oleate contaminated with 0.6% oleate in 24.3% yield (Table I), fully confirming the results of Keppler *et al.* (1) and emphasizing the great value of the method for obtaining reasonable quantities of methyl linoleate in a comparatively simple manner.

TABLE I

Isolation of Pure Methyl Linoleate from 2,886 g. of Safflower Seed Oil Methyl Esters

Fraction No.	Methylated safflower seed oil	I	II	III	IV	V
G. urea added	1,924	1,588	866	2,405	1,500	......
Fatty acid	Moles percentage of methyl esters obtained by GLC					
Laurate	tr.	tr.	......	......	......	......
Myristate	tr.	0.4	......	......	......	......
Palmitate	6.2	47.3	1.3	......	......	......
Palmitoleate	tr.	tr.	0.7	......	......	......
Stearate	3.1	15.5	......	......	......	......
Oleate	10.9	17.1	40.0	9.5	0.6	......
Linoleate	79.8	17.5	58.0	90.5	99.4	100
Arachidate	tr.	1.8	......	......	......	......
$C_{20:1}$?	tr.	0.4	......	......	......	......
Iodine value	142.3	56.5	135.3	155.9	169.4	172.4
Yield of urea adduct g.	......	1,700	1,820	1,030	2.746	1,580
Wt. % ester in urea adduct	......	26.5	25.5	24.5	25.5	25.4
Yield expressed as % of original methyl esters	......	......	......	......	24.3	13.9

However the formation of the urea adduct from the mother liquor remaining after the fourth crystallization not only increased the yield of methyl linoleate by 13.9%, but, in addition, the product was completely free of other fatty acid methyl esters.

If Fractions IV and V are combined, the additional step which we have introduced provides an increased yield of methyl linoleate and also makes possible the preparation of a product, albeit in smaller yield, of greater purity than has hitherto been possible.

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ABSTRACTS .... R.A. REINERS, Editor

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• Fats and Oils

NEW SOLVENT SYSTEM FOR SEPARATION OF FATTY ACIDS C_{10}–C_{18} BY COUNTERCURRENT DISTRIBUTION. F. Will, III (Alcoa Res. Labs., Aluminum Co. of Am., New Kensington, Pa.). *Anal. Chem.*. 33, 647–48 (1961). Fatty acids C_{10} to C_{18} have been separated from each other by the countercurrent distribution technique in the new solvent system using petroleum ether as an upper layer and a 9 to 1 ratio of dimethyl sulfoxide to 1-octanol as a lower layer.

OXIDATIVE RANCIDITY IN COOKED MULLET. Marelynn Zipser and Betty Watts (Dept. of Food and Nutrition, Fla. State Univ., Tallahassee). *Food Tech.* 15, 318–321 (1961). The muscle lipids of mullet begin to oxidize very rapidly after cooking, as shown by increases in TBA number and rancid odors. Intensity of the reaction appears to be greater in tissues containing large quantities of lipids and heme pigments than in tissues containing lesser amounts. The oxidative reaction is retarded by limited oxygen supply and by low (freezer) temperatures, but was not completely inhibited under the condition studied. Inhibition was more complete from the antioxidant mixture of sodium tripolyphosphate and sodium ascorbate, either alone or in combination with curing salts.

IRRADIATION FLUOROMETRIC METHOD FOR ESTIMATION OF DIETHYLSTILBESTROL IN BEEF LIVER TISSUE. J.M. Goodyear and N.R. Jenkinson (Control Div., Eli Lilly & Co., Indianapolis, Ind.). *Anal. Chem.* 33, 853–56 (1961). Additional information is given on the application of an irradiation fluorometric method which has been recently developed for the specific measurement of diethylstilbestrol in biological samples.

EFFECTS OF VARYING THE CHEMICAL COMPOSITION OF STATIONARY PHASE ON THE SEPARATION OF CERTAIN C_{19} AND C_{27} STEROIDS BY GAS CHROMATOGRAPHY. S.R. Lipsky and R.A. Landowne (Dept. of Internal Medicine, Yale Univ. School of Med., New Haven, Conn.). *Anal. Chem.* 33, 818–28 (1961). Gas chromatographic analyses of mixtures of C_{19}, C_{21}, and C_{27} steroids were performed. The chemical composition of these substrates was correlated to differences in separation factors for closely related steroids. Relationships were derived which describe the effect of structural changes in the steroid molecule upon their order of elution from the chromatographic column.

AN IMPROVED SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF TOCOPHEROLS USING 4,7-DIPHENYL-1,10-PHENANTHROLINE. C.C. Tsen (Grain Res. Lab., Board of Grain Commissioners for Canada, Winnipeg 2, Man., Canada). *Anal. Chem.* 33, 849–51 (1961). An improved method for the determination of tocopherols, based on the method of Emmerie and Engel, is proposed.

DETECTION OF OLEFINS BY EPOXIDATION AND HYDROXAMATION AND CHARACTERIZATION BY REARRANGEMENT OF EPOXIDES TO CARBONYL COMPOUNDS. J.G. Sharefkin and H.E. Shwerz (Dept. of Chem., Brooklyn College, Brooklyn, N.Y.). *Anal. Chem.* 33, 635–39 (1961). Two most general tests for the olefin bond, decolorization of bromine and permanganate, give positive signs of reaction with many nonolefinic reducing reagents. Such false positive tests are avoided by devising tests in which the sign of a positive reaction depends on a chemical change in the substrate rather than the reagent. Commercial 40% peracetic acid transforms olefins to their glycol monoacetates which are treated with hydroxylamine and the hydroxamic acids are detected as the wine red ferric salt. Olefins are also characterized by rearranging the epoxides with boron trifluoride to carbonyl compounds that are then converted to solid dinitrophenylhydrazone. Reactions may be carried out on a semimicro scale and permit identification of olefins in the presence of acetylenes and other reductants.

DETECTION AND CHARACTERIZATION OF ACETYLENES BY HYDRATION TO CARBONYL COMPOUNDS AND FORMATION OF 2,4-DINITROPHENYLHYDRAZONES. J.G. Sharefkin and E.M. Boghosian (Dept. of Chem., Brooklyn College, Brooklyn, N.Y.). *Anal. Chem.* 33, 640–44 (1961). A method has been developed for differentiating the acetylene from the olefin functional group, both of which decolorize both bromine and permanganate, by hydrating with a boron trifluoride, mercuric oxide, and trichloroacetic acid catalyst mixture. The carbonyl compounds formed are treated with 2,4-dinitrophenylhydrazine and a phenylhydrazone is formed by addition of methanolic potassium hydroxide to produce a wine red color.

NATURALLY OCCURRING EPOXY ACIDS. I. DETECTION AND EVALUATION OF EPOXY FATTY ACIDS BY PAPER, THIN-LAYER, AND GAS-LIQUID CHROMATOGRAPHY. J. Morris, R.T. Holman, and K. Fontell (Hormel Inst. and Dept. of Physiol. Chem., Univ. of Minnesota, Austin, Minn.). *J. Lipid Res.* 2, 68–76 (1961). Paper, thin-layer, and gas-liquid chromatographic (GLC) methods were developed for detection and measurement of epoxy and other oxygenated fatty acids in naturally-occurring oils. Techniques were tested both on synthetic acids and their mixtures and on 6 seed oils. For the latter studies, GLC and thin-layer techniques were especially useful, together demonstrating presence of at least 3 distinct epoxy acids in each of these oils. Total epoxy esters could readily be determined in admixture with saturated esters. The internal standard method must be used to obtain quantitative results from peak areas.

