ABSTRACTS

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

• Fats and Oils

THERMAL REACTIONS OF METHYL LINOLEATE. I. HEATING CONDITIONS, ISOLATION TECHNIQUES, BIOLOGICAL STUDIES AND CHEMICAL CHANGES. W. R. Michael, J. Craig Alexander and N. R. Artman (The Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio). *Lipids* 1, 353–58 (1966). Methyl linoleate, diluted with an equal weight of methyl laurate, was heated without exclusion of air at 200C for 200 hours. The reaction mixture was separated by means of molecular distillation, urea adduction, column chromatography, and gas chromatography. Cyclic and aromatic materials were detected in the nonurea adductable monomer fractions. The dimer was separated into polar and nonpolar fractions. Analytical data for the nonpolar dimer are consistent with a cyclic Diels-Alder product. Bioassays showed the nonadductable monomer, the polar dimer, and a fraction of intermediate boiling point to be toxic when administered to weanling male rats. Urea-adductable fractions, nonpolar dimer, and polymer were not toxic. The concentrations of the toxic components were so low that the heated linoleate, before fractionation but after removal of the laurate, was not toxic.

II. THE STRUCTURE OF AROMATIC C-18 METHYL ESTERS. W. R. Michael. *Ibid.*, 359–64. This report describes the characterization of C-18 aromatic esters from the heated linoleate and the independent synthesis of two of them. The esters were isolated by a combination of molecular distillation, urea adduction, column chromatography, and gas chromatography. They were characterized by infrared, ultraviolet, NMR, and mass spectroscopy. The analytical data for the isolated esters were compared with the data for the synthetic esters, methyl 11-(2′-methylphenyl)undecanoate, methyl 7-(2′-pentylphenyl)heptanoate, and methyl 8-(2′-butylphenyl)octanoate. The latter two compounds were found to be components of the aromatic fraction isolated from heated linoleate, and their synthesis is described in detail.

III. CHARACTERIZATION OF C-18 CYCLIC ESTERS. W. R. Michael. *Ibid.*, 365–8. This paper presents the isolation and characterization of nonaromatic cyclic monomers formed from the heated linoleate. The esters were isolated by a series of column chromatographic separations, followed by repeated gas chromatography to obtain fractions containing C_{18} cyclic esters. Characterization of the esters was achieved by use of infrared, NMR, mass spectroscopy, and standard chemical analyses. Also characterized were the isomers found in a complex mixture of cyclic monomers which had been partially separated by column chromatography. Use of both physical and chemical methods of analyses permitted characterization of the mixture of isomers without their having been separated from each other.

ISOMERIC MONOETHYLENIC FATTY ACIDS IN HERRING OIL. R. G. Ackman (Fisheries Res. Board of Canada, Halifax Lab., Halifax, Nova Scotia) and J. D. Castell. *Lipids* 1, 341–48 (1966). Monoethylenic fatty acids from herring oil were concentrated by chromatography on silver nitrate-silicic acid columns. Examination of consecutive fractions by open tubular gas chromatography confirmed the preferential elution of longer chain length esters and of esters within one chain length with the double bond closer to the terminal methyl group. Isomeric monoethylenic fatty acids with double bonds in the positions closer to the carboxyl group than the approximate midpoint of the even-numbered fatty acid chains could not be adequately separated by gas chromatography and were determined by ozonolysis. The isomers observed are consistent with primary formation from saturated acids through the action of an enzyme specifically removing hydrogen atoms in positions Δ^9 and Δ^{10} relative to the carboxyl group. Chain extension of particular monoethylenic isomers by two carbon atoms in the C_{20} and longer chain lengths is apparently influenced by the position of the double bond.

IDENTIFICATION AND DISTRIBUTION OF EPOXYACYL GROUPS IN NEW, NATURAL EPOXY OILS. W. H. Tallent, Diana G. Cope, J. W. Hagemann, F. R. Earle and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 335–40 (1966). New high-epoxy vegetable oils from nine species representing three plant families and four genera have been investigated. The epoxyacyl moiety in at least one oil from each genus was characterized and shown to be the (+)-vernoloyl (*cis*-12,13-epoxy-*cis*-9-octadecenoyl) group. Intraglyceride distribution studies revealed a general preference of the (+)-vernoloyl groups for the β-position of triglyceride molecules. Interglyceride distribution of (+)-vernoloyl groups was studied in three oils and found not to agree with predictions based on either 1,2,3-random or 1,3-random-2-random distribution. A striking exception to the general intraglyceride distribution pattern was discovered in the monoepoxy triglyceride fraction from *Euphorbia lagascae* seed oil.

COMPOSITIONAL VARIATION IN SEED OILS OF THE CREPIS GENUS. F. R. Earle, A. S. Barclay and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 325–27 (1966). Seed oils from eight species of the genus *Crepis* (family Compositae) fall into three groups differing in chemical composition. Besides conventional fatty acids the oils contain either vernolic acid (47–68%), crepenynic (36–65%), or both (18–35% vernolic and 7–11% crepenynic). Within any one section of the genus, the oils are chemically similar, among the limited groups of samples examined.

THE OCCURRENCE OF METHYL METHOXYSTEARATE ISOMERS IN THE METHYL ESTERS PREPARED FROM SHEEP PERINEPHRIC FAT. R. P. Hansen (Food Chem. Div., Dept. of Scientific and Ind. Res., Wellington, New Zealand) and J. F. Smith. *Lipids* 1, 316–21 (1966). A fraction has been isolated from sheep perinephric fat and identified by techniques which included mass and infrared spectrometry, as a mixture of the 8 to 14- methoxyoctadecanoic acid isomers. It is postulated that these isomers are artifacts produced by rigorous esterification with methanol and concentrated H_2SO_4 of a large sample of sheep perinephric fatty acids which are presumed to have contained trace amounts of constituent hydroxy fatty acids. It is estimated that these methoxystearic acid isomers represented approximately 0.08% of the total weight of fatty acids.

PYROLYSIS CHROMATOGRAPHY OF LIPIDS. I. MASS SPECTROMETRIC IDENTIFICATION OF PYROLYSIS PRODUCTS OF HYDROCARBONS. R. T. Holman, M. Deubig and H. Hayes (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 247–53 (1966). The products of pyrolysis at 600C of normal paraffins C_{10}–C_{18}, 2-methyl octadecane, 4-methyl octadecane, 6-methyl octadecane, cyclohexyl decane, cyclopentyl decane, 2,2,4,4,6,8,8-heptamethyl nonane, pristane and phytane were studied by means of a pyrolysis gas chromatograph directly coupled to a mass spectrometer. n-Paraffins yield a homologous series of n-olefins. Branched paraffins yield two homologous series, one of n-olefins and one of branched olefins. The n-olefin corresponding to the position of the branch is not formed. Interpretation of pyrolograms is similar in principle to the interpretation of mass spectra.

STEREOCHEMISTRY OF α-PARINARIC ACID FROM IMPATIENS EDGEWORTHII SEED OIL. M. O. Bagby, C. R. Smith, Jr. and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 263–67 (1966). α-Parinaric acid is a major constituent fatty acid (48%) from *Impatiens edgeworthii* Hook F. seed oil. Partial hydrazine reduction of the tetraene gave products which permit defining the stereochemistry of α-parinaric acid. Its structure is *cis*-9, *trans*-11, *trans*-13, *cis*-15-octadecatetraenoic acid. The tetraene readily reacts with maleic anhydride to give the Diels-Alder product with no *trans*-unsaturation. The formation of this adduct is contrary to previous reports.

KETO FATTY ACIDS FROM CUSPIDARIA PTEROCARPA SEED OIL. C. R. Smith, Jr. (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 268–73 (1966). The seed oil of *C. pterocarpa* contains three keto fatty acids with unusually long carbon chains: 15-oxo-*cis*-18-tetracosenoic (5.4%), 17-oxo-*cis*-20-hexacosenoic (13.4%) and 19-oxo-*cis*-22-octacosenoic (3.3%) acids. These acids were isolated by countercurrent distribution of the corresponding methyl esters. Their structures were established by oxidative degradation, by reduction to known compounds, and by nuclear magnetic resonance and infrared spectra.

