Cancer Res.* 29, 258–60 (1969). Components and procedures used to prepare intravenous fat emulsions for animal experiments are described. These are exemplified by details for making the emulsions containing 7,12-dimethylbenz(a)anthracene used to induce mammary cancer and leukemia.



DIET AND CORONARY HEART DISEASE, DIETARY ANALYSIS ON FIFTY FEMALES. Aileen Finegen, N. Hickey, B. Maurer, and R. Mulcahy (The Coronary Heart Disease Res. Unit, St. Vincent's Hosp., Dublin 2, Ireland). *Am. J. Clin. Nutr.* 22, 8–9 (1969). No significant differences were noted in the dietary background of 50 female patients with classical CHD when compared with 50 age- and sex-matched controls. The female subjects consumed about 20% fewer calories than age-matched males, but no significant differences were noted in the proportion of different foodstuffs consumed by the two sexes.

VITAMIN A DEFICIENCY AND PHOSPHOLIPID METABOLISM. R. F. Krause, Kathryn Beamer and Charlotte Lawrence (Dept. of Biochem., West Va. Univ. Med. Center, Morgantown, W. Va. 26506). *Am. J. Clin. Nutr.* 22, 27–32 (1969). One, two, and three hours after subcutaneous administration of approximately 0.08 mc $^{32}P_i$ to both vitamin A-deficient and pair-fed control rats, livers were removed and subcellular phospholipids analyzed for radioactivity. The specific activity of the lipid-P was higher in all vitamin A-deficient subcellular lipid fractions than in controls. The specific activity of phosphatidyl ethanolamine was higher than lecithin in all fractions. Vitamin A deficiency did not alter the percentages of lecithin and phosphatidyl ethanolamine found in the various subcellular fractions. The subcutaneous administration of 1,000 IU vitamin A 72 hr before injection of $^{32}P_i$ reduced the specific activity of all subcellular phospholipid fractions to control levels. Fasting (72 hr) increased the specific activity of the mitochondrial lipid from both control and deficient animals, but the specific activity of the vitamin A-deficient rats remained higher.

COMPOSITION OF HUMAN CHYLE CHYLOMICRONS FOLLOWING SINGLE FAT FEEDINGS. C. Schlierf, W. H. Falor, P. D. Wood, Y. Lee and L. W. Kinsell (Metabolic Res., Highland Gen. Hosp., Oakland, Calif.). *Am. J. Clin. Nutr.* 22, 79–86 (1969). A meal containing a well-defined fat and a very small amount of radioactively labeled free cholesterol was fed in two consecutive studies to a male patient with cannulation of the left thoracic duct. Chyle was collected for 15 or 16 hr following the meal. Recovery of fed fat was 19–27%, and of fed cholesterol radioactivity, only 2.5–3.6%. Absorbed cholesterol traveled predominantly on the chylomicron fraction of total chyle and was present in both the free and esterified forms. Phosphatidyl choline was the predominant phospholipid of chyle chylomicrons (77 mole % of total phospholipids) followed by phosphatidyl ethanolamine (16%) and sphingomyelin (7%); lysophosphatidyl choline was not detected. The fatty acid composition of the fed fat had some influence on the fatty acid composition of chylomicron cholesterol ester but a lesser influence on the composition of chylomicron phosphatidyl choline and phosphatidyl ethanolamine. Chylomicron sphingomyelin was virtually unaffected by the nature of the fat fed, and the characteristic fatty acids of chain length greater than $C_{18}$ were present in significant proportions.

INCREASED ADRENAL $\Delta^5$-3β-HYDROXYSTEROID DEHYDROGENASE IN VITAMIN A-DEFICIENT COCKERELS. Cheryl F. Nockels and R. B. Herrick (Dept. of Avian Science, Col. State Univ., Fort Collins, Col. 80521). *Proc. Soc. Exp. Biol. Med.* 130, 410–12 (1969). Mild vitamin A deficiency in SCWL cockerels increased $\Delta^5$-3β-hydroxysteroid dehydrogenase concentration in the adrenal cortices and decreased the enzyme concentration in the Leydig cells of the testis. The vitamin A deficiency produced significantly larger combs and testes, increased spermatozoa maturation, and reduced bursa of Fabricius size. The increase in adrenal enzyme may account for the testicular effects observed.