COUNTERCURRENT DISTRIBUTION OF SOYBEAN FATTY ACID METHYL ESTERS BIOSYNTHETICALLY LABELED WITH H^3 AND C^{14}. H.J. Dutton, E.P. Jones, C.R. Scholfield, W. Chorney, and N.J. Scully (Northern Regional Research Lab., Agric. Res. Service, U.S. Dept. Agriculture, Peoria, Ill.). *J. Lipid Res.* 2, 63–67 (1961). Soybean plants were cultured (a) in presence of $C^{14}O_2$ and (b) with H^3OH in the nutrient medium. The oils were extracted from the seeds at various stages of maturation and preparations containing randomly C^{14}- and H^3-labeled fatty acid esters were obtained by transesterification. Fatty acid compounds of the various ester preparations were determined by gas-liquid chromatography (GLC). The labeled ester preparations were submitted to countercurrent distribution in a 200-tube automatic countercurrent distribution apparatus. Fractions obtained during countercurrent distribution were analyzed singly or in combination by GLC and their radioactivity was also assayed in order to follow the course of the procedure and to determine purity and activity of the fractions. Over-all recoveries of about 90 per cent were possible by countercurrent distribution. The products obtained included pure labeled linoleate, 97 per cent linolenate, a 2:1 oleate-palmitate mixture, 83 per cent pure stearate, and concentrates of C_{20} and higher acid esters.

QUANTITATIVE GAS LIQUID CHROMATOGRAPHY OF FATTY ACID METHYL ESTERS WITH THE THERMAL CONDUCTIVITY DETECTOR. L.A. Horrocks, D.G. Cornwell, and J.B. Brown (Dept. of Physiol. Chem., Ohio State Univ., Columbus 10, Ohio). *J. Lipid Res.* 2, 92–94 (1961). Relative katharometer responses for Me esters of fatty acids of two homologous series were calculated by the method of least squares from experimental data. These correction factors were used to analyze known mixtures and to recalculate published experimental data on known mixtures and were shown to give more accurate analytical values, particularly for lower fatty acid esters than those obtained by assuming peak areas are directly correlated with weight per cent. Relative response data are listed for saturated esters (acetate through behenate) and for C_{18} unsaturated Me esters (oleate, linoleate, linolenate, elaidate). The calculated correction factors for saturated Me esters are compared with a theoretical relationship $R_1R_2=(M_1M_2)^{2/3}$ based on molecular weights shown to be in good agreement.

VARIOUS APPLICATIONS OF ION EXCHANGE RESINS IN THE CHEMISTRY OF FATS AND THEIR DERIVATIVES. A. Ollero and A. Soto (Instituto de Quimica "Alonso Barba," Seville, Spain). *Grasas y Aceites* 11, 81–96 (1960). A review is given of the use of ion exchange resins for the separation of free fatty acids from fats, the separation of fatty acid mixtures, the separation of glycerine, the interreaction of fatty acids with their salts, and various other chemical processes.

THE APPLICATION OF ION EXCHANGE RESINS AS CATALYSTS IN THE CHEMISTRY OF FATS AND RELATED COMPOUNDS. A. Ollero and A. Soto (Instituto de Quimica "Alonzo Barba," Seville, Spain). *Grasas y Aceites* 11, 29–33 (1960). The use of ion exchange resins for catalyzing the esterification, hydrolysis, alcoholysis, and epoxidation of fats is reviewed.

PROCESSING SEED OILS. R. de Castro and F. Ramos (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 97–101 (1960). Cottonseed and soybean oils were refined, bleached, and deodorized in pilot plant tests to determine the optimum processing conditions. The effects of time, agitation, amount of lye, and temperature on batch refining were studied. The effect of temperature on bleaching was determined. The influence of pressure, time, steam blowing rate, and antioxidants on deodorization was also studied. Methods for improving the quality of soapstock and a possible classification for the quality of soapstock are discussed.

A METHOD FOR STUDYING THE INFLUENCE OF METALLIC SALTS ON THE DEVELOPMENT OF RANCIDITY IN FATS. Miss R. Vasquez, R. Gutierrez, and J.M.R. de la Borbolla (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 26–28 (1960). Pieces of filter paper were impregnated with a solution of the metallic salt under study. After drying, the paper was soaked in a fatty oil and kept in the dark. The development of rancidity in the fatty oil was followed by odor, peroxide number, and iodimetric titration. The effects of Mn, Fe, Tl, Cu, Co, Ni, Cr, Pb, V, Sn, Zn, Na, Mg, K, Ca, Ba, Sr, Li, Cd, Ce, Mo, W, U, and Ag salts were tested. Cu, Co, Mn, Fe, and Tl were *the most active in promoting* the development of rancidity, while Ni, Cr, and Pb showed moderate activity. Antioxidants improved the stability of a fat when Cu, Fe, or Mn were present.

ORGANOLEPTIC TESTING OF FATS. SELECTION OF A PANEL FOR STUDIES OF RANCIDITY. R. Gutierrez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 3–8 (1960). From an initial group of 45 persons, the 12 most suitable tasters were selected to form a panel for grading the organoleptic properties of fats. Using a 1 to 10 grading scale, panel members were evaluated for reproducibility in grading the same sample and for being able to distinguish between various levels of rancidity. Results were evaluated statistically.

INFRARED SPECTROSCOPY OF FATTY SUBSTANCES. J.R. Barcelo (Instituto de Optica, Madrid, Spain). *Grasas y Aceites* 11, 34–40 (1960). A review.

A NEW CRITERION FOR CHARACTERIZING THE UNSAPONIFIABLE MATERIAL IN OLIVE OIL. J. Gracian and J. Martel (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 59–66 (1960). Determination of the hydroxyl number of the unsaponifiable material in olive oil was found to be a good method for characterizing the unsaponifiable fraction. In mechanically extracted (table grade) olive oil, the unsaponifiable hydroxyl number (UNH) was found to be between 30 and 50. Solvent extracted (lower grade) olive oils gave UHN values above 65. Almond, peanut, soya, and cottonseed oils also gave UHN values above 65. UHN analysis could serve to differentiate pure, table grade olive oil from solvent extracted or adulterated olive oil.

STUDIES ON THE RANCIDIFICATION OF OLIVE OIL. XI. COMPARISON OF DIFFERENT TESTS FOR DETERMINING THE DEGREE OF RANCIDITY. R. Gutierrez and A. Vargas (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 67–70 (1960). Edible olive oil was aged in three ways: in an oven at 70°, in a Swift stability apparatus (A.O.M. method), and at room temperature in the presence of light. The process of oxidation was followed by means of organoleptic examination, peroxide number, Kreiss test, Watts and Major aldehyde test, thiobarbituric acid test, and alcoholic alkali test. All tests showed similar curves for the development of rancidity: an initial induction period during which little change occurred, followed by rapid development of oxidation products.

TRACE ELEMENTS IN EDIBLE FATS. VII. SPECTROGRAPHIC ANALYSIS OF TRACE METALS. A. Vioque and M. del Pilar (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 11, 71–78 (1960). A spectrographic method for the analysis of trace metals in edible fats is described. Fat samples were ashed in the presence of $Mg(NO_3)_2$ and then dissolved in HCl. Fe, Cu, Mn, Zn, Al, Ni, and Sn were then extracted with various organic reagents. Concentrated solutions of these extracts were then burned to obtain emission spectra. Tests on known samples showed the method to a quantitative for each of the seven metals. Various olive oils were examined by this method and found to contain traces of Fe, Cu, Mn, Zn, and Al.

SPLITTING OF FATS. RELATIONSHIPS BETWEEN ANALYTICAL CHARACTERISTICS. R. Ceballos (AGRA, S.A., Bilbao, Spain). *Grasas y Aceites* 11, 79–82 (1960). The author discusses the mathematical relationships between the various analyses used to determine the degree of hydrolysis of a fat: % free fatty acids, acid number, saponification number, neutralization number, and hydroxyl number. Mathematical relationships between these analyses and the content of mono-, di-, and triglycerides are presented.