ISOLATION AND CHARACTERIZATION OF GLYCERIDES IN HUMAN HAIR LIPIDS BY THIN-LAYER AND GAS CHROMATOGRAPHY. E. J. Singh, L. L. Gershbein and H. J. O'Neill (Northwest Inst. for Med. Res., Chicago, Ill.). *Lipids* 1, 274–78 (1966). Techniques for the quantitative analysis of hair lipids using thin-layer chromatography (TLC) together with a proximate analysis of components in one sample deduced by these criteria are presented. Mono-, di- and triglycerides were separated by TLC using Silica Gel G as adsorbent. The chromatoplates were developed with 98% acetone + 2% petroleum ether. Additional checking was affected by IR spectra. For determination of glyceride composition, methyl esters of the component fatty acids were prepared by transesterification and submitted to gas chromatography. Comparison of the levels of each of the constituent fatty acids showed no remarkable differences between the three classes of glycerides in one hair lipid pool. Although certain discrepancies in the amounts of a few fatty acid components might be construed for one pool of lipids from hair of white full-headed men in contrast to findings with two Negro pools, no unequivocal conclusions can be drawn presently.

CHEMICAL COMPOSITION OF THE WAX SECRETED BY A SCALE INSECT (CEROPLASTES PSEUDOCERIFERUS GREEN). Yoshio Tamaki (Agricultural Chemicals Inspection Station, Ministry of Agr. and Forestry, Kodaira-shi, Tokyo, Japan). *Lipids* 1, 297–300 (1966). The wax material in the secretion of a scale insect, *C. pseudoceriferus* was analyzed chemically with special interest to the composition of higher fatty acids and higher alcohols. The wax consists of 34.2% fatty acids, 27.1% unsaponifiable matter and 29.5% resin acids. The fatty acids were found to be a complex mixture of 15 normal acids ranging from C_8 to C_{32}. Of these, octacosanoic, triacontanoic and dotriacontanoic acids comprise over 30% of the wax. Presence of relatively large amount of unsaturated fatty acids of the C_{18} series (2.8% of the wax) is of particular interest. From the unsaponifiable fraction, only one saturated straight chain alcohol, hexacosanol, was detected (2.7% of the original wax). The other unsaponifiable matter was considered to be cyclic or branched carbon chain, and consisted of at least 12 to 20 compounds. The resin acid fraction was also found to be a complex mixture of at least 13 to 14 components.

THE TRANS-3-ENOIC ACIDS OF GRINDELIA OXYLEPIS SEED OIL. R. Kleiman, F. R. Earle and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 301–4 (1966). *trans*-3-Hexadecenoic acid (14%) and the previously unreported *trans*-3-octadecenoic acid (2%) have been identified in seed oil of *G. oxylepis* Greene, Compositae. Evidence was also found for the existence of other acids with *trans*-3 unsaturation.

PREPARATION OF PURE METHYL ESTERS BY COUNTER DOUBLE CURRENT DISTRIBUTION. C. R. Scholfield, R. O. Butterfield and H. J. Dutton (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 163–65 (1966). Counter double current distribution with continuous stills for solvent and product recovery and an acetonitrile-hexane solvent system is a convenient method for preparative isolation of individual fatty methyl esters. Preparations of pure methyl linoleate from safflower esters and a methyl arachidonate concentrate from hog liver lipids are described.

A SIMPLE, RAPID MICROMETHOD FOR THE DETERMINATION OF THE STRUCTURE OF UNSATURATED FATTY ACIDS VIA OZONOLYSIS. E. Christense Nickell and O. S. Privett (Univ, of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 166–70 (1966). A micromethod for the localization of double bonds in unsaturated fatty acids via ozonolysis employing pyrolytic cleavage of ozonides in the presence of a hydrogenation catalyst is described. Cleavage of the ozonides is carried out in a gas-liquid chromatographic instrument in a small glass tube, containing the catalyst, inserted in the top of the column opposite the input heaters at 225C. Ozonides of methyl esters of straight chain unsaturated fatty acids are cleaved through the action of the catalyst to aldehyde fragments which are swept simultaneously into the column for analysis. The double bond positions are deduced from the chain length of the fragments. The method is demonstrated on methyl oleate, linoleate, linolenate and arachidonate.

MASS SPECTROMETRY OF LIPIDS. I. CYCLOPROPANE FATTY ACID ESTERS. W. W. Christie and R. T. Holman (The Hormel Inst., Univ. of Minnesota, Austin, Minn.). *Lipids* 1, 176–82 (1966). A method was developed for the almost quantitative conversion of unsaturated esters (from monoenes to tetraenes) to cyclopropanes using diiodomethane and a highly active zinc-copper couple. These derivatives are sufficiently volatile for GLC analysis and *cis* and *trans* isomers can be distinguished by this technique. Equivalent chain lengths of the cyclopropane derivatives were measured on polar and nonpolar phases. The mass spectra of the monocyclopropane compounds are very similar to those of the parent unsaturated esters. Those of dicyclopropanes, however, are quite distinctive so that the original structure of the ester can be deduced. Polycyclopropanes give complex spectra which are difficult to interpret in terms of the position of the original double bonds.

THE STRUCTURE OF THE GLYCERIDES OF ERGOT OILS. L. J. Morris and S. W. Hall (Biosynthesis Unit, Unilever Res. Lab., Colworth House, Sharnbrook, Bedford, England). *Lipids* 1, 188–96 (1966). The oils from sclerotia or from suitable mycelial cultures of *Claviceps purpourea* (ergot) contain up to 44% of ricinoleic acid but no free hydroxyl groups. This is due to the presence of, besides normal triglycerides, tetra-acid, penta-acid and hexa-acid triglycerides. These contain respectively one, two and three ricinoleic acids esterified to glycerol, these in turn being acylated at their hydroxy groups with normal long-chain fatty acids. By suitable complementary use of TLC, GLC and lipase hydrolysis techniques, the proportions, compositions and structures of these novel triglyceride classes were determined. Four types of positional specificities in fatty acid combinations could be shown by our procedures. These are discussed and, on the basis of our results, some tentative proposals as to possible biosynthetic mechanisms are advanced.

FATTY ACID DISTRIBUTION IN THE BOVINE PRE- AND POSTPARTUM TESTIS. B. Ahluwalia and R. T. Holman (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 197–201 (1966). Testes from fetuses, calves, bulls and recently castrated animals were analyzed for total lipids, lecithin, cephalin, triglycerides, diglycerides, cholesteryl esters and cholesterol. Total lipids increase somewhat with age, but in the castrated animal the increase is more marked. Phospholipid content increases with age, but decreases in the castrated animal. Cholesterol decreases and triglyceride increases after birth and in the castrated animal. Polyunsaturated acids increase with age in all lipid classes. Eicosatrienoic acid is more abundant in fetal testicular lipids than in testes removed after birth. In the castrated testis there is a general decrease in the unsaturated fatty acids. Acids of the ω6 family are the predominant polyunsaturated acids and increase somewhat with age in all lipids. The ω3 family of polyunsaturated acids appears mostly toward the end of fetal life and increases after birth. Acids of the linoleate family reach approximately 25% of total acids in most lipid classes at maturity whereas the ω3 acids range from 1 to 9%.

FRACTIONATION OF TRIGLYCERIDE MIXTURES BY PREPARATIVE GAS CHROMATOGRAPHY. A. Kuksis and J. Ludwig (Dept. of Biochem., Queen's Univ., Kingston, Ontario, Canada). *Lipids* 1, 202–8 (1966). A semiautomatic system is described for gas-chromatographic separation and recovery of triglycerides of uniform molecular weight in milligram quantities. It employs an Aerograph Autoprep 700 (Wilkins Instrument and Research, Inc.) equipped with a stream splitter and a hydrogen flame ionization detector. The column is an aluminum or stainless steel tube (¼ in. O.D. × 2 ft) and contains silanized Chromosorb W (60–80 mesh) coated with 5% (w/w) JXR or SE-30. Five to ten milligrams of mixed triglyceride are injected at a time and the temperature is programmed exponentially from 150 to 350C. With split ratios of 1:5 to 1:10 collections of 20 to 50 mg of each peak can be made with some 10 to 20 injections.

