ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: R. Aguilar B., J. G. Endres, Kazuo Fukuzumi, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

8,9,13-TRIACETOXYDOCOSANOIC ACID, AN EXTRACELLULAR LIPID PRODUCED BY A YEAST. F. H. Stodola, R. F. Vesonder and L. J. Wickerham (N. Reg. Res. Lab., Peoria, Ill.). *Biochemistry* 4, 1390–1394 (1965). An extracellular lipid produced by the yeast NRRL YB-2501 was shown to be the triacetate of 8,9,13-trihydroxydocosanoic acid. The structure of the trihydroxy acid was established by its conversion to suberic acid and 5-ketotetradecanoic acid.

STUDY OF IONIC STRUCTURES IN PHOSPHOLIPIDS BY INFRARED SPECTRA. M. B. Abramson, W. T. Norton, and R. Katzman (Albert Einstein Coll. of Med., New York 61, N.Y.). *J. Biol. Chem.* 240, 2389-2395 (1965). The infrared spectra of octadecyl dihydrogen phosphate, dioctadecyl hydrogen phosphate, and phosphatidic acid are compared with those of their sodium salts. The spectra of lecithin and sphingomyelin are interpreted as showing a fully ionized phosphate group bonded to water with no association of P-OH groups. The major absorption band at 1100 cm^{-1} is indicative of the PO^- group. Structures for phosphatidylserine, phosphatidylethanolamine, and lecithin are proposed on the basis of the spectral interpretations. A method for the preparation of sphingolipids is described.

INITIAL KINETIC STUDY OF UREA ADDUCTION WITH N-OCTANE, N-DECANE AND N-DODECANE. L. E. Lahti and F. S. Manning (Carnegie Inst. Technol., Pittsburgh, Pa.). *Ind. Eng. Chem. Process Design Dev.* 4, 254–258 (1965). Solutions of known concentrations of urea in ethanol and of n-octane, n-decane, or n-dodecane in ethanol were passed through a diverging tubular reactor. Adduct precipitation rates of urea with the n-alkane were computed from the steady-state temperature profiles as measured by thermocouples. This preliminary work indicates that these reactions are exceedingly fast (99% complete in a fraction of a second) and that precipitation exhibited first-order growth rates. Nucleation and solution temperatures of solutions containing prepared concentrations of urea and n-alkane in ethanol and in 25% methanol-75% propanol mixtures were also measured.

CHEMICAL TECHNIQUE FOR DETERMINING THE CONFIGURATION OF NATURAL FATS: OPERATION OF SPECIFIC RESTRICTED RANDOM DISTRIBUTION RULE B IN GARCINIA INDICA AND VATERIA INDICA SEED FATS. A. R. S. Kartha, *Indian J. Chem.* 2 (5), 199–203 (1964). The proportions of symmetrical and unsymmetrical disaturated glycerides in natural fats have been determined by selective removal of azelaic acid by hydrolysis of the isolated mono- and di-azelain mixture with K_2CO_3 in acetone, simultaneous oxidation of the hydrolysis products with acetone/$KMnO_4$ and isolation of the neutral products thus produced by an improved Ca salt/ethyl acetate procedure. Unsymmetrical monoazelains and all diazelains are converted to acidic products, whilst symmetrical monoazelains are converted to neutral products. The proportions of symmetrical components in the total disaturated glycerides in *Garcinia indica* and *Vateria indica* seed fats determined by this procedure have been found to be 34 and 63% respectively. The proportions of configurational isomers are, therefore, not constant as postulated by the Restricted Random Distribution Rule but are variable as postulated by the Specific Restricted Random Distribution Rules. The magnitude of the variation of configurational isomers in *V. indica* seed fat indicates the operation of Specific Restricted Random Distribution Rule B in natural fats. (Rev. Current Lit. Paint Allied Ind.).

SYNTHESIS OF HYDROXYCITRIC LACTONE AND ITS EFFECT. Kazuo Horikawa and Shinroku Masuyama (Osaka Munic. Tech. Research Inst., Osaka). *Yukagaku* 14, 179–85 (1965). Hydroxycitric lactone, m.p. 172–3C (decompn.), was synthesized by oxidation of *trans*-trimethylaconitate with potassium permanganate and its structure was presumed from N.M.R. spectra. The lactone was added to cottonseed and soybean oils and its stabilizing effect on oils was found to be about equal to that of citric acid by the A.O.M. method and better by the oven test.

ESTIMATION OF TOTAL CARBONYL CONTENT IN OXIDIZED OIL BY 2,4-DINITROPHENYLHYDRAZINE. Hisashi Kumazawa and Tamotsu Oyama (Nagoya Munic. Hyg. Research Inst., Nagoya). *Yukakagu* 14, 167–71 (1965). Approximate measurement of total carbonyl value of an oxidized oil by 2,4-dinitrophenylhydrazine method can be made by reading of extinction at 440 mμ with the use of following formula: Total carbonyl value (meq./kg.) $= E/(0.584 \times W) \times 10^3$ where E = extinction coef. at 440 mμ, W = weight (mg.) of oil. When this method is applied to oils having a high peroxide value, falsely high carbonyl values are obtained. Some carbonyl radicals in oxidized glyceride molecules are more difficult to react with 2,4-dinitrophenylhydrazine than with hydroxylamine or hydrazine.

STUDY ON THE BÖHMER NUMBER. II. BÖHMER NUMBER OF DOMESTIC HOG FAT AND EXAMINATION OF HIGH BÖHMER NUMBER. Masao Imamura, Isao Niiya, Kazuko Takagi and Taro Matsumoto (Japan Margarine and Shortening Makers Assoc., Tokyo). *Yukagaku* 14, 234–7 (1965). The Böhmer numbers of 16 kinds of lard from Yorkshire and Berkshire breeds were examined. Abdominal fat was comparatively high with mean value of 76.41, followed by fat from rib, back, bones in order named 75.83, 79.41 and 74.96. The fats of higher Böhmer numbers seemed to afford larger yield of precipitated glyceride. There were almost no differences in Böhmer number of lard between hog breeds (being slightly higher in Yorkshire) and the place of production. The glyceride precipitated from this sample contained about 15% of mono-unsaturated glyceride and about 24% of stearodipalmitin.

SIGNIFICANCE OF CARBONYL VALUE INVOLVED IN THE DETERIORATION OF OILS. I. RELATIONSHIP BETWEEN DECOMPOSITION TEMPERATURE OF PEROXIDE AND CARBONYL VALUE. Hisashi Kumazawa (Nagoya Munic. Hyg. Research Inst., Nagoya). *Yukagaku* 14, 229–33 (1965). Soybean oil was aerated at 150, 160 and 170C for 180 minutes for formation of oxidized oil and the oxidized oil was decomposed at 150, 160 and 170C in the current of carbon dioxide. Oxidized soybean oil, rapeseed oil and lard were prepared by aeration at 98C, then those were decomposed by heating at 60, 98, 150, and 200C in the current of carbon dioxide. The peroxide value of each oil remain unchanged for 8 hours at 60C but almost all of them decomposed at 200C. Estimation of carbonyl value may serve as a reliable index of deterioration of frying oil.

STUDIES OF THE OILS FROM FISHES CAUGHT IN THE INLAND SEA OF JAPAN. III. COMPOSITION OF OILS FROM GRAY MULLET (MUGIL CEPHALUS) AND SCIAENID (SCIANA SCHLEGELLI). Shigeru Hamada and Sei-ichi Ueno. *Yukagaku* 14, 191–4 (1965). The yields of body oil and entrail oil, and their properties are given.

RANCID FLAVOR OF EDIBLE OILS. I. RANCID FLAVOR COMPONENTS OF SOYBEAN OIL. Naoki Iwata, Masaharu Morita and Shizuyuki Ota (Ajinomoto Co., Kawasaki, Kanagawa Pref.). *Yukagaku* 14, 241–6 (1965). Soybean oil was oxidized at 110C until the development of strong rancidity and the oil was distilled in vacuo (0.05–0.1 mm. Hg) at 80C. The volatile components were condensed in a trap cooled with liquid nitrogen, taken up in a few drops of ethyl ether, separated into 3 fractions (acids, carbonyl and non-carbonyl compounds) by use of 10% sodium carbonate and Girard's reagent. Each fraction was fractionated by gas chromatography and infrared spectroscopy. Compounds identified in the order of fraction are as follows: acetaldehyde (+ hydrocarbon), crotonaldehyde, valeraldehyde, saturated alcohol (+ unsaturated ketone), pent-1-en-3-ol, 2-pentenal, caproylaldehyde, amyl alcohol (+ unsaturated ketone), 2-hexenal, heptylaldehyde (+ unsaturated ketone), propionic acid, 2-heptenal (+ butyric acid), octyl aldehyde, 2,4-heptadienal (+ oct-1-en-3-ol and unsaturated ketone), nonylaldehyde, valeric acid (+ saturated alcohol), 2-nonenal, caproic acid, unsaturated aldehyde, 2,4-decadienal.

STUDIES ON THE ANTARCTIC WHALE OILS BY GAS-LIQUID CHROMATOGRAPHY USING A HYDROGEN FLAME IONIZATION DETECTOR. I. ANALYSIS OF THE FATTY ACIDS FROM SEI WHALE BLUBBER OIL. Yoshio Sano and Kimiko Murase (Taiyo-Miyoshi Research Institute of Whale Oil, Tokyo). *Yukagaku* 14, 104–12 (1965). Antarctic whale oil was converted to methyl esters, these were separated by preliminary urea complex fractionation and subsequent silicic acid column chromatography or thin layer chromatography on silica gel impregnated with silver nitrate. Each fraction was then analyzed by gas-liquid chromatography on a polyester column before and after hydrogenation. The oil was found to contain more than 45 fatty acids, ranging from 12 to 24 carbon atoms in chain length, in which normal saturated acids containing 12–22 inclusive of carbon atoms, branched-chain acids containing 14–18 inclusive of carbon atoms, monoenoic acids containing 14–24 inclusive of carbon atoms, dienoic acids containing 14, 16, 18 and 20 carbon atoms, trienoic acids containing 16, 18, 20 and 22 carbon atoms, polyenoic acids of 16:4, 17:4, 18:4, 20:4, 19:5, 20:4, 22:4, 19:5, 20:5, 21:5, 22:5, 22:6 and 24:6, and large numbers of un-

identified components were found. It is noteworthy to find polyunsaturated odd-numbered and branched chain fatty acids in the oil. II. FATTY ACID COMPOSITION OF FIN WHALE, BLUE WHALE AND SEI WHALE OILS. Yoshihiko Sano, Dainosuke Aikawa and Kimiko Murase. *Ibid.* 171-8. Blubber, bone and viscera oils from fin whale, blue whale and sei whale were tested as above. In general, viscera oil contained more 20:5 and 22:6 fatty acids and less monoenoic acids as contrasted with blubber or bone oils.

CHEMICAL COMPONENTS IN OLIVES. II. THE PRESENCE OF NATURAL DIGLYCERIDES IN OLIVES AND CRUDE OLIVE OILS. A. Vazquez Roncero and M. Mancha Perelló. *Grasas y Aceites* 16, 13–16 (1965). Chromatographic and spectrophotometric data reveal the presece of 1,2-diglycerides in ripe olives and also in fresh crude olive oil. In aged crude olive oils, and in olive oils obtained from spoiled fruits, 1,3-diglycerides isomers and free fatty acids are also detected. By chemical or enzymatic hydrolysis of the triglycerides, both types of the diglycerides isomers are formed.

III. VARIATIONS OF LIPOSOLUBLE COMPONENTS DURING RIPENING. *Ibid.*, 17–23. Variations in the amount of ethyl ether soluble fraction during olive development and ripening was studied by thin layer chromatography. This soluble fraction is considered as "total fat" and is composed by triglycerides plus certain minor liposoluble components which are readily separated by thin layer chromatography. The variations of the most important components are given.

TRACE ELEMENTS IN EDIBLE FATS. XI. DIRECT DE-METALISATION OF HEAVY METALS IN OLIVE OIL BY CATION EXCHANGE RESINS. A. Vioque, T. Albi and M. Albi. *Grasas y Aceites* 16, 8-12 (1965). The macroreticular resin Amberlyst 15, in its H^+ form, retains satisfactorily the oxidative heavy metals Fe, Mn, Cu and Zn present in olive oil. Several resins were tested and the techniques and experimental conditions are given.

THIN LAYER CHROMATOGRAPHY OF SARDINE PHOSPHOLIPIDS. A. S. El-Nockrashy and M. M. Mahfouz (National Research Center, Dokki, Egypt). *Grasas y Aceites* 16, 5-7 (1965). Description of the qualitative and quantitative thin layer chromatographic determination of the sardine brain, muscle and digestive tract phosphatides is given.

THE DIMER CONCENTRATES FROM AUTOXIDIZED METHYL DOCOSAHEXAENOATE. Kazuo Fukuzumi and Tsutomu Maruyama (Nagoya Univ.). *Kogyo Kagaku Zasshi* 68, 308 (1965). The dimer concentrates obtained from autoxidized methyl docosahexaenoate were investigated in order to elucidate the polymerization mechanism. Methyl docosahexaenoate (97% pure) was autoxidized by blowing with dry air at 35C. The autoxidized methyl ester was extracted with solvents to obtain the fraction corresponding to the dimer, partition chromatography being used to prepare the dimer concentrates. The molecular weight, the peroxide value, and the ultraviolet and infrared spectra for the dimer concentrates were determined. The dimer concentrates obtained from autoxidized polymers of nonconjugated methyl docosahexaenoate arise by the formation of both carbon-oxygen bond and carbon-carbon bond. This dimer concentrate contains more —OOH groups than that obtained from the conjugated ester.

HYDROGENATION OF THE CONJUGATED DIENE CONCENTRATE OF METHYL DOCOSAHEXAENOATE BY USING NICKEL-DIATOMACEOUS EARTH CATALYST. Kazuo Fukuzumi and Katsuhiko Tomiyasu (Nagoya Univ.). *Kogyo Kagaku Zasshi* 68, 954–7 (1965). Methyl docosahexaenoate (97% pure) was isomerized with alkali and then separated by the urea-adduct procedure to prepare the conjugated diene concentrate of the compound. This conjugated diene concentrate was hydrogenated at 180 ± 1C by using nickel-diatomaceous earth catalyst. Of each sample, refractive index, hydrogen value, molecular weight, and ultraviolet and infrared spectra were determined. The rate of the disappearance of the conjugated diene during hydrogenation is considerably faster than that of the nonconjugated double bonds. During hydrogenation conjugated diene shows a slight tendency toward polymerization. At first *cis-trans* conjugated diene and then *trans-trans* conjugated diene reduce rapidly, but isolated *trans* double bonds increase to attain the maximum with the hydrogen value of 201–142.

REFINING AND STABILIZATION OF SOYBEAN OIL TREATED WITH NITRIC ACID SOLUTIONS. R. Guillaumin, N. Drouhin, C. Defromont and F. Douard (Lab. of Paris). *Rev. Franc. Corps Gras* 12, 185–197 (1965). When soybean oils are degummed with nitric acid solutions in the pilot plant, the refining loss is reduced. Oils treated with nitric acid have good stability in storage and better flavor than oils treated in a conventional manner.