STUDY OF OLIVE OIL-WATER EMULSIONS BY MICROSCOPY AND DIFFRACTION. R. Marquez (Instituto de Optica "Daza de Valdez," Madrid, Spain). *Grasas y Aceites* 11, 83–90 (1960). Light microscopy, electron microscopy, X-ray diffraction, and electron diffraction techniques were used to study the nature of water-oil emulsions in alpechin (the water phase obtained by crushing olives). Microphotographs showing the structure of the emulsion are presented. The structure of the interfacial surface was found to be similar to that of butter fat globules in milk. The presence of metallic elements at the interfacial surface was established by means of X-ray and electron diffraction patterns.

A NEW METHOD FOR THE DETECTION OF DIGLYCERIDE ON A MICROSCALE. B.F.C. Clark (Univ. Chemical Lab., Lensfield Road, Cambridge, Great Britain). *J. Chromatography* 5, 368–9 (1961).

A new method is described for the detection of diglycerides in microgram quantities by paper chromatography. The experimental procedure described allows 5–10 micrograms of diglyceride to be detected on paper chromatograms.

An apparatus for large scale preparative chromatography with especial application to the separation of a long chain fluoro-fatty acid. R.J. Hall (Biochem. Dept., Agr. Research Council, Inst. Animal Physiology, Babraham, Cambridge, Great Britain). *J. Chromatography* **5**, 93–7 (1961). An apparatus is described for the separation and purification of reversed phase chromatography on cellulose powder treated with liquid paraffin of 10 g. or more of mixed long chain fatty acids.

The separation of C_6–C_{12} dibasic acids in the presence of monobasic acids: A simple procedure by paper chromatography. J.L. Occolomitz (Defence Standards Lab., Maribyrnong, Victoria, Australia). *J. Chromatography* **5**, 373–4 (1961). A modification of the technique of Zbinovsky allows the separation of C_6–C_{12} dibasic acids in the presence of monobasic acids by paper chromatography.

Chromatography of some lipids on polytetrafluoroethylene. A.C. Arcus and G.G. Dunckley (Medical Research Council of New Zealand, Medical School, Dunedin, New Zealand). *J. Chromatography* **5**, 272–3 (1961). Chromatographic separation of vitamins A and D and cholesterol is obtained by using polytetrafluoroethylene as column packing.

The separation of glycerides of mixed fatty acid chain length by paper chromatography. R.T. Ory (Southern Regional Research Lab., New Orleans, La.). *J. Chromatography* **5**, 153–6 (1961). A chromatographic separation on glass fiber paper of mixed glycerides of acetic, butyric, stearic, palmitic, and oleic acids in solvents consisting of 2% and 5% ether in iso-octane has been described.

Chromatography of lipids on silicic acid: Infrared spectrophotometric elution curve. J.J. Wren and P.M. Lenthen (The Lyons Labs., Hammer Smith Road, London). *J. Chromatography* **5**, 370–1 (1961). Measurements at 1745 cm^{-1} on eluates of lipids on silicic acid column were found very satisfactory to facilitate preparative column chromatography.

A note on a rapid method for the determination of lipids in brewing adjunct cereals. G.J. Haas and A.I. Fleischman (Liebmann Breweries, Brooklyn, N.Y.). *Cereal Chem.* **38**, 198–202 (1961). A rapid and reproducible method for the determination of lipids in adjunct cereals is reported.

Fatty acid composition of the depot fats of the Kiwi (Apteryx Australis Mantelli). F.B. Shorland and Joan P. Gass (Dept. of Scientific & Industrial Res., Wellington, New Zealand). *J. Sci. Food Agr.* **12**, 174–7 (1961). The depot fat of a flightless bird, the New Zealand Kiwi has been shown to be similar in fatty acid composition to that of other land birds except for its unusually high content (approximately 10%) of C_{20} highly unsaturated acids, the origin of which has not been established.

Chemical investigation of seeds of selected tropical plants. I. Component acids of the fats or oils. A. Mackie and D.G. Mieras (Heriot-Watt College, Edinburgh). *J. Sci. Food Agr.* **12**, 202–5 (1961). The major component acids in the seeds of various plants as determined by gas chromatography were as follows: *Pinang mabuk*, lauric 15.9%, myristic 50.6%, palmitic 14.8%; *Monodora myristica*, oleic 37.2%; linoleic 49.7%; *Xylopia aethiopica*, palmitic 38.6%, oleic 41.6%; *Anogeissus schimperi*, palmitic 29.4%, oleic 15.4%, linoleic 38.6%; *Mangifera indica*, stearic 47.8%, oleic 38.2%;*Carapa procera*, palmitic 31.3%, oleic 49.3%, linoleic 11.9%.

Protein and lipid constitution of some Pakistani pulses. B.E. Baker, J.A. Papaconstantinou, C.K. Cross, and N.A. Khan (Macdonald College, McGill Univ., Quebec, Canada). *J. Sci. Food Agr.* **12**, 205–7 (1961). The five pulse oils examined (gram, mung, mash, masur, lobia) differed markedly in fatty acid composition. Especially interesting was the relatively high cerotic acid content of mung and the high behenic acid content of mash. In all, 19 fatty acids were determined by gas chromatography in the light petroleum extracts.

Separation of some glycerides of cocoa butter by paper chromatography. E.H. Steiner and A.R. Bonar (British Food Mfg. Industries Res. Assoc., Randalls Rd., Leatherhead, Surrey). *J. Sci Food Agr.* **12**, 247–50 (1961). A technique of reverse-phase paper chromatography is described by means of which the 3 monounsaturated glycerides of cocoa butter (2-oleodistearin, 2-oleopalmitostearin, and 2-oleodipalmitin) were separated. The technique was applied successfully to ''bloom'' crystals, showing the same 3 glycerides as in the original cocoa butter but with a smaller proportion of oleodipalmitin. Illipe butter (Borneo tallow) could also be analyzed by this technique, but the method was not satisfactory in the case of butter fat or palm kernel fats.

Preparation of crystallizable stearic acid. T.H. McGuine and N.V. Feldpush (Wilson & Co., Inc.). *U.S. 2,985,674.* A mixture of fatty acids having an iodine number less than 12 and a ratio of stearic acid to palmitic in the range of a maximum of 75 parts stearic per 100 parts of palmitic-stearic and a maximum of 58 parts of palmitic acid per 100 parts of the mixture, is distilled under sub-atmospheric pressure and at a temperature intermediate between the boiling temperature of palmitic and stearic. Odor producing substances are fractionated out as well as fatty acids having less than 16 carbon atoms present in excess of 9% of the mixture. A eutectic product, identifiable as stearic acid of commerce, is crystallized from the distillate product.

• Fatty Acid Derivatives

Phosphatidylhydroxyproline. I. Synthesis of distearoyl L-α-glycerylphosphoryl-L_g, L_s-hydroxyproline. E. Baer and A. Zschocke (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto 5, Ontario, Canada). *J. Biol. Chem.* **236**, 1273–76 (1961). Distearoyl L-α-glycerylphosphoryl-L_g, L_s-hydroxyproline, a member of a new group of phosphates of potential biological interest, has been synthesized. The phosphatidylhydroxyproline, the first of its kind, was obtained by phosphorylation of N-carbobenzoxy-L, L-hydroxyproline benzyl ester with phosphorus oxychloride and triethylamine, esterification of the (N-carbobenzoxy-L, L-hydroxyproline benzyl ester) phosphoryl dichloride with D-α,β-distearin, and subsequent removal of the protective groups by catalytic hydrogenolysis.

N-methylcephalins. I. Synthesis of distearoyl L-α-glycerylphosphoryl-(N-methyl) ethanolamine. E. Baer and Sripada Pavanaram (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto 5, Ontario, Canada). *J. Biol. Chem.* **236**, 1269–1272 (1961). The first chemical synthesis of an N-methylcephalin, *viz.*, distearoyl L-α-glycerylphosphoryl-(N-methyl) ethanolamine, is reported. It was obtained by phosphorylating D-α,β-distearin with phenylphosphoryl dichloride and pyridine, esterifying the resulting distearoyl L-α-glycerylphenylphosphoryl chloride with N-carbobenzoxy-N-methylethanolamine, and removing the protective phenyl and benzyl groups by catalytic hydrogenolysis. This member of an interesting although little known group of glycerophosphatides furnishes one of the structural links between cephalin and lecithin.