FAT AND NITROGEN BALANCE WITH MEDIUM-CHAIN TRIGLYCERIDES AFTER MASSIVE INTESTINAL RESECTION. K. G. Pinter, H. Hyman and O. Bolanos (Jeggerson Med. Center, 6431 Airline Highway, Metairie, La. 70003). *Am. J. Clin. Nutr.* 22, 14–20 (1969). Three patients with massive intestinal resection were studied to determine the effect of substituting medium-chain triglycerides for long-chain triglycerides on fat and nitrogen balance. On the medium-chain triglyceride-supplemented diet there was a reduction of steatorrhea and there was also an improvement in nitrogen balance. The abnormally low serum lipids were improved. The patients with diarrhea experienced a decrease in the number of bowel movements. The possible causes for these results are suggested to be decreased intestinal motility, improved proteolysis in the gut, and the beneficial effects of protein sparing by the greater number of available calories for the maintainance of homeostasis.

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VARIABILITY OF PLASMA PHOSPHOLIPIDS IN NORMAL ADULTS. W. H. R. Nye (Univ. of New Mex., Dept. of Med., Albuquerque, N. Mex.). *Am. J. Clin. Nutr.* 22, 5–7 (1969). Plasma lipids are known to be influenced by dietary history and by other environmental factors. To assess the amount of variation that occurs in phospholipid composition, individual plasma phospholipids have been determined serially under strict dietary control, employing eight dietary periods and two normal subjects. Coefficients of variations (CV) of serial samples frequently exceed cv of replicate analyses, but are of the same order of magnitude as cv of other biological variables. Mean spinglmyelin and lecithin vary at times with changes in diet. Proportions among the individual plasma phospholipids are thus not as stable as has been generally thought.

STUDIES ON PHOSPHOLIPASE A. I. ISOLATION AND CHARACTERIZATION OF TWO ENZYMES FROM CROTALUS ADAMANTEUS VENOM. M. A. Wells and D. J. Hanahan (Dept. of Biochem., College of Med., Univ. of Arizona, Tucson 85721). *Biochemistry* 8, 414–423 (1969). Two proteins with phospholipase A activity were purified from *Crotalus adamanteus* venom by a combination of gel filtration; chromatography on a weak cation-exchange resin, DEAE-cellulose, and SE-Sephadex; and crystallization. Both proteins have the same sedimentation coefficient (3.11 S), diffusion coefficient ($9.02 \times 10^{-7}$ cm$^2$/sec), molecular weight (30,000, as determined from sedimentation and diffusion coefficient and high-speed equilibrium ultracentrifugation), extinction coefficient ($E^{1\%}_{280}$ 22.7), frictional coefficient (1.16), partial specific volume (0.718 ml/g), and indistinguishable amino acid analyses. However the two proteins are clearly separated on disc gel electrophoresis. Both proteins have specific activities of 3200 $\mu$equiv of fatty acid released/min per mg as assayed in ether-methanol solutions using phosphatidylcholine as substrate. There are some unusual features in the amino acid compositions. Out of a total of 266 residues there are 24 residues of glycine, 16 residues of proline, and 15 residues of cystine. There are no detectable free sulfhydryl groups. Both proteins are extremely stable. One enzymatically active protein is not generated from the other during the isolation procedure. All attempts to characterize the difference between the two proteins by tryptic fingerprinting have been unsuccessful.

CONTROL OF FATTY ACID METABOLISM. I. INDUCTION OF THE ENZYMES OF FATTY ACID OXIDATION IN ESCHERICHIA COLI. G. Weeks, M. Shapiro, R. O. Burnes and S. J. Wakil. (Dept. Biochem., Duke Univ. Med. Center, Durham, N. Carolina 27706). *J. Bacteriol.* 97, 827–836 (1969). Fatty acid oxidation in *E. coli* is an inducible system. The inhibitory effect of glucose on growth is explained in terms of catabolite repression. The activities of the five key enzymes of $\beta$ oxidation vary coordinately over a wide range indicating all are under unit control. Induction of the enzymes of $\beta$ oxidation is a function of fatty acid chain length, C10 and C12 are not inducers while C14 and longer fatty acids are.