INVESTIGATION OF THE BEHAVIOR OF SOME EDIBLE OILS DURING CONTROLLED FRYING AND OVERHEATING OPERATIONS. P. Ramel, A. M. LeClerc, J. Dumain and D. Faucquemberque (Central Lab. of Food Res., Paris, Fr.). *Rev. Franc Corps Gras* 12, 153–165 (1965). Peanut, olive, rapeseed, soybean, sunflower, grapeseed and corn oils were heated at 200C for periods of 24, 48 and 72 hours in the presence of air. In 4 liters of each of the above oils, about 20 kilograms of French cut potatoes were fried in 1 kilogram portions. The following analytical values were determined on both the heated and frying oils: specific gravity, refractive index, viscosity, ultraviolet absorption, solubility in normal propanol, color (trichromatic); iodine, saponification, acid and peroxide values; oxidized acids, fatty acid composition, tocopherols, and benzopyrenic hydrocarbons. In both cases of heating the viscosity, specific gravity, refractive index, the ultraviolet absorption and oxidized acid content increased. The polyunsaturated fatty acids and especially linolenic acid underwent destruction which was proportional not only to the initial concentration, but also to the duration of heating or frying. In both frying and heating, the polymer content of the oils also increased in proportion to the time of heating and frying. The heated oils deteriorated more than the frying oils. For example, frying oils after 20 frys were much less altered than the same oils heated for 24 hours. Oils high in polyunsaturated fatty acids were hardly more vulnerable to change than oils low in polyunsaturates such as peanut and olive oils.

ON SOME TESTS OF ALKALINE ISOMERIZATION OF OLEIC ACID. M. Naudet, L. Comeau, J. Pasero (Nat. Lab. of Fatty Materials). *Rev. Franc. Corps Gras* 12, 175–183 (1965). Oleic acid was treated under pressure and at 300C to 350C, in various conditions, with alkaline aqueous solutions. This treatment induced a migration of the ethylenic bond which was distributed almost regularly along the chain from the 2–3 to the 15–16 positions. The two extreme positions were slightly preferred and the 3–5 and 5–6 positions rather hindered. In more drastic conditions a side reaction takes place and produces, as does the Varrentrapp reaction, the rupture of the chain in the 2–3 position and the formation of palmitic acid.

USE OF DIELECTRIC ANALYSIS IN THE SYNTHESIS OF FATTY ACIDS FROM HYDROCARBONS. C. Matasa. *Oleagineux* 20, 109 (1965). Fatty acids can be synthesized from hydrocarbons by oxidation. The acid value is commonly used as a control method. The acid value is not readily adaptable to continuous control. In this paper the oxidation of hydrocarbons to fatty acids is followed by measuring either of two electrical characteristics, the dielectric constant ϵ, and the dielectric loss angle δ. The use of the dielectric constant is possible since the dipole moment of hydrocarbons is very small and, as the oxidation reaction proceeds, the dielectric constant or dielectric loss angle increases because fatty acids have an appreciable dipole moment. It was shown that when the reaction temperature is between 20 and 70C and therefore the oxidation rate and fatty acid formation is low, the dielectric constant is directly correlatable to the acid value of the reaction mixture. However, above 70C the dielectric constant does not correlate with the acid value. Above 70C, the dielectric loss angle is correlatable to the acid value and is therefore a measure of the degree of oxidation. The method does not work when the acid value rises above 70 milligrams of KOH per gram, since oxidized side reaction products, such as alcohols and carbonyls, are formed which themselves have dipole moments.

STEREOSPECIFIC ANALYSIS OF TRIGLYCERIDES: AN ANALYSIS OF HUMAN DEPOT FAT. H. Brockerhoff (Fisheries Res. Board of Canada, Halifax Lab.). *Arch. Biochem. Biophys.* 110, 586–92 (1965). In the stereospecific analysis of the triglycerides of human depot fat, the first step is a random hydrolysis of the α-bound esters by pancreatic lipase. Strictly random lipolysis is not the rule, but it can be achieved in many cases by diluting the fat with hexane. Starting with random lipolysis, an improved procedure of stereospecific triglyceride analysis has been developed and is described. Results are given for the fatty acid distribution in human fat.

ON THE USE OF FLUORESCEIN AND DICHLOROFLUORESCEIN AS NON-DESTRUCTIVE STAINS FOR LIPIDS. P. J. Dunphy, K. J. Whittle and J. F. Pennock (University of Liverpool). *Chem. Ind. (London)* **1965**, 1217–18. Fluorescein and dichlorofluorescein can be used as stains in both visible and u.v. light for lipids on paper and thin layer chromatography. The lipids can be recovered unchanged.

OCCURRENCE OF 2,6,10,14-TETRAMETHYLPENTADECANOIC ACID IN SHEEP FAT. R. P. Hansen (Dept. of Scientific and Industrial Res., Wellington). *Chem. Ind. (London)* **1965**, 1258–9. Isolation of this C_{19}-multibranched fatty acid was made from ewe perinephric fat using techniques which included low temperature crystallization from solvents, fractional distillation *in vacuo*, hydrogenation and silicic acid-silver nitrate chromatography. Content was estimated to be of the order of 0.06% of the total weight of fatty acids.

MICROBIOLOGICAL QUALITY OF EDIBLE EMULSIONS DURING MANUFACTURE AND STORAGE. G. Tuynenburg Muys (Unilever Res. Lab.). *Chem. Ind. (London)* **1965**, 1245–50. Various components of edible emulsions may serve as nutrients for several genera of micro-organisms. By modifying the composition of the emulsions the development of bacteria can be suppressed. Microbiological Composition Analysis should be carried out on semi-products and final products in order to predict the spoilage flora and growth possibilities for bacteria. The analytical method is described, illustrations are given of the molds and yeasts which may occur in margarine and butter, and the microbiological control of a margarine factory is described.

METHOD FOR MAKING MARGARINE OF REDUCED TENDENCY TO SPATTER AND PRODUCT OBTAINED THEREBY. H. Pardun (Lever Brothers Co.). *U.S. 3,194,665*. A process for preparing a margarine of reduced tendency to spatter comprises forming an aqueous mixture, suitable for providing at least part of the aqueous phase in margarine, with a pH of 4.5 to 5 and which contains suspended in it the residue left after extracting comminuted soya bean with polar and non-polar solvents, the protein in the residue being undenatured. The residue amounts to 0.1 to 2% by weight of the margarine.

• Fatty Acid Derivatives

RUST-PREVENTIVE PROPERTIES OF LONG-CHAIN ALKYLPHOSPHONIC AND ALKYLPHOSPHOROUS ACID DERIVATIVES. Hiroshi Sakurai, Yoshiki Okamato, Takeshi Kasahara, Takio Taniguchi, and Yuzo Machida (Osaka Univ.). *Yukagaku* **14**, 123–8 (1965). 9(10)-Phosphonostearic acid, 9(10)-phosphonostearyl alcohol, 9(10)-hydroxyphosphinylstearic acid, 9(10)-hydroxyphosphinylstearyl alcohol, and 8 other organo-phosphorus derivatives were synthesized. A solution containing 1–3% of above compounds and 3% of sorbitanmonoöleate in spindle oil was coated on steel plate and anti-corrosive effect in salt water was measured. Four of the above compounds showed excellent anticorrosive action.

PROPERTIES OF 1,3-BUTYLENEGLYCOL DIESTERS AS A PLASTICIZER FOR PVC. Yoshiki Ohshiro, Michio Oka and Saburo Komori (Osaka Univ.). *Yukagaku* **14**, 186–90 (1965). The diesters composed of 1-benzoyloxy-3-acyloxybutane (acyl group = hexanoyl to tetradecanoyl), 1-acyloxy-3-benzoyloxybutane, 1,3-dibenzoyloxybutane, 1,3-dihexanoyloxybutane, 1,3-didecanoyloxybutane, 1,3-didodecanoyloxybutane, 1-hexanoyloxy-3-tetradecanoyloxybutane, 1-octanoyloxy-3-dodecanoyloxybutane, 1-decanoyloxy-3-dodecanoyloxybutane, 1-dodecanoloxy-3-hexanoyloxy (3-octanoyloxy-, and 3-decanoyloxy)-butane, 1-tetradecanoyloxy-3-hexanoyloxy (3-octanoyloxy-)butane were synthesized. The products showed compatibility, cold resistance and mechanical strength comparable to dioctylphthalate.

REACTION OF PHENOL AND LAURIC ACID IN THE PRESENCE OF JAPANESE ACID CLAY. ISOLATION OF *o*- AND *p*-LAUROYLPHENOL AND LAURONE. Ju Kumanotani (Uni. Tokyo). *Yukagaku* **14**, 254–5 (1965). Reaction of phenol and lauric acid (molar ratio 4:1) in the presence of 10% acid clay for 2 hours at 183–90C gave *o*-lauroylphenol, m. 42.5–3C, *p*-lauroylphenol, m. 69–70C and laurone, m. 69–9.5C.

PYROLYSIS OF ETHYLENE GLYCOL FATTY ACID ESTERS. Kazuo Kitamura and Noboru Tachikawa (Ritsumeikan Univ., Kyoto and Kyoto Univ.). *Yukagaku* **14**, 250–4 (1965). Pyrolyses of 4 ethylene glycol di-fatty acid esters (A) and 4 ethylene glycol mono-fatty acid esters (B), prepared from ethylene glycol and butyric, caprylic, lauric and palmitic acids, were carried out at 200–750C in nitrogen atmosphere. The products of pyrolysis from (A) were fatty acids, their vinyl esters and a small amount of lower fatty acids and ketones, and those from (B) were fatty acids, acetaldehyde and a small amount of fatty acid vinyl esters, lower fatty acid and ketones.

LONG CHAIN CARBOXYLATES OF BIVALENT METALS. Ryohei Matsuura (Kyushu Univ.). *Nippon Kagaku Zasshi* **86**, 560–72 (1965). Saturated fatty acid salts from caprylic to stearic acids and oleate of bivalent metals, such as magnesium, calcium, strontium, barium, zinc, cadmium, mercury, lead, manganese, nickel, cobalt, and copper were synthesized, and then infrared spectra and X-ray diffraction of their crystals were determined. In the infrared spectra, the COO^- anti-symmetrical stretching frequencies were related to the electronegativity of metals, and the absorption band of the CH_2 rocking vibration at about 720 cm^{-1} was separated into two bands in the anhydrous salts, but it was one band in the salts with water of crystallization. The solid structure and the properties of non-aqueous solutions of cupric salts of fatty acids and cobalt oleate were investigated.

MOLDING ABILITIES OF OCTADECYLAMINE SALTS TO SILICA POWDER. Gaku Izumi and Masayoshi Kita (Government Res. Inst. of Technol., Nagoya). *Kogyo Kagaku Zasshi* **68**, 1087–9 (1965). The molding ability of several octadecyl amine salts to non-plastic silica powder was determined by the previously reported method using silica powder, amine salts and water. When 5% salt on the basis of the powder was used, the degree of molding ability was in the following order, acetate > propionate > hydrochloride > sulfate. On the addition of 10% salt, the order became different from the above-mentioned case. The mechanism of molding ability of octadecyl amine salts to silica powder was discussed.

REACTION OF 1,2-EPOXYDODECANE WITH VARIOUS AMINO-COMPOUNDS. Kazuhiro Shibata, Shuji Shimada, and Sumio Matsuda (Osaka Univ.). *Kogyo Kagaku Zasshi* **68**, 957–60 (1965). The reaction of 1,2-epoxydodecan, one of the long chain alkylene oxides, with various amino compounds was investigated. As amino compounds, besides ammonia, various compounds were used, such as primary and secondary amines, acid amides, mono- and diethanolamines, and pyridinium salts. In the reaction with ammonia and lower aliphatic primary amines, not only the addition product of one molecule of epoxide, but that of

two molecules were obtained (these addition products yielded secondary and tertiary amines, respectively). The amino group reacts more rapidly than hydroxyl in the reaction with ethanol amine. It was ascertained that bromohydrin is produced as the intermediate in the reaction with bromopyridinium salt.

REACTIONS WITH ALKYLALUMINUM. II. ON THE REDUCTION OF ESTERS OF HIGHER FATTY ACIDS BY DIALKYLALUMINUM HYDRIDES. H. Reinheckel (Inst. for Fat Res., Berlin-Adlershof, Ger.). *Oleagineux* 20, 31 (1965). A certain number of esters of the higher molecular weight saturated and unsaturated fatty acids have been reduced to the corresponding saturated or unsaturated fatty alcohols using diethyl- and diisobutylaluminum hydrides. The reduction is realized in the best conditions with benzene as solvent or, in the absence of a solvent, by keeping the temperature at 80C. In any case the reaction mixture remains homogeneous, allowing a quantitative reduction. Ethyl ether can be also used as solvent, but a longer process time is needed because of the lower temperature of reaction. In the case of fatty acids with a terminal double bond, reducer is fixed by the double bond, and when the complex is reduced, the double bond is converted to a saturated bond, and the carboxyl group is reduced to an alcohol. In the case of unsaturated fatty acids without terminal double bonds, such as oleic acid and linolenic acid, reduction of the carboxyl group with dialkylaluminium hydrides does not influence the double bond. The author has shown by means of gas liquid chromatography that in the case of linoleic acid, particularly pure linoleic alcohol is formed, free of all traces of saturated or monounsaturated alcohol.

SYNTHESIS OF CYCLOOXAPENTADECANE DERIVATIVES. A. Hochapfel (Lab. of Lipochem. of C.N.R.S.). *Oleagineaux* 20, 179 (1965). The 11-bromo methylundecanoate, prepared from undecylenic acid, is condensed with 4-hydroxybutyric acid to give the dimethyl ester of the oxy(4-butanic)11-undecanoic acid. The reaction and its by-products were studied. The above compound was cyclised to the acyloin, and compounds such as the diketone, dialcohol, monoketone were prepared and described. All these cyclic compounds, having a cycle with 14 carbon atoms and one oxygen, have a pleasant smell.

ANTIBACTERIAL COATING COMPOSITIONS. L. R. Hines and R. J. Shirk (American Cyanamid Co.). *U.S. 3,192,057*. The coating composition consists essentially of acylated glycerides having the general formula $CH_2OR_1CHOR_2CH_2OR_3$ in which R_1 is the acyl radical of a fatty acid of 12 to 22 carbon atoms, R_2 is selected from the group consisting of hydrogen, the acyl radical of a fatty acid of 2 to 5 carbon atoms and the acyl radical of a fatty acid of 12 to 22 carbons, and R_3 is selected from the group consisting of hydrogen and the acyl radical of a fatty acid of 2 to 5 carbons. Dispersed in the acylated glycerides is from 0.0001% to 0.0025% by weight of a tetracycline antibiotic.

TALL OIL DIESTERS. S. Altscher and T. F. Groll, Jr. (Nopco Chemical Co.). *U.S. 3,192,193*. An aliphatic diester of tall oil (containing 2–55% by weight of rosin) and ethoxylated glycerine having from 15–27 moles of ethylene oxide is described.

PROCESS FOR THE PRODUCTION OF UNSATURATED FATTY ALCOHOLS. W. Rittmeister (Dehydag, Deutsche Hydrierwerke G.m.b.H.). *U.S. 3,193,586*. Described is a process for producing unsaturated fatty alcohols by catalytic reduction of unsaturated fatty materials such as unsubstituted unsaturated fatty higher acids and their esters formed with lower alkyl alcohols containing 1–4 carbon atoms. A reaction mixture consisting essentially of at least one of the unsaturated fatty material, a lower alkyl alcohol in an amount corresponding to 1 to 5 times the volume of unsaturated fatty materials and hydrogen (50–500 times the stoichiometrically required molar quantity) in the vapor phase is passed through a reaction space containing a contact catalyst of low activity in lump form. The catalyst is selected from the group consisting of zinc-chromium, zinc-barium-chromium, zinc-cadmium-chromium, zinc-magnesium-chromium, zinc-vanadium, cadmium-vanadium, zinc-cadmium-vanadium, and zinc-cadmium-barium-vanadium catalysts, the volume being from 6 to 12 times the hourly volume of feed material. The reaction is conducted at a temperature of 250 to 350C at a pressure of at least 100 to 500 atmospheres gage.