• Biology and Nutrition

Conversion of oleic acid to linoleic acid. C. Yuan and K. Bloch (James Bryant Conant Laboratory, Harvard Univ., Cambridge, Mass.). *J. Biol. Chem.* **236**, 1277–79 (1961). This paper deals with the role of oleic acid as a precursor for linoleic acid and with the nature of the processes which introduce the second double bond of the diolefine system. *Torulopsis utilis*, a lipid-rich yeast known to contain large amounts of linoleate, has been found to form this acid efficiently from oleate.

Estimation of total body fat from potassium-40 content. E.C. Angerson, W.H. Langham, G.B. Forbes, and J.B. Hursh (Univ. of Calif., Los Alamos, New Mexico). *Science* **133**, 1917–18 (1961). A brief review is given of the development of methods for the determination of total body potassium by whole-body scintillation counting and of studies to establish the utility of body potassium as a measure of gross body composition including fat.

Lipid metabolism in cultured cells. I. Factors affecting cholesterol uptake. J.M. Bailey (Dept. of Biochem., School of Med., George Washington Univ., Wash., D.C.). *Proc. Soc. Exp. Biol. Med.* **107**, 30–35 (1961). Some of the factors influencing uptake of cholesterol by a strain of mammalian cells growing *in vitro* have been examined. When emulsions of free (nonprotein bound) cholesterol were added to serum medium, relatively small increases in cholesterol content of the medium resulted in large increases in cholesterol content of the cells. By use of C^{14} labelled cholesterol, it was shown that unbound cholesterol was taken up preferentially as compared with cholesterol in the protein-bound form. Cholesterol content of cells was not influenced by addition of stearic acid or linoleic acid to the growth medium. It is concluded that the main factor controlling cellular cholesterol uptake may be the relationship between serum cholesterol and the binding power of the serum proteins, rather than the cholesterol level itself.

EFFECTS OF CONJUGATED ACIDS ON IN VIVO CHOLESTEROL METABOLISM IN THE MOUSE. W.T. Beher, W.L. Anthony, and Margaret Beher (Edsel B. Ford Inst. for Medical Research, Henry Ford Hospital, Detroit, Mich.). *Proc. Soc. Exp. Biol. Med.* **107**, 49–51 (1961). Free and conjugated bile acids had qualitatively similar effects on mouse liver cholesterol levels and *in vivo* cholesterol-x-C^{14} synthesis rates. The effects of free bile acids on cholesterol metabolism are not due to the exhaustion of amino acids used in formation of glycine and taurine conjugates.

GAS-LIQUID CHROMATOGRAPHY OF HUMAN BILE ACIDS. R. Blomstrand (Swedish Med. Res. Council, Unit for Biochem. Res. on Atherosclerosis, Univ. of Lund, Sweden). *Proc. Soc. Exp. Biol. Med.* **107**, 126–128 (1961). The major bile acids in samples of bile as determined with the aid of gas-liquid chromatography were cholic acid, chenodeoxycholic, and deoxycholic acid. Regarding the proportions of the different bile acids, the results from this small group agree with those of Wootton and Wiggins, Isaksson, and Shovall. Deoxycholic acid seemed to disappear in obstructive jaundice. In hepatic bile obtained from patients without jaundice only very small amounts of deoxycholic acid were found. Similar results have been reported by Sjovall and Rudman and Kendall. An interesting finding is the very small amount of deoxycholic acid present in a patient with familial hypercholesterolemia. Further studies are in progress on the bile acid pattern in diseases with an altered cholesterol metabolism.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. R. Bressler and S.J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, N.C.). *J. Biol. Chem.* **236**, 1643–1650 (1961). A highly purified enzyme system was prepared from pigeon liver which converts malonyl and acetyl coenzyme A (CoA) to palmitate in the presence of reduced triphosphopyridine nucleotide. Acetyl-CoA can be replaced to some extent by propionyl-CoA and to a much smaller extent by butyryl-CoA. When acetyl-, propionyl-, or butyryl-CoA were used the major products of fatty acid synthesized were palmitic (80%), heptadecanoic (70%), and stearic acids (85%), respectively. Three and seven tritium atoms were incorporated into palmitate from tritium-labeled acetyl-CoA ($CT_3COSCoA$) and malonyl-CoA ($HOOCCT_2COSCoA$), respectively, in accordance with the stoichiometric formulation of palmitate synthesis. In the absence of reduced triphosphopyridine nucleotide, acetyl-CoA condenses with malonyl-CoA with the release of CO_2. The product of the condensation was not acetoacetate, β-hydroxybutyrate, or butyrate. Possible mechanisms of fatty acid synthesis are discussed.

TOCOPHEROL CONTENT OF MATERNAL AND FETAL TISSUES AS RELATED TO VITAMIN E INTAKE DURING GESTATION. Dorothy Wei Cheng, K.G. Braun, B.J. Braun, and K.H. Udani (Department of Anatomy, State Univ. of Iowa College of Med., Iowa City, Iowa). *J. Nutrition* **74**, 111–19 (1961). Female rats were reared from weaning until the end of gestation on a pure vitamin E-deficient ration. In the positive control group each rat was given daily 2 mg. of dl-α-tocopherol acetate during the first 5 days of gestation. In the experimental groups, either 2 or 4 mg. of the vitamin was given on the 10th day of gestation, whereas in the negative control group no vitamin E supplement was supplied. All rats were autopsied on the 21st day of gestation. The maternal serum tocopherol level was lowest in the vitamin E-deficient group, highest in the vitamin E-deficient group, and intermediate in the groups with abnormal young.

FAT EXCRETION IN DOGS LACKING BOTH BILE AND PANCREATIC JUICE. B.J. Cohen (Dept. of Physiology and the Vivarium School of Med., Univ. of Calif.). *Proc. Soc. Exp. Biol. and Med.* **107**, 40–42 (1961). In 6 dogs deprived of both pancreatic juice and bile and fed varying amounts of olive oil or oleic acid added to a control meal, the fat assimilative deficiency was approximately 60%. It was comparable in 3 dogs with bile deficiency. In 4 dogs lacking pancreatic juice, oleic acid was absorbed as well as in normal dogs. However, the assimilative deficiency for olive oil was nearly 50%. Apparently in the dog, mechanisms other than the actions of bile and pancreatic juice can account for the assimilation of approximately 40% of the dietary fat.

THE IMPROVEMENT OF THE NUTRITIVE VALUE OF RAW WHEAT GERM MEAL BY AUTOCLAVING. R.D. Creek, V. Vasaitis, and G. Schumaier (Dept. of Poultry Husbandry, Univ. of Maryland, College Park, Maryland). *Poultry Sci.* **40**, 822–24 (1961). The results presented in this paper are indicative that raw wheat germ contains a thermolabile factor which impairs its digestion and/or utilization by the chick.

CHEMICAL CARCINOGENESIS IN BIRDS, A REVIEW. C.G. Crispens, Jr. (Dept. of Zoo., Wash. State Univ., Pullman, Wash.). *Poultry Sci.* **40**, 745–54 (1961). The literature on neoplasms in birds is both extensive and controversial. In this paper an attempt has been made to review that portion concerning the chemically induced avian tumors and their transmissibility. A section dealing with much of the recent literature on the Rous sarcoma has been included.

LIPIDE DISTRIBUTION IN EGG YOLK LIPOPROTEIN COMPLEXES. R.J. Evans and S.L. Bandemer (Dept. of Agr. Chem., Mich. State Univ., East Lansing, Mich.). *Poultry Sci.* **40**, 597–602 (1961). Egg yolk contains two lipoprotein complexes, lipovitellin and lipovitellenin. Lipovitellin contained 47.5 per cent of the total egg yolk protein and 6.8 per cent of the lipide. Lipovitellenin contained 38.6 per cent of the protein and 93.2 per cent of the lipide. The lipovitellin preparation contained 21.7 per cent lipides, mostly firmly-bound, and the lipovitellenin, 82 per cent, mostly lightly-bound. The lightly-bound lipide fraction was nearly all neutral fat. The firmly-bound lipide of lipovitellin was principally phosphatidyl choline and of lipovitellenin phosphatidyl ethanolamine.