INFLUENCE OF PENTACHLOROPHENOL ON FATTY ACIDS OF COHO SALMON (ONCHORGNCHUS KISUTCH). D. Hanes, H. Krueger, L. Tinsley and C. Bond (Oregon St. Univ., Corvallis, Ore.). *Proc. West. Pharmacol. Soc.* 11, 121–5 (1968). Control salmon catabolized 25% of their available fatty acids (mass in diet plus mass in Day 0 salmon) over a 14-day period compared to 47% in potassium pentachlorophenate (KPCP) poisoned salmon. Individual fatty acids showed a tendency to be either lost or conserved due to their different rates of net catabolism. The tendency of each acid to be lost or conserved was the same in both untreated and KPCP poisoned salmon. The excess net catabolism of each fatty acid in salmon under KPCP poisoning was directly proportional to the available mass of that fatty acid.

# • Drying Oils and Paints

CYCLIC COMPOUNDS SEPARATED FROM HEATED OILS AND FATS. III. CYCLIC MONOMER OBTAINED FROM HEATED LINSEED OIL IN THE ABSENCE OF CATALYST AND SOLVENT. Hyoji Kusaka and Noboru Matsuo (Seikei Univ., Tokyo). *Yukagaku* 17, 671–5 (1968). Linseed oil was heated 12 hours at 275C in $CO_2$, then saponified to give linseed oil fatty acids. Esterification gave the methyl ether. Distillation and formation of urea adduct gave 11% non-urea adduct (cyclic monomer) and 62% urea adduct-forming ester (straight chain).

ROLE OF SURFACE-ACTIVE AGENTS, PARTICULARLY PHOSPHOAMINOLIPIDS, IN VARIOUS PAINT SYSTEMS. H. Kittel. *Double Liaison* No. 155, 807–16 (1968). The author recalls the general principles of wetting and the properties of a good wetting agent, then studies wetting agents of the phosphoaminolipid type, generally called lecithins. He compares the $\alpha$ and $\beta$ lecithins, cephalin, serin-cephalin, inositol phosphatide and the diphosphoric ester of inositol, in respect of structure and chemical properties. However, the composition of natural lecithins is variable because there are many possibilities concerning the nature of the fatty acids that esterify two to the three alcoholic functions of glycerol, leading to differences in the properties of natural lecithins. The raw materials must be refined to obtain products with constant properties. Comparisons are made between the results obtained with raw and refined lecithins. (Rev. Current Lit. Paint Allied Ind. No. 317)

CASTOR OIL CHEMISTRY. G. Silverstone. *Austral. O.C.C.A. Proc. & News* 5 No. 8, 4 (1968). The many uses to which castor oil may be put are briefly surveyed with particular reference to the chemistry of ricinoleic acid and the fatty acid mixtures produced from the oil by different techniques of dehydration. Some work on the simultaneous dehydration and polymerisation of methyl ricinoleate and the clay-catalysed polymerisation of a dehydrated castor oil fatty acid of high conjugation is described and also a recent method of *cis/trans* isomerisation of unsaturated systems. (Rev. Current Lit. Paint Allied Ind. No. 319)

THE OXYCOPOL PROCESS. R. A. Austin, G. Pylant and E. K. Harper. *American Tung Oil Topics* 12, No. 1, 2–7 (1968). The manufacture of varnishes from pure phenolic resins and tung oil, through an oxidative-polymerisation process, is described. Such vehicles are prepared at steam temp., yet they are equal to or superior in overall performance to the conventional tung oil/pure phenolic resin varnishes prepared at high temps. They are superior to moisture-cured urethanes in durability, toughness without flaking, and adhesion. (Rev. Current Lit. Paint Allied Ind. No. 317)

NEW OILS AND FATTY ACIDS FOR SURFACE COATING RESIN MANUFACTURE. K. B. Gilkes and T. Hunt (BP Chemicals (UK) Ltd., Plastics Dept., Sully, Penarth, Glamorgan). *J. Oil Colour Chem. Assoc.* 51, 389–401 (1968). Some recent developments are reviewed in the field of oils and fatty acids for the manufacture of surface coating resins. Materials for both air-drying and stoving systems are considered. They are arranged under the following headings: 1. New conventional fatty acids. 2. New synthetic acids. 3. New drying oils derived from conventional drying oil fatty acids. 4. Synthetic alternatives to conventional drying oils.