PAPER SIZED WITH FATTY ACID ESTERS OF METHYLOLATED ROSIN, METHOD OF MAKING SAME, AND SIZE PASTE THEREOF. J. H. Stump, Jr. (Tenneco Chemicals, Inc.). *U.S. 3,194,728*. The described paper consists of a water-laid web of cellulosic fibers carrying alum-precipitated size. The size has an acid value in the range of 0–50 and is the alkali metal saponification product of a material selected from the group consisting of ester-acid of fatty acids containing 16–20 carbon atoms and methylolated rosin acids, the reaction product of such an ester-acid with from 1–10% by weight of an unsaturated aliphatic dicarboxylic acid,

and the reaction product of such an ester-acid and the anhydride of an unsaturated aliphatic dicarboxylic acid, the ester-acid having an acid value of not more than 110. The amount of size carried by the web is in the range of 0.25–5% by weight of the fibers on a dry basis. The method of manufacturing sized paper and the aqueous size paste are also claimed.

• Biochemistry and Nutrition

INTRAMOLECULAR PATTERNS OF FATTY ACID INCORPORATION INTO TRIGLYCERIDES BY LAMB INTESTINAL MUCOSA. I. A. Hansen (Univ. of Western Australia). *Arch. Biochem. Biophys.* 110, 485–9 (1965). Preparations of lamb intestinal mucosa incorporated varying amounts of added labeled fatty acids into triglyceride, depending on the nature of the fatty acid. By subsequent hydrolysis of the triglyceride with pancreatic lipase, it appeared that palmitate had been incorporated approximately randomly, while oleate and stearate had been preferentially incorporated into the α-position.

PLASMA LIPID VARIATIONS AND FATTY ACID COMPOSITION IN NORMAL MALE AND FEMALE ADULT RABBITS. C. E. Lutton and T. T. Tsaltas (Dept. of Pathology, Jefferson Med. College, Philadelphia, Pa.). *Proc. Soc. Exp. Biol. Med.* 118, 1048–1051 (1965). Plasma lipid concentration was determined for adult male and female New Zealand rabbits. Comparison was made of the various lipid fractions between the sexes, and the female rabbit was found to have significantly higher concentrations of total lipids, glycerides, phospholipids, free and esterified cholesterol. The fatty acid composition of various lipid fractions was also determined. Statistically significant differences were found to exist in the fatty acid composition of the above fractions. On the other hand, sex did not affect significantly the fatty acid composition of the same lipid fractions.

FATTY CIRRHOSIS IN THE RAT. VII. INFLUENCE OF DIFFERENT LEVELS OF DIETARY FAT ON EARLY DEPOSITION OF FAT IN LIVER. F. W. Hoffbauer and F. G. Zaki (Minneapolis Med. Res. Found., Hennepin County Gen. Hosp., Minneapolis, Minn.). *Proc. Soc. Exp. Biol. Med.* 118, 1130–1132 (1965). Liver fat accumulation was studied in groups of young rats fed one of 3 low protein diets containing, respectively, 5%, 20% and 38% lard. Each diet furnished the same quantity of protein (casein and soy-α-protein). The rapidity and magnitude of fat accumulation was greatest in rats fed the 38% lard diet and least in those receiving the one containing 5% lard. In previous studies the same diets were fed for 15 weeks; the 38% lard diet produced the greatest incidence and the most severe degree of cirrhosis, whereas the group fed the 5% lard diet had the least severe degree of liver damage. The severity of the fatty cirrhosis that ultimately develops in choline deficient rats is chiefly determined by rate and magnitude of fat accumulation in the liver in the first 3 weeks of the experiment.

THE FATTY ACID COMPOSITION OF FREE AND BOUND LIPIDS IN FREEZE-DRIED MEATS. I. Giam and L. R. Dugan, Jr. (Dept. of Food Science, College of Agr., Michigan State Univ., East Lansing). *J. Food Sci.* 30, 262–265 (1965). The fatty acid composition of free and bound lipids in freeze-dried pork, lamb, and beef was determined by gas-liquid chromatography (GLC). Both raw and cooked samples were studied to establish whether cooking affected the fatty acid content of either fraction. Sixteen acids were identified in pork, lamb, and beef. In the bound lipids fraction, traces of saturated C_{13}, C_{15}, and C_{17} were evident. Three peaks remained unidentified. These unknown peaks are probably unsaturated acids, although the possibility that they may be oxidation products cannot be ruled out entirely. The bound lipids fraction of the meat samples studied was found to have a greater quantity of polyunsaturated fatty acids than the free lipids fraction. The linoleic, behenic, and arachidonic acid content of the bound lipids exceeded that of the free lipids fraction. Cooking prior to freeze-drying appeared to have no significant influence on the fatty acid composition of either free or bound lipids. Lamb and beef are similar to each other in fatty acid composition, and quite different from pork. The myristic and myristoleic acid content is higher in lamb and beef than in pork, but the linoleic and arachidonic acid content of pork exceeds that of lamb and beef.

EPINEPHRINE-INDUCED NORMALIZATION OF LIPID METABOLISM IN ADRENALECTOMIZED RATS. M. Friedman and S. O. Byers (Harold Brunn Institute, Mount Zion Hospital and Medical Center, San Francisco, Calif.). *Science* 148, 644–646 (1965). In adrenalectomized rats given adequate supportive therapy with sodium chloride and hydrocortisone, lipemia is markedly elevated after a triglyceride meal. This defect can be corrected by the administration of epinephrine.

STUDIES ON ETHIONINE. VII. FATTY ACID SYNTHESIS IN LIVERS OF ETHIONINE-TREATED RATS. C. H. Doering and Y. Natori (Dept. of Biochem., Univ. of Calif. School of Med., San Francisco). *Proc. Soc. Exp. Biol. Med.* 118, 957–961 (1965). The effect of administration of ethionine upon fatty acid synthesis in a system from the livers of female and male rats has been investigated. Three hours after administration of ethionine, fatty acid synthesis in the livers of both sexes was reduced to about 50% of the control. At 5 hours, male rate recovered from the initial inhibition to 77% of the control, whereas the synthesis in females was further reduced to 24%. It was found that the ethionine effect was not merely due to a deficiency in the supply, or in availability of ATP, NADPH, or CoA. Nor was the impairment due to an accumulation of ethionine itself or S-adenosylethionine. The possibility is considered that the inhibition of fatty acid synthesis at 5 hours in the liver of female rats may result from the inhibition of the synthesis of acetyl-CoA carboxylase, which is found in the supernatant fraction, in addition to a partial impairment of microsomal function.

STRUCTURE AND SYNTHESIS OF MILK FAT. VII. DISTRIBUTION OF FATTY ACIDS IN MILK FAT TRIGLYCERIDES WITH SPECIAL REFERENCE TO BUTYRATE. P. S. Dimick and S. Patton (Dept. of Dairy Sci., The Pennsylvania State Univ., University Park). *J. Dairy Sci.* 48, 444–449 (1965). Silicic acid column chromatography (SACC) and low-temperature-crystallization from acetone of hydrogenated milk fat were employed to isolate the

low molecular-weight triglycerides from milk fat. These techniques supplemented with thin-layer chromatography (TLC) and gas chromatography (GC) of the intact triglycerides and fatty acids esterified to the glycerol molecule enabled determination of the maximum amount of butyrate present. Fractionation by SACC of goat and cow milk fat triglycerides permitted the isolation of 63 to 70 triglyceride fractions according to molecular weight. No fraction contained over 20.4 mole per cent butyrate. Fractionation by low-temperature crystallization and GC revealed a maximum of 23.5 mole per cent of butyrate in the low molecular-weight triglyceride types. Thus, it was evident that no milk fat triglyceride fraction isolated contained more than one mole of butyrate per mole of triglyceride. This demonstrates that the normal level of butyrate present in milk fat (10 mole per cent) is distributed with medium- to long-chain fatty acids over a rather large mole per cent of the triglycerides.

PROTEOLIPIDS. IV. FORMATION OF COMPLEXES BETWEEN CYTOCHROME c AND PURIFIED PHOSPHOLIPIDS. M. L. Das, E. D. Haak, and F. L. Crane (Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.). *Biochemistry* **4**, 859–865 (1965). Purfied beef heart acidic lipids such as cardiolipin and inositide can form an isooctane-insoluble lipid-cytochrome c complex which contains 10 moles of phospholipid per mole of cytochrome c. Highly purified lecithin is unable to form any isooctane-soluble complex, whereas the highly purified unsaturated phosphatidylethanolamine fraction of beef heart can form an isoocatane-soluble complex which has a molar phosphorus-to-cytochrome c ration of 24. The extraction of this complex into isooctane is rather sluggish as free phosphatidylethanolamine is also extracted along with it into the isooctane phase. Under certain conditions both phosphatidylethanolamine and lecithin can aid in forming highly soluble complexes in isooctane in which cytochrome c is fully neutralized. In these complexes the external basic sites of cytochrome c are neutralized by acidic lipid, and additional amounts of lecithin or phosphatidylethanolamine are incorporated into the complex depending on which of the two predominates in the reaction mixture.

METABOLISM OF FREE FATTY ACIDS IN OBESE HUMANS. J. Brown (Univ. of Calif. School of Med., Los Angeles). *Proc. Soc. Exp. Biol. Med.* **118**, 901–904 (1965). To study the metabolism of FFA in obese patients compared to normal subjects, measurements were made of recovery of expired $C^{14}O_2$ from oxidation of 10 μc of albumin-bound palmitate-1-C^{14}. Specific activity of $C^{14}O_2$ was normal in 5 moderately obese women. The response to glucose administration was abnormal in 4 of 5 obese patents who failed to show the usual marked decrease in $C^{14}O_2$ specific activity. In contrast, glucose elicited the usual fall in serum FFA. These findings suggest that the adipose tissue response to glucose is normal but there is a defect in the mechanism by which glucose diverts FFA from oxidation to storage in muscle and liver. It is suggested that adaptation to fat utilization might explain the defect.

PLASMA LIPIDS OF DOGS DURING AND AFTER CHRONIC ETHANOL ADMINISTRATION. J. D. Beard and J. J. Barboriak (Marquette Univ. School of Med., Milwaukee, Wis.). *Proc. Soc. Exp. Biol. Med.* **118**, 1151–1154 (1965). The response of plasma lipids to daily administration of ethanol (4 g/kg body weight) for 12 weeks and to the cessation of ethanol administration was investigated in dogs. Chronic administration of ethanol resulted in marked and sustained increases in plasma concentrations of triglycerides, lipid phosphorus and total cholesterol, and in a decrease of plasma unesterified fatty acids. There was a slight increase in plasma volume. Upon discontinuing administration of ethanol the plasma lipids returned to baseline levels.

AFLATOXINS: ENVIRONMENTAL FACTORS GOVERNING OCCURRENCE IN SPANISH PEANUTS. L. J. Ashworth, Jr. (Texas A&M Univ., College Station), H. W. Schroeder and B. C. Langley. *Science* **148**, 1228–1229 (1965). Aflatoxins are absent from freshly harvested peanuts although *Aspergillus flavus* infest most of the kernels from pods having visible openings. Microbial competition, governed by kernel moisture, limits aflatoxin content of kernels. The toxins are subject to microbial breakdown but the amount broken down is governed by initial aflatoxin concentration.

GAS CHROMATOGRAPHIC STUDIES OF VITAMINS D_2 AND D_3. P. P. Nair, C. Bucana, S. de Leon, and D. A. Turner (Dept. of Med., Siani Hosp. of Baltimore, Inc., Baltimore, Md.). *Anal. Chem.* **37**, 631–636 (1965). A gas chromatographic method for the separation and determination of vitamins D_2 and D_3 is described. Biological material, such as whole blood and liver, was saponified and subjected to stepwise purification involving differential solubility in 72% ethanol, precipitation of the provitamins and cholesterol as the digitonides, selective extraction with carbon tetrachloride, and silicic acid and aluminum oxide column chromatography. Thermal cyclization products of the vitamins D (pyro and isopyro derivatives), formed during gas chromatography, gave rise to double peaks, which were shown to be quantitatively formed from the parent compounds. Gas chromatographic criteria for the vitamin D group, their provitamins, and dihydrotachysterol were established on two types of stationary phases: a methylpolysiloxane containing a low percentage of phenyl groups (SE 52), and a mixture of (SE 52) with a β-cyanoethyl methylpolysiloxane (949).

REACTIONS OF VITAMIN E WITH PEROXIDES. II. REACTION OF BENZOYL PEROXIDE WITH D-α-TOCOPHEROL IN ALCOHOLS. C. T. Goodhue and H. A. Risley (Res. Labs., Distillation Products Industries, Div. of Eastman Kodak Co., Rochester, N. Y.). *Biochemistry* **4**, 854–858 (1965). Benzoyl peroxide oxidation of d-α-tocopherol in the presence of alcohols resulted in the formation of 8a-alkoxy-α-tocopherones. The alkoxy groups were derived from the alcohols. Examples of straight-chain alkoxy-α-tocopherones with up to eighteen carbon atoms were made. A secondary alkoxy derivative was made, but a tertiary derivative could not be made. The use of ferric chloride-2,2′-bipyridine or bromine as oxidizing agent also resulted in the formation of the substituted α-tocopherones.

PHOSPHOLIPIDS OF CLOSTRIDIUM BUTYRICUM. N. Baumann, P. Hagen and H. Goldfine (Dept. of Bacteriology and Immunology, Harvard Med. School, Boston). *J. Biol. Chem.* **240**, 1559–67 (1965). Phospholipids isolated from *Clostridium butyricum* in the exponential phase of growth have been separated by thin-layer chromatography. The major phosphatides have been identified as N-methylethanolamine phosphatides, which are predominantly in the plasmalogen form; phosphatidylglycerol, which is predominantly in the diacylphosphatide form; and ethanolamine phosphatides, which are approximately equally divided between the diacylphosphatide and plasmalogen forms. Several minor phosphatides have also been partially purified but not identified. The biosynthesis of the major phosphatides has been studied in growing cultures. The time course of incorporation of P^{32}-labeled inorganic phosphate into phos-

phatidylglycerol, ethanolamine, and N-methylethanolamine phosphatides is consistent with precursor-product relationships between the ethanolamine and N-methylethanolamine phosphatides, and also between each diacylphosphatide and the corresponding plasmalogen. The incorporation of a series of carboxyl-labeled fatty acids into the lipid-bound fatty acids and aldehydes of growing cells of *C. butyricum* was measured, and in each case the cellular fatty acids and aldehydes with the same hydrocarbon chain length and structure had equal or nearly equal specific activities.

TRANSMETHYLATION PRODUCTS AS INTERMEDIATES IN ERGOSTEROL BIOSYNTHESIS IN YEAST. J. R. Turner and L. W. Parks (Dept. of Microbiology, Oregon State Univ., Corvallis, Oregon). *Biochim. Biophys. Acta* 98, 394–401 (1965). The methylated nonsaponifiable products obtained by transmethylation from *S*-adenosyl-L-methionine have been identified as sterols. At least three sterols possessing the transferred methyl groups are observed; one of these is ergosterol. One of the unidentified sterols serves as a precursor of ergosterol in extracts of yeast. Formation of the methylated derivatives is greatly stimulated by carbonate.