EFFECT OF CENTRIFUGATION AT 20,000 × G. ON LIPID DISTRIBUTION OF HUMAN SERA. J.C. Forbes, P.D. Camp, A.J. Wasserman, W.T. Tucker, A.L. Forber, and O.M. Petterson (Dept. of Biochem. and Med., Med. College of Virg., and Veterans' Admin. Hosp., Richmond, Virg.). *Proc. Soc. Exp. Biol. and Med.* **107**, 224–27 (1961). The effects of centrifugation at 20,000 × g. for 2 hours on lipid distribution of various human sera have been studied. In general, when neutral fat was below 176 mg. %, very little, if any, cholesterol or phospholipids rose to the surface. When neutral fat content was markedly elevated, as much as 90% of both cholesterol and neutral fat and 50% of phospholipids underwent flotation.

THE ESTIMATION OF VITAMIN A ALDEHYDE WITH THIOBARBITURIC ACID. S. Futterman and L.D. Saslaw (Howe Lab. of Ophthalmology, Mass. Eye and Ear Infirm., and Harvard Med. School, Boston, Mass.). *J. Biol. Chem.* **236**, 1653–57 (1961). A new colorimetric procedure is reported for the estimation of vitamin A aldehyde. The assay does not distinguish among various isomers of vitamin A aldehyde, but no color is produced with either vitamin A or β-carotene. The procedure has been applied directly to retinal extracts. The rhodopsin content of the dark-adapted calf retina was calculated to be approximately 1 mg. or about 2% of the ethanol-insoluble dry weight of the tissue.

EFFECT OF NICOTINIC ACID AND RELATED COMPOUNDS ON INCORPORATION OF MEVALONIC ACID INTO CHOLESTEROL. W. Gamble and L.D. Wright (Cornell Univ. Grad. School of Nutrition). *Proc. Soc. Exp. Biol. Med.* **107**, 160–162 (1961). Nicotinic acid and related compounds (0.1 to 5 mg. per ml.) have no significant effect on conversion of mevalonic acid to non-saponifiable material by rat liver homogenates. The incorporation of acetate into non-saponifiable material (largely cholesterol) decreases with increasing amounts of nicotinic acid. At 1 mg. per ml. of nicotinic acid a 34% average decrease in biosynthesis was observed. The results suggest that the locus of the nicotinic effect may be somewhere between acetate and mevalonate.

OXIDATION OF PALMITATE-1-C^{14} BY RED BLOOD CELLS. J.P. Hrachovec, M. Leblanc, and M. Rockstein (N.Y. Univ. Med. Center, N.Y. Univ. School of Medicine). *Proc. Soc. Exp. Biol. Med.* **107**, 205–207 (1961). Washed, red blood cells from normal, adult rats were incubated *in vitro* in a modified Tyrode phosphate medium with palmitate-1-C^{14}, the oxidation of which was demonstrated and measured by following the incorporation of radioactivity in the respiratory CO_2. Rate of palmitate oxidation to CO_2 has been shown to increase with number of red blood cells in the incubating vessels and with concentration of palmitate, and also depends on duration of the incubation. The data are discussed in relation to the present concepts of fat metabolism *in vivo*.

LIPOPROTEIN CONTENT OF HUMAN PATHOLOGICAL SEROUS FLUIDS. D.A. Kellogg (Dept. of Nutrition, Harvard School of Public Health, Boston, Mass.) and G.V. Mann. *Proc. Soc. Exp. Biol. Med.* **107**, 102–105 (1961). Lipids and proteins exist in peritoneal, pleural, joint, hydrocele, and pericardial effusions in large complexes having migrational characteristics in the ultracentrifuge similar to plasma lipoproteins. Concentration ranges from 5 to 50% of that in plasma. Classification of fluids according to traditional concepts of pressure and irritation reveals that irritative fluids tend to have higher concentrations of low density lipoproteins, total cholesterol, and globulin than do pressure fluids. The origin of these large lipoprotein aggregates is uncertain. The various possibilities are discussed.

TURBIDIMETRIC DETERMINATION OF TOTAL SERUM CHOLESTEROL. G.R. Kingsley and O. Robnett (Dept. of Physiological Chem., School of Med., Univ. of Calif., Los Angeles 24, Calif.). *Anal. Chem.* **33**, 561–64 (1961). Total serum cholesterol can be quantitatively determined by absorbance measurement of the turbidity produced upon the addition of sodium alcoholate to serum. The relationship of turbidity produced to cholesterol concentration appears to be linear within the limits described by the procedure. The results obtained by this simple turbidimetric technique for the rapid determination of serum cholesterol are in good agreement with those by established methods.

THE SENSITIVITY OF CHOLESTEROL ESTERIFICATION TO ENVIRONMENTAL STRESS. P.S. Klein and Rita M. Dahl (Div. of Biol. and Med. Research, Argonne Nat. Lab., Argonne, Ill.). *J. Biol. Chem.* **236**, 1658–60 (1961). Animals stressed by simple restraint for 30 minutes after injection of isotopic acetate exhibit patterns of cholesterol incorporation into liver and plasma esters that differ qualitatively and quantitatively from those of unstressed animals. These results indicate that the mere act of measurement may upset certain parameters in lipid metabolism. The significance of this lability in cholesterol metabolism is discussed.

THE FATTY ACID AND POSITIONAL SPECIFICITIES OF LIPOPROTEIN LIPASE. E.D. Korn (Lab. of Cellular Physiology and Metabolism, NIH, U.S. Public Health Service, Bethesda 14, Md.). *J. Biol. Chem.* **236**, 1638–42 (1961). Chylomicrons derived from olive oil, corn oil, cream, and cocoa butter were incubated with lipoprotein lipase and pancreatic lipase. The molar percentage composition of the free fatty acids formed during the hydrolysis was compared to the composition of the substrate triglyceride. These, and other, data indicate that lipoprotein lipase is similar to pancreatic lipase in having no specificity among glyceride bonds involving palmitic, stearic, oleic, and linoleic acids. There were also no experimentally significant differences in the observed rates of hydrolysis of glyceride esters of capric, lauric, myristic, and palmitoleic acids, but these were present in the chylomicrons in concentrations too low to obtain reliable data. Lipoprotein lipase, unlike pancreatic lipase, hydrolyzes all three ester bonds of a triglyceride molecule at the same rate, or at very similar rates.

SPECTROFLUOROMETRIC DETERMINATION OF TOTAL BILE ACIDS IN BILE. S.J. Levin, J.L. Irvin, and C.G. Johnston (Dept. of Surgery, Wayne State Univ. College of Med., Detroit, Mich.). *Anal. Chem.* **33**, 856–60 (1961). The method of Minibeck has been modified to permit the accurate spectrofluorometric determination of total bile acids in bile. This procedure is applicable to the mixtures of bile acids found in the bile of human beings and various experimental animals.

INFLUENCE OF DIET ON SERUM CHOLESTEROL IN THE CHICK. J.E. Marion, H.M. Edwards, Jr. and J.C. Driggers (Poultry Dept., Univ. of Georgia, Athens, Georgia). *J. Nutrition* **74**, 171–75 (1961). Variations in dietary protein, energy, and cholesterol failed to influence serum cholesterol levels in growing chicks when fed a diet very low in fat. Increases of serum cholesterol were obtained by the addition of corn oil to a diet containing cholesterol. An inverse relationship between dietary protein and serum cholesterol was noted only when corn oil was present in the diet. This relationship was pronounced when cholesterol was incorporated in a corn oil supplemented diet. Growth responses were observed when corn oil was added isocalorically to the low-fat diet indicating that the chicks fed the low-fat diet may have developed a fatty acid deficiency. Greater growth response to the addition of corn oil occurred with diets low in protein which suggests that the protein level of the diet may greatly influence fatty acid deficiency.

