ABSTRACTS

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

• Fats and Oils

THE ANTIOXIDANT ACTIVITY OF VEGETABLE EXTRACTS. I. FLAVONE AGLYCONES. D. E. Pratt and Betty M. Watts (Dept. of Food and Nutrition, Florida State Univ., Tallahassee, Florida). *J. Food Sci.* 29, 27–34 (1964). Quercetin, isolated from hydrolyzed extracts of several plant tissues, accounted for a large portion of the antioxidant activity of the extracts. The most significant role of the hot-water extracts from the various plants given is apparently their ability to terminate the free radical reactions occurring during lipid oxidation.

LIQUID (OIL) SHORTENINGS IN WHITE BREAD. II. EFFECT OF ELEVATED TEMPERATURES. E. G. Bayfield and W. E. Young (Florida State Univ., Tallahassee, Fla.). *The Baker's Digest* 37, 59–66 (1963). Good quality bread can be made by the sponge and dough process when proofing doughs are actually above 110F. However, the performance of such doughs is enhanced by the addition of more hard fat than is normally used at lower temperatures. The bread crumb qualities are largely determined by the higher melting point fractions of the shortening used.

A GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF THE ANTIOXIDANTS BHA, BHT, AND ETHOXYQUIN IN AQUEOUS AND IN HYDROCARBON SOLUBLE SAMPLES. T. K. Choy, J. J. Quattrone, Jr. and N. J. Alicino (Nopco Chem. Co., Fine Chem. Div., Harrison, N. J.). *J. Chromatog.* 12, 171–177 (1963). A gas-liquid chromatographic method for separating and determining, to the nearest ppm, BHA, BHT and ethoxyquin is presented. Liquid stationary phase used was SE-30 on ether Chromosorb W or firebrick. The data obtained were comparable to those obtained by ultraviolet spectrophotometric determinations.

INFLUENCE OF SOLID COLUMN SUPPORTS ON THE GLC ANALYSIS OF HIGHER FATTY ACIDS. H. Buhring (Physiol.-Chem. Inst. of Universitat, Hamburg, Germany). *J. Chromatog.* 11, 452–458 (1963). A procedure is described to test the influence of solid supports on quantitative gas-chromatographic analysis of fatty acid methyl esters. Acid treated kieselguhr or hexamethyl disilazane treated firebrick was found to be adequate in producing low adsorptive supports which maintained reproducible results in quantitative analysis.

A PROPOSED BASIS FOR THE SYSTEMATIC IDENTIFICATION OF UNSATURATED FATTY ACID ESTERS THROUGH GAS-LIQUID CHROMATOGRAPHY ON POLYESTER SUBSTRATES. R. G. Ackman and R. D. Burgher (Fisheries Res. Board of Can., Tech. Sta., Halifax, N. S.). *J. Chromatog.* 11, 185–194 (1963). Systematic separation factors may be established among various unsaturated fatty acid methyl esters analysed by gas-liquid chromatography on polyester substrates. These are apparently dependent on differences in the magnitude of the carbonyl end chain and end carbon chain parts of the fatty acid chain.

SOME NEWER CONCEPTS OF THE RELATION OF EMULSIFIER STRUCTURE TO FUNCTIONALITY. H. Birnbaum (Hachmeister Inc., Pittsburgh, Pa.). *The Baker's Digest* 37, 44–51 (1963). An emulsifier or emulsifier system for continuous mixing must contain high melting monoglycerides with sufficient monosterin or monopalmitins to act as effective clathrating compounds. In addition to these, an ionic emulsifier for gluten interaction should be included. It is shown that a well formulated emulsifier combination works equally well in both continuous and batch processes of bread production; however, an emulsifying system for batch processes does not always work in a continuous process since the batch process has greater tolerances to variables discussed than do the continuous processes.

REFINING OF CRUDE COMMERCIAL SARDINE OIL. D. P. Sen, N. P. Dani, N. V. Sripathy, K. Visweswariah, N. L. Lahiry and V. S. Vernekar (Central Food Technol. Res. Inst., Mysore, India). *Food Sci. (Mysore)* 12, 189–193 (1963). A simple and cheap refining procedure was presented for refining commercial sardine oil to an oil which could be put to industrial use. Using the method presented, the refined oil met specifications required by foreign countries.

CARBONYLS IN OXIDIZING FAT. VI. THE GIRARD T REAGENT IN THE ISOLATION AND DETERMINATION OF MICRO AMOUNTS OF N-ALIPHATIC ALDEHYDES AND 2-ALKANONES. A. M. Gaddis, R. Ellis and G. T. Currie (Meat Lab., Eastern Util. Res. and Dev. Div., USDA, Beltsville, Md.). *J. Food Sci.* 29, 6–16 (1964). Carbonyls in oxidized fat were converted to their Girard T hydrazones by reacting the oxidized fat at room temperature with Girard T reagent in the presence of aqueous t-butyl alcohol. Quantitative recovery of the aldehydes was obtained, but the 2-alkanones did not give a consistent recovery. The method presented is believed to be useful for the isolation of aldehydes from oxidized fats and oils.