A COMPARATIVE STUDY OF THE PHOSPHOLIPIDS AND FATTY ACIDS OF SOME INSECTS. P. G. Fast (Insect Pathol. Res. Inst., Sault Ste. Marie, Ontario, Canada). *Lipids* 1, 209–15 (1966). Phospholipids of 27 species of insects representing 6 orders and 20 families were examined by DEAE cellulose column chromatography to determine the choline/ethanolamine phosphoglyceride ratios, and by gas chromatography to determine the constituent fatty acids. The phosphorus in the ethanolamine

phosphoglycerides accounted for approximately 50% of the total lipid phosphorus in aphids (Homoptera) and in all but one family of Diptera (flies) examined while the phosphorus in the choline phosphoglycerides accounted for only about 25%. Ethanolamine and choline phosphoglycerides were present in approximately equal proportions in one family of Diptera and in the Coleoptera (beetles) examined. In the other insects examined choline phosphoglycerides predominated, ethanolamine phosphoglycerides comprising only about 25–30% of total lipid phosphorus as they do in most mammalian tissues. Diptera in which ethanolamine phosphoglycerides were the major phosphatides were also characterized by high proportions of fatty acids less than 18 carbons long, particularly palmitoleic acid, in the neutral lipids. Aphids are characterized by a preponderance of 14-carbon fatty acids. The evidence suggests that predominance of ethanolamine phosphoglycerides is associated with a preponderance of shorter chain fatty acids in the neutral lipids. Differences also exist between Diptera and other insects in the fatty acid compositions of different phosphatides, particularly with respect to the distribution of 18-carbon acids. The compositions observed in insects that contained large amounts of the choline phosphoglycerides are similar to those found in vertebrates. Similarities in fatty acid composition of the choline phosphoglycerides in such widely divergent organisms suggest that the fatty acids may play a greater role in phospholipid function than has heretofore been demonstrated.

GAS-LIQUID CHROMATOGRAPHY OF TRIGLYCERIDES FROM ERUCIC ACID OILS AND FISH OILS. R. D. Harlow, C. Litchfield and R. Reiser (Dept. of Biochem. and Nutr., Texas Agr. Expt. Station, College Station, Texas). *Lipids* 1, 216–20 (1966). By critically selecting optimum operating conditions, quantitative gas-liquid chromatography of triglycerides has been extended to molecules containing substantial amounts of C_{20}, C_{22}, and C_{24} fatty acids. The triglycerides of four erucic acid oils (water cress, rapeseed, nasturtium, and *Lunaria annua*) and two fully hydrogenated fish oils (menhaden and tuna) have been quantitatively analyzed by this technique. The average fatty acid chain length calculated from the triglyceride composition of each oil agreed closely with that determined by GLC of its respective methyl esters. Several conclusions about the triglyceride composition of the fats analyzed are discussed.

DETERMINATION OF THE SPECIFIC POSITIONS OF CIS AND TRANS DOUBLE BONDS IN POLYENES. O. S. Privett and E. C. Nickell (The Hormel Inst., Univ. of Minnesota, Austin, Minn.). *Lipids* 1, 98–103 (1966). A method is described for the determination of the positions and geometric configurations of double bonds in polyunsaturated fatty acids. The procedure consists of three steps: 1) Partial reduction of the double bonds with hydrazine under conditions which give high yields of monoenes. 2) Isolation of the *cis*- and the *trans*-monoene fractions by thin-layer chromatography (TLC) directly or in the form of their ozonide derivatives. In the former technique, selective argentation is employed, in the latter, silicic acid adsorption. 3) Determination of the structure of the monoenes via reductive ozonolysis.

The position of the double bonds is determined from the structures of the monoenes. Since the *cis*-monoenes are separated from the *trans*-monoenes the geometric configuration of each double bond is determined. The method also provides a direct determination of the spacings of the internal double bonds and it may be employed for the determination of the structures of mixtures of fatty acids in conjunction with direct ozonolysis procedures. The various ramifications of the method are demonstrated on pure fatty acids and model mixtures thereof.

QUANTITATIVE DETERMINATION OF UNSATURATION IN OILS BY USING AN AUTOMATIC-TITRATING HYDROGENATOR. T. K. Miwa, W. F. Kwolek and I. A. Wolff (Northern Reg. Res. Lab., Peoria. Ill.). *Lipids* 1, 152–57 (1966). A procedure was developed to adapt an automatic-titrating hydrogenator to the rapid determination of unsaturated carbon-carbon bonds in seed oils. Its utility as a research tool for detecting unusual types of unsaturation was demonstrated by analysis of 35 oils. When the hydrogen-iodine value of an oil determined by the hydrogenator differed significantly from the iodine value by the Wijs method, the presence of unsaturation such as acetylenic or conjugated double bonds was indicated. For repetitive analysis of samples of the same oil, or of oils having nearly the same extent of unsaturation, the hydrogenator can successfully accommodate injection of a new sample every 2 to 5 min. Possible utility of the method for monitoring samples from a processing plant is apparent.

DETERMINATION OF THE STRUCTURE OF LECITHINS. M. L. Blank, L. J. Nutter and O. S. Privett (The Hormel Inst., Univ. of Minnesota, Austin, Minn.). *Lipids* 1, 132–35 (1966). A method is described for the determination of the classes of lecithins in terms of unsaturated and saturated fatty acids based on a total fatty acid composition, the composition of the fatty acids in the β-position, and the amount of disaturated class determined via mercuric acetate adduct formation. The accuracy of the method was determined on lecithins of known composition and the method was applied to lecithins isolated from milk serum and egg lipids, safflower and soybean oils.

GLYCOLIPIDS OF BRIZA SPICATA SEED. C. R. Smith, Jr., and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Lipids* 1, 123–27 (1966). The seeds of *Briza spicata* contain 20% of lipid that is semisolid and quite unusual in character. This lipid contains 49% digalactosylglycerides, 29% monogalactosylglycerides, and consequently little, if any, conventional triglycerides. The predominant fatty acids present are palmitic, oleic, and linoleic. Partial resolution of the galactosylglycerides on the basis of fatty acid composition was achieved by counter-current distribution.

FATTY ACIDS OF LINDERA UMBELLATA AND OTHER LAURACEAE SEED OILS. C. Y. Hopkins, Mary J. Chisholm and Linda Prince (Div. of Pure Chem., Nat. Res. Council, Ottawa, Ontario, Canada). *Lipids* 1, 118–22 (1966). Seed kernel oils of seven species of Lauraceae were examined and the fatty acid composition of six of these was determined. The oil of *Lindera umbellata* had 4% of *cis*-4-decenoic, 47% of *cis*-4-dodecenoic, and 5% of *cis*-4-tetradecenoic acid in the total fatty acids. Positive identification of these acids was made and new derivatives were prepared. Possible routes of biosynthesis are discussed. Oils from the other species did not contain more than a trace of unsaturated C_{10}–C_{14} acids. Their major acids were capric and lauric with varying amounts of unsaturated C_{18} acids.

LABORATORY CONTAMINANTS IN LIPID CHEMISTRY: DETECTION BY THIN-LAYER CHROMATOGRAPHY AND INFRARED SPECTROPHOTOMETRY AND SOME PROCEDURES MINIMIZING THEIR OCCURRENCE. G. Rouser, G. Kritchevsky (Dept. of Biochem., City of Hope Med. Center, Duarte, California), Mary Whatley and C. F. Baxter. *Lipids* 1, 107–12 (1966). Many sources of contamination for lipid preparations exist in the laboratory. These contaminants can be detected using thin-layer chromatography (TLC) and infrared spectroscopy. Numerous components that are potential contaminants and can lead to false analyses were demonstrated by TLC in laboratory soaps, cleaners, hand creams and lotions, hair tonics, laboratory greases, floor waxes, oil vapors, tobacco smoke, hydrocarbon phases for gas-liquid chromatography, etc. Procedures preventing introduction of contaminants are presented including descriptions of equipment and precautions to eliminate or minimize contamination. These are useful in isolation of pure polar and nonpolar lipids.

AN ELECTROSTATIC PRECIPITATOR FOR PREPARATIVE GAS-LIQUID CHROMATOGRAPHY. L. Borka and O. S. Privett (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 104–6 (1966). The effect of the operating variables of electrostatic precipitators on the recovery and structure of methyl esters and related aerosol forming compounds collected in preparative gas-liquid chromatography was studied. Aerosol formation was prevented by AC or DC voltages of 5000 to 12000 volts. AC was more effective than DC but caused changes in structure which were detectable by both thin-layer and gas-liquid chromatographic methods of analysis. An apparatus of simple construction and operation was designed for the collection of methyl esters and its use demonstrated with several model compounds.