NEW COATINGS BASED ON DRYING OIL ALDEHYDES AND HYDROXYL BEARING RESINS. *J. Paint Technol.* 41, 17–24 (1969). P. R. Sampath and A. E. Rheineck (No. Dakota St. Univ., Polymers and Coatings Dept., Fargo, N.D. 56102). The preparation and properties of coatings based on linseed mono-aldehyde oil are described. A number of derivatives were prepared via reaction at the aldehyde functionality with resinous polyols while preserving the olefinic unsaturation in the oil moiety. The hydroxyl bearing resins that gave useful products comprise the copolymers of hydroxyethyl methacrylate with various proportions of methyl methacrylate, ethyl acrylate and styrene. This is a possible way of preparing oil modified acrylic resins. In addition, commercially available hydroxyl terminated hydrocarbon resins like Poly BD CS15, a styrene-butadiene copolymer resin, and RJ-100, a styrene-allyl alcohol copolymer, were tried as the resinous polyols. High molecular weight products were prepared combining the advantages of both oil unsaturation and increased molecular weights. Satisfactory coatings were obtained with products containing aldehyde oils in proportions ranging from 20–55% by weight. A number of these products gave satisfactory air drying films and were found to have good film properties. These new types of aldehyde oil derivatives offer an interesting approach to the effective utilization of linseed oil in paint formulations.

EPOXIDIZED URETHANE OILS. J. E. Masters (Celanese Coatings Co.). *U.S. 3,424,766.* A process for preparing epoxidized urethane oils comprises: (a) alcoholizing an epoxidized triglyceride oil with a polyol to form an epoxidized ester containing unreacted hydroxyl groups; the polyol should contain 2–6 aliphatic hydroxyl groups and no other groups reactive with ester groups and should be used in an amount to give 1 to 6 hydroxyl groups per mol of the oil; and (b) coupling the hydroxyl containing epoxidized ester with a diisocyanate

by reaction of the isocyanate group with the hydroxy groups in the ratio of 0.8 to 1 isocyanate groups per hydroxyl group to form an epoxidized urethane oil.

SALTS OF PARTIAL FATTY ESTERS OF CARBOXYLIC POLYMERS USEFUL IN AQUEOUS COATING COMPOSITIONS. M. Skoultchi and J. Fertig (National Starch and Chemical Corp.). *U.S. 3,428,588.* A method of preparing air-drying, crosslinkable resin compositions comprises the process of reacting a vinyl polymer containing anhydride groups within its molecule with an ester-alcohol derived from an unsaturated fatty acid.

## • Detergents

REGENERATION OF WEAKLY ACIDIC CATION EXCHANGERS CHARGED WITH DETERGENTS. C. Oehme and H. Brost (Farbenfabriken Bayer A.G.). *U.S. 3,420,774.* A process is claimed in which nonionic detergents are desorbed from a weakly acidic cation exchanger by means of alkaline aqueous solutions, followed by regeneration of the ion exchanger with dilute aqueous mineral acid.

DETERMINATION OF NONIONIC SURFACTANTS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. J. C. Sheridan, E. P. K. Lau and B. Z. Senkowski (Anal. Res. Lab., Hoffman-La Roche, Inc., Nutley, N.J. 07110). *Anal. Chem.* 41, 247–50 (1969). A quantitative method for the rapid determination of nonionic surfactants is described. The surfactant is precipitated as a heteropoly phosphomolybdic acid-barium complex and the molybdenum in the supernatant solution is assayed by atomic absorption. Optimum conditions for the analysis of high levels of molybdenum in the presence of high levels of barium were determined. The effect of other cations of the solution was determined.