CONSTITUENTS OF THE HYDROCARBON FRACTION OF BEEF BRAINS. H. J. Nicholas and K. J. Bombaugh (Dept. of Obstetrics, Univ. of Kansas Medical Center, Kansas City, Kan.). *Biochim. Biophys. Acta* 98, 372–379 (1965). A hydrocarbon fraction previously detected in acetone concentrates of beef brains has been found to contain squalene. In addition, a homologous series of saturated, branched hydrocarbons ranging in size from approximately C_{10} to C_{30} was indicated by gas chromatography and other criteria. The possibility of paraffin hydrocarbons being present was indicated also. The presence of squalene was strongly indicated among these hydrocarbons, although more rigorous proof will be necessary to establish its identity with certainty.

PARTITION OF FATTY ACIDS OF 20-24 CARBON ATOMS BETWEEN SERUM ALBUMIN AND LIPOPROTEINS. Eleasar Shafrir, Shimon Gatt and Sarah Khasis (Dept. of Biochem., Hebrew Univ., Hadassah Medical School, Jerusalem, Israel). *Biochim. Biophys. Acta* 98, 365–371 (1965). The distribution of free fatty acids of chain length of 16–24 carbon atoms between the albumin and lipoproteins of human serum was investigated by ultracentrifugal partition and electrophoretic separation. With elongation of the carbon chain, less fatty acids was bound to albumin. More than 90% of the added palmitate remained with albumin, while the corresponding value for lignocerate was only 10–30%. The balance was distributed with the lipoproteins or remained unbound. Presence of one or more double bonds resulted in an increased proportion of free fatty acids bound to albumin. The possible role of lipoproteins as carriers of free fatty acids of 20 or more carbon atoms is discussed.

THE FORMATION AND ISOLATION OF LONG-CHAIN ACYL CARNITINES IN MITOCHONDRIA. S. J. Friedberg and R. Bressler (Dept. of Medicine, Duke Univ. Medical Center and Co-op. Lipid Lab. of the Vets. Adm. Hosp., Durham, N. C.). *Biochim. Biophys. Acta* 98, 335–343 (1965). Using [^{14}C] carnitine and [^{14}C] palmitate as substrates, a compound of carnitine and long-chain fatty acids was isolated from beef-heart mitochondria by a series of chromatographic procedures. Further analysis showed that it contains neither phosphorus nor glycerol and is therefore considered to represent acyl carnitine. The formation of the compound and fatty acid oxidation were simultaneously stimulated by carnitine.

INCORPORATION OF PHOSPHATE-P^{32} IN RABBIT KIDNEY LECITHINS AS A FUNCTION OF LECITHIN UNSATURATION. C. F. Wurster, Jr. and J. H. Copenhaver, Jr. (Dept. of Biol. Sciences, Dartmouth College, Hanover, N. H.). *Biochim. Biophys. Acta* 98, 351–355 (1965). The incorporation of P^{32} into rabbit kidney cortex lecithins has been studied. Kidney slices were incubated with inorganic phosphate-P^{32}, and reductive ozonolysis was employed to determine the P^{32} incorporation into disaturated, α'-saturated-β-unsaturated, α-unsaturated-β-saturated, and diunsaturated lecithins, and the lowest was found among the α-saturated-β-unsaturated lecithins.

INVESTIGATION ON THE LIPIDS OF THE L FORM OF PROTEUS P18. II. G. Rebel at P. Mandel (Institut de Chimie Biologique, Faculte de Medicine, Strasbourg, France). *Biochim. Biophys. Acta* 98, 380–393 (1965). Isolation of vitamin K and coenzyme Q from the neutral lipids of Proteus and its L form is described. A method is described for the separation of coenzyme Q and vitamin K through silicic acid column chromatography. The migration of some natural quinones in thin-layer chromatography is reported. The analysis of neutral lipids of P18 led to the isolation of vitamin K and coenzyme Q_7, coenzyme Q_8

and coenzyme Q_9. L forms contain only vitamin K_8 and coenzyme Q_8. The amount of quinones is higher in L forms than in the bacteria. The extension of the coenzyme Q nomenclature to all the quinones with a polyisoprenic side chain, specially the napthoquinones is proposed.

THE OCCURRENCE OF γ-LINOLENIC ACID IN FUNGI. R. Shaw (Unilever Res. Lab., Colworth House, Sharnbrook, Bedfordshire, Great Britain). *Biochim. Biophys. Acta* **98**, 230–237 (1965). The fatty acids from fat extracted from 31 species of fungi artificially cultured on fat-free media have been analysed by gas-liquid chromatography. One or more examples were taken from four orders of phycomycetes, seven orders of ascomycetes and five orders of basidiomycetes. γ-Linolenic acid (double bonds at 6,9,12 positions) was found only in the phycomycetes. All nine species of phycomycetes studied, including six species of the order *Mucorales*, contained γ-linolenic acid, but no α-linolenic acid. No α-linolenic acid was detected in the ascomycetes and basidiomycetes. Many members of these classes yielded α-linolenic acid. The phylogenetic significance of these results is discussed.

DIETARY ALTERATIONS OF THE MITOCHONDRIAL LIPID PATTERN. A. Sheltawy (Agricultural Res. Council Inst. of Animal Physiol., Cambridge). *Biochem. J.* **95**, 561–7 (1965). Changes in the lipid composition of rat liver mitochondria from both sexes have been studied in response to normal, fat (17% olive oil), and fat-cholesterol (0.2% in 17% olive oil) diets. In the non-phospholipid fraction, normal females had higher mitochondrial cholesterol concentrations than males. Free sterol was decreased in fat-cholesterol fed females, but not in males. In the phospholipid fraction, normal rats of both sexes had a predominance of mitochondrial lecithin over other phosphatides, but females had slightly higher lecithin concentrations than males. Fat-cholesterol fed females had equal concentrations of lecithin and cephalin. In the minor phosphatides, normal males had higher concentrations of phosphoinositides than females. The phosphatidic acid plus polyglycerophosphatide concentration was increased above normal in fat-fed females. Fat-cholesterol fed females had higher concentrations of phosphoinositides than normal. In general, changes in the mitochondrial lipid fractions occurred in female but not in male rats.

THE BIOSYNTHESIS OF RICINOLEIC ACID. A. T. James, H. C. Hadaway and Joan P. W. Webb (Unilever Res. Lab.). *Biochem. J.* **95**, 448–52 (1965). Ricinoleic acid is shown to be synthesized in the immature castor bean seed only after 3–4 weeks from the time of fertilization. Synthesis occurs both in the isolated embryo and the endosperm. Linoleic acid does not act as precursor of ricinoleic acid in the isolated bean embryo. Oleic acid is the direct precursor. The reaction does not use molecular oxygen, suggesting that ricinoleic acid is not an intermediate in the conversion of oleic to linoleic.

DIETARY FAT AND CORONARY HEART DISEASE. A. N. Howard and G. A. Gresham (Dept. of Pathology, Univ. of Cambridge). *Chem. Ind. (London)* **1965**, 831–7. The authors review (57 references) evidence relating dietary fat and coronary heart disease. They conclude that results from animal experiments support the thesis that dietary fats are important in the etiology of vascular disease and that the characterization of the various nutritional factors involved could have important applications to the human disease of coronary thrombosis.

SOME RECENT DEVELOPMENTS IN FAT NUTRITION. W. O. Lundberg (The Hormel Institute). *Chem. & Ind. (London)* **1965**, 572–82. This is the First International Lecture of the Oils & Fats Group of the Society of Chemical Industry. The author discusses the nutritional and metabolic aspects of so-called essential fatty acids and very briefly, relationships between dietary fats and vascular disease.

EFFECTS OF HYPERVITAMINOSIS A ON RAT TISSUE LIPIDS. U. K. Misra (Univ. of Delhi). *Biochem. J.* **95**, 30P (1965). Male rats were given intramuscularly 100,000 i.u. of prepalin (retinol) for 10 days. Vitamin A values per 100 ml of plasma of rats were 80–100 i.u. for the controls and 600–800 i.u. for the experimental animals. A significant increase in the lipids of liver, intestine and brain was found in the rats given excess vitamin A. Kidney lipids decreased significantly on vitamin A administration. Cholesterol in all tissues except heart increased significantly in rats with hypervitaminosis A. Tissue phospholipids and their turnover were not affected except in kidney where a significantly increased P^{32} uptake was observed as compared to controls.

EVALUATION OF ANTIOXIDANTS IN DEODORIZED AND NONDEODORIZED BUTTEROIL STORED AT 30C. C. J. Wyatt and E. A. Day (Dept. of Food Sci. and Tech., Oregon State Univ., Corvallis). *J. Dairy Sci.* **48**, 682–686 (1965). Tenox 2, 2,4,5-trihydroxybutyrophenone, nordihydroguaiaretic acid, lauryl gallate, propyl gallate, quercetin, and charred nonfat milk solids were evaluated in deodorized and nondeodorized butteroil stored 12 months at 30C. The samples were analyzed at one-month intervals for 2-thiobarbituric acid numbers, peroxide value, free carbonyls, and average flavor threshold. The antioxidants were effective in stabilizing the oil against flavor deterioration in the deodorized samples. However, in the nondeodorized oil, a flavor deterioration occurred early in storage which was attributed to nonoxidative reactions. This flavor defect was described as stale or lactone.

LIPIDS AND METALS IN FAT GLOBULE MEMBRANE FRACTIONS. T. Richardson and P. L. Guss (Dept. of Dairy and Food Industries, Univ. of Wisconsin, Madison). *J. Dairy Science,* **48**, 523–530 (1965). Fat globule membrane material (FGMM) was isolated from buttermilk of churned, washed cream. Unfractionated FGMM was obtained by isoelectric precipitation of buttermilk solids. Fractionated FGMM was obtained by differential centrifugation of buttermilk, yielding three pellets, and isoelectric precipitation of the remaining supernatant solids, yielding a fourth pellet. Two minor fractions were obtained by lyophilization of the final supernatants from the isoelectric precipitation steps. Analyses of the centrifugal fractions indicated two basic categories: 1) a high-density, reddish-brown fraction high in protein and low in lipid. 2) a low-density, cream-colored fraction low in protein and high in lipid. Lipid of the high-density fraction was higher in phospholipid and greater in total unsaturation and polyunsaturation than that of the low-density fractions. Fatty acid analyses showed virtually no qualitative differences, but quantitative differences among the various fractions did exist. Iron was high in the high-density fractions, whereas copper was more evenly distributed. Highest ratios of metal-to-fatty acid indicate one copper and one iron per 24 and 21 polyunsaturated fatty acid molecules, respectively.

ISOLATION AND IDENTIFICATION OF α-TOCOPHEROL, A VITAMIN E FACTOR, FROM ORANGE FLAVEDO. W. F. Newhall (Citrus Experiment Station, Univ. of Florida, Lake Alfred, Fla.) and S. V.

Ting. *J. Agr. Food Chem.* 13, 281–282 (1965). Extraction of the dried outer peel layer (flavedo) of oranges with n-hexane gave a viscous residue which was dewaxed by treatment with methanol. Chromatographic separation of the filtrate residue on an alumina column, a silicic acid column, and finally on silicic acid-coated thin-layer chromatographic plates afforded a pure sample of α-tocopherol.

LIPID COMPONENTS OF BILE FROM CHOLINE DEFICIENT RATS. I. C. Wells and J. M. Buckley (Dept. of Biochem., Creighton Univ. School of Medicine, Omaha, Nebr.). *Proc. Soc. Exp. Biol. Med.* 119, 242–243 (1965). The results obtained by the analyses of bile, collected from normal and choline deficient male rats during the first 24 hours after cannulation of the bile duct, indicate that the volume of bile produced is not changed but the concentrations of lipid components are generally decreased. Esterified cholesterol was absent and free cholesterol was in the same concentration as normal in the deficient bile. These findings may explain the previously observed accumulation of cholesterol esters in the livers of choline deficient rats.

STUDIES WITH MENHADEN OIL IN PRACTICAL-TYPE BROILER RATIONS. H. M. Edwards, Jr. and K. N. May (Poultry Dept., Univ. of Georgia, Athens, Georgia). *Poultry Sci.* 44, 685–689 (1965). The addition of menhaden oil to a practical-type broiler ration caused improvements in feed efficiency of the same magnitude as resulted when corn oil, poultry fat, blended fat or beef tallow were added to the ration. The addition of as little as 2% menhaden oil to the ration imparted off-flavor to the meat of chickens fed this ration. The addition of unsaturated fat to the ration along with the 2% menhaden oil appeared to decrease the extent of the off-flavor in the meat. However, it did not entirely prevent it.

UPTAKE OF PALMITIC ACID-1-C^{14} AND P^{32}-PHOSPHOLIPID-LABELED CHYLOMICRONS BY PERFUSED LIVER AND LIVER SLICES. B. Edgren and D. B. Zilversmit (Dept. of Physiol., Univ. of Tennessee Med. Units, Memphis). *Proc. Soc. Exp. Biol. Med.* 119, 64–71 (1965). Liver slices from post absorptive dogs and fed rats were incubated for up to 3 hours with chylomicrons containing palmitate-1-C^{14} and P^{32}-phospholipid suspended in phosphate buffer. The ratio of P^{32}/C^{14} in the liver slices was in most instances higher than that of the substrate chylomicrons. Reincubation of the dog liver slices with buffer or nonlabeled chylomicrons showed some release of C^{14} and P^{32}. Cyanide failed to inhibit lipid uptake by dog liver tissue, but lowered temperatures reduced the uptake. Dog liver slices deactivated by heating took up chylomicron P^{32} but the C^{14} uptake was greatly diminished from normal. Separation of chylomicrons into different size classes by centrifugation in sucrose gradients showed that the smaller particles were relatively richer in P^{32} than the larger chylomicrons. Evidence indicated, however, that the high P^{32}/C^{14} ratios in the liver slice are probably not caused by preferential uptake of small chylomicron particles.

SYNTHESIS OF TRITIUM-LABELED PROSTAGLANDIN E_2 AND STUDIES ON ITS METABOLISM IN GUINEA PIG LUNG. E. Änggård, K. Gréen, and B. Samuelsson (Dept. of Chem., Karolinska Institutet, Stockholm 60, Sweden). *J. Biol. Chem.* 240, 1932–1940 (1965). The synthesis of tritium-labeled prostaglandin E_2 is described. Enzymes in the particle-free fraction of guinea pig lung homogenates convert prostaglandin E_2 (11α,15-dihydroxy-9-keto-prosta-5, 13-dienoic acid) into two metabolites. These metabolites have been assigned the structures 11α,15-dihydroxy-9-keto-prost-5-enoic acid and 11α-hydroxy-9,15-diketoprost-5-enoic acid.

THE ARTIFACTUAL NATURE OF LIPID PEROXIDES DETECTED IN EXTRACTS OF HUMAN AORTA. F. P. Woodford, C. J. F. Bottcher, K. Oette, and E. H. Ahrens, Jr. (The Rockefeller Inst., New York). *J. Atheroscler. Res.* 5, 311–316 (1965). Lipid peroxides have been determined in lipid extracts of human aortas of varying degrees of atherosclerosis. Values lower than 2μ equiv./g lipid were obtained and evidence is presented that these, and the much higher values obtained by earlier workers, are largely attributable to artifactual formation of the peroxides during preparation of the tissue. This does not exclude the possibility of the participation of lipid peroxides in the atherosclerotic process.