PRESENT STATUS OF RICE BRAN OIL INDUSTRY IN INDIA. K. S. Murti (Osmania Univ. Dept. of Chem. Tech., Hyderabad, India). *Indian Oil Soap J.* 31 (8), 217–233 (1966). The chemistry and technology of the manufacture of rice bran oil and rice bran is reviewed.

THE DETECTION OF ADULTERATION OF SESAME OILS WITH VEGETABLE OILS BY THIN LAYER CHROMATOGRAPHY. R. K. Shivastava

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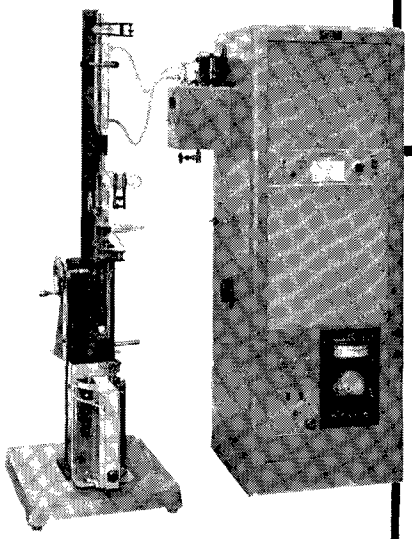

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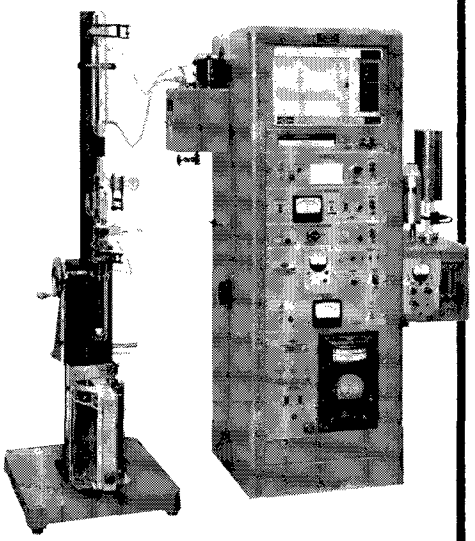

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and P. G. Bhutey. *Indian Oil Soap J.* 31, No. 9, 264–267 (1966). Adulterants, such as linseed, peanut and safflower oils, in sesame oils can be detected as low as the 5% level with use of reverse phase thin layer chromatography.

VAPOR PHASE HYDROGENATOR FOR UNSATURATED FATTY ACIDS. J. Lecerf and J. Bezard (Dept. of Nutr., Fac. of Sci., Dijon, Fr.). *Rev. Franc. Corps Gras* 13, No. 7, 455–462 (1966). In the gas chromatography of fish oils, a complex mixture of fatty acids, including polyunsaturated acids, is obtained. A method has been developed by which the individual fatty acid effluent from a gas chromatography column is hydrogenated. The saturated fatty acids are collected and then rechromatographed. From the second chromatograph it is possible to determine the chain length of the corresponding polyunsaturated acid.

A TENTATIVE PROCEDURE FOR THE CORRELATION OF CHEMICAL VALUES AND FLAVOR MODIFICATIONS OF EDIBLE TALLOWS DURING THE INDUCTION PERIOD. M. Loury, G. Lechartier and C. Bloch (Lab. Jean Ripert, Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc Corps Gras* 13, 395–406 (1966). Animal fats have a natural, fresh flavor which is generally acceptable. However, unstabilized animal fats readily become rancid. There are chemical tests which can easily detect rancidity, but these tests are of no value since a rancid fat has little commercial value. Between the two extreme states, freshness and rancidity, there are different states of fats which can be detected organoleptically, but show no definite analytical differences. It was concluded that an estimate of peroxide values is very important and can give more information than the generally used carbonyl value.

ON THE AUTOXIDATION OF FATTY METHYL ESTERS WITH AND WITHOUT QUERCETIN. A. Letan (Dept. of Food and Biotech., Haifa, Israel). *Oleagineux* 21, 377–380 (1966). Fatty-acid methyl esters from cottonseed oil were autoxidized at 60C, with and without quercetin, to a peroxide value of about 500 μM/g. The changes in peroxide value and in extinction at 232 and 270 mμ (conjugated dienes and trienes) were measured and related to the decrease in the content of quercetin. Extinction at 232 mμ increased linearly with peroxide value and the peak at 270 mμ initially present in the esters disappeared. In the substrate oxidizing without quercetin no induction period was observed; in the esters, oxidizing in presence of quercetin (0.023%, w/w) the induction period lasted 215 hours and the rate of peroxide accumulation was at that stage about 7 times slower than during the post-induction period. During the induction period the rate of loss of quercetin was about 8 times slower as compared with the later stage of oxidation, and the average chain-length of the free radical reaction also about 8 times shorter.

RAPID REPRODUCIBLE PROCEDURE FOR PREPARATION OF WAFERS OF DRIED FOODS, ESPECIALLY THOSE OF HIGH FATTY CONTENTS: A TOOL FOR COLORIMETRY. L. C. Berardi, W. H. Martinez, G. J. Boudreaux and V. L. Frampton (Southern Regional Res. Lab., U.S. Dept. of Agr., New Orleans, Louisiana). *Food Technol.* 20 (9), 120–22 (1966). A method is described for rapid reproducible manufacture of wafers of dried foods possessing uniform smooth surfaces. The method involves the distribution of the dry food sample between thin disks of Teflon in a die. After the die and its contents are evacuated for a short specified time, they are pressed quickly with a relatively low pressing load to form wafers which can be used in reflectance measurements. Wafers of the same food sample yielded nearly identical reflectance spectra. A high degree of reproducibility as measured by reflectance spectra was also obtained with wafers prepared by different operators with different presses. The method was found satisfactory for preparing wafers of dry foods of high fatty contents, such as lyophilized egg yolks and lyophilized peanut butter, as well as those of intermediate or low fatty contents.

EVALUATION OF LIPID OXIDATION IN PLANT TISSUES. Ki Soon Rhee and Betty M. Watts (Dept. of Food and Nutr., Florida State Univ., Tallahassee, Florida). *J. Food Sci.* 31, 664–8 (1966). Essential to application of the TBA test to plant tissues as a measure of prior lipid oxidation is inactivation of lipoxidase in the blending procedure by a strong acid. The production of TBA-reactive material during blending without acid may give a useful measure of the "lipid oxidation potential" of vegetable materials, as affected by their content of lipoxidase, substrate and antioxidants. Comparative data are presented on fatty acids and lipoxidase in dried Blackeye and Green (Burpee's blue bantam) peas, and the data are related to the TBA values in blending of these peas. Wide distribution of lipoxidase in vegetables and fruits has been demonstrated. Among the materials analyzed, the extracts of roots, tubers, botanical fruits with edible seed portion, and seeds usually showed a high lipid-oxidizing activity. Comparing families, the extracts of many vegetables belonging to *Leguminosae, Solanaceae,* and *Cruciferae* had relatively higher activity.

EFFECT OF ANTIOXIDANTS ON LIPOXIDASE ACTIVITY IN MODEL SYSTEMS AND PEA (PISUM SATIVUM) SLURRIES. *Ibid.*, 669–74. The antioxidants BHA, propyl gallate, quercetin, gallic acid, turnip green extract and sodium tripolyphosphate were tested for their inhibitory effect on linoleate oxidation catalyzed by purified soybean lipoxidase or crude pea lipoxidase, and on lipid oxidation occurring in blending of peas. In artificial lipoxidase-linoleate systems, most phenolic inhibitors, especially BHA and propyl gallate, were very effective, but sodium tripolyphosphate was ineffective. The effectiveness of antioxidants decreased with increase in lipoxidase concentration. The relative effectiveness of the various antioxidants was quite different in pea slurries from that in artificial systems. Higher concentrations of propyl gallate, turnip green extract and sodium tripolyphosphate retarded the pea lipid oxidation, but no significant inhibitory effect was found with other antioxidants tested. Factors which might contribute to variations in the behavior of antioxidants in pure model systems versus raw pea slurries are discussed. Hydrogen peroxide at concentrations of 0.005% or higher rapidly destroyed lipoxidase activity.