EVAPORATION RETARDED BY MONOLAYERS. F. MacRitchie (C.S.I.R.O. Wheat Res. Unit., North Ryde, Australia). *Science* 163, 929–931 (1969). The reduction in the steady-state rate of evaporation of water by hexadecanol monolayers depends only on the air velocity above the surface and is independent of the absolute rate of evaporation up to air velocities of 40 centimeters per second. This indicates that the monolayer does not affect the vaporization step but increases the size of the diffusion boundary layer. The mechanism (the creation of a surface pressure gradient in the monolayer which reduces the net stress on the surface by the air) is discussed.

OBSERVATION OF THE STATE OF NATURAL FATTY SOIL AND ITS MODEL SUBSTANCES ON POLYETHYLENE IN VARIOUS WASHING SOLUTIONS. Teruo Tsunoda and Yoichi Oba (Hitachi Central Lab., Tokyo). *Yukagaku* 18, 41–6 (1969). Behaviors of natural fatty soil extracted from soiled cloth and its model substance on polyethylene in various washing solution were observed. Rolling up phenomenon did not occur for the natural fatty soil placed on polyethylene in 0.1% sodium dodecylbenzene-sulfonate (NaDBS) aqueous solution. Small liquid drops were removed from soiled surface in aqueous solution of alkaline builders such as sodium tripolyphosphate (STPP) and sodium metasilicate. Any change for the state of soiled model substances such as tristearin, stearic acid and paraffin wax was not recognized in all solutions. However, rolling up phenomenon was observed for squalene in aqueous solution in both NaDBS and STPP. The change of behavior of mixtures containing various ratios of squalene and oleic acid was also observed as a function of immersion time in aqueous solutions of NaDBS and STPP and of a 1:2 mixture of NaDBS and STPP.

THE INFLUENCE OF ANIONIC SURFACTANTS ON THE ADSORPTION OF SURFACE ACTIVE CATIONS. H. Müller and E. Krempl (Farbwerke Hoechst A. G., Frankfort, Germany). *Tenside* 5, 333–5 (1968). The adsorption of cationic surfactants on solid interfaces is influenced by anionic surfactants. In aqueous solution the adsorption increases with the presence of long-chain carboxylic acid anions. The adsorption maximum is fairly close to the equivalence point, while with increased excess of anionic surfactant the adsorption rate of the surface active cations is reduced. In non-aqueous systems, the adsorption of cationic surfactants is less dependent on the kind and quantity of anionic surfactants.

THE MEASUREMENT OF THE DYNAMIC SURFACE TENSION USING THE METHOD OF MAXIMUM BUBBLE PRESSURE. J. Kloubek (Czechoslovak Acad. of Sciences, Prague). *Tenside* 5, 317–23 (1968). The bubble pressure method for determining the time dependency of the surface tension of liquids is discussed. An instrument developed by Sudgen, which was modified for the determination of the dynamic values, is described, along with the method for calculating results. The determination of the instrument constant and the reproducibility for pure liquids and for solutions of dodecylamine are discussed. The results reported indicate the range of applicability of the method.

EXPERIMENTS WITH FATTY ALCOHOL ETHER SULFATES, I. ELIMINATION OF FOAM DEPRESSION CAUSED BY SEBUM WITH THE HELP OF FATTY ACID ALKANOLAMIDES. E. Götte (Henkel & Cie. G.m.b.H., Dusseldorf, Germany). *Tenside* 5, 328–30 (1968). The method of foam determination according to specification DIN 53,902. Sheet 1, was modified so that that the booster effect due to alkanolamides when fatty alcohol ether sulfate foam is loaded with sebum can be easily recognized. This booster effect is seen only when the system is loaded with grease.