BIOSYNTHESIS OF PROGESTERONE, STEROLS, AND SQUALENE FROM ACETATE-1-C^{14} AND MEVALONATE-2-C^{14} BY THE BOVINE CORPUS LUTEUM IN VITRO. H. R. Hellig and K. Savard (Univ. of Miami School of Med., Miami 36, Florida). *J. Biol. Chem.* 240, 1957–1961 (1965). The conversion of mevalonate-2-C^{14} as well as acetate-1-C^{14} to squalene, sterols, and progesterone by slices of bovine corpus luteum was established. The degree of C^{14} labeling of the products studied varied according ot the substrate used. The utilization of both acetate-1-C^{14} and mevalonate-2-C^{14} for synthesis of progesterone-C^{14} was increased to a comparable degree by pituitary luteinizing hormone. The utilization of leucine-2-C^{14} for progesterone synthesis appeared to be negligible as compared with that of acetate and mevalonate.

COMPARISON OF PLASMA PROTEIN CHANGES IN ANTIOXIDANT DEFICIENCY MUSCULAR DYSTROPHY AND GENETIC MUSCULAR DYSTROPHY IN THE CHICKEN. L. L. Tureen, P. M. Farrell and R. R. Cova (Dept. of Neurology and Psychiatry, St. Louis Univ. School of Med.). *Proc. Soc. Exp. Biol. Med.* 119, 28–32 (1965). Chickens on an antioxidant and sulfur amino acid deficient diet, develop nutritional myopathy. Plasma protein changes, progressively developing during the course of the disease, are characterized by a significant reduction in the albumin fraction, a significant rise in the globulin fraction and a significant fall in the A/G ratio. Paralyzed chickens of a genetic dystrophic strain fail to show such changes. The plasma protein profile is comparable to that of healthy chickens on a control diet. Genetic dystrophic chickens on an antioxidant and sulfur amino acid deficient diet grow poorly, develop the most severe degree of paralysis, and have a shorter survival period. It is concluded that the metabolic defect in genetic dystrophic chickens is one localized to the muscular system, while that in antioxidant and sulfur amino acid deficiency is a generalized one. The significance of the protein changes is briefly discussed.

THE BIOSYNTHESIS OF ETHER-CONTAINING PHOSPHOLIPIDS IN THE SLUG, ARION ATER. G. A. Thompson, Jr. (Dept. of Biochem., Univ. of Washington, Seattle, Wash.). *J. Biol. Chem.* 240, 1912–1918 (1965). The terrestrial slug *Arion ater* has been found to be a promising organism for the study of the formation of lipid ethers. The incorporation of glucose-6-C^{14}, palmitic acid-1-C^{14}, and chimyl alcohol-H^3 into glyceryl ether lipids has been measured. At all time intervals studied, including those during which maximum tracer uptake occurs, the glyceryl ether phospholipids and diacyl phospholipids are similar in specific radioactivity whereas the plasmalogens are lower in specific radioactivity than the other classes. Large amounts of fed glyceryl ethers can be incorporated into the tissue lipids, and the feeding of these compounds partially inhibits the biosynthesis of glyceryl ethers from palmitic acid.

LIPID COMPOSITION OF DRY BEANS AND ITS CORRELATION WITH COOKING TIME. K. K. Takayama, P. Muneta, and A. C. Wiese (Dept. Agr. Biochem. and Soils, Univ. of Idaho, Moscow, Idaho). *J. Agr. Food Chem.* 13, 269–272 (1965). The triglyceride and phosphatide contents of seven varieties or types of dry beans and the Alaska pea were determined. The triglyceride content ranged from 0.89% for Alaska peas to 1.54% for Michelite beans. The phosphatide content averaged near 1%, except for lima beans which averaged 0.88%. Gas-liquid chromatography was used to study the component fatty acids of the triglycerides and phosphatides. The main fatty acids of the triglycerides were palmitic, oleic, linoleic, and linolenic. Small amounts of myristic acid were found in all varieties except Great Northern beans. Lauric acid was found in Alaska peas. The list of component fatty acids of the phosphatides was similar to the triglycerides, except for the omission of linolenic acid in the phosphatides of the Great Northern, Michelite, Pinto, and Lima beans. Palmitic acid constituted about 50% of the fatty acids in the phosphatides of the eight types of beans and peas studied. No significant simple correlation coefficients were obtained between triglyceride, phosphatide, or crude lipid content and the cooking time for the dry beans.

BRAIN SPHINGOLIPIDS IN EXPERIMENTAL "ALLERGIC" ENCEPHALOMYELITIS. H. P. Schwarz, I. Kostyk, A. Marmelejo & P. Panageotopoulos (Dept. of Clinical Pathology, Philadelphia General Hospital, Philadelphia, Pa.). *Proc. Soc. Exp. Biol. Med.* 119, 42–44 (1965). Determination of the ratios of sphingomyelin:lipid-galactose in brain and spinal cord of a group of E.A.E. rabbits and a group of normal rabbits showed remarkable similarity of the ratios within each of the groups of rabbits. Comparison of the values of the two groups with one another, however, showed that the sphingomyelin:lipid-galactose ratios of both brain and spinal cord from the E.A.E. rabbits were significantly lower than those from the normal ones. The metabolic-enzymatic cause of this change is subject to further investigation.

ESTERIFICATION OF CHOLESTEROL BY CANINE ADRENAL CELL FRACTIONS. L. Swell, R. E. Dailey and C. R. Treadwell (Dept. of Biochem., School of Med., George Washington Univ., Washington, D.C.) *Proc. Soc. Exp. Biol. Med.* **119**, 71–73 (1965). Canine adrenal cell fraction (mitochondria, microsomes, and soluble fraction) were found to convert cholesterol-4-C^{14} to esters and adrenal steroids. The most active cell fraction was mitochondria; mitochondria also contained most of the adrenal cholesterol (as ester). The cholesterol esters synthesized by mitochondria and microsomes contained a high proportion of polyunsaturated fatty acids. The esters synthesized were similar in composition to those present in mitochondria and microsomes.

SITE OF FAT ABSORPTION IN THE CHICK. R. Renner (School of Household Econ., Univ. of Alberta, Edmonton, Alberta). *Poultry Sci.* **44**, 861–864 (1965). Experiments have been conducted to determine the site of absorption of fat in the four-week-old chicken by studying the extent of absorption of tallow, lard and soybean oil in five successive segments of the small intestine. Results showed that little fat was absorbed until the middle (third) segment of the small intestine was reached. Here, absorption was maximum with most of the remaining absorbable fat being removed in the fourth segment. Absorption in the fifth or terminal segment of the small intestine was low and was negligible in the caeca and in the large intestine.

THE EFFECT OF BORON ON THE LIPID CONTENT AND DISCOLORATION OF POTATOES. N. I. Mondy, A. Bourque, S. Breslow (Grad. School Nutr., N.Y. State College Home Econ., Cornell Univ., Ithaca, N.Y.) and L. R. Mattick. *Food Sci.* **30**, 420–425 (1965). Ontario, Katahdin, and Pontiac potatoes grown with and without boron foliar spray were examined for discoloration and lipid content. The lipid was fractionated into free fatty acids, neutral fat, and phospholipids. The free fatty acids from each of the three fractions were esterified and determined quantitatively by gas chromatography. Discoloration was measured with a Hunter color-difference meter. The total lipid of all three varieties was higher in potatoes treated with boron than in the control potatoes. Cortex tissue was significantly higher in lipid content than center tissue. Pontiac potatoes, the variety most resistant to discoloration, had the highest lipid content. The phospholipid fraction of all three varieties was higher in the potatoes treated with boron; the neutral fat fraction was higher in Pontiac potatoes treated with boron than in untreated the amount of unsaturated and decrease the amount of saturated fatty acids. The free fatty acid fraction of potatoes receiving boron treatment were lower in palmitic and higher in linoleic acid than the control.

FURTHER STUDIES OF THE EFFECT OF LINOLEIC ACID ON REPRODUCTION IN THE HEN. H. Menge, C. C. Calvert and C. A. Denton (U.S. Dept. Agr., Poultry Res. Branch, Animal Husbandry Res. Div., Beltsville, Md.). *J. Nutr.* **86**, 115–119 (1965). Single Comb White Leghorn female pullets were reared from hatching to 25 weeks of age with a low fat purified diet calculated to contain 0.005% linoleic acid (18:2). The pullets were then distributed into 6 groups of 20 birds each and given safflower oil at increments calculated to furnish zero, 10, 20, 40, 80, and 250 mg of 18:2/bird/day respectively. An increase in egg production, egg size, fertility and hatchability paralleled an increase in dietary 18:2 with the exception that hatchability still remained zero at the 10-mg level. Only 20 mg of 18:2 daily were necessary in this extracted, purified diet to increase fertility from 73.4 to 92.5%, and to decrease early embryonic mortality from 31.0 to 10.8%. Higher levels of 18:2 had no further effect on fertility or early embryonic mortality. The presence of quantities of eicostrienoic acid (20:3) in the plasma and yolk lipids from essential fatty acid-deficient hens suggests a possible relationship between the development or expression of the various reproductive characteristics and the tissue level of 20:3.

THE EFFECT OF ANTIOXIDANT TREATMENT ON THE METABOLIZABLE ENERGY AND PROTEIN VALUE OF HERRING MEAL. B. E. March, J. Biely, H. L. A. Tarr, and F. Claggett (Dept. of Poultry Sci., Univ. of British Columbia, Vancouver 8, Canada). *Poultry Sci.* **44**, 679–685 (1965). The effects of storage on the nutritive value of herring meals have been studied. Whole and presscake herring meals manufactured at different times with and without treatment with antioxidants butylated hydroxytoluene and 1,2-dihydro-6-ethoxy,-2,2,4-trimethylquinoline have been compared. The lipids extracted with chloroform-methanol from either fresh or stored herring meals were tolerated when fed to chicks at a level of 10% and supplied approximately 2,300 caloried of M.E. per pound. The M.E. of the intact herring meals was maintained at a higher level during storage when the meals had been treated with an antioxidant. The solubility of

the lipids in both diethyl ether and in chloroform-methanol in the stored meals was higher when the meals had been treated with antioxidant. When the overall nutritive values of the meals as protein supplements in chick-starting diets were compared after several months storage, the antioxidant-treated meals gave significantly better growth. The difference in protein supplementary value between the untreated and the antioxidant-treated meals was not related to the levels of chemically determined "available" lysine present after storage.

UPTAKE, HYDROLYSIS AND SYNTHESIS OF CHOLESTEROL ESTERS BY A TRANSPLANTABLE ADRENAL CORTICAL TUMOR. W. J. Lossow, G. Shyamala, S. Shah, and I. L. Chaikoff (Dept. of Physiology, Univ. of California, Berkeley). *Proc. Soc. Exp. Biol. Med.* **119**, 126–131 (1965). A very low-density, cholesterol-labeled lipoprotein fraction of rat chyle, in which about 70% of the sterol-C^{14} was in the esterified form, was injected intravenously into normal rats and into rats bearing the transplanted Snell adrenal cortical tumor 494H. The esterified and free sterol-C^{14} contents of the tumor and of the normal adrenal glands were measured at several intervals after the injection. The same general pattern—an initial decrease followed by an increase in the proportion of sterol-C^{14} esterified—was observed for tumor and normal gland. This suggests that in both cases the uptake and hydrolysis of labeled chyle cholesterol esters were followed by cholesterol reesterification. In the tumor, however, the hydrolysis occurred later and the subsequent reesterification was much less pronounced.

STUDIES OF MALE SURVIVORS OF MYOCARDIAL INFARCTION. IV. SERUM LIPIDS AND FIVE-YEAR SURVIVAL. J. A. Little, H. M. Shanoff, R. D. Roe, A. Csima, and R. Yano (Dept. of Med., Univ. of Toronto, Toronto, Ontario, Canada). *Circulation* **31**, 854–862 (1965). This study examined life expectancy and serum lipids in 120 men with atherosclerotic coronary heart disease. Five-year survival from onset of infarction was 79%. No relationship could be demonstrated between survival and the level of the total serum cholesterol, std. S_f 0–12, 12–20, 20–100, and 100–400 lipoproteins. Survival for patients with an infarct less than 6 months before entry into the study was shorter, despite serum lipid levels the same as the remainder of the group. Although the age of onset of coronary disease is influenced by serum lipid levels, survival subsequent to infarction is not. This paradox suggests that serum lipids affect rate of atherogenesis in the long preclinical stage but in the short clinical stage other factors determine survival.

INFLUENCE OF MEDIUM-CHAIN TRIGLYCERIDE (MCT) ON CHOLESTEROL METABOLISM IN RATS. D. Kritchevsky and S. A. Tepper (Wistar Inst. of Anatomy and Biology, Phil., Pa.). *J. Nutr.* **86**, 67–72 (1965). Medium-chain triglyceride (MCT) is a liquid, saturated fat composed almost entirely of triglycerides of C_8 and C_{10} fatty acids. The effect of MCT on serum and liver cholesterol levels of normal and cholesterol-fed rats and upon hepatic lipogenesis in rats was compared with coconut oil and corn oil. Normal rats fed 20% MCT exhibited lower serum and liver cholesterol levels than did control rats or rats fed 20% coconut oil or corn oil. In rats fed 2% cholesterol and 0.5% cholic acid and 20% MCT, serum cholesterol levels were about one-half of levels observed in rats fed cholesterol-cholic acid and either coconut or corn oil. Liver cholesterol levels in the MCT-fed rats were about 65% of levels in the other 2 groups. The serum β-lipoprotein cholesterol was elevated to the same extent in all 3 groups. The α:β lipoprotein cholesterol ratio is 0.10. When hypercholesteremic rats were fed cholesterol-free diets containing 20% of MCT, coconut or corn oil for 2 weeks, serum and liver cholesterol levels decreased at the same rate in all 3 groups.

TOCOPHEROL CONTENT OF HUMAN ADIPOSE TISSUE. K. Imaichi, S. Cox, L. W. Kinsell, M. Schelstraete and H. S. Olcott (Inst. for Metabolic Res., Highland-Alameda County Hosp. Oakland, Calif.) *Am. J. Clin. Nutr.* **16**, 347–350 (1965). Human adipose tissue was obtained from a group of twelve subjects who had been ingesting diets containing large amounts of polyunsaturated fat for eighteen months or more and from a group of thirty-one hospitalized control subjects. The average tocopherol contents of the adipose tissues (132 and 144 μg. per gm. lipid) did not differ appreciably between the two groups, but there were wide variations within the groups (from 20 to 910 μg. tocopherol per gm. lipid).

METABOLISM OF LABELED DIETHYLSTILBESTROL IN RUMINANTS. F. C. Hinds, H. H. Draper, G. E. Mitchell, Jr., and A. L. Neumann (Dept. of Animal Science, Univ. of Illinois, Urbana, Ill.). *J. Agr. Food Chem.* **13**, 256–259 (1965). The results of an earlier study on the metabolism of tritium-labeled diethylstilbestrol (DES-T) in lambs and steers have been confirmed and extended. The "free phenolic" material found in the tissues and excreta after DES-T administration was identified by carrier crystallization and chromatographic methods as stilbestrol, and the "conjugated" material excreted in the urine as its glucuronide. It was shown that no other forms of DES are present in appreciable quantities in alcohol-ether extracts of the tissues and excreta. Rumen microflora were shown to be capable of hydrolyzing the glucuronide *in vitro* and it was proposed that the excretion of the free form in the feces is partially the result of degradation of the conjugate by intestinal bacteria.