LIPID OXIDATION IN FROZEN VEGETABLES IN RELATION TO FLAVOR CHANGE. *Ibid.*, 675–79. The TBA test, adapted for vegetable material, was useful in following lipid oxidation in frozen peas. Gas-liquid chromatographic analysis for the loss of unsaturated fatty acids was not feasible for determining lipid oxidation in unblanched vegetables. This work has established that rancidity is not a main cause of flavor deterioration in frozen Blackeye peas (*Vigna sinensis*) and possibly in other frozen vegetables. The amount of lipid oxidation occurring in frozen raw peas was too small to produce rancid odors. Lipoxidase was rapidly inactivated by a short blanching time, and no regeneration of the enzyme occurred during frozen storage of garden peas (*Pisum sativum*).

EFFECTS OF LIPIDS ON BREAD BAKED FROM FLOURS VARYING WIDELY IN BREAD-MAKING POTENTIALITIES. Y. Pomeranz, G. L. Rubenthaler, R. D. Daftary and K. F. Finney (Dept. of Flour and Feed Milling Industries, Kansas State Univ., Manhattan, Kansas). *Food Technol.* 20 (9), 131–34 (1966). Bread was baked from flour milled from hard red winter, hard red spring, soft red winter, durum, and club (white) wheat varities, each from the 1963 and 1964 crops. Loaf volumes were increased 87–195 cc and crumb grains were improved by adding 3 g vegetable shortening per 100 g of flour. The improving effect increased steeply from additions of up to 1.5 g shortening, and thereafter increased only slightly up to 4.5 g shortening. Adding 0.5 g polar lipids isolated from 6 flours to a composite hard red winter flour almost equaled the improving effect of 3 g shortening; adding 0.5 g non-polar flour lipids had very little effect; and adding 0.5 g unfractionated original flour lipids had an immediate effect. Neither shortening nor any of the tested wheat flour lipids affected gassing power. Loaf volume increase and crumb grain improvement were accompanied by parallel retardation of crumb-firming during storage. The effects on bread quality of shortening or of polar lipids were independent of wheat class or variety.

CHANGES IN EXTRACTABILITY OF LIPIDS DURING BREAD-MAKING. Chien-Mei Chiu and Y. Pomeranz (Dept. of Flour and Feed Milling Industries, Kansas State Univ., Manhattan, Kansas). *J. Food Sci.* 31, 753–58 (1966). Free lipids were extracted with petroleum-ether, and total lipids with a chloroform-methanol mixture from flour, dry milk solids, yeast, dough, fermented dough, bread crumb and bread crust. Dough formulations used in bread making included (in addition to a

basic formula of flour, water, yeast and sodium chloride) either sugar, commercial vegetable shortening, and dry milk solids, or their combinations. The extracted lipids were fractionated by thin-layer chromatography (TLC). Petroleum ether-soluble flour lipids were reduced to ⅓ during dough mixing or fermentation; subsequent baking lowered the residual free lipids to half. Petroleum ether-soluble free lipids were affected little by dough composition. Only small amounts of hydrogenated vegetable shortening were bound during dough mixing, but about ⅓ to ½ of the added shortening lipids became bound during baking. Processing flour into bread had no effect on the amounts of total lipids extractable by the chloroform-methanol mixture. Fractionation of extracted lipids by TLC showed that much more polar wheat flour lipids than nonpolar components were bound during dough mixing.

FATTY ACIDS IN NEUTRAL LIPIDS AND PHOSPHOLIPIDS FROM CHICKEN TISSUES. M. A. Katz, L. R. Dugan, Jr. and L. E. Dawson (Food Science Dept., Michigan State Univ., East Lansing, Michigan). *J. Food Sci.* 31, 717–20 (1966). Lipid material from skin, depot fat, and dark and white meat from broiler-type male chickens was fractionated into neutral lipids and phospholipids by column chromatography. The fatty acids of these fractions were analyzed by gas-liquid chromatography. Muscle tissues contained relatively larger quantities of phospholipids than did skin and depot fat. Neutral lipids and phospholipids had similar percentages of unsaturated fatty acids. Some 18 different fatty acids were found in the neutral lipids, and 22 fatty acids were found in the phospholipid fraction. The composition of fatty acids in the neutral lipids was similar in the four tissues. Phospholipids from muscle tissues contained more long-chain fatty acids than phospholipids from skin and depot fat. Arachidonic acid was found to be one of the major fatty acids in the phospholipid fraction.

GAS-SOLID CHROMATOGRAPHY OF HYDROCARBONS ON ACTIVATED ALUMINA. EFFECT OF CARRIER GAS ON RETENTION TIME AND COLUMN EFFICIENCY. R. L. Hoffmann and C. D. Evans (Northern Reg. Res. Lab., Peoria, Ill.). *Anal. Chem.* 38, 1309–12 (1966). The quantitative accuracy of gas-solid chromatography (GSC) of hydrocarbons on activated alumina depends on instrumental paramenters. Retention times, peak width, peak height and column efficiency vary with certain molecular characteristics of the carrier gases used to elute hydrocarbons from actviated alumina. These characteristics include mass, atomic cross section and composition. Experimental GSC data have been correlated with these molecular characteristics for eight pure carrier gases. The molecular weight and structural types of hydrocarbons amenable to alumina GSC are strongly influenced by the particular carrier gas selected. Hydrogen and carbon dioxide elute saturated hydrocarbons up to C-12, whereas at the same theoretical plate efficiency helium can elute members up to C-6 only. For unsaturated hydrocarbons, degree of unsaturation and molecular weight set the elution limit. At elevated temperatures column efficiencies for the different carrier gases became similar.

THEORY OF GEL FILTRATION (PERMEATION) CHROMATOGRAPHY. J. C. Giddings and K. L. Mallik (Dept. of Chem., Univ. of Utah, Salt Lake City, Utah). *Anal Chem.* 38, 997–1000 (1966). The theory of zone broadening in gel filtration chromatography is formulated. Starting with a general plate height equation, particular contributions are evaluated in the light of the unique characteristics of this technique. Experimental values, taken from several literature sources, are shown to often exceed the hoped for limits characteristic of high efficiency columns. Reasons for this, including the large ratio of column to particle diameter, are discussed. It is concluded that the excess plate height is not due to stationary phase nonequilibrium because this term is almost negligibly small in gel filtration. This, along with coupling, permits a relatively high speed of operation.

PHOSPHOLIPID-METAL COMPLEXES. INTERACTION OF TRIPHOSPHOINOSITIDE- AND PHOSPHATIDYLSERINE-METAL COMPLEXES WITH ETHYLENEDIAMINE, POLYAMINOACIDS AND PROTEIN. J. G. Fullington and H. S. Hendrickson (Western Reg. Res. Lab., U.S. Dept. Agr., Albany, Calif.). *J. Biol Chem.* 241, 4098–4100 (1966). When ovalbumin, poly-L-lysine, poly-L-aspartic acid, or ethylenediamine is added to a biphasic chloroform-methanol-water system containing the Mg(II), Ni(II), or Ca(II) complex of triphosphoinositide or phosphatidylserine, mixed complexes are formed as evidenced by the formation of an interfacial precipitate similar to that observed by Dawson containing phospholipid, metal, and protein or polyamino acid, or by the presence of ethylenediamine in the chloroform-rich phase where it is ordinarily insoluble. Stable mixed complex formation was shown by gel filtration studies. Analysis of complexes before and after gel filtration indicates stable binding of one ethylenediamine per phospholipid-metal unit and weak binding of an additional molecule of the amine. Polylysine is bound to the triphosphoinositide-Ni(II) complex in a 0.64:1 ratio on a weight basis.

MICROREACTOR CHROMATOGRAPHY. QUANTITATIVE DETERMINATION OF DOUBLE BOND POSITIONS BY OZONIZATION—PYROLYSIS. V. L. Davison and H. J. Dutton (Northern Reg. Res. Lab., Peoria, Ill.). *Anal. Chem.* 38, 1302–05 (1966). Direct injection of ozonized fatty esters into the heated injector port of a gas chromatograph offers a one-step procedure for decomposing ozonides and for analyzing the resulting aldehydic fragments to determine double bond positions. In this manner, microliter samples of ozonides may be analyzed. Acidic functional groups, formed during thermal cleavage, have been effectively eliminated by inserting a short column containing well oxidized zinc granules or zinc oxide on an inert support between the injector port exit and the fractionating column. Monoaldehydes and aldehydic esters were effectively separated in a temperature-programmed gas chromatograph and a mixed polyester-glycol, liquid phase column. A microreactor apparatus has been developed as an independent accessory in which a 5-ul. sample may be successively ozonized, thermally cleaved, and injected without sample transfer and attendant losses. This procedure provides an easy and rapid analysis and is particularly adapted to samples available only in limited amounts.