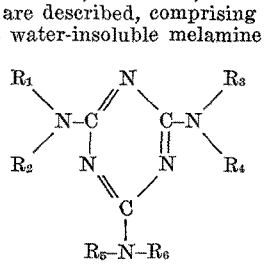
PROCESS FOR THE CONTINUOUS PRODUCTION OF FATTY ACID ESTERS OF HYDROXY SULFONATES. F. A. Holland, G. J. McGrimlisk and W. A. Kelly (Lever Bros. Co.). *U.S. 3,420,857.* An improved method for the formation of fatty esters of hydroxy sulfonates is characterized by continuously supplying to the reaction kettle, during the course of the reaction, fatty acid reactants of a composition corresponding to that of the fatty acids volatilized during the course of the reaction, by which means it is possible to reduce the proportion of esters of relatively high molecular weight fatty acids which are formed. This method can also be used in conjunction with an improved process for stripping unreacted fatty acids from the finished reaction mass to reduce the content of lower molecular weight fatty acids.

PROCESS FOR THE PRODUCTION OF FATTY ACID ESTERS OF HYDROXY SULFONATES. G. J. McCrimlisk (Lever Bros. Co.). *U.S. 3,420,858.* An improved method is described for the purification of crude reaction mixtures containing fatty esters of hydroxy sulfonates together with residual unreacted hydroxy sulfonates and free fatty acids, consisting of a two-step vacuum stripping operation to remove unreacted fatty acids. In the first step, vacuum stripping is conducted under moderate vacuum to remove a portion of the free fatty acids and to permit esterification of hydroxy sulfonates to continue. In the second step, a higher molecular weight fatty acid is added to maintain the crude reaction mixture fluid and permit continued distillation of unreacted fatty acids of lower molecular weight.

OLEFIN SULFONATES. W. A. Di Salvo and J. S. Schrager (Colgate-Palmolive Co.). *U.S. 3,420,875.* An improvement is claimed in the production of olefin sulfonates which comprises first neutralizing the acid mix (produced by reaction between $SO_3$ and olefin) with sufficient sodium hydroxide to give the blend a pH of at least about 12 and a viscosity of 5,000 to 30,000 cp, while maintaining the temperature below about 150F. The viscous alkaline blend is then continuously passed into a zone maintained under superatmospheric pressure where it makes contact with a heated solid heat-exchange surface maintained at a temperature of at least about 350F so as to raise the temperature of the blend to at least about 330F within a period of less than five minutes.

FOAM PRODUCING MATERIAL. J. F. Jackovitz and W. B. Jamison (Walter Kidde & Co., Inc.). *U.S. 3,422,011.* A foam concentrate is described which comprises an ethoxylated alkyl sulfate salt, an aliphatic alcohol such as myristyl or lauryl alcohol acting as a foam stabilizer, and a diether monohydric alcohol acting as a levelling agent to reduce the weight of the foam and improve the drainage characteristics.

LOW-SUDSING DETERGENT COMPOSITIONS. E. Schmadel and E. Gotte (Henkel & Cie., G.m.b.H.). *U.S. 3,422,020.* Low sudsing detergents are described, comprising at least one wash-active agent and a water-insoluble melamine derivative having the *formula:*



where $R_1$, $R_3$ and $R_5$ each represent hydrogen or a $C_2$–$C_{24}$ organic radical, and $R_2$, $R_4$ and $R_6$ are each a $C_1$–$C_{24}$ organic radical.

(Continued on page 291A)

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DETERGENT COMPOSITION. C. H. Roy (Procter & Gamble Co.). *U.S. 3,422,021.* A detergent composition is claimed, consisting essentially of an organic anionic, nonionic or ampholytic detergent, and, as a detergency builder, a compound selected from the group consisting of the water-soluble salts of ethylidene-, isopropylidene-, benzylmethylene-, bis(benzyl) methylene-, mono- and dichloromethylene-, mono- and dibromomethylene-, mono- and difluoromethylene-, 2-carboxyethylidene- and bis(carboxymethyl)methylenediphosphonic acid. The weight ratio of builder to detergent should be in the range of 1:3 to 10:1, providing a pH in aqueous solution of about 8 to 12.