INFLUENCE OF DIETARY LIPIDS ON THE FATTY ACID COMPOSITION OF NEUTRAL LIPIDS AND PHOSPHATIDES IN CHICK LIVER BILE. J. L. Glenn and H. Dam (Dept. of Biochem. and Nutr., Polytechnic Inst., Copenhagen, Denmark). *J. Nutr.* **86**, 143–153 (1965). Diets in which the fat content was derived from either cottonseed oil, linseed oil, rapeseed oil, a high linoleic acid margarine, butter, or a commercial stock diet were fed to one-week-old chicks for 6 weeks. An additional group of chicks was fed a fat-free diet. The influence of these diets on the fatty acyl content of hepatic and biliary phospholipids and non-phosphatide lipids was determined, and where possible, a direct comparison in the fatty acid content of a liver phosphatide was made with its biliary counterpart. The results demonstrated that phosphatidylethanolamine possessed distinctly different acyl groups in bile when compared with liver, and the differences were similar with all diets. Phosphatidylcholine in bile also had a different fatty acid content than the liver phosphatide but the differences were not as consistent as for phophatidylethanolamine. Possible explanations for the alterations of the bile compounds are discussed.

FATTY ACID COMPOSITION OF RAT LIVER DURING CHOLINE DEFICIENCY. E. A. Glende, Jr. and W. E. Cornatzer (Dept. of Biochem., School of Med., Univ. of North Dakota, Grand Forks, N.D.). *J. Nutr.* **86**, 178–186 (1965). The fatty acid compositions of whole liver triglycerides, diglycerides, total phospholipids, and lecithin, and mitochondrial total phospholipids and lecithin were determined on rats which had developed fatty livers after they had been fed a low protein, choline-deficient diet for 10 or 28 days. Experiments were conducted with either a hydrogenated vegetable oil or safflower oil as the source of dietary fat. Overall, there was essentially no difference in the fatty acid patterns of the liver lipids from the choline-deficient animals when compared with those receiving a choline supplement. However, the type of fat and carbohydrate in the diet accounted for changes in the fatty acid composition in both the choline-deprived and choline fed rats. The hydrogenated vegetable oil, which has a high amount of oleic acid, caused the liver lipid oleic acid content to increase and produced a lowering of the linoleic and arachadonic acid levels, whereas safflower oil, containing a high content of linoleic acid, caused the liver lipid oleic acid level to drop while the linoleic acid level remained nearly constant.

SERUM LIPID CHANGES FOLLOWING MYOCARDIAL INFARCTION. T. Deegan and P. J. Hayward (Sefton General Hospital, Liverpool, Great Britain). *J. Atheroscler. Res.* **5**, 267–275 (1965). Serum lipid changes following myocardial infarction were followed in two groups of males and females during January–April, 1963, and September–December, 1963, to determine the time required for the lipid levels to return within limits determined in normal male and female subjects. Lipid levels fell after infarction and reached minima at the end of the first week. Parallel effects noted in cholesterol and phospholipid fractions were not shared by triglyceride levels. Normal patterns of lipid levels were achieved during the fourth week after infarction. No influences were attributable to seasonal effects, anti-coagulant therapy or, as far as could be judged, diet. Assessment of the individual patterns following infarction emphasized the subjective response of the lipid levels to external influences and the need to cover all lipid levels, if possible, in following such responses.

COMPARATIVE NUTRITIONAL VALUE OF CORN OIL AND OLIVE OIL FOR GROWING CHICKENS. N. J. Daghir and R. I. Tannous (American Univ. of Beirut, Beirut, Lebanon). *Poultry Sci.* **44**, 697–

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701 (1965). Male chicks were fed from the 3rd to the 9th week of age rations containing 5 or 10% of either corn oil, edible olive oil or crude olive oil. All fats added to the diet significantly improved feed efficiency, but had no significant effect on body weight gains. No statistically significant difference were observed in plasma or liver cholesterol levels. Fatty acid composition of body fat was influenced to a great extent by the kind of fat fed. The major alterations in body fat composition were in the linoleic + linolenic and oleic acid fractions. These results present further evidence that the composition of the fat in the ration should be given careful consideration in the production of poultry meat for human consumption.

THE CAROTENOIDS OF CERTAIN FRUITS (APPLE, PEAR, CHERRY, STRAWBERRY). M. Galler and G. Mackinney (Dept. of Nutritional Sciences, Univ. of California, Berkeley, Calif.). *Food Sci.* **30**, 393–395 (1965). The carotenoids of nine varieties of apple, four varieties of pear, two of strawberry, and one of cherry were examined. The first three fruits are low in carotenoid (0.3–5.0 ppm on a fresh-fruit basis), the pears exceptionally so (0.3–1.2 ppm). The cherry ranks somewhat higher (5–11 ppm). With the possible exception of the cherry, no new polyene synthesis appears to occur during ripening.

STRUCTURE OF THE CAROTENOID NEOXANTHIN. A. L. Curl (West. Reg. Res. Lab., Albany, Calif.). *Food Sci.* **30**, 426–432 (1965). The products formed on reaction of neoxanthin and hydrochloric acid in methanol and in acetone indicate that neoxanthin is 3,3′,5′-trihydroxy-5′6′-dihydro-5,6-epoxy-beta-carotene. The tertiary 5′-hydroxyl group reacts in a similar manner to the allylic 3′-hydroxyl group in lutein.

EFFECT OF VITAMIN D ON THE ACTIVITY OF ALKALINE PHOSPHATASE IN THE BLOOD AND BONES OF ALBINO RATS DEPENDING ON THE CALCIUM AND FAT CONTENT OF THE DIET. K. K. Golikov (Inst. of Nutrition, Acad. Med. Sci. U.S.S.R., Moscow). *Ukr. Biokhim. Zhur.* **37** (1), 97–103 (1965). The purpose of the present work was to explain the effect of vitamin D on the activity of alkaline phosphatase in the blood and bones of albino rats, when their diets contained different quantities of fat, and also calcium and phosphorus in a 4:1 ratio. The animals received diets containing 41, 22, and 4.5% fat, calculated on a caloric basis. Each of the three diets was fed to two groups of animals one of which recieved 5 I.U. of vitamin D_2 daily, and the other 0.128 I.U. Differences found in the experiment depended on the quantity of vitamin D and on the fat content in the diet. Vitamin D, added to diets with a normal quantity of fat, decreased the activity of alkaline phosphatase in the blood and bones after 24 days on the diet. Added to diets containing a high quantity of fat, vitamin D increased the activity of alkaline phosphatase in blood and bone. For the group of animals fed diets for 24 days with an increased quantity of fat, the activity of alkaline phosphatase in the blood and bones changed under the influence of vitamin D depending on the calcium content in the diet. Cases of rickets were observed in animals kept on diets with normal or lowered activity of the alkaline phosphatase of the blood.

CHANGES IN THE CONTENT OF LIPIDS AND KETONE BODIES IN THE LIVER, BLOOD AND URINE OF CATTLE WITH AGE. S. I. Kusen and V. G. Yanovich (Ukrainian Res. Inst. for the Physiol. and Biochem. of Domestic Animals, Lvov). *Ukr. Biokhim. Zhur.* **37**, 122–29 (1965). A study was made of the content of several compounds of lipid metabolism in the liver tissue (obtained by biopsy), blood, and urine of two groups of calves. The first group was from 1 to 20 months of age, the second from 1 to 10. The concentration of total lipids and their iodine number, lipoid phosphorus, cholesterol, and ketone bodies were determined in the liver and blood. In the urine, only the ketone bodies were determined. Regular changes in lipid metabolite concentrations in the liver, blood, and urine with the age of the animal were determined. The season also was observed to have a marked effect on the content of several lipid compounds.

THE INFLUENCE OF SEASONAL VARIATION, DIET AND PHYSICAL ACTIVITY ON SERUM LIPIDS IN YOUNG MEN IN ANTARCTICA. A. Antonis, M. C. Path, I. Bersohn, R. Plotkin, D. L. Easty, and H. E. Lewis (E. Oppenheimer Heart Res. Unit, South Africa Inst. for Med. Res., Johannesburg, South Africa). *Am. J. Clin. Nutr.* **16**, 428–435 (1965). Seasonal changes in serum total cholesterol, phospholipid and triglyceride levels were minimal although physical activity and dietary intake showed considerable variation; the latter factors apparently balancing each other. The changes in the alpha- and beta-lipoprotein cholesterol concentration were significant. In winter beta-lipoprotein cholesterol levels rose significantly while alpha-lipoprotein cholesterol levels fell significantly.

PLASMA AND TISSUE LIPIDS IN HYPERCHOLESTEREMIC PIGEONS. S. Banerjee, P. Narasimha Rao and A. Bandyopadhyay (Dept. of Physiology, S.M.S. Medical College, Jaipur, India). *Proc.*

Soc. Exp. Biol. Med. 119, 150–153 (1965). Different fractions of plasma lipids and lipid content of tissues were determined in hypercholesteremic pigeons. Hypercholesteremia was produced by feeding sesame oil and cholesterol. Hypercholesteremic pigeons had significantly higher levels of plasma β-lipoprotein cholesterol, phospholipids, triglycerides, β-lipoprotein percentage and increased β:α lipoprotein ratio; increased cholesterol in the liver and carcass; increased phospholipid in the liver; increased total lipid in the liver and diminished total lipid in the heart and skin. There had been no interrelationships between plasma levels and tissue distribution of lipids. Hypercholesteremia disturbed the lipid metabolism in pigeons.

THE EFFECT OF HEPARIN PRETREATMENT ON DEVELOPMENT AND CLEARING OF ALIMENTARY LIPEMIA. J. J. Barboriak, R. C. Kory and L. H. Hamilton (Depts. of Phar., Med. and Physiol., Marquette Univ. School of Med., Milwaukee, Wisc.). *Am. J. Clin. Nutr.* 16, 412–416 (1965). Ten fasting subjects, who received 50 mg. heparin intravenously 30 minutes before ingestion of a high fat meal, responded with an immediate but brief rise in plasma unesterified fatty acid (UFA) levels. The subsequent lipemia was significantly higher than that which developed in a second comparable group of ten subjects who received the same high fat meal but no pretreatment with heparin. The pretreated subjects also showed reduced lipemia-clearing activity following a second dose of heparin administered 3 hours after the meal.

A POSSIBLE BIOSYNTHETIC PATHWAY TO THE CONJUGATED POLYETHENOID ACIDS. F. D. Gunstone (St. Salvator's College, The University, St. Andrews, Scotland). *Chem. Ind. (London)* 1965, 1033–4. A biosynthetic pathway is suggested for conjugated polyethenoid acids derived from linoleic acid which involves (a) oxidation, (b) anionotropic rearrangement, (c) 1,4-dehydration, (d) *cis*→*trans* stereomutation. The pathway for acids possibly derived from linolenic acid would include steps (a) and (c). Hydroperoxides or phosphorylated hydroxy or hydroperoxy compounds may also be involved.

DRY MILK PRODUCT AND PROCESS OF MANUFACTURE. J. B. Shields, L. J. Nava, and C. A. Kempf (Dairy Foods, Inc.). *U.S. 3,164,473.* A method for processing fat-containing milk solids consists of the following steps: 1) moist porous aggregates of the milk solids are contacted with added extraneous lecithin, the aggregates having a moisture content of the order of 7 to 16%; 2) the aggregates are heated to a temperature above ambient to promote distribution of the lecithin; 3) the excess moisture is removed from the aggregates to form the final product. The amount of lecithin added is sufficient to provide a lecithin content of from 0.1 to 1% of the final dry product.

METHOD OF PREPARING INTRAVENOUSLY INJECTABLE FAT EMULSIONS FREE FROM SIDE REACTIONS OR COMPLICATIONS. A. J. Wretlind. *U.S. 3,169,094.* An intravenously injectable fat emulsion free of undesirable side effects comprises an aqueous mixture of (a) soybean oil which has been produced by extraction with organic solvents under conditions to avoid oxidation at a temperature not exceeding 100C, and (b) egg phosphatides which have been produced by successive extractions with alcohol and acetone and then purified by treatment with petroleum ether under conditions to avoid oxidation. The emulsion has a particle size of less than about 4 microns.

SOLID, VITAMIN E-ACTIVE PRODUCT AND PROCESS FOR MAKING IT. G. Brooks (Eastman Kodak Co.). *U.S. 3,173,838.* A process for making a cold water dispersible, dry, finely divided, solid vitamin E-active product comprises the following steps: preparing a dispersion of a water insoluble, vitamin E-active oil (5–60% of dispersion) in a solution of acacia (10–60%) and water (30–60%); converting the dispersion into a dry, finely divided, solid product; and rinsing the product with a nonpolar solvent for the vitamin E-active oil. The improvement comprises the step of admixing into the dispersion with gentle agitation a quantity of a surface active agent selected from the group consisting of lecithin, hydroxylated lecithin, a polyoxyethylene adduct of sorbitan monolaurate, in which the ethylene oxide content averages about 20 mole %, sodium lauryl sulfate and alkyl trimethylammonium chlorides derived from tallow. The quantity of the surface active agent is in the range of 1–10% by weight of the acacia.

PROCESS FOR DISTINGUISHING NATURAL α-TOCOPHEROL FROM SYNTHETIC α-TOCOPHEROL. D. R. Nelan (Eastman Kodak Co.). *U.S. 3,173,926.* A sample of the α-tocopherol is mixed with a water soluble ferricyanide salt in aqueous solution, thus forming a mixture comprising an aqueous and an oil phase. The optical activity of the oil phase is measured. If the tocopherol is d-α-tocopherol, the oil phase will have a substantially enhanced positive rotation; if the tocopherol is dl-α-tocopherol the specific rotation will be essentially zero.

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PROCESS OF CHROMATOGRAPHIC EXTRACTION OF VITAMIN D_2 AND/OR PRE-VITAMIN D_2. F. Balestic (Commissariat a l'Energie Atomique). *U.S. 3,185,716.* A process of chromatographic extraction of vitamin D_2 and pre-vitamin D_1 prepared by the ultraviolet irradiation of ergosterol comprises: forming a solution of the irradiation products associated with the vitamin and and pre-vitamin and unconverted products in a non-polar or weakly polar organic solvent, effecting chromatographic adsorption of the solution by passage through Florida fuller's earth, and eluting the vitamins with an organic solvent which is not less polar than the first-mentioned solvent.

METHOD OF PRODUCING VITAMIN A ACID ESTERS. S. Saijo and K. Ohizumi (Sumitomo Chemical Co., Ltd., Osaka). *U.S. 3,187,027.* The method comprises reacting vitamin A acid with a di-(lower alkyl) sulfate and an alkaline compound selected from the group consisting of hydroxides, carbonates, and bicarbonates of alkali metals and alkali earth metals in a heterogeneous system including a hydrocarbon solvent, and recovering the resulting lower alkyl ester of vitamin A acid from the hydrocarbon solvent.