FACTORS AFFECTING MACADAMIA NUT STABILITY II. ROASTED KERNELS. A. Dela Cruz, C. Cavaletto, H. Y. Yamamoto and E. Ross (Dept. Food Sci. Technol., Univ. Hawaii, Honolulu, Hawaii). *Food Technol.* 20 (9), 123–4 (1966). The effects of moisture, heat and light on the storage stability of roasted macadamia kernels, *Macademia integrifolia* 'Keauhou 246,' were evaluated by chemical and sensory methods. Kernels of 1.1% moisture had good stability under all storage conditions, showing slight quality decreases but developing no staleness in 16 months of storage. Kernels of 1.7 and 2.9% moisture had poor storage stability. Generally, quality over a 16-month period decreased with increasing moisture content and increasing storage temperature. Small differences in free fatty acid values where highly correlated with differences in flavor scores. Light had no obvious effect on storage stability.

COMPOSITION OF COMMERCIAL PEANUT BUTTERS. Sara Roberson, J. E. Marion and J. G. Woodroof (Georgia Expt. Station). *J. Am. Dietet. Assoc.* 49, 208–10 (1966). Thirty brands of commercial peanut butter were analyzed for moisture, oil, protein and fatty acid composition. Organoleptic evaluations were also made on the samples. Results showed wide differences in protein and oil content between samples. The major fatty acids were, in order of decreasing magnitude: oleic, linoleic, palmitic and stearic. Other fatty acids noted were: behenic, arachidic, linolenic and lignoceric. Differences were noted in the fatty acid composition of different samples. The levels of palmitic and linoleic acids appeared to be inversely related to total sensory scores and had correlation coefficients of −0.52 and −0.38, respectively.

LOW CALORIC FATTY SPREAD. H. J. Duin and J. A. Schaap (Lever Brothers Co.). *U.S. 3,266,904.* A low-energy fatty composition suitable for spreading on bread consists of a water-in-fat emulsion in which the fat phase amounts to 40–60% of the total weight and is composed of edible fat emulsified with margarine emulsifiers consisting of a mixture of partial glycerides and phosphatides and in which the aqueous phase contains as its major constituent 4–20% of its weight of a protein such as casein or albumin.

PROCESS FOR IMPROVING THE FLAVOR STABILITY OF PEANUT BUTTER. J. S. Baker, R. E. Mersfelder and R. L. Wille (Procter & Gamble Co.). *U.S. 3,266,905.* The described process consists of the following steps: (a) injecting inert gas into a peanut butter slurry at a rate ranging from about 6–30 volume % of the rate the slurry is being pumped in the process system at the point of injection and while the slurry is maintained in a process system under a positive pressure of a least 3 atmospheres, (b) retaining the inert gas in the process system for

a period of time sufficient for substantially dissolving the inert gas in the slurry, (c) subsequent to the solution of the inert gas, flashing the slurry to substantially atmospheric pressure whereby an oxygen-inert gas mixture is released from solution in the slurry, (d) removing the released oxygen-inert gas mixture from the system, (e) rapidly chilling the slurry to a temperature less than 100F to crystallize the glyceride solids in the slurry, and (f) packing the crystallized peanut butter in an oxygen-free atmosphers. The steps (a) through (d) are carried out a plurality of times so that the peanut butter contains not more than about 0.5 volume % of dissolved, absorbed, entrained and accessible oxygen when measured within 15 minutes after packing.

PREPARATION OF WHIPPABLE COMPOSITIONS. R. F. Kozlik and J. L. Swanson (General Mills, Inc.). *U.S. 3,266,907.* The process of making a dry whippable composition for use in the preparation of dessert toppings and icings from a mixture consisting of 5–15 parts shortening, 3–10 parts emulsifier, 45–85 parts sugar, 2–6 parts proteinaceous material, 0–20 parts flavoring agents, 0–1.5 parts lecithin compound, 0–0.6 part citric acid and 0–2.0 parts dye comprises: (1) agitating the shortening and emulsifier to form a homogeneous mass; (2) passing the resulting mass through a scraped-surface heat exchanger to obtain a plastic mass having a fine crystal structure, and (3) intensively blending the resulting plastic mass with the sugar, proteinaceous material, flavoring agents, lecithin, citric acid and dye so that substantially all of the sugar and proteinaceous material particles are smeared with the plastic mass to produce the dry whippable composition without further treatment.

AQUEOUS EMULSION COMPOSITION. J. F. Abere (Minnesota Mining and Mfg. Co.). *U.S. 3,266,921.* An aqueous emulsion comprises an amount not in excess of about 50% by weight based on water of a polymerized polyene fatty acid having a plurality of carboxyl groups per molecule, at least a stoichiometric equivalent of a polyalkylenimine curing agent and an emulsifying agent.

STABILIZED CAKE BATTER SYSTEM AND PROCESS FOR PRODUCING SAME. R. G. K. Strobel (Procter & Gamble Co.). *U.S. 3,268,338.* A process for improving a cake batter system comprising shortening, flour, water and sugar, comprises incorporating in the batter emulsion from 0.5–16%, by weight of the shortening, of an alpha-phase crystal-tending emulsifier which is lipophilic and hydrophilic and contains at least one higher fatty acid radical having from 12–22 carbon atoms and at least one free and unesterified hydroxyl group, from 0.1–8% of a high temperature batter stabilizer, and from 0.001–1.0% of a non-toxic, water-soluble polyvalent metal ion salt.

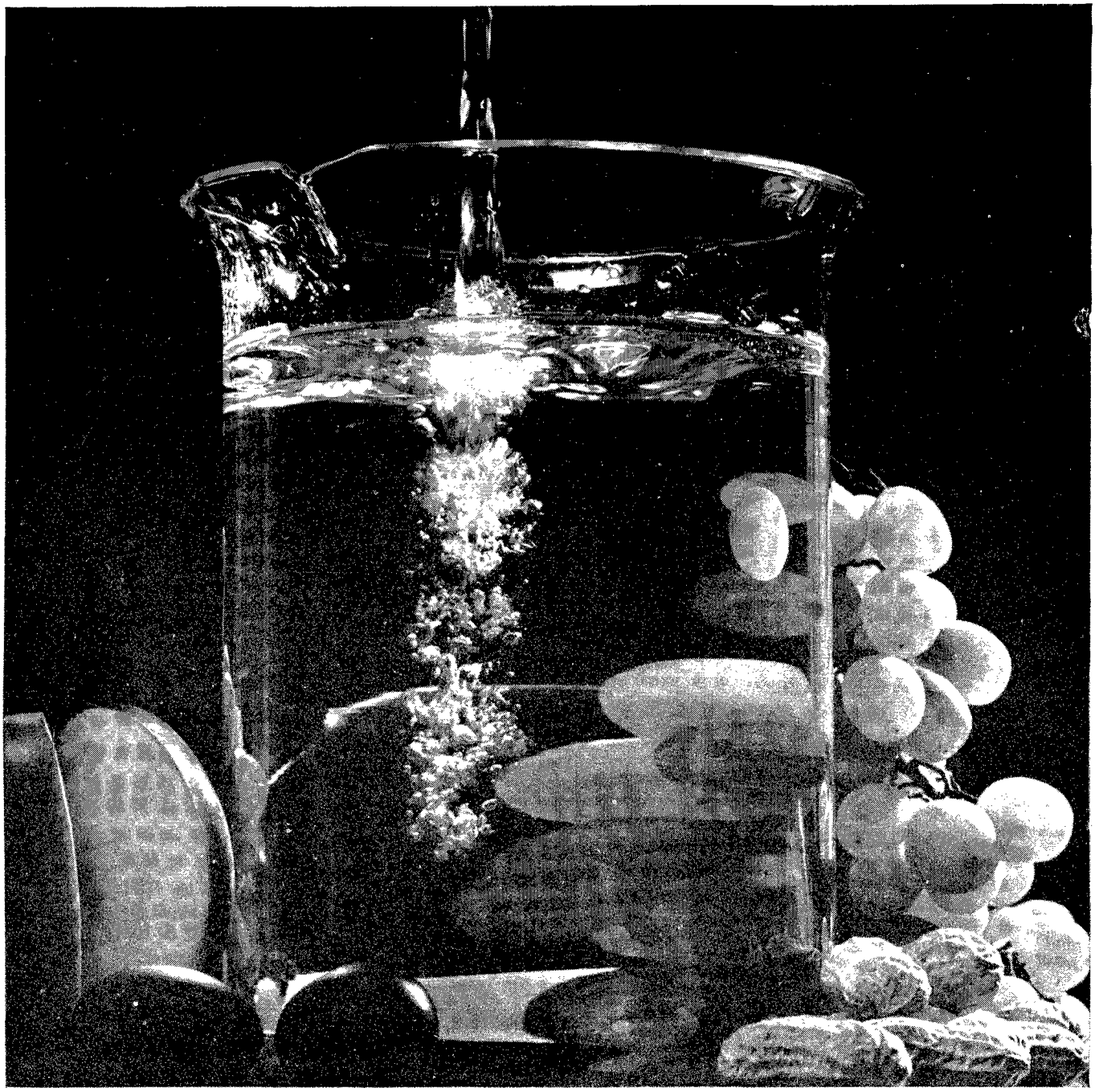
MARGARINE OIL AND MARGARINE MADE THEREFROM. V. K. Babayan and H. Lehman (Drew Chemical Corp.). *U.S. 3,268,340.* The major portion of a margarine oil composition consists of a rearranged mixture of 1–10 parts by weight of at least one lauric acid oil and 1 part of at least one non-lauric acid oil taken from the class consisting of corn, safflower, sesame, peanut, soy and cottonseed having a Wiley melting point of 73–80F. The minor portion of the margarine oil consists of 4–20% by weight of the composition of at least one hydrogenated lauric acid oil and from 3–6% of at least one additive taken from the class consisting of stearines and triglycerides of higher fatty acids having 16 or more carbon atoms and resembling tristearine in solid fat content. The margarine oil composition has a Wiley melting point of 84–102F.