TWO STAGE POLYMERIZATION OF UNSATURATED FATTY ACIDS. J. E. Milks and N. H. Conroy (Arizona Chem. Co.). *U.S. 3,422,124.* A polymerization reaction in two stages comprises: first, polymerizing monomeric higher fatty acids employing an anhydrous acid menstrum at a temperature of 180–260C, separating the resultant polymeric acids from the reaction mixture to recover a monomeric fraction, and, second, polymerizing at 220–260C the monomeric fraction with acid-treated mineral clay in an aqueous environment so as to obtain a ratio of dimer to trimer of at least 4.5 to 1.

METHANEHYDROXYDIPHOSPHONIC ACIDS AND SALTS USEFUL IN DETERGENT COMPOSITIONS. O. T. Quimby (Procter & Gamble Co.). *U.S. 3,422,137.* Diphosphonate compounds such as methylenehydroxydiphosphonic acid and its alkali metal and ammonium salts are claimed. The acid is prepared by reacting phosgene and an alkali metal dialkyl phosphite, and water washing and hydrolyzing the reaction product.

PROCESS FOT THE MANUFACTURE OF DETERGENT SULFONATES. S. Holzman, K. Tivon and B. Z. Milwidsky (Dahlia Kibbutz Hashomer Hazair). *U.S. 3,422,138.* Hydroxyalkane sulfonates for use in detergents are prepared by sulfonating an olefin with $SO_3$ in a reaction system comprising the olefin in mixture with an alcohol having a low rate of evaporation at the reaction temperature (80C), and saponifying the resultant product.

WHIPPABLE TOPPING MIX. J. J. Miles, Jr., M. Pader and S. W. Thompson (Lever Bros. Co.). *U.S. 3,423,211.* A whippable topping mix contains a base fat, a water dispersible protein and 3–10% of a monoacetylated monoglyceride of a $C_{16}$–$C_{18}$ fatty acid and other additives.

DETERGENT PROCESSES. K. J. Shaver (Monsanto Co.). *U.S. 3,423,321.* Detergent compositions are prepared by incorporating sodium tripolyphosphate hexahydrate into an aqueous slurry containing a base, sodium trimetaphosphate and optionally other conventional detergent ingredients, forming the slurry into a foam and removing sufficient water by chemical combination or evaporation to result in a solid porous product. The tripolyphosphate hexahydrate promotes the transformation of trimetaphosphate into tripolyphosphate hexahydrate. An added benefit can be obtained by incorporating into the slurry up to about 30% of an aryl sulfonate such as sodium benzene sulfonate or sodium cumene sulfonate.

TABLETTED DETERGENTS HAVING IMPROVED GREEN STRENGTH. R. S. Cooper and A. D. Urfer (Stauffer Chemical Co.). *U.S. 3,423,322.* Tabletted detergents having improved green strength are prepared by incorporating with a sodium tripolyphosphate builder and synthetic surfactant from about 0.17% to about 6% by wt. of a potassium pyrophosphate or polyphosphate.

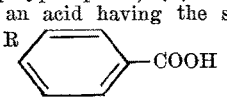
PROCESS FOR THE MANUFACTURE OF LIGHT-COLORED OLEFIN SULFONATION PRODUCTS OR OF THE CORRESPONDING SULFONATES. H. Baumann and W. Stein (Henkel & Cie., G.m.b.H.). *U.S. 3,423,453.* A process is disclosed for the sulfonation of $C_8$-$C_{22}$ olefins to produce olefin sulfonates characterized by their light color, the process being carried out in two stages. In the first stage, the olefin is reacted at 0–50C with an $SO_3$-inert gas mixture containing 0.5–10% by vol. of $SO_3$, until a time when the ratio of the amount of $SO_2$ being liberated and the amount of $SO_3$ simultaneously being absorbed by the olefin amounts to 1.5–2.5 times the ratio of $SO_2$:$SO_3$ calculated for that point in the reaction corresponding to an absorption of 0.5 mols of $SO_3$ per mol of olefin. In the second stage, the mixture from the first stage is contacted at a reduced temperature of −10 to 40C with an $SO_3$-inert gas mixture containing $SO_3$ in an amount equal to up to 80% of the concentration used in the first stage. The feed rate of the $SO_3$-inert gas mixture in the second stage is at least 20% higher than that employed in the first stage; the reaction is contained until at least 90% of the olefins originally charged have been sulfonated.