LIPID METABOLISM OF PUPPIES AS AFFECTED BY KIND AND AMOUNT OF FAT AND OF DIETARY CARBOHYDRATE. H. F. Wiese, M. J. Bennett, E. Coon and W. Yamanaka (Bruce Lyon Memorial Res. Lab., Children's Hospital of the East Bay, Oakland, Calif.). *J. Nutr.* **86**, 271–280 (1965). Feeding 37 young growing puppies diets similar in composition to those fed infants demonstrated that sucrose, Dextri-Maltose, and corn syrup are equally suitable as types of dietary carbohydrate. No significant differences were observed in rate of growth or response of blood sugar levels or serum levels of protein and total fatty acids between groups of animals fed these sugars as the major source of carbohydrate. Cholesterol levels were lowest when sucrose was fed in diets containing corn or hydrogenated coconut oil. Lactose was not acceptable as the sole source of carbohydrate for the young puppy.

REPELLENCY OF SKIN-SURFACE LIPIDS OF HUMANS TO MOSQUITOES. W. A. Skinner and H. Tong (Dept. of Pharmaceutical Chem., Stanford Res. Inst., Menlo Park, Calif.) and H. Maibach, A. A. Khan and T. Pearson. *Science* **149**, 305–306 (1965). Skin lipids obtained from the washings, in acetone or diethyl ether, of the foreheads or arms of humans are very repellent to female *Aedes aegypti* when evaluated in a dual-port olfactometer. By means of thin-layer chromatography, the repellent substances can be separated from nonrepellent material also present in *skin lipids.*

DOUBLE BETA-LIPOPROTEIN: A NEW GENETIC VARIANT IN MAN. W. Seegers, K. Hirschhorn and L. Burnett (Bellevue Hospital, New York City). *Science* **149**, 303–304 (1965). A β-lipoprotein variant, in which two bands appear after electrophoresis, has been found in three generations of a family. The variant, immunologically also a β-lipoprotein, differs in molecular size. density, and charge from normal β-lipoprotein. Individuals showing the variant appear to be heterozygous for an uncommon mutant gene.

THE FORMATION OF PLASMA LIPOPROTEINS FROM APOPROTEIN IN PLASMA. P. S. Roheim, L. Miller and H. A. Eder (Depts. of Med. and Physiol., Albert Einstein College of Med., New York, N.Y.) *J. Biol. Chem.* **240**, 2994–3001 (1965). Rat plasma contains an apoprotein which combines with lipid in the liver and is released into the plasma as lipoproteins. The highest rate of incorporation is into the density < 1.019 lipoprotein fraction although there is some incorporation into the other lipoprotein fractions. Ammonium sulfate fractionation of the plasma proteins has shown that the apoprotein is in the globulin fraction.

STUDIES ON THE MECHANISM OF CELLULAR DEATH. II. CARBOHYDRATE AND LIPID CHANGES DURING EARLY AND LATE CARDIAC NECROSIS IN THE DOG. A. Raychaudhuri, B. L. Strehler, R. Wilder, M. Gee and G. Press (Baltimore City Hospitals, Baltimore, Maryland). *J. Gerontol.* **20**, 338–345 (1965). In the noninfarcted dog myocardium the distribution of glycogen was segmented along the myofibrils. Glycogen was perceptibly reduced in the earliest infarcts and was completely lost later (well-delineated infarct). Leukocytes laden with glycogen granules appeared to about 16 to 24 hours after occlusion. The subendocardial Purkinje fibers had a strong glycogen and PAS reaction in both infarcted and non-infarcted areas. A non-glycogen PAS positive material appeared in the infarct between 4 and 6 hours and persisted up to 480 hours. Neutral fat droplets were found to be sparsely distributed in the non-infarcted myofibers. These droplets increased in size and number with infarcts between 4 and 72 hours, but were primarily associated with cells bordering the infarct proper. Leukocytes in the infarcted zone and histiocytes in the fibrotic area were laden with neutral fat.

BIOSYNTHESIS OF C-18-OXYGENATED STEROIDS BY AN ALDOSTERONE-SECRETING HUMAN ADRENAL TUMOR. METABOLISM OF PROGESTERONE-4-^{14}C, 11-DEOXYCORTICOSTERONE-1,2-^{3}H AND PREGNENOLONE-4-^{14}C. P. R. Raman, D. C. Sharma, R. I. Dorfman and J. L. Gabrilove (Inst. Hormone Biol., Syntex Res. Center, Palo Alto, Calif.). *Biochemistry* **4**, 1376–1385 (1965). Homogenate as well as subcellular fractions of an adrenal tumor from a female patient with primary aldosteronism were incubated with progesterone-4-^{14}C, 11-deoxycorticosterone-1,2^{3}H and pregnenolone-4-^{14}C. The incubation mixtures were extracted, partitioned, and chromatographed along with steroid carriers on a Celite column with gradient elution. Radioactive metabolites corresponding to carrier steroids were further characterized by several paper and thin-layer chromatography systems and finally by conversion into suitable derivatives. Besides 11-deoxycorticosterone and corticosterone, aldosterone and 18-hydroxycorticosterone were among the incubation products. As compared to the whole homogenate, subcellular fraction (6500 X g sediment) more actively converted 11-deoxycorticosterone into 18-hydroxycorticosterone. Subcellular fraction (105,000 X g sediment) alone failed to convert 11-deoxycorticosterone into aldosterone.

THE BIOSYNTHESIS OF PHOSPHATIDIC ACID AND LYSOPHOSPHATIDIC ACID BY GLYCERIDE PHOSPHOKINASE PATHWAYS IN ESCHERICHIA COLI. R. A. Pieringer and R. S. Kunnes (Dept. of Biochem., Temple Univ. School of Med., Philadelphia, Penn.). *J. Biol. Chem.* **240**, 2833–2838 (1965). An enzyme found in the cytoplasmic particulate fraction of broken cell preparations of *Escherichia coli* readily catalyzed the synthesis of phosphatidic acid according to the following reaction: α,β-diglyceride + ATP $\rightarrow$ α-phosphatidic acid + ADP. The enzymatic reaction required the presence of magnesium ion and a detergent. The enzyme was stable to the heat of a boiling water bath. After heat treatment, the particulate enzyme preparations were almost completely free of interfering phosphatase and other degradative enzymatic reactions. Under similar conditions of incubation α-lysophosphatidic acid was synthesized from monoglyceride and adenosine triphosphate.

SPHINGOSINE BASES OF NORMAL HUMAN WHITE MATTER. E. A. Miscatelli and J. R. Mayes (Univ. of Texas Southwestern Med. School, Dallas, Tex.). *Biochemistry* **4**, 1386–1390 (1965). The sphingosine bases of the nonganglioside polar lipids of two areas of human white matter were analyzed by means of gas-liquid chromatography. Sphingosine accounted for 94–99% and dihydrosphingosine 1–5% of the total. Little difference was found between the two areas analyzed, the corpus callosum and the pons-medulla oblongata portion of the brain stem. C_{16} dihydrosphingosine was found at levels up to 2%, and C_{14} dihydrosphingosine was found in trace quantities. No C_{20} dihydrosphingosine or C_{20} sphingosine was present. Other compounds were noted in minor quantities, one of which may be C_{16} sphingosine.

THE LIPID RESPONSE OF YOUNG WOMEN TO DIETARY CARBOHYDRATES. I. MacDonald (Dept. of Physiol., Guy's Hospital Med. School, London, S.E. 1, England). *Am. J. Clin. Nutr.* **16**, 458–463 (1965). Low fat diets containing either 450 g maize starch or 450 g sucrose were given to five women for periods of 25 days. The findings were compared with these for men on similar diets. On the sucrose diet the women showed a decrease in the total serum lipid mainly as glycerides and cholesterol, whereas the men showed the reverse. The fatty acid pattern of the serum in response to the sucrose diet was similar in each sex, this not being so on the starch diet. The composition of adipose tissue in women in contrast to that in men remained constant while on each dietary carbohydrate. These findings are compatible with the view that dietary sucrose in men leads to a serum lipid picture similar to that seen in ischemic heart disease.

A SYSTEM OF PROPORTIONED FAT DIETS FOR CLINICAL USE. A. Galbraith and F. T. Hatch (Dietary Dept. and the Med. Ser-

vices, Mass. Gen. Hospital; and the Dept. of Med., Harvard Med. School, Boston, Mass.). *Am. J. Clin. Nutr.* 16, 480–491 (1965). The major objectives of the proportioned fat diet are the attainment of ideal body weight, and the reduction of elevated levels of both cholesterol and triglycerides in serum. To achieve this end, control is required of (1) the total caloric intake in relation to the energy expenditure, (2) the proportions of total fat and carbohydrate, (3) the amounts of saturated and polyunsaturated fatty acids, and (4) the intake of cholesterol.

COMPLETE STRUCTURES OF THE GLYCOPHOSPHOLIPIDS OF MYCOBACTERIA. Y. C. Lee and C. E. Ballou (Dept. of Biochem., Univ. of California, Berkeley). *Biochemistry* 4, 1395–1404 (1965). 1-Glycerylphosphoryl-L-myoinositol di-, tri-, tetra-, and pentamannosides were isolated from the deacylated chloroform-methanol extracts of *Mycobacterium phlei* and *M. tuberculosis* cells by a combination of DEAE-Sephadex column chromatography and paper chromatography. The structures of the carbohydrate portion of these glycophospholipids were studied after removal of the glycerylphosphoryl group by ammoniacal hydrolysis. The methanolysates of the permethylated myoinositol tri- and tetramannosides contained 1,3,4,5-tetra-O-methylmyoinositol as well as the methyl glycosides of 2,3,4,6-tetra-O-methyl-D-mannose and 2,3,4,-tri-O-methyl-D-mannose, in ratios of 1:2:1 and 1:2:2, respectively. The results indicate that the tri- and tetramannosides have the same branched structure as the pentamannoside in which the mannoses are attached to positions 2 and 6 of the myoinositol ring. Partial acid hydrolysis of the myoinositol pentamannoside with Dowex 50 yielded a pair of myoinositol tetramannoside isomers and a pair of myoinositol trimannoside isomers.

VITAMIN A AND CAROTENOIDS. I. INTESTINAL ABSORPTION AND METABOLISM OF ^{14}C-LABELED VITAMIN A ALCOHOL AND β-CAROTENE IN THE RAT. H. S. Huang and D. S. Goodman (Dept. of Med., Columbia Univ. College of Physicians and Surgeons, New York, N.Y.). *J. Biol. Chem.* 240, 2839–2844 (1965). Studies were conducted on the composition of lymph vitamin A (retinyl) esters and on the distribution of all *trans* vitamin A alcohol (retinol) and carotene derivatives in lymph, after the administration of retinol or β-carotene to rats. Retinol-15-^{14}C and ^{14}C-β-carotene produced biosynthetically by *Phycomyces blakesleeanus* were fed by gastric tube to rats with cannulated thoracic ducts. Chyle was collected and the lipid was extracted and chromatographed on columns of alumina. Washed chylomicrons contained 82% of the recovered radioactivity after the administration of either retinol or β-carotene. Retinyl esters were the predominant labeled compounds in all samples of lymph, and contained approximately 90% of the radioactivity recovered after the administration of labeled retinol, or of highly purified labeled β-carotene. Small amounts of labeled retinol were also recovered in all samples of lymph.

LIVER LIPIDS IN A CASE OF HYPERVITAMINOSIS A. R. F. Krause (Dept. of Biochem., West Virginia Univ. Med. Center, Morgantown, W. Va.). *Am. J. Clin. Nutr.* 16, 455–457 (1965). The ingestion of 50,000 I.U. of vitamin A by an elderly adult for seventeen years did not result in obvious signs and symptoms of vitamin A toxicity. The total liver contained 5.4 gm. of vitamin A. The lipid content was within normal limits. Palmitic acid was the major fatty acid in the various lipid fractions isolated.

PENETRATION OF LIPID MONOLAYERS BY POLYENE ANTIBIOTICS. R. A. Demel and L. L. M. van Deenen (Organisch Chemisch Laboratorium, Der Rijksuniversiteit to Utrecht, The Netherlands) and S. C. Kinsky. *J. Biol. Chem.* 240, 2749–2753 (1965). Filipin and nystatin readily penetrate monolayers of cholesterol and ergosterol at initial surface pressures greater than the collapse pressure of the antibiotics. Interaction was stronger with filipin than with nystatin. Under the same conditions, there was essentially no interaction with a variety of pure synthetic phospholipids unless sterol was present. Filipin did not penetrate monolayers prepared from polyene-insensitive bacteria. Filipin did penetrate monolayers prepared from lipid extracts of beef erythrocytes, which are rapidly lysed by the polyenes. When the extract was separated into a neutral lipid and a phospholipid fraction, filipin did not penetrate a monolayer of the phospholipids but did interact with the neutral

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lipids consisting primarily of cholesterol. At high initial surface pressures, penetration of either antibiotic was accompanied by a very small percentage increase in the area of the monolayer. From these results, it was concluded that the polyene antiobiotics interact specifically with sterols and penetration of only a few antibiotic molecules into the cell membranes of sensitive organisms causes "reorientation" of the sterol molecules.

SITE OF THE IN VITRO INHIBITION OF CHOLESTEROL BIOSYNTHESIS BY TOLBUTAMIDE AND PHENETHYLBIGUANIDE. J. E. Dalidowicz and H. J. McDonald (Dept. of Biochem. and Biophysics, Graduate School and Stritch School of Med., Loyola Univ., Chicago, Ill.). *Biochemistry* 4, 1138–1143 (1965). The site of inhibition of cholesterol biosynthesis from 2-^{14}C-melvonate by tolbutamide and phenethylbiguanide has been investigated *in vitro* using a rat liver enzyme system. Tolbutamide does not inhibit the formation of either the isoprenols of squalene but it does inhibit CO_2 evolution from 2-^{14}C-mevalonate and lanosterol formation when arsenite is present in the incubation mixture. The data, therefore, show that tolbutamide stops the biosynthetic pathway at the cyclization of squalene. Phenethylbiguanide, on the other hand, inhibits the formation of both cholesterol and nonsaponifiable lipids, resulting in the accumulation of isoprenol compounds.

AN INHIBITORY EFFECT OF VITAMIN A ON THE INDUCTION OF TUMORS OF FORESTOMACH AND CERVIX IN THE SYRIAN HAMSTER BY CARCINOGENIC POLYCYCLIC HYDROCARBONS. E. W. Chu and R. A. Malmgren (Nat'l. Cancer Instit., Nat'l. Institutes of Health, Bethesda, Maryland). *Cancer Res.* 25, 884–895 (1965). The oral administration of 7,12-dimethylbenzanthracene (DMBA) of benzo(a)-pyrene (Bp) to Syrian hamsters induced dyskeratotic lesions and carcinoma of the forestomach and small intestine but only the DMBA induced dyskeratotic lesions of the esophagus. Painting the uterine cervix of Syrian hamsters with DMBA induced perineal skin and vaginal carcinoma in 100% of the animals and cervical carcinoma in 22% of the animals. In animals similarly treated with DMBA or Bp the addition of 0.5% vitamin A palmitate to the diet prevented the development of carcinoma of the gastrointestinal tract; adding the vitamin A palmitate to the fluid used for painting the cervix prevented the development of carcinoma of cervix and vagina but did not inhibit the development of carcinoma of the perineal skin. The implication of the inhibitory effect of vitamin A on the induction of squamous cell cacinoma of the mucous membranes of the hamster is considered.