SAFFLOWER OIL COMPOSITION. R. Erickson (A. C. Grace Co.). *U.S. 3,269,844.* The described composition consists of safflower oil, 1.2–1.5% by weight of glycerol mono- or dioleate, and 1.2–1.5% of a polyoxyethylene monooleate in which the glyceride of oleic acid and the polyoxyethylene monooleate are present in the ratio of 40–60 parts by weight of one to 60–40 parts by weight of the other.

PROCESS OF PREPARING STABLE TRIGLYCERIDES OF FAT FORMING ACIDS. Betty L. Bradshaw, R. O. Feuge and N. V. Lovegren (Sec'y. of Agr., U.S.A.). *U.S 3,270,040.* A process for converting a liquid mixture of fatty acid triglycerides in which at least 20 weight % of the triglycerides have an average chain length of the fatty acid groups of at least 12 carbon atoms, to the thermodynamically stable crystalline form comprises: subjecting the liquid mixture to extraordinary physical stress while maintaining the temperature with a range defined by a lower limit which is the melting point of the alpha crystalline form of the fatty acid triglycerides and an upper limit which is the melting point of the highest melting form.

LOW-TEMPERATURE RENDERING OF ANIMAL FATTY TISSUE. O. G. Artar, C. J. Filipowicz and J. C. Wilcox (Armour and Co.). *U.S. 3,270,041.* A low temperature rendering process for recovering substantially protein-free fat and highly stable protein-rich fat from animal tissue comprises the following steps: decreasing the particle size of the tissue and providing a flowable mass having a temperature between 65 and 80F; mechanically dislocating the fat from the proteinaceous material of the tissue by grinding the tissue between blunt surfaces to cause a temperature rise of no more than 10F and no less than 3F, while maintaining the temperature of the tissue between 79–85F; decreasing the viscosity of the ground mass of fat and protein by heating; and centrifuging to obtain a substantially protein-free and a protein-rich fraction having improved storage life while maintaining the temperature in the range of 92–100F.

CONTINUOUS BREAD MAKING PROCESS WITH NORMALLY LIQUID SHORTENING. P. M. Koren and F. R. Schwain (Procter & Gamble Co.). *U.S. 3,272,634.* The shortening in the described process comprises a suspension in a liquid glyceride vehicle of 6–14% by weight of shortening of substantially fully saturated fatty glyceride solids, having an iodine value not greater than 12, the solids consisting of 0.8–6.0% of monoglycerides of fatty acids having from 16–22 carbons, 0.0–6.0% of diglycerides of fatty acids having 16–22 carbons, and 2.0–8.0% of triglycerides of fatty acids having 16–22 carbons. The amount of shortening which is added at the first mixing stage is not less than 2.8%, based on weight of flour content in the dough.



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• Fatty Acid Derivatives

INTERCONVERSION OF FATTY ALDEHYDES AND DIMETHYL ACETALS AT LOW TEMPERATURES. V. Mahadevan, C. V. Viswanathan and W. O. Lundberg (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 349–52 (1966). Facile procedures are described for nearly quantitative conversion of saturated and unsaturated fatty aldehydes to their dimethyl acetals, and vice versa, at low temperatures. The methods are based on the chemical behavior of aldehydes and dimethyl acetals in 100% sulfuric acid. Under the experimental conditions described, no side reactions seemed to occur. The purity of the aldehydes and dimethyl acetals was ascertained by thin-layer chromatography, infrared spectra and other techniques.

THE SYNTHESIS OF ^{14}C- AND ^{3}H-LABELED GLYCEROL ETHERS. E. O. Oswald, C. Piantadosi, C. E. Anderson and F. Snyder (The Med. Div., Oak Ridge Inst. of Nuclear Studies, Oak Ridge Assoc. Univ., Oak Ridge, Tenn.). *Lipids* 1, 241–46 (1966). The racemic ^{14}C- and ^{3}H-labeled alpha and beta derivatives of octadecyl glycerol ether (batyl alcohol) and of hexadecyl glycerol ether (chimyl alcohol) of high specific activity were synthesized by treating the appropriate alkyl halides with a large excess of the potassium salts of isopropylidene or benzylidene glycerol. By use of the trifluoroacetic anhydride esterification procedure, the labeled diesters of alpha and beta octadecyl and hexadecyl glycerol ethers were prepared. The labeled monoesters of beta octadecyl and of beta hexadecyl glycerol ethers were isolated from the reaction mixtures by silicic acid column chromatography.

PREPARATION OF SULFATE ESTERS. R. O. Mumma (Dept. of Biochem., The Pennsylvania State Univ., Univ. Park, Penna.) *Lipids* 1, 221–23 (1966). This communication reports a new method for the synthesis of sulfate esters, in good yield, under mild conditions. Sulfuric acid reacts with an alcohol and dicyclohexylcarbodiimide in a polar solvent to produce sulfate esters.

REACTIONS OF DIMETHYL SULFOXIDE WITH SULFONATE ESTERS OF FATTY ALCOHOLS. I. SYNTHESIS OF HIGHER SATURATED AND UNSATURATED FATTY ALDEHYDES. V. Mahadevan, F. Phillips and W. O. Lundberg (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 183–87 (1966). Long-chain saturated fatty aldehydes (C_{10} to C_{18}), as well as the C_{18} unsaturated aldehydes (oleyl, linoleyl, and linolenyl), were synthesized in good yields by the selective oxidation of the sulfonate esters of the corresponding alcohols with dimethyl sulfoxide in the presence of sodium bicarbonate. Chromatographic procedures for the isolation of the pure aldehydes from the reaction mixtures are described. The purity of the aldehydes was ascertained by thin-layer chromatography, melting points of their 2,4-dinitrophenyl hydrazones, infrared spectra and other physical methods.

LONG-CHAIN FATTY ACIDS CONTAINING ETHER LINKAGE. I. THE ANTIBACTERIAL AND FUNGICIDAL ACTIVITIES OF SOME NEW β-ALKYLOXYPROPIONIC ACIDS AND THEIR METHYL ESTERS. Yoshiro Abe (Dept. of Applied Chem., Keio Univ., Koganei-shi, Tokyo, Japan). *Lipids* 1, 141–45 (1966). β-Alkoxypropionic acids and their methyl esters were made with alkoxy groups ranging from C_4H_9O to $C_{18}H_{35}O$: $R\text{-}O\text{-}CH_2CH_2COOH(CH_3)$. Methyl esters and acids were also made with one and with two oxyethylene groups between the alkoxy group and the propionic acid group: $RO(CH_2\ CH_2\ O)n\text{-}CH_2\ CH_2\ COOH(CH_3)$. The compounds were tested against *Staphylococcus aureus* and against *Penicillium* for growth inhibition. The optimum size of the alkoxy group appears to be $R = C_{12}H_{25}$. Oxyethylene groups enhanced the activity against *S. aureus*, but had relatively little effect against *Penicillium*.