INHIBITING ACTION OF OXIDIZED PORK FAT ON THE GERMINATION OF SPORES OF BACILLUS SUBTILIS. C. B. Ramsey and J. D. Kemp (Univ. of Kentucky, Lexington). *J. Food Sci.* 28, 562–566 (1963). Rancid lard inhibited the germination and/or growth of *Bacillus subtilis* spores. This inhibitory effect was suggested to be used as a criterion of pork fat rancidity.

AN IMPROVED COLORIMETRIC METHOD FOR DETERMINING ENDOSULFAN (THIODAN) RESIDUES IN VEGETABLES AND BEEF FAT. J. C. Maitlen, K. C. Walker and W. E. Westlake (Entomology Res. Div., USDA, Yakima, Wash.). *J. Agric. Food Chem.* 11, 416–418 (1963). Residues of endosulfan (Thiodan) were determined in beef fat. The sample was extracted with hexane or pentane, the extracts cleaned up, solvent removed, and the residue is reacted with methanolic alkali and aqueous pyridine, and the resulting color measure spectrophotometrically. From 45 pesticides, only captan, chlordan, heptachlor, interfered with the method.

THE SCIENTIFIC EVALUATION OF UNFAMILIAR VEGETABLE OILS. M. R. Mills (Milling Group Development Labs., British Oil and Cake Mills Ltd., Albion Wharf, Erith, Kent, England). *J. Oil and Colour Chemists' Assoc.* 47(3), 187–203 (1963). The problems involved in characterizing an oil completely are given with reference to a few specific examples. The unfamiliar vegetable oils discussed are those in which long-chain unsaturated acids, conjugated acids, hydroxy, epoxy and cyclopropenoid acids have been found.

THE MECHANISM OF OXIDATIVE POLYMERISATION. AUTOXIDATIVE DECOMPOSITION OF MONOETHENOID FATTY ACID PRIMARY OXIDATION PRODUCTS. J. H. Skellon (Chem. Dept., Brunel College, England). *J. Oil and Colour Chemists' Assoc.* 46, 1001–1009 (1963). The mechanism of peroxide formation and decomposition in film formation is given. The earlier stages of oxidative polymerisation in oils was elucidated by studying the fatty acids and esters at high temperature oxidation. A mechanism is given explaining the intermediate reactions occurring in the polymerization of oils.

DETERMINATION OF OXIDATIVE CHANGES IN RAW MEATS BY THE 2-THIOBARBITURIC ACID METHOD. A. Keskinel, J. C. Ayres and H. E. Snyder (Dept. of Dairy and Food Ind., Iowa State Univ., Ames, Iowa). *Food Technol.* 18, 101–104 (1964). Oxidative changes during storage of raw and cooked beef, lamb, pork and turkey meats were determined by the TBA test. TBA numbers varied with the extent of hematin catalysis. Cooked ground meat samples showed slightly higher TBA numbers than did the raw ground samples. TBA numbers of cooked slices were considerably higher than those of raw slices. TBA numbers were found to be inversely related to the initial pH.

RESPONSES OF CEREALS TO ANTIOXIDANTS. R. H. Anderson, D. H. Moran, T. E. Huntley and J. L. Holahan (Cereal Dev. Dept., James Ford Bell Res. Ctr., General Mills, Minneapolis, Minn.). *Food Technol.* 17, 1587–1592 (1963). Stabilities of cereals are not a function of the amount of lipids or differences in composition of lipids but largely dependent upon the antioxidants formed during toasting or puffing. Alpha-tocopherol and ascorbic acid were not effective as an antioxidant. Certain enolic carbonyl compounds did have some antioxidant activity in cereals.

RANCO METHOD FOR DETERMINING RANCIDITY IN RENDERED PORK FAT. C. B. Ramsey, J. D. Kemp and R. B. Grainger (Kentucky Agriculture Exp. Sta., Lexington, Kentucky). *Food Technol.* 18, 105–108 (1964). The method presented involved heating the fat with an isopropyl alcohol solution of potassium hydroxide. The optical density of this solution under the prescribed conditions was termed the Ranco number. It correlated well with

TBA values, peroxide values, and iodine numbers of fats samples oxidized for various periods.

TASTE DEGRADATION [REVERSION] IN OILS CONTAINING LINOLENIC ACID. V. Holm. *Acta Polytechn. Scand.* (*Chem. Series* No. 21) (1963) *Norw. Contr.*, No. 16, 48–53. The part played by volatile aldehydes, as well as non-volatile products formed during decomposition of peroxides, in the autoxidative degradation of the oils(soya and rape), the content of volatiles and non-volatiles in oils stored in air and absence of light and the effect of non-volatiles on the acceleration of formation of peroxides and volatile aldehydes, are discussed. (Rev. Current Lit. Paint Allied Ind.)

NEW CRYSTAL FORM OF FATTY ACIDS. R. F. Holland and J. R. Nielsen. *Acta Cryst.* **16**, Pt. 9, 902–6 (1963). An investigation of the infrared spectra of single crystals of hexadecanoic, octadecanoic and docosanoic acids has provided evidence for the existence of a new crystal form. The infrared spectrum of the new form of hexadecanoic acid is compared with the spectra of the *A*-, *B*- and *C*-forms. Some conclusions about the structure of the new form are presented. (Rev. Current Lit. Paint Allied Ind.).