ALPHA-TOCOPHEROL CONTENT OF FOODS. R. H. Bunnell, J. Keating, A. Quaresimo and G. K. Parman (Hoffmann-LaRoche Inc., Nutley, New Jersey). *Am. J. Clin. Nutr.* 17, 1–10 (1965). A variety of foods were assayed for α-tocopherol content using modern analytical technics. An important feature of this study was to assay foods as eaten to obtain a more accurate picture of the actual α-tocopherol intake in the diet. Of particular interest was the finding that frozen foods which were fried in vegetable oil were surprisingly low in tocopherol indicating severe losses of tocopherol during freezer storage. The α-tocopherol content of typical breakfast, luncheon and dinner menus was calculated using the values obtained in this study. These menus indicated a daily intake of α-tocopherol ranging from 2.6 to 15.4 mg. with an over-all average of 7.4 mg. This value is about half of previous estimates of daily vitamin E intake and therefore indicates the possibility of relatively low α-tocopherol intake in a portion of the population, depending somewhat on dietary habits.

PROTEINS OF S_f 10–400 LIPOPROTEINS FROM LIPEMIC HUMAN PLASMA. J. L. Bobbitt and R. S. Levy (Dept. of Biochem., Univ. of Louisville School of Med., Louisville, Ky.). *Biochemistry* 4, 1282–1288 (1965). The relationship of the S_f 10–400 lipoproteins to chylomicrons and other low-density lipoproteins in human lipemic plasma was investigated by comparing the protein portion of the lipoproteins. The S_f 10–400 lipoprotein class was divided into five fractions, each with a different lipid composition and encompassing a different S_f range. N-Terminal amino acid analyses of these fractions showed little variation in their protein composition. Serine and threonine were the major N-terminals and aspartic and glutamic acids the minor N-terminals in all fractions. The same four amino acids were found, but in different ratios, in the chylomicron and S_f 0–10 classes. The S_f 10–400 lipoproteins from different plasmas were exhaustively extracted with cold ether, and the protein-phospholipid residues were compared by analytical ultracentrifugation. One of the major components of the residue from S_f 10–400 lipoproteins from lipemic plasma appeared to be identical with the major component of the residue from S_f 0–10 lipoproteins from nonlipemic plasma.

SYNTHESIS OF 2-SOLANESYL-1, 4-NAPHTHOQUINONE, NEW MEMBER OF A VITAMIN K_2 GROUP. D. Misiti, H. W. Moore and K. Folkers (Sanford Res. Inst., Menlo Park, Calif.). *Biochemistry* 4, 1156–1160 (1965). 2-Solanesyl-1,4-naphthoquinone and 2-phytyl-1,4-naphthoquinone have been synthesized by the reaction of solanesol and phytol, respectively, with the 1,4-naphthohydroquinone, and have been extensively characterized by spectral and chromatographic data. The 2-solanesyl-1,4-naphthoquinone appears to correspond in ultraviolet absorption characteristics to the described quinone, "SFQ," from *Streptococcus faecalis* 10C1, although the eight-unit isoprenolog is not excluded. The 2-phytyl-1,4-naphthoquinone and "SFQ" appear to be different but related compounds; chromatographic data also support these interpretations. The 3-desmethyl forms of vitamin K_2, which are in nature, are of particular interest in differentiating the biochemical functions of various quinones; the 3-methyl group of the better known methyl homologs is essential to the proposed quinone-methine mechanism of oxidative phosphorylation.

LIPIDS OF ATHEROSCLEOTIC ARTERY. III. HYPOTHESIS ON THE CAUSE OF ATHEROSCLEROSIS FROM THE VIEWPOINT OF FAT CHEMISTRY. Kazuo Fukuzumi (Nagoya Univ., Chikusaku, Nagoya). *Yukagaku* 14, 119–22 (1965). A hypothesis is advanced that the oxidized fats form the complex with the proteins in the aorta, and then the lipids, such as cholesterol or its esters, are deposited in the complex in the artery. This explains the preceeding report showing that oxidized lipids are concentrated in the phospholipids of atherosclerotic aorta, that it contains *trans-trans* conjugated diene hydroperoxide, that lipid-protein complexes are present in atherosclerotic abdominal aorta and that oxidized lipids containing *trans*-isomer are present in the lipids combining with aorta proteins. Atherosclerosis also, occurs on consuming a large amount of fat or cholesterol, and by removing thyroid gland and feeding with food lacking in vitamin B_6. The fact that the development of atherosclerosis can be restrained by large doses of vitamin C or pantothenic acid or large amount of protein endorse the above hypothesis.

ABSTRACTS: DRYING OILS AND PAINTS

THE INFLUENCE OF THE AGE OF HOGS IN THE ASSIMILATION OF FATS. G. Varela, J. Fornollá and J. Ruano. *Grasas y Aceites* 16, 1–4 (1965). An experiment carried out in the Zaidin Agronomical Center, Spain. Hogs were fed increasing amounts of the same blend of nutrients and the assimilation coefficient of the fats was tested every three months, up to a year of age. No significant variation of the assimilation coefficient was noted.

FATTY ACID OXIDATION AND KETOGENSIS IN TRANSPLANTABLE LIVER TUMORS. L. Bloch-Frankenthal, J. Langan, H. P. Morris and S. Weinhouse (The Fels Res. Inst., Temple Univ. School of Med., Philadelphia, Penn.) *Cancer Res.* 25, 732–736 (1965). In general there was a reciprocal relationship between the ability to oxidize fatty acids and the ability to phosphorylate glucose. Those tumors which grew slowly and lacked the capability for glucose phosphorylation readily oxidized fatty acids, whereas the high glycolyzing tumors failed to oxidize fatty acids.

THE EXCHANGE LABELING OF KETO STEROIDS WITH TRITIUM BY ADSORPTION CHROMATOGRAPHY ON BASIC ALUMINA. P. D. Klein and J. C. Knight (Div. of Biol. and Med. Res., Argonne Nat'l. Lab., Argonne, Ill.). *J. Am. Chem. Soc.* 87, 2657–2661 (1965). Keto steroids may be labeled with tritium by chromatography on basic alumina treated with tritiated water. The tritium is not removed by recrystallization in hydroxylic solvents but 95% can be back-exchanged under strongly basic conditions. Reduction of the keto steroids with lithium aluminum hydride occurs without loss of label and provides the corresponding alcohols in which the tritium is no longer exchangeable. The method provides pure, highly labeled products with remarkable economy of tracer.

• Drying Oils and Paints

QUALITY CONTROL OF HEAT-BODIED LINSEED OILS. I. T. Enya. *Bull. Tech. Ass. Graph. Arts Japan* 5, (11), 78–80 (1962). The acid value (A.V.) of litho varnishes is one of the most important characteristics affecting the rheological properties of printing inks. Printing vehicles are seriously affected by small amounts of water and soaps which may remain after acid refining. An attempt was made to depress the A.V. of the litho varnishes (heat-bodied linseed oils) by esterification with glycerol instead of alkali refining with NaOH. It was shown that a varnish having a lower A.V. and useful for printing could be obtained by thermal esterification with glycerol without any special operation such as agitation. (Rev. Current Lit. Paint Allied Ind.).

OIL-MODIFIED URETHANE VEHICLES BASED ON METHYL GLUCOSIDE. H. M. Kennedy and J. P. Gibbons (Corn Products Co., New York, N.Y.). *Paint Varnish Prod.* 55, 47–52 (1965). The preparation of linseed oil-modified urethane coating vehicles with methyl glucoside was investigated. The film properties of these systems were compared with those from similar vehicles made from glycerol and pentaerythritol. The addition of methyl glucoside to the oil and catalyst after the alcoholysis temperature was reached produces final vehicle colors similar to those obtained with glycerol and pentaerythritol. Also with methyl glucoside, the amount of excess hydroxyls present for the urethane reaction can be held to a minimum of 5 percent for the 75 and 80 percent oil content vehicles and to 10 percent for the 65 to 70 percent oil content systems when a urethane catalyst, dibutyltin dilaurate, is present to facilitate complete reaction of the isocyanate groups to produce viscosity stable vehicles. Methyl glucoside vehicles were essentially equivalent in performance to the pentaerythritol systems at similar oil content.

FRACTIONATION OF OLEOGLYCEROPHTHALIC RESINS. J. P. Helme, G. Bosshard, J. Molines, M. Rouzier and J. Rouzier (Lab. of Robbe Freres, Dieppe, Fr.). *Rev. Franc. Corps Gras.* 12, 167–173 (1965). An acetone-water fractionation was used to demonstrate the heteromolecularity of oleoglycerophthalic resins. The fractions exhibit a wide viscosity distribution and vary in phthalic anhydride and fatty acid content. A relation following Kuh's equation: $(\eta) = K. M. \alpha$ was established between the intrinsic viscosity and mean molecular weight of the various fractions. Selected fractions have been tested for flow point,

water resistance and wrinkling. Paints made from some of the fractions were tested for drying, hardening, gloss retention and change of viscosity during storage. From the data, the approximate structure of alkyd resins such as the volume, form and the polarity of constituent macromolecules was determined.

WATER-DISPERSED INDUSTRIAL AND ARCHITECTURAL COATINGS. H. M. Schroeder (Spencer Kellogg Div. Textron, Buffalo, N.Y.). *Paint Varnish Prod.* **55**, 31 (1965). A review.

COATING VEHICLE. S. G. Wilson, M. R. Olson and D. E. Tweet (Cargill, Inc.). *U.S. 3192,061.* An improved vehicle for coating comprises a mixture of: 30–40% by weight of the vehicle of an unsaturated drying oil, 50–60% of a member selected from the group consisting of the reaction product of 2-hydroxymethyl-5-norborene with maleic acid, the reaction product of 2-hydroxymethyl-5-norborene with maleic anhydride and the reaction product of 2-hydroxymethyl-5-norborene with fumaric acid, and 10–20% of an adduct of 2-hydroxymethyl-5-norborene with an unsaturated drying oil fatty acid.

COATING COMPOSITION COMPRISING AN OXYGEN-CONTAINING DIOLEFIN POLYMER AND A DRYING OIL. J. F. McKay and D. F. Koenecke (Esso Res. and Eng. Co.). *U.S. 3,196,121.* The described composition comprises: (A) a polymeric composition selected from the group consisting of (1) a liquid polymer of a C_4-C_6 conjugated diolefin which has been reacted with a member of the group consisting of air and oxygen so as to incorporate between about 10 and 20% oxygen in its structure and (2) a liquid polymer of a C_4-C_6 conjugated diolefin which has been reacted with 0.01–2.5 weight percent of an anhydride selected from the group consisting of maleic anhydride, chlormaleic anhydride and citraconic anhyride, (B) 5–25% of a conjugated drying oil and (C) 0.01–5.0% of an acid phosphorus compound selected from the group consisting of an inorganic acid of phosphorus and the metallic salts thereof and containing at least one replaceable acidic hydrogen.

• Detergents

A STUDY OF DOUBLE LAYER REPULSION AND VAN DER WALLS ATTRACTION IN SOAP FILMS. J. Lyklema and K. J. Mysels (Dept. of Chem., Univ. of Southern Calif., Los Angeles, Calif.). *J. Am. Chem. Soc.* **87**, 2539–2540 (1965). Measurements of equilibrium thicknesses of soap films over a range of ionic strengths are presented for mobile and rigid films of sodium lauryl sulfate in the presence of lithium chloride. The forces determining this thickness are discussed in terms of existing theories of van der Walls attractions and of electric double layer repulsion. Some of the problems involved in the experimental testing of these theories are brought out. While there is good qualitative agreement between theory and experiment, definite quantitative discrepancies appear also. It is suggested that some of these could stem from limitations of the double layer theory.

α-SULFONATION OF FATTY ACIDS WITH SULFUR TRIOXIDE. III. QUANTITATIVE DETERMINATION OF α-SULFOFATTY ACID. *Yukagaku* **14**, 237–41 (1965). Tetsuro Ishiguro, Yoshimitsu Ishiwada, Terumune Ogushi, and Teruzo Asahara (Chuo Univ. and Tokyo Univ.). The pH titration method was applied to the analysis of α-sulfofatty acid and newly developed photometric method was compared with methylene blue method. α-Sulfopalmitic acid was precipitated as copper salt in the aqueous medium and the copper ion remaining in the solution was determined photometrically. The reaction of α-sulfofatty acid with copper sulfate proceeded in the molar ratio of 2:1.

SURFACE ACTIVITY OF POLYPROPYLENEGLYCOL. Yoshio Nemoto, Hiroyuki Funahashi, Kazuya Kunugi and Michio Kashima (Nagoya Munic. Ind. Research Inst. and Asahi Denka Kogyo Co.). *Yukagaku* **14**, 247–9 (1965). Polypropyleneglycols (PPG) of lower molecular weights are easily soluble in water but become less soluble with an increase in the number of propylene oxide units. The molecular weight of PPG showing any remarkable solubility in water is limited up to about 2000 and PPG of this molecular weight range show very high surface activity and dye-dispersing effect.

THE BIODEGRADABLE DETERGENTS. G. Jacini (Stazione Sperimentale per le Industrie degli Olii e dei Grasii. Centro Nazionale per la Lipochimica del Consiglio Nazionale delle Ricerche, Milano, Italia) (in French). *Grasas y Aceites* **16**, 23–31 (1965). The non-biodegradable detergents resist the transformation into CO_2 and H_2O by the microorganisms present in sewage waters, therefore posing an increasing problem to highly industrialized countries. The situation in Europe and the U.S.A. is discussed and several solutions proposed. In West Germany it is obligatory by law the use of detergents with a biodegradability of at least 80%.

THE PROPERTIES OF LONG-CHAIN N-ALKYL PHOSPHINIC ACIDS. Hiroshi Sakurai, Yoshiki Okamoto, and Kiyoshi Horiuchi (Osaka Univ.). *Kogyo Kagaku Zasshi* **68**, 961–3 (1965). n-Alkyl phosphinic acid having even number of carbon atoms, such as from 10 to 18, were synthesized. In the surface activity, sodium n-alkyl phosphinates were superior to corresponding sodium alkyl phosphonates reported previously. As the number of carbon decreases, the activity of the phosphinates becomes excellent whereas the reverse is true in the phosphonate series. The alkyl phosphinic acids having a few carbon number, such as C_{10}, are chemically unstable. Their surface tension becomes high in course of time. Alkyl phosphinic acids having more than twelve carbons are stable.

WHAT'S AHEAD FOR DETERGENTS? T. W. Carmody (Union Carbide Corp.). *Soap Chem. Specialities* **41** (6), 47–50 (1965). The author discusses the raw materials which will probably be used in detergents of the future. Recently there has been a dramatic slowdown in the use of the so-called "hard" materials, tetrapropyl benzene, with a shift to the so-called "soft" linear alkylates. If a law requiring products that degrade faster than LAS is not passed, then LAS will continue to grow as the main detergent ingredient. Within the next one to two years the alkyl phenol market will probably give way to primary and secondary alcohol ethoxylates.

WATER-SOLUBLE LIQUID DETERGENT COMPOSITIONS. R. C. Taylor and Elizabeth J. Meehan (Atlantic Refining Co.). *U.S. 3,190,836* A water-soluble liquid detergent composition consists of 50–60 weight % of a mixture of an anionic surface active agent and a nonionic surface active agent and a solvent for the mixture. The mixture of surface active agents consists of 40–50 weight % of an aqueous solution of triethanolamine C_{10}-C_{16} alkyl benzene sulfonate of about 60 weight % concentration and from 50–60 weight % of the condensation product of one mole of octyl phenol with 5 moles of ethylene oxide. The solvent consists of from 80–100 weight % of hydrocarbons boiling in the range of 175–600F having a total aromatic content of at least 28 weight % and from 20–0 weight % of tetrahydrofurfuryl alcohol.