THE SYNTHESIS OF C^{14}-LIPIDS IN RABBIT ATHEROMATOUS LESIONS. H.A. Newman, Esther McCandless, and D.B. Zilversmit (Dept. of Physiology, Univ. of Tenn., Memphis, Tenn.). *J. Biol. Chem.* **236**, 1264–68 (1961). Rabbits were treated by injection with sodium acetate-1-C^{14} to measure the incorporation of this label into the phospholipids and other lipids of plasma and intima.

COMPARISON OF TWO ANTIOXIDANTS AND TWO SOURCES XANTHOPHYLL IN A PIGMENTATION STUDY WITH BROILERS. R.G. Ratliff, E.J. Day, and J.E. Hill (Miss. Agr. Exp. Station, Staye College, Miss.). *Poultry Sci.* **40**, 716–19 (1961). The addition of 0.0125% ethoxyquin to broiler rations significantly enhanced pigmentation in three out of four instances. BHT, at the same dietary level, significantly improved pigmentation in one instance but significantly depressed pigmentation in another instance.

SPONTANEOUS-OCCURRING MUSCULAR NECROSES AND ENCEPHALOMALACIA IN THE TURKEY. R.H. Rigdon (Dept. of Path., Univ. Texas Med. Branch, Galveston, Texas). *Poultry Sci.* **40**, 766–71 1961). The pathologic changes occurring spontaneously in a group of 34 Broad Breasted Bronze turkeys are reported. Focal areas of necroses are present in striated muscles throughout the body. The extent of the muscular necroses varies in different anatomical sites of the same bird, as well as in different birds. A second lesion occurring infrequently in the turkey is encephalomalacia. Some turkeys developed paralysis, pendulous crop, or an enlarged tibio-metatarsal joint. The etiology of these lesions in the striated muscle and in the brain is discussed.

CONVERSION OF ZYMOSTEROL-C^{14} AND ZYMOSTENOL-H^{3} TO CHOLESTEROL BY RAT LIVER HOMOGENATES AND INTACT RATS. G.J. Schroepfer, Jr. (Dept. of Physiological Chem. and Med., Med. School, Univ. of Minn., Minneapolis 14, Minn.). *J. Biol. Chem.* **236**, 1668–73 (1961). The incorporation of zymosterol-C^{14} and zymostenol-24,25H^{3} into cholesterol by both Bucher and Waring Blendor homogenates of rat liver has been demonstrated. These conversions did not require the presence of added nicotinamide, diphosphopyridine nucleotide, or magnesium salts. On the basis of observations made in this study it is suggested that sterols with a Δ^{24} double bond are not significant intermediaries in the conversion of zymostenol to cholesterol. Zymostenol, but not zymosterol, was efficiently incorporated into the cholesterol of liver after intraportal administration to rats treated with triparanol.

DEPOSITION OF CHOLESTEROL AND CHOLESTANOL IN EXPERIMENTAL RABBIT ATHEROSCLEROSIS. E. Schwenk, Y. Omori, and E. Joachim (Worcester Foundation for Exp. Biol., Shrewsbury, Mass.). *Proc. Soc. Exp. Biol. Med.* **107**, 83–85 (1961). Contrary to the original findings, it is established that cholesterol-C^{14} and cholesterol-H^{3} are deposited in tissues of rabbits in exactly the same way. The reason for the discrepancy in deposition of the two substances in earlier experiments was found in the presence of chemically negligible traces of cholestanol-H^{3} which had then not been eliminated from cholesterol-H^{3} fed. Deposition is different for different tissues and that of cholestanol is only a very small fraction of that for cholesterol.

STUDIES OF TRIGLYCERIDE BIOSYNTHESIS IN HOMOGENATES OF ADIPOSE TISSUE. D. Steinberg, Martha Vaughn, and S. Margolis (NIH, U.S. Public Health Service, Bethesda 14, Md.). *J. Biol. Chem.* **236**, 1631–37 (1961). Requirements for the synthesis of neutral lipids by cell-free homogenates of rat epididymal adipose tissue are described. All of the observations in the complete system and in studies of single reactions are compatible with the pathway of glyceride synthesis proposed earlier by other workers for the system from liver, involving the formation of phosphatidic acid from fatty acyl coenzyme A derivatives and α-glycerophosphate followed by conversion of this to diglyceride, which is then esterified to form triglyceride. In homogenates of adipose tissue lipolysis goes on simultaneously with esterification. This occurs even when there is a net decrease in free fatty acids during incubation.

TISSUE LIPID FATTY ACID COMPOSITION IN PYRIDOXINE-DEFICIENT RATS. L. Swell, M.D. Law, P.E. Schools, Jr., and C.R. Treadwell (Vets. Admin. Center, Martinsburg, West Virginia). *J. Nutrition* **74**, 148–56 (1961). The influence of pyridoxine deficiency on the fatty acid composition (gas-liquid chromatography) of the cholesterol ester, triglyceride and phospholipid fractions of serum, liver and adrenal have been determined. Comparison of the tissue lipid fractions of both normal and pyridoxine-deficient rats indicated that only the triglyceride fraction of the serum and liver and the phospholipid fraction of the liver showed declines in the level of arachidonic acid and increases in linoleic acid. The cholesterol ester fatty acids of those tissues showed no significant change as a result of pyridoxine deficiency. Pyridoxine deficiency had no effect on the serum lipid levels, but there was a significant decline in the liver free cholesterol and a large decline in the liver phospholipid fraction (50%). Adrenal corticoid homone synthesis was not impaired in the pyridoxine-deficient animal, nor was there any change in the level of the adrenal polyunsatured fatty acids.

VITAMIN K IN THE NUTRITION OF MINK. H.F. Travis, R.K. Ringer, and P.J. Schaible (Fur Animal Project, Dept. of Poultry Sci., Michigan State Univ., East Lansing, Mich.). *J. Nutrition* **74**, 181–84 (1961). The dietary requirement of normal adult mink was established as being less than 13 mg. of menadione sodium bisulfite (U.S.P.) per ton, or 6.5 μg. per pound of feed. Practical ranch rations would contain much higher levels of vitamin K activity. Mink fed a semipurified ration had comparable blood-clotting times to those fed a typical ranch ration.

STUDIES IN STEROID METABOLISM. X. GAS CHROMATOGRAPHIC ANALYSIS OF ESTROGENS. H.H. Wotiz and H.F. Martin (Dept. of Biochem., Boston Univ. School of Med., Boston 18, Mass.). *J. Biol. Chem.* **236**, 1312–17 (1961). The acetic acid esters of estrone, estradiol, and estriol have been quantitatively separated and measured by gas chromatography on a silicone column. Evidence for quantitative acetylation and thermal stability has been presented. Variation of column conditions was shown to allow either rapid analysis, in less than 7 minutes, or allow longer retention times resulting in the separation of similar compounds in 3 hours.

OLIVE SEED PROTEINS. I. M.J. Fernandez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **11**, 19–25 (1960). Suitable conditions for extracting the proteins from three varieties of olive seeds were studied. Proteins were extracted most efficiently with a basic solution and precipitated with HCl. The resultant dried precipitate contained 62 to 75% protein based on its nitrogen content.

GAS CHROMATOGRAPHY SEPARATIONS OF STEROIDS WITH POLYESTER PHASES. E.O.A. Haahti, W.J.A. Vander Heuvel, and E.C. Horning (Natl. Heart Inst., Bethesda, Md.). *J. Org. Chem.* **26**, 626–7 (1961). Five polyesters were used as the stationary phase for gas chromatographic separation of steroids. 0.75% phase on Gas Chrom P was found to be satisfactory. The effect of polar phase when compared with SE-30 originally used, this technique was an increased (relative to cholestane) retention time for steroids containing polar substituent groups.