LAUNDERING ADJUNCT AND METHOD OF PREPARING. R. A. Bauman (Colgate-Palmolive Co.). *U.S. 3,424,545.* A home laundering process is described, which uses an aqueous detergent containing phosphorylated cellulose (with about 5.3% phosphorus) in the wash cycle to sequester the calcium and magnesium ions present in the water.

METHOD FOR TREATING WASHABLE GOODS. L. R. Schiltz and R. H. Rogers (Swift & Co.). *U.S. 3,424,546.* A method for inhibiting the growth of staphylococcal bacterial growth on fabric comprises contacting the fabric with a washing compound containing a mixture of the lauryl-pyridinium salt of 5-chloro-2-mercaptobenzothiazole and 2,2′-dihydroxyl 3,5,6–3′,5′,6′-hexachlorodiphenyl methane.

HEAVY-DUTY LIQUID DETERGENT COMPOSITION. S. Kakegawa, K. Matsuyama and Y. Naganuma (Kao Soap Company, Ltd.). *U.S. 3,424,689.* A transparent and homogeneous heavy-duty liquid detergent composition consists essentially of (1) 5–30% by wt. of an anionic detergent surfactant, (2) 15–45% by wt. of a potassium polyphosphate, (3) 1–25% by wt. of an alkali metal salt of an acid having the structure:




where R is either hydrogen, hydroxyl or a $C_1$–$C_3$ alkyl, and (4) the balance water, the solid components in the composition totaling less than 75% by wt.

NONCAKING LINEAR SECONDARY ALKYL SULFONATE AND SULFATE DETERGENT COMPOSITIONS. D. M. Marquis (Chevron Research Co.). *U.S. 3,424,690.* A process is claimed for suppressing the caking tendencies of nonsoap detergents in which the detergent active is $C_9$–$C_{20}$ secondary alkyl sulfate or alkyl sulfonate, by dispersing in the detergent a small but effective amount of sodium or potassium sulfosuccinate. The anticaking properties provided by this additive are particularly effective in built detergent compositions.

EDIBLE EMULSIONS CONTAINING OLEAGINOUS GELS. C. H. Japikse (Procter & Gamble Co.). *U.S. 3,425,843.* An edible emulsion is made from about 10–70% by wt. of an aqueous acidic solution having a pH of 2 to 6.5 and from about 30–90% by wt. of an oleaginous gel having a stable beta-crystalline phase, as described in U.S. 3,425,842.

MIXTURE OF SURFACE-ACTIVE COMPOUNDS AND PROCESS FOR PREPARING SAME. W. Stein, H. Baumann and M. Voss (Henkel & Cie. G.m.b.H.). *U.S. 3,424,693.* A process is described for the preparation of mixtures of surface-active compounds containing sulfonates and sultone reaction products by reacting an alpha-olefin with 1–1.7 mols of gaseous $SO_3$ at a temperature below 70C, neutralizing the crude sulfonation mixture with 50–95% (based on the amount of $SO_3$ reacted) of an alkaline neutralizing agent, reacting the sultones present in the partially neutralized mixture with a sultone-reacting reagent, bleaching and recovering the mixture.

ALKENE SULFONATION PROCESS AND PRODUCTS. J. Rubinfeld and W. Bian Gwan Ouw (Colgate-Palmolive Co.). *U.S. 3,428,654.* Strong sulfuric acid is used to treat sultones or sultone-containing mixtures which are obtained by sulfonation of olefins. On neutralization of the treated material an active detergent of reduced free oil content is obtained.

PREPARATION OF NONIONIC DETERGENTS. C. M. Starks and E. F. Kennedy (Continental Oil Co.). *U.S. 3,428,692.* Polyoxyethylene ether nonionic detergents having the general formula $R(OCH_2CH_2)_nOCH_2CH_2OH$ in which R is a detergent range alkyl or alkyl substituted phenyl radical are heated in the presence of nickel catalyst to provide a corresponding nonionic detergent in which the terminal $-CH_2OH$ grouping is replaced with a hydrogen atom.