OCCURRENCE OF TRANS-9-TRANS-12-OCTADECADIENOIC ACID AS A SEED OIL COMPONENT. M. J. Chisholm and C. Y. Hopkins. *Can. J. Chem.* **41**, 1888–92 (1963). *trans*-9-*trans*-12-Octadecadienoic acid was found to be a component of the glyceride oil of the seeds of *Chilopsis linearis*. It was isolated by fractional crystallisation of the acids at low temperatures and removal of conjugated acids as their adducts with maleic anhydride. Identification was made by absorption spectra and by preparation of derivatives and degradative products. A rough estimate of the composition of the total fatty acids was: saturated acids 5%; *trans*-10-*trans*-12-octadecadienoic acid 12%; *trans*-9-*trans*-12-octadecadienoic acid 15%; *trans*-9-*trans*-11-*cis*-13-octadecatrienoic acid 25%; linoleic acid 25%; undetermined 18%. (Rev. Current Lit. Paint Allied Ind.)

SPLITTING OF INDIAN VEGETABLE OILS. III. USE OF CATION EXCHANGE RESIN IN TWITCHELL PROCESS. S. D. Thirumala Rao and Ch. S. Prakasa Rao (Oil Technol. Res. Inst., Anantapur). *Chem. Age India* **14**, 476–8 (1963). Sulfonic acid type cation exchange resin was bound to be an efficient catalyst for splitting of coconut oil. Use of 2 to 3% resin results in 80 to 90% split in about 12 hours. These fatty acids are lighter colored than those obtained when sulfuric acid was used as a catalyst.

REFINING OF TOBACCOSEED OIL. B. R. Reddy, K. Rama Varma, B. A. R. Somayajulu, S. D. Thirumala Rao and K. S. Murti (Oil Technol. Res. Inst., Anantapur). *Research Industry (India)* **8**, 227–8 (1963). The refining and bleaching of tobaccoseed oil has been studied. Conventional alkali refining and bleaching yields a satisfactory oil. Addition of 0.5% tetrasodium pyrophosphate reduced refining loss by 30%.

REMOVAL OF GOSSYPOL FROM COTTONSEED OIL BY P-AMINOSALICYLIC ACID. J. Patwari and S. D. Thirumala Rao (Oil Technol. Res. Inst., Anantapur). *Indian J. Technol.* **1**, 435–6 (1963). The efficiency of *p*-aminosalicylic acid for the removal of gossypol from crude cottonseed oil has been compared with that of *p*-aminobenzoic acid; the former is produced indigenously and is easily available. At 0.6% level on the weight of oil, both chemicals effect almost complete removal of gossypol.

A SIMPLE, SPECIFIC SPRAY FOR THE DETECTION OF PHOSPHOLIPIDS ON THIN-LAYER CHROMATOGRAMS. J. C. Dittmer and R. L. Lester (Dept. of Biochem., College of Medicine, Univ. of Kentucky, Lexington, Ky.). *J. Lipids Res.* **5**, 126–7 (1964). A modification of the molybdenum blue reagent of Zinzadze (*Ind. Eng. Chem.* **7**, 227, 1935) is described which, when used as a spray gives an instantaneous, specific reaction with phospholipids on silica gel or alumina plates. The sensitivity of the phosphate spray was determined on serial dilutions of egg lecithin and phosphatidyl ethanolamine. As little as 0.005 μmole of both phosphatidyl ethanolamine and phosphatidyl choline could be detected when the molybdenum spray was used alone. A wide range of compounds including phosphatidic acid, cardiolipin, sphingomyelin, phosphatidyl ethanolamine, -serine, -choline, -inositol and -inositol diphosphate were all found to give positive reactions with the molybdenum spray. Fatty acids, fatty acid methyl esters, triglycerides, long-chain alcohols, cholesterol, ceramide, sphingosine, cerebroside and cerebroside sulfate do not give a positive reaction.

SPECTROPHOTOMETRIC DETERMINATION OF TRACES OF PEROXIDES IN ORGANIC SOLVENTS. D. K. Banerjee and C. C. Budke (U. S. Industrial Chem. Co., Cincinnati, Ohio). *Anal. Chem.* **36**, 792–6 (1964). A sensitive spectrophotometric method for the determination of traces of organic peroxides in organic solvents is described. The sample is diluted with a mixture of acetic acid and chloroform and treated with potassium iodide after deaeration. The iodine liberated is measured spectrophotometrically at 470 mμ in 1-cm cells. Active oxygen in the range of 5 to 80 ppm can be determined. By using 1.5-cm cells and a wavelength of 410 mμ for the absorbance measurements, the range of the method can be extended to cover 0 to 5 ppm of active oxygen. Quantitative results have been obtained with 17 commercial peroxides of varying reactivity. No reaction was obtained with di-tert-butyl peroxide and dicumyl peroxide. The method was satisfactory for the determination of peroxides in benzene, chloroform, 2-propanol, methanol, pentane, hexane, toluene, ethyl ether, acetone, vinyl acetate, and ethyl acetate. It should be applicable to organic solids which are soluble in a mixture of acetic acid and chloroform.

GAS LIQUID CHROMATOGRAPHY OF RETINOL (VITAMIN A) DERIVATIVES. P. E. Dunagin, Jr. and J. A. Olson (Dept. of Biochemistry, Univ. of Florida College of Med., Gainesville, Fla.). *Anal. Chem.* **36**, 756–9 (1964). Anhydro retinol, methyl retinyl ether, retinal and methyl retinoate are separated by gas liquid chromatography at 150C on conventional columns, packed with Gas Chrom P or glass beads coated with SE-30, whereas retinol and retinyl acetate are largely converted to anhydro retinol under the same conditions. After treatment of these columns with β-carotene, however, retinol and retinyl acetate can also be separated with little destruction. These compounds were collected after chromatography by adsorption on alumina or cotton and were identified by their ultraviolet spectra.

AUTOXIDATION OF METHYL LINOLEATE: EFFECT OF SEX HORMONES AND OF NICOTINIC ACID AND RELATED COMPOUNDS. D. Kritchevsky and S. A. Tepper (Wistar Inst. of Anatomy and Biology, Philadelphia, Pa.). *Proc. Soc. Exp. Biol. Med.* **115**, 841–3 (1964). The influence of a number of nicotinic acid analogs and homologs (nicotinic acid, nicotinamide, picolinic acid, pyridine 3-sulfonic acid and (3-pyridyl)acetic, -propionic and -butyric acids) and sex hormones (testosterone, androsterone, epiandrosterone, estradiol, estriol, estrone and hexesterol) upon the ascorbic acid catalyzed oxidation of methyl linoleate has been studied. Experiments were carried out in phosphate (pH 6.8) and Tris (pH 8.5) buffers. The extent of oxidation was measured by the thiobarbituric acid color reaction. None of the sex hormones had any effect on the oxidation of methyl linoleate in either buffer. In phosphate buffer only ω-(3-pyridyl)propionic and -butyric acids failed to enhance oxidation of methyl linoleate after 6 hours. In incubations carried out in Tris buffer picolinic acid inhibited oxidation of methyl linoleate. None of the other test compounds had any effect. In the absence of test compounds the type of buffer did not affect the rate of methyl linoleate oxidation.

DETERMINATION OF THE COMPONENT GLYCERIDES OF SEED OILS CONTAINING SATURATED, OLEIC AND LINOLEIC ACIDS. F. D. Gunstone, F. B. Padley and M. I. Qureshi (The University, St. Andrews). *Chem. Ind. (London)* **1964**, 483. Two quantitative procedures based on thin-layer chromatography on impregnated silica gel are described for the determination of the component glycerides of seed oils. In the first method the adsorbed spots are extracted and a known amount of methyl heptadecanoate is added to each extract before it is converted to methyl esters for analysis by gas-liquid chromatography. In the second technique, the oil is first separated into three fractions by low temperature crystallization and then these simpler mixtures are separated by thin-layer chromatography. The two procedures were applied to *Jatropha curcas* seed oil which contains 16.4% palmitic, 1.3% hexadecenoic, 6.4% stearic, 39.8% oleic, and 36.1% linoleic acid. Results compared favorably with each other and with calculated values.

COMPOSITION OF THE SEED FATS OF THE CAPPARIDACEAE FAMILY. A. Sen Gupta (Banaras Hindu University) and M. M. Chakrabarty. *J. Sci. Food Agr.* **15**, 69–73 (1964). The percentage composition of the mixed fatty acids of the seed fats of *Gynandropsis pentaphylla* and *Capparis aphylla* is: myristic

0.3, 0.6; palmitic 18.3, 21.1; stearic 8.1, 7.7; arachidic 2.0, 2.0; oleic 15.4, 57.2; linoleic 53.9, 11.4 and linolenic 2.0, 0.0, respectively. Literature values for fatty acid content for various other members of the Capparidaceae family are also included.

THE COMPONENT FATTY ACIDS OF CITRULLUS COLOCYNTHIS SEED FAT. A. Sen Gupta (Banaras Hindu University) and M. M. Chakrabarty. *J. Sci. Food Agr.* **15**, 74–7 (1964). The seed fat contains 10.4% palmitic acid, 6.52% stearic, 1.70% arachidic, 20.92% oleic, 58.81 % linoleic and 1.65% linolenic. The presence of conjugated triene has not been detected.

PROCESS FOR PREPARING NON-GREASY FRIED COMESTIBLES. A. B. Goulston. *U.S. 3,127,271.* The process of preparing a non-greasy fried sliced comestible of reduced oil content comprises suspending a mass of fried sliced comestible of vegetable origin (potato, onion or corn) in an enclosure above and out of contact with a low boiling organic solvent for the oil; heating the solvent to effect vaporization thereof; passing the vapors through and over the mass of fried sliced comestible; condensing the vapors at a point above the mass of comestible; dripping the condensed solvent down and through the comestible to extract at least a portion of the oil content; and continuing the vaporization, condensing and extracting for a time sufficient to extract a predetermined amount of oil from the comestible and to provide a fried comestible of reduced oil content which is substantially free of surface oil.

METHOD FOR MAKING PEANUT SPREAD. J. S. Baker, E. E. Colby and T. W. Hurley (Procter & Gamble Co.). *U.S. 3,127,272.* A method is described for making a packaged peanut spread suitable for storage without sticking to the packaging material. A mixture of ground peanuts and a stabilizer is heated at a temperature sufficiently high to melt all fatty materials present, rapidly cooling the mixture to a temperature of from 35–85F and immediately packaging the mixture in a performed flexible wrapping. The total elapsed time for cooling and packaging does not exceed about 1.25 minutes. A minimum amount of crystallization of fatty material occurs prior to completion of packaging and the packaged mixture is subsequently maintained without agitation until the fatty material therein is crystallized. The stabilizer comprises, by weight of the spread, from 0.3–3.5% of completely hydrogenated fatty glyceride and from 0–20% of a partially hydrogenated fatty glyceride having an SCI value at 50F of from about 17 to 28 and an SCI value at 92F of not more than about 6.

METHOD FOR DEODORIZING OIL AND SIMILAR MATERIALS AND APPARATUS FOR THE WORKING THEREOF. J. A. DeSmet (Extraction continue DeSmet, Antwerp). *U.S. 3,129,076.* A method for deodorizing liquid material comprises: a) passing the material through a column; b) passing the material from the column successively through a plurality of compartments arranged in series for deodorizing treatment; c) discharging the treated material from the last compartment of the series; d) injecting a fluid into each of the compartments in such a manner as to subject the resulting fluid-material mixture therein to a circulating motion which is stronger than the flow of the material through the series of compartments; e) causing the fluid-material mixture to separate into fluid and material and returning the material to the flow through the series of compartments and f) passing the separated fluid through the column countercurrently to the material passing therethrough.

STABLIZED PEANUT BUTTER AND METHOD OF PRODUCING THE SAME. J. H. Sanders (Procter & Gamble Co.). *U.S. 3,129,102.* A peanut butter comprising a homogeneous mixture of particles of peanuts and peanut oil has dispersed therein from 0.5% to 5.0%, by weight of peanut butter, of a hydrogenated rapeseed oil stabilizer having an iodine value not greater than about 10.

PROCESS FOR PRODUCTION OF LOW-MELTING EDIBLE HARDENED OIL. T. Kuwata, S. Takumi and T. Hashimoto (Nikki Kagaku Kabushiki Kaisha). *U.S. 3,129,235.* A fatty oil is hydrogenated at a temperature of 130 to 200C under a hydrogenation pressure of from 1 to 10 atmospheres for ½ to 2 hours in the presence of about 2% of a copper-chromium-manganese oxide catalyst. Preparation of the catalyst is described in detail.

• Fatty Acid Derivatives

SYNTHESIS OF PALMITALDEHYDE-1,2-^{3}H. B. Weiss (Dept. of Biochemistry, New York State Psychiatric Inst. and College of Physicians and Surgeons, Columbia Univ., New York, N. Y.). *Biochemistry* **3**, 584–7 (1964). Palmitoin was oxidized to the diketone with CrO_3 in glacial acetic acid. Both the diketone and palmitoin were hydrogenated over Pt in glacial acetic acid in the presence of ^3H_2O. The glycol was degraded with periodic acid to palmitaldehyde-1,2-^{3}H, and the isotope distribution on carbon atoms 1 and 2 was determined by derivatization to the thiosemicarbazone and by oxidation and conversion to palmitamide. The aldehyde obtained by reduction of the diketone was of higher specific activity than that derived from acyloin, but the C-1/C-2 ratios of tritium activity were similar. Reduction of the diketone with [^{3}H] $LiAlH_4$ yielded aldehyde with high specific activity and with isotope predominantly on carbon atom 1.

WETTING AND ANTI-STRIPPING ALIPHATIC ETHER AND POLYAMINE CHAIN COMPOUNDS FOR USE IN CONNECTION WITH ASPHALT COMPOSITIONS. J. Katz. *U.S. 3,129,106.* A heat stable asphalt additive which has stable anti-stripping properties at elevated temperatures of 250 to 400F is composed of the reaction product of 1 to 3 mols of fatty acids containing 8 to 22 carbon atoms with 1 mol of dialkylaminoalkoxyalkyl amine. The reaction product is formed by heating the mixture of the fatty acids and the amine up to about 300 to 450F for from 4 to 5 hours and removing any water generated. The alkyl groups contain 1 to 4 carbon atoms.

FUNGICIDAL COMPOSITIONS. O. Telle and F. Grewe (Farbenfabriken Bayer Aktiengesellschaft). *U.S. 3,127,311.* Fungicidal compositions contain an organic fungicide in an amount from 5–95% together with: a) 2–10% of a member selected from the group consisting of phenyl hydroxy polyglycol ethers, fatty acid polyglycol esters and fatty alcohol polyglycol ethers, the fatty alcohols and acids having 8–25 carbon atoms and being esterified with up to 50 glycol residues; b) 1–10% of fatty acid metal salts, the fatty acid having 8–25 carbon atoms, the metal being calcium, magnesium, zinc or aluminium; c) up to 10% of a solid organic acid, this acid being a lower aliphatic dicarboxylic or hydroxycarboxylic acid or salicylic acid and d) the balance being inert filler.

DIOXOLATED FATTY ACID ESTERS. F. E. Kuester (Swift & Co.). *U.S. 3,127,418.* Described are glyceride esters of fatty acids having 10–22 carbons, at least one fatty acyl radical of the esters having at least one dioxolane group on contiguous carbons of the radical, the carbons being in the 4,5 position of the dioxolane groups.

• Biology and Nutrition

EFFECT OF FEEDING SAFFLOWER OIL ON THE FATTY ACID COMPOSITION OF MILK. R. M. Parry, Jr., J. Sampugna, and R. G. Jensen (Dept. of Animal Industries, Univ. of Connecticut, Storrs, Conn.). *J. Dairy Sci.* **47**, 37–40 (1964). Eight Guernsey and Jersey cows received, according to a three-period switchback design: one of two rations, 15% added safflower oil or a control diet, with both rations equalized for energy and protein content. Yield of milk, milk fat, and 4% FCM, as well as fat per cent, were all significantly depressed ($P < 0.01$) by the oil. Similarly, decreases were noted in all saturated fatty acids determined in the milk fat. In contrast, the content of unsaturated fatty acids was approximately doubled, with oleic acid contributing the major increase (19.2%). The palmitoleic acid concentration in the milk fat increased significantly, although this acid was absent in the safflower oil. Linoleic acid, which contributed 81% of the fatty acids in the oil fed to the cows, gave less increase. While the linolenic acid content was also elevated, this was not statistically significant.

ACETATE METABOLISM IN THE RUMINANT. J. R. Sabine and B. C. Johnson (Dept. of Animal Science, Univ. of Illinois, Urbana, Ill.). *J. Biol. Chem.* **239**, 89–93 (1964). Acetate-1-C^{14} or -2-C^{14} were infused into either the ruminal or jugular veins of fed sheep for periods up to more than 10 hours. Calculations of the rate and extent of acetate metabolism *in vivo* gave the following mean results: turnover rate, 5.2 meq per hour per kg of body weight; half-life of pool acetate, 1.3 minutes; turnover time of acetate pool, 1.9 minutes; acetate pool size, 6.6 meq per sheep; acetate space, 20% of body weight; oxidation of injected acetate-C^{14} to CO_2, 56% in 10 hours (thus 56% of the acetate coming into the pool); deriva-

tion from acetate of expired CO_2, about 46%. There were no significant differences between the peripheral and ruminal vein infusions of acetate-C^{14} nor between 1-C and 2-C labeled acetate in the data computed. The data indicate the conversion of much of the pool acetate into other compounds before oxidation, the turnover time from acetate to CO_2 being of the order of 3 hours, in contrast to the acetate pool turnover time of 2 minutes.

STEREOCHEMISTRY AT THE CENTER OF SQUALENE DURING ITS BIOSYNTHESIS FROM FARNESYL PYROPHOSPHATE AND SUBSEQUENT CONVERSION TO CHOLESTEROL. B. Samuelsson and D. S. Goodman (Dept. of Med., Columbia Univ., N. Y. 32, N. Y.). *J. Biol. Chem.* 239, 98–101 (1964). Squalene was synthesized from farnesyl-C^{14} pyrophosphate with rat liver microsomes and tritium-labeled reduced triphosphopyridine nucleotide ($TPNH^3$), and then directly converted to cholesterol in a two-stage continuous incubation. The 2 central carbon atoms of squalene, which become labeled with H^3 from $TPNH^3$, appear in cholesterol as carbon atoms 11 and 12. The isolated C^{14}-H^3-cholesterol was injected into a bile fistula rat, followed by collection of bile and isolation of bile acids. Both cholic and chenodeoxycholic acid had almost the same H^3:C^{14} ratio as the injected cholesterol. Oxidation of cholic acid to the 12-keto derivative under nonenolizing conditions resulted in loss of slightly more than half the H^3 (relative to C^{14}).

ABSORPTION OF PREFORMED VITAMIN A FROM LIGATURED POULTRY INTESTINAL SECTIONS. T. E. Shellenberger, D. B. Parrish and P. E. Sanford (Kansas State Univ., Manhattan, Kansas). *J. Nutr.* 82, 99–105 (1964). Absorption of aqueous dispersions of vitamin A was studied, using ligatured intestinal sections as modified *in vivo* systems. After injecting vitamin A acetate into duodenum, posterior small intestine, or cecum, the vitamin A content of duodenal and intestinal tissues was found to be similar, but that in blood serum was 50% higher after duodenal injections; little vitamin A was absorbed from the cecum. Absorption was better in younger and egg-strain birds than in older and broiler-strain birds. Vitamin A acetate was absorbed faster from the duodenum than from the small intestine, and also resulted in vitamin A increasing to higher levels in blood serum and liver.

INFLUENCE OF HIGH PROTEIN DIETS ON VITAMIN A METABOLISM AND ADRENAL HYPERTROPHY IN THE CHICK. G. S. Stoewsand and M. L. Scott (Dept. of Poultry Husbandry and Graduate School of Nutrition, Cornell Univ., Ithaca, N. Y.). *J. Nutr.* 82, 139–144 (1964). High dietary levels of isolated soybean protein, purified isolated soybean protein, casein-gelatin, vitamin-free casein, or amino acid mixtures formulated to simulate isolated soybean protein were administered to chicks. When adequate dietary intake of the high protein diets was obtained, a significantly decreased liver vitamin A storage was observed as compared with that of pair-fed chicks consuming the same protein at moderate dietary levels. Isolated soybean protein diets had the most marked effects in reducing vitamin A liver stores. The depletion of vitamin A ester in the liver was more complete than the depletion of vitamin A alcohol. Enlargement of the adrenal glands occurred in chicks consuming the high isolated soybean protein diets. This enlargement appeared to be due primarily to hypertrophy of the adrenal cortical tissue.

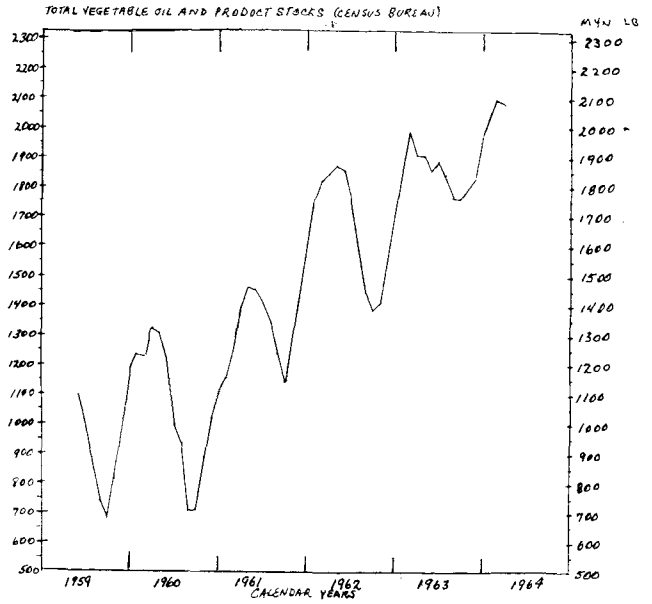
BILE ACIDS. XIX. METABOLISM OF LITHOCHOLIC ACID-24-C^{14} IN THE RAT. P. J. Thomas, S. L. Hsia, J. T. Matschiner, E. A. Doisy, Jr., W. H. Elliott, S. A. Thayer, and E. A. Doisy (Dept. of Biochem., St. Louis Univ. School of Med., St. Louis 4, Mo.). *J. Biol Chem.* 239, 102–05 (1964). Approximately 0.7 mg (3.8 μc) of lithocholic acid-24-C^{14} was administered intraperitoneally to each of three rats with bile fistulas. More than 93% of the administered radioactivity was recovered in the bile during 48 hours. Several metabolites were identified: chenodeoxycholic, 3α,6β-dihydroxy-5β-cholanoic, α-muricholic, and β-muricholic acids. It is suggested that chenodeoxycholic, 3α,6β-dihydroxy-5β-cholanoic, and α-muricholic acids may be intermediates in the conversion of lithocholic acid to β-muricholic acid. No radioactivity was found in cholic acid.

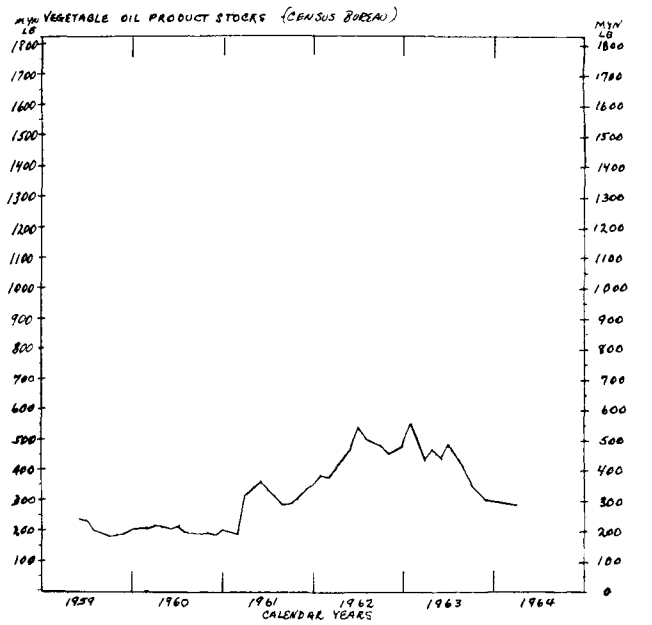
BIOCHEMISTRY OF THE α-GLYCERYL ETHERS. I. DISTRIBUTION IN MAMMALIAN TISSUES AND IN STARFISH. D. Todd and G. P. Rizzi (Dept. of Chem. Eng. and Chemistry, Worcester Polytech. Inst., Worcester, Mass.). *Proc. Soc. Exp. Biol. Med.* 115, 218–22 (1964). A number of animal lipids have been separated into neutral and phospholipids, and each of these fractions examined, after hydrolysis, for glyceryl ethers. A paper chromatographic method of separating the various α-glyceryl ethers from one another is described. In mammals the richest site of bound glyceryl ethers is in the marrow.

(Continued on page 44)

End of the Road . . .

(Continued from page 19)





Of all the assumptions made here, the most critical of all, and the least amenable to demonstration, is the one that meal demand will remain sloppy for the better part of the next twelve months. Nearly all analysis in some situation will lean to the forecast method known as "extrapolation through ignorance." This involves the thesis that when in doubt assume indefinite continuation of the current trend. To some extent this has been done here. If this works in this case, then as far as oil stock build-up is concerned, we have reached the end of the road.

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ABSTRACTS: BIOLOGY AND NUTRITION

(Continued from page 41)

EFFECT OF DEGREE OF FATTY ACID UNSATURATION IN TOCOPHEROL DEFICIENCY-INDUCED CREATINURIA. L. A. Witting and M. K. Horwitt (L. B. Mendel Res. Lab., Elgin State Hosp., Elgin, Ill.). *J. Nutr.* 82, 19–33 (1964). The rate of development of creatinuria in the tocopherol-deficient rat proved to be dependent on the degree of unsaturation of the dietary fatty acids. Data were obtained consistent with relative *in vivo* rates of fatty acid peroxidation of monoenoic, dienoic, trienoic, tetraenoic, pentaenoic, and hexaenoic fatty acids in the ratios 0.025:1:2:4:6:8, and tocopherol requirements for constant diminution in the rates of peroxidation in the ratios 0.3:2.3:4:5:6. Muscle phospholipid fatty acid compositions were dependent on the compositions of the dietary fats but were independent of the level of dietary fat between 7.5 and 19%. Within this range the rates of development of creatinuria and the tocopherol requirements were also independent of the level of dietary fat. One milligram of d-α-tocopheryl acetate per kilogram rat per week delayed the onset of creatinuria by 17 to 20 weeks.

BIOLOGICAL AND NUTRITIONAL PROPERTIES OF ESTERIFIED OILS. A. Uzzan (ITERG, Paris, Fr.). *Rev. Franc. Corps Gras* 10, 517–30 (1963). Esterified oils obtained by the esterification of distilled fatty acids with distilled glycerine have been the object of numerous discussions in which concern has been voiced as to the nutritional value of these oils. The characteristics, structure and especially the biological use and toxicity of these synthetic oils have been questioned. This study was designed to critically evaluate reports of *in vivo* studies on the use of synthetic triglycerides. The author concludes that synthetic triglycerides are not carcinogenic, do not cause atherosclerosis or hypercholesteremia and are readily available and nutritionally useful to the experimental animal.

THE CONTROL OF THE NUTRITIONAL VALUE OF SOYBEAN CAKE. M. R. Feron (Tech. Dir. Soc. Astra Calve, Paris, Fr.). *Rev. Franc. Corps Gras* 10, 661–666 (1963). The difficulty in measuring the nutritive value of soybean cake by either a rat feeding test or by *in vitro* test is pointed out. It is suggested that either the Frolich test or the Orange G test be used since both are simple and satisfactorily reproducible. 68 references are given.

THE DEVELOPMENT AND USE OF SOY FLOUR IN HUMAN FEEDING. M. Lynn and C. Adolphson (Archer Daniels Midland, Minneapolis, Minn.). *Rev. Franc. Corps Gras* 10, 649–659 (1963). A paper presented at the conference on soybeans and soybean products held at Paris, France on October 2, 1963. The origin of soy flour was traced and its physiological and nutritive properties as well as its composition described. Usage of soy flour in bread, cakes, biscuits and cookies was discussed.

RELATIONSHIP BETWEEN DIETARY FATS AND THE DEVELOPMENT OF BILE STONES IN ANIMALS. H. Dam (Polytech. Inst., Copenhagen). *Riv. Ital. Sostanze Grasse*, Sympos. Issue 1962, 85–93. Hamsters fed on a fat-free, high sucrose diet, with or without vitamin E, develop crystalline bile stones with a high (90%) cholesterol content, as well as dark colored, amorphous stones having a high content of bile acids. The more easily digestible the carbohydrates used in the diet (glucose, sucrose), the higher the incidence of cholesterol stones. When the carbohydrates in the diet are replaced by fats, there is a complete reversal of trend, with the incidence of cholesterol stones being greatly reduced and in some cases (more unsaturated fats) disappearing altogether. In a mixed fat-carbohydrate diet, the incidence of cholesterol stones is also reduced to zero when the glucose is replaced by starch or lactose. An appropriate change in diet, to one rich in fats and starch, is capable of redissolving previously formed cholesterol stones, but not the amorphous ones. In similar experiments on chickens, these animals did not develop bile stones even when fed on a fat-free glucose diet. Chickens' bile has been found to have a bile acids:cholesterol ratio ten times higher than in hamsters and a ratio of liposoluble phosphorus to cholesterol seven times higher. A similar situation, not conducive to formation of cholesterol stones, has been found with mice.

THE BIOSYNTHESIS OF STEROLS IN SOLANUM TUBEROSUM. D. F. Johnson, E. Heftmann, and G. V. C. Houghland (Natl. Insts. of Arthritis and Metabolic Diseases, NIH). *Arch. Biochem. Biophys.* 104, 102–5 (1964). The incorporation of mevalonic acid-2-C^{14} into potato plants of the Katahdin variety was studied for an extended period of growth. The largest incorporation into the major sterols, stigmasterol and beta-sitosterol, occurred in 1 week. At any growth period, total and specific activity of stigmasterol are almost always less than in the case of sitosterol.