THE PATH OF CARBON IN PHOTOSYNTHESIS OF THE LIPIDS. R.A. Ferrarri and A.A. Benson (Pennsylvania State Univ.). *Arch. Biochem. Biophys.* **93**, 185–92 (1961). The rates of C^{14} incorporation into lipids and their components during steady-state photosynthesis in $C^{14}O_2$ by *Chlorella pyrenoidosa* reveal the metabolic importance of the galactolipids and phosphatidyl glycerol. The most rapidly labeled were galactosyl glycerol, digalactosyl glycerol, diglycerophosphate, sulfoglycosyl glycerol, and glycerophosphorylinositol. Labeling of the triglycerides proceeded more slowly than that of the surfactant lipids. The fatty acids of phosphatidylglycerol and the galactosyl diglycerides were more readily labeled than any other esterified fatty acids.

COENZYME Q. XXIV. ON THE SIGNIFICANCE OF COENZYME Q_{10} IN HUMAN TISSUES. P.H. Gale, F.R. Koniuszy, A.C. Page, Jr. and K. Folkers (Merck, Sharp & Dohme Res. Labs.) and H. Siegel. *Arch. Biochem. Biophys.* **93**, 211–13 (1961). Several organs and tissues of 3 humans were examined for coenzyme Q content. The liver, heart, spleen, kidney, pancreas, and adrenals contained relatively high concentrations of coenzyme Q_{10}; thyroid and brain contained quite low levels. The total body content appeared to be in the range of 0.5–1.5 g., and the intestinal flora may contribute only negligible amounts of Q_{10} to body stores. Thus, coenzyme Q_{10} would seem to have an important role in human health and disease because of (a) its presence in essential organs, (b) its direct link to known vitamin-derived coenzymes, (c) its coenzymic functions, and (d) an apparent role in oxidative phosphorylation.

POLYUNSATURATED FATTY ACIDS IN TISSUES OF GROWING MALE AND FEMALE RATS. J.G. Kirschman and J.G. Coniglio (Vanderbilt Univ. School of Med.). *Arch. Biochem. Biophys.* **93**, 297–301 (1961). Polyunsaturated fatty acid concentrations of tissues were determined in male and female rats of weanling, 3 months, and 6 months of age. No significant differences were found in concentrations in corresponding tissues of the males and females. Concentrations did change with age. The changes were different for each tissue and varied with the polyene concerned. Hexaenes comprised the greatest portion of polyunsaturated fatty acids in the brain, while dienes predominated in muscle and pentaenes in the testes. Tetraenes were in uniformly high concentrations in all organs and tissues studied and varied less with age than any of the other polyenes. Brain contained only trace amounts of dienes but relatively large quantities of tetraenes.

THE DETERMINATION OF CHOLESTEROL AND COPROSTEROL IN FAECAL LIPIDS. T. Gerson (Dept. of Scientific and Ind. Res., Wellington, New Zealand). *Biochem. J.* **77**, 446–8 (1960). A method is described for the simultaneous quantitative determination of cholesterol and coprosterol, both free and total, in faecal lipids. Standard deviations, based on percentage recovery, were ± 2.80 and 3.41% for cholesterol and coprosterol, respectively. Other sterols normally present in faeces did not materially affect the results. Sterols are precipitated with digitonin and treated with ferric chloride–acetic acid–concentrated sulfuric acid reagent. The absorption is measured at 440 and 560 mμ, and the weights of sterols calculated from standard curves.

FATTY ACID COMPOSITION OF PHOSPHOLIPIDS FROM SUBCELLULAR PARTICLES OF RAT LIVER. Marjorie G. Macfarlane, G.M. Gray, and L.W. Wheeldon (Lister Inst. of Preventive Medicine, London). *Biochem. J.* **77**, 626–31 (1960). The lipid extracted from the mitochondria of rat liver was similar to that from the microsomes except that the mitochondria contained significantly more cardiolipin than the microsomes. Monoenoic acids (53%), palmitic acid (23%), and linoleic acid (15%) were the main acids in the neutral lipid fraction; the lecithin and kephalin fractions contained, respectively, 25% and 40% of the fatty acids as C_{20} and C_{22} acids, with a high proportion of arachidonic and docosahexaenoic acids.

STUDIES ON PHOSPHOLIPIDS. 7. THE DISTRIBUTION OF COMPLEX PHOSPHOLIPIDS IN VARIOUS SPECIES AND TISSUES. F.D. Collins and Valerie L. Shotlander (Univ. of Melbourne). *Biochem. J.* **79**, 316–20 (1961). Analysis of the phospholipids of rat tissues agreed with published results except for the presence of a complex phospholipid which contains ethanolamine, serine, and choline. Complex phospholipids were shown to be present also in egg yolk and allantoic membrane, influenza virus, human plasma, cabbage leaf, human brain, yeast, and a fresh-water crustacean.

8. PHOSPHOLIPIDS IN RAT-LIVER MITOCHONDRIA AND MICROSOMES. *Ibid.*, 321–24 (1961). The phospholipids were examined by the countercurrent distribution of the dinitrophenylated and methylated derivatives. The mitochondrial lipids contained a higher proportion of cardiolipin than the microsomes. The difference in the complex phospholipids in the two fractions is due to the presence of a component in microsomes which is absent from mitochondria. No lysolecithin could be detected in either fraction.

RECENT WORK IN THE PHOSPHOLIPID FIELD. T. Malkin (The University, Bristol). *Chem. & Ind. (London)* **1961**, 605–11. This review, with 37 references, covers recent work on the synthesis of lecithins and cephalins, structure of the plasmalogens, inositol phosphatides, and the sphingolipids.

DIET AND HEART DISEASE—FACTS AND UNANSWERED QUESTIONS. T.B. VanItallie and S.A. Hashim (St. Luke's Hospital, New York). *J. Am. Dietet. Assoc.* **38**, 531–5 (1961). The authors define briefly what is now established about the effect of diet on serum lipids. Studies carried out over a period of 3 years indicate the manipulation of the fatty acid pattern of the diet is effective in lowering serum cholesterol in most subjects with cholesterol levels higher than 230 mg. per 100 ml. Also pointed out are important questions about which present knowledge remains deficient. In view of the impact which the partial information now available is having and will continue to have on American dietary patterns and on the food industry, the authors stress the need for filling in quickly the major gaps in our knowledge.

FASHIONING A PRACTICAL VEGETABLE OIL FOOD PATTERN. AN EXPERIMENTAL STUDY. Helen B. Brown (Cleveland Clinic Foundation). *J. Am. Dietet. Assoc.* **38**, 536–39 (1961). Results of tests have proved that a vegetable oil food pattern as served from the research kitchen effectively reduced serum cholesterol levels in both normal and hypercholesterolemic individuals. The diet was nutritionally adequate and provided 12–13% of calories as protein and 30–40% as fat. The total fat calories consisted of 3–6% animal fat, 20–30% as vegetable oil (cottonseed), and 2–6% basic fat (fat present in low-fat foods).

LIVING WITH THE VEGETABLE OIL FOOD PATTERN. Alla P. Meredith (Cleveland Clinic Foundation). *J. Am. Dietet. Assoc.* **38**, 543–45 (1961). The vegetable oil food pattern provides an adequate diet and is easily prepared at home with some modifications in standard recipes. Foods in which vegetable oil replaces other fats can be palatable and acceptable not only to patients, but to all members of the family. The author cites the need for more commercial products available through regular markets which would meet the requirements of a vegetable oil diet.