FATTY ACIDS AS SOURCES OF DICARBOXYLIC ACIDS. B. Sreenivasan (Res. Lab. Tata Oil Mills, Sewri, Bombay 33, India). *Indian Oil Soap J.* 31, No. 8, 234–243 (1966). A comprehensive review of the laboratory and commercial preparation of dicarboxylic acids.

STRUCTURAL EFFECTS OF ARYLSTEARIC ACIDS AS COMBINATION OXIDATION AND RUST INHIBITORS. J. L. Snead, J. Messina and H. Gisser (Frankford Arsenal, Phil., Pa.). *Ind. Eng. Chem. Product Res. Dev.* 5, 222–25 (1966). Effect of variation in molecular configuration of hydroxyarylstearic acids on effectiveness as combination oxidation and rust inhibitors in bis (2-ethylhexyl)sebacate was studied. Alkyl groups ortho and para to the hydroxyl of 9(or 10)-hydroxyarylsteraic acids enhanced oxidation protection but decreased rust protection some-

what. A second hydroxyl on the aryl ring, e.g. 9(or 10)-(2,3-dihydroxyphenyl)stearic acid, yielded still better oxidation protection, while 9,12-bis(4-hydroxyphenyl)stearic acid was the best antioxidant, of those studied, with only a slight compromise in rust protection. Alkaline earth soaps of the compounds were also effective combination inhibitors. The additives described are generally good antioxidants up to 175C, effectiveness decreasing with increasing temperature, and they provide adequate protection against rust.

COPOLYMERS OF EPOXY FATTY ESTERS AND/OR FATTY ALCOHOLS WITH C_4–C_6 LACTAMS. R. J. Johnson (Swift & Co.). *U.S. 3,269,965.* A method for preparing a hard resinous composition comprises: forming a mixture of an oxirane substituted higher fatty composition such as esters of epoxy fatty acids or alcohols and an amount of a lactam of 4–6 carbons sufficient to react with some, but not all, of the positions at a temperature of 50–400C to form a copolymer, and then further reacting the copolymer with an epoxy curing agent.

POLYMERIZATION OF UNSATURATED COMPOUNDS WITH AROMATIZED LINOLEIC ACID. M. E. Hannah, Jr. (Tenneco Chemicals Inc.). *U.S. 3,269,968.* In the production of linear polymers by polymerization of a water insoluble, unsaturated organic compound containing a $CH_2{=}C<$ group while dispersed in an aqueous medium in the presence of an emulsifying agent under polymerization as an emulsifying agent the sodium or potassium salt of aromatized linoleic acid.

• Biochemistry and Nutrition

WATER-SOLUBLE PRODUCTS OF UV-IRRADIATED, AUTOXIDIZED LINOLEIC AND LINOLENIC ACIDS. N. Baker and L. Wilson (Veterans Admin. Center, Los Angeles, and Dept. of Biological Chem., UCLA Center for the Health Sci., Los Angeles, Calif.). *J. Lipid Res.* **7**, 341–8 (1966). The water-soluble products of the UV-initiated autoxidation of linoleic and linolenic acids emulsified in water were separated into volatile and relatively involatile components, each of which reacted with both thiobarbituric acid (TBA) and peroxidase. The volatile TBA-reactive compound is probably malonaldehyde and the volatile peroxidase-reactive compound is hydrogen peroxide. Additional compounds which absorb UV light were present in the volatile fraction. The mass of relatively involatile compounds was about 20 times greater than that predicted from either peroxidase or TBA assays of water extracts of oxidized linolenic acid. The properties of the water extract were similar to those shown by others for the products of prolonged autoxidation (without UV-irradiation) of emulsified methyl linoleate.

WATER-SOLUBLE INHIBITOR(S) OF TUMOR RESPIRATION FORMED FROM ULTRAVIOLET-INDUCED OXIDATION OF LINOLEIC AND LINOLENIC ACIDS. *Ibid.*, 349–56. Inhibition of Ehrlich ascites carcinoma respiration by aqueous extracts of oxidized linoleic or linolenic acid (aqueous emulsions UV-irradiated, 90 min) was associated entirely with relatively involatile compounds which were both thiobarbituric acid (TBA)-reactive and peroxidase-reactive. Inhibitory compounds were heat stable and migrated in thin-layer chromatography with aldehydes, "hydroperoxides," and TBA-reactive compounds. Peroxidase-catalyzed reduction of the "hydroperoxide" diminished the inhibition. At least 12 compounds (approximate chain length, 7C to 13C) containing α,β-unsaturated carbonyl groups were isolated by gas-liquid chromatography (GLC) of dried extracts of oxidized linolenic acid. No single fraction inhibited tumor respiration, but the recombined mixture of all compounds caused complete respiratory inhibition of ascites tumor cells. Less material was required to inhibit oxygen consumption before than after GLC presumably because the more highly inhibitory components of the extract (along with "hyperperoxides" and TBA-reactive compounds) were lost during GLC. Extracts from oxidized linolenic acid were found to produce in all tumor cells cytoplasmic evaginations which were readily detected by phase microscopy.

ABNORMAL GANGLIOSIDES IN TAY-SACHS DISEASE, NIEMANN-PICK'S DISEASE AND GARGOYLISM. D. A. Booth, H. Goodwin and J. N. Cumings (Inst. of Neurology, The National Hosp., Queen Square, London, England). *J. Lipid Res.* **7**, 337–40 (1966). The molar ratios of N-acetyl neuraminic acid, hexose, hexosamine and sphingosine have been determined for the abnormal ganglioside in Tay-Sachs disease that was previously detected as a fast-moving band in thin-layer chromatography, and in two abnormal fast-moving bands of gangliosides from the cortex and white matter of the brain in cases of gargoylism

(Continued on page 532A)

Guests at Kentucky Breakfast enjoy traditional Kentucky breakfast.

(Continued from page 494A)

Members Attend Sessions of Choice

The technical sessions got under way Monday morning immediately after the General Assembly, with three outstanding symposia: Oil and Seeds, Flotation, and Medium Chain Glycerides. Later that afternoon, three new symposia began: Soap Bacteriostats, Odors and Flavors, and Chemistry and Structure of Lipoproteins. (The Odors and Flavors symposium is reviewed on page 498A, this issue.)

Monday also found AOCS members with multiple committee assignments busy trying to fit into their schedules the important meetings on Hydrogenation of Oils, Feed Grade Fats, Safflower Seed Analysis, Antioxidants, Fatty Nitrogen, Drying Oils, Epoxidized Oils, Membership, Advertising, Education and Instrumental Techniques.

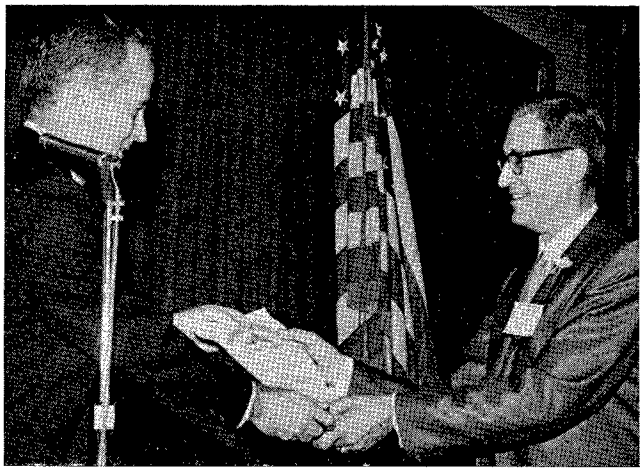
DPI-ECPI Reception Highlights Monday Social Events

The annual reception sponsored by Distillation Products Industries and Eastman Chemical Products, Inc., always a distinguished feature of AOCS meetings, clearly maintained its tradition of hospitality in spite of the adverse conditions resulting from the strike. Members of the DPI and ECPI firms joined forces with members of the hotel administrative staff and tireless committeemen in serving