THE α-TOCOPHEROL CONTENT OF LEAVES AS AFFECTED BY GROWTH RATE. V.H. Booth and A. Hobson-Frohock (Dunn Nutritional Lab., Milton Rd., Cambridge). *J. Sci. Food Agr.* **12**, 251–6 (1961). Fost-growing leaves of cress, lettuce, and other plants had tocopherol contents of about 70 p.p.m. based on dry matter (7 p.p.m. fresh weight), while evergreen and other slow-growing leaves had up to 1400 p.p.m. (450 p.p.m. fresh). In long leaves of grass, iris, narcissus, and other plants, the α-tocopherol content was low near the base where growth is fast and maximal near the apex where growth is slow. In young short leaves of narcissus, the gradient was only slight. Tocopherol contents of leaves increased during summer and reached maxima in autumn or winter. In evergreen leaves, the values fell in spring. Dying and fallen leaves had higher contents than green leaves. In blooms of narcissus, the α-tocopherol contents diminished considerably during development. The authors conclude that α-tocopherol contents of leaves is inversely related to growth rate.

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• Drying Oils and Paints

COATINGS BASED ON ACRYLAMIDE INTERPOLYMERS. H.A. Vogel and H.G. Bittle (Pittsburgh Plate Glass Co., Research and Development Center, Paint Div., Springdale, Pa.). *Ind. Eng. Chem.* **53**, 461–63 (1961). The baked finishes made from interpolymer resins, as sole resinous binder and when modified by the additional use of several other types of resins are described.

ACRYLIC COATINGS CROSS-LINKED WITH AMINO RESINS. J.C. Petropoulos, C. Frazier, and L.E. Cadwell (Stamford Res. Labs., American Cyanamid Co., Stamford, Conn.). *Ind. Eng. Chem.* **53**, 466–68 (1961). This article describes the preparation of linear acrylic copolymers containing various amounts of methylolacrylamide, *beta*-hydroxyethyl methacrylate, or methacrylic acid. These monomers introduce into the linear copolymers pendant groups which are capable of reacting with amino-formaldehyde resins to yield thermosetting systems. There is also presented a comparison of the film properties of these thermosetting resins with conventional industrial finishes. An attempt is made to correlate the properties of these materials on the basis of their chemical composition and structure.

EPOXY RESINS IN THERMOSETTING ACRYLICS. D.D. Applegath (The Dow Chemical Co., Midland, Mich.). *Ind. Eng. Chem.* **53**, 463–65 (1961). Many different acrylic interpolymers can be thermoset by using many types of epoxy resins. Properties are just as dependent on the choice of epoxy system as they are on the choice of acrylic interpolymer.

THERMOSETTING COMPOSITIONS BASED ON ACIDIC COPOLYMERS CROSS-LINKED WITH DIEPOXIDES. J.D. Murdock and G.H. Segall Canadian Industries Limited, Central Res. Lab., McMasterville, Quebec, Canada). *Ind. Eng. Chem.* **53**, 465–66 (1961). This article gives an account of the development of one-coat universal appliance finishes based on acidic copolymers cross-linked with diepoxides.

SELF-PLASTICIZED PHENOLIC RESINS. J.H. Freeman and E.J. Traynor (Westinghouse Res. Lab., Pittsburgh 35, Pa.). *Ind. Eng. Chem.* **53**, 573–4 (1961). The principle of steric hindrance by suitable alkyl substituents is employed to reduce the hydrogen bond-forming ability of a cured phenolic resin. Resulting products in the form of laminates can be punched cleanly at room temperature in sufficient thickness to be of interest as base materials for use in printed circuits. Because they contain no added low molecular weight ingredients as plasticizers, the laminates are free of the customary blistering, solvent extraction, and other difficulties normally associated with a migratory additive. The most effective substituent is indicated to be the *meta*-isopropyl group. The same polymers may also be made into a satisfactory grade of post-formable laminate, free of added plasticizer.

THERMOSETTING COMPOSITIONS FROM REACTING ACRYLAMIDE INTERPOLYMERS WITH FORMALDEHYDE. R.M. Christenson and D.P. Hart (Pittsburgh Plate Glass Co., Paint Div., Research Center, Springdale, Pa.). *Ind. Eng. Chem.* **53**, 459–61 (1961). An investigation was made of methods of obtaining thermosetting polymers suitable for use in coating application by reacting acrylamide interpolymers with formaldehyde.

POLYMETHYLENE POLYPHENOLS. PREPARATION, RESINS, AND VARNISHES. W.R. Brookes (Chem. Materials Dept., General Electric Co., Pittsfield, Mass.). *Ind. Eng. Chem.* **53**, 570–2 (1961). Internal plasticization of phenolic systems is used to improve flexibility and resilience. This is accomplished by the reaction of long chain C_{25} paraffin wax with phenol by chlorination of the wax and alkylation of phenol with the chlorowax. The waxphenol formed is methylolated with formaldehyde under alkaline conditions, cross-condensed with phenol on the acid side, and then converted to molding resins and laminating varnishes. These materials exhibit the considerably improved property of resilience and flexibility as compared to conventional phenolics. Molding compounds have improved impact strength and superior flow characteristics of preheatability and transfer times. The laminating varnishes overcome their usual brittleness by displaying good cold punching qualities.

SOLVENT OXIDATION OF LINOLEUM CEMENT. A.K. Forsythe (Armstrong Cork Co.). *U.S. 2,985,535.* A partially esterified tall oil produced by selective esterification of only the fatty acid content of tall oil with a polyhydric alcohol containing 3–5 carbon atoms is dissolved in an aliphatic hydrocarbon solvent having a boiling point in the range of 88–460°F. to form a solution of solvent: esterified tall oil weight ratio of 1:3 to 10:1. The solution is maintained at a temperature of about 160–240°F., and oxygen is passed through to precipitate oxidized tall oil fatty esters in the form of a gel.

DEHYDRATION OF PENTAERYTHRITOL ESTERS AND PREPARATION OF RESINS FROM SAID DEHYDRATED ESTERS. W.M. Kraft (Heyden Newport Chemical Corp.). *U.S. 2,985,601.* One mole of pentaerythritol is heated with 1 to 2 moles of monocarboxylic acid (fatty acids containing 6 to 18 carbon atoms, benzoic acid, or mixtures of fatty acids and benzoic) at a temperature between 150 and 230° to remove 1 mole of water of esterification per mole of acid. The partially esterified pentaerythritol is then heated and dehydrated at 150 to 230° in the presence of an acid catalyst to remove from 0.4 to 0.8 mole of water per mole of pentaerythritol, thus forming a partially esterified dipentaerythritol-containing pentaerythritol reaction product.

ALKYD RESIN UTILIZING TRIMELLITIC ANHYDRIDE AND TALL OIL. R.E. Van Strien and B.A. Bolton (Standard Oil Co.). *U.S. 2,985,603.* A very long oil length (greater than 77%) alkyd resin is the reaction product of a polyhydric alcohol containing at least 2 hydroxy groups, tall oil fatty acids, rosin, and an acidic material such as trimellitic acid, trimesic acid, hemimellitic acid, trimellitic anhydride, or hemimellitic anhydride. The finished product has an acid number between 2 and 15.

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• Detergents

BLUE MOTTLED SOAP. B.M. Milwidsky (Haifa, Israel). *Soap Chem. Specialties* **37**(5), 62–5, 139–40 (1961). Formulations and the process for manufacturing mottled soap are presented. Although blue mottled soap does not have the detergent properties of the high grade soaps or the modern detergents, in the more under-developed parts of the world and in times of fat shortage, it still plays an important role.

POLYMERS IN EMULSIFICATION. J.S. Wolff and R.J. Meyer (B.F. Goodrich Chemical Co., Cleveland). *Soap Chem. Specialties* **37**, (5), 131–5 (1961). The permanent stability of oil-in-water emulsions has been shown to be a complex inter-relationship of dependent factors which tend to result in complicated formulations and the use of excessive quantities of surface-active materials. It is suggested that yield value of the continuous water phase constitutes a simple rheological solution to the problem of stability by providing for permanent suspension of the oil spheres independent of all other destabilizing factors. "Carbopol" polymers are found to be unique in the field of synthetic and natural polymers in their ability to develop plastic rheological behavior and yield value in water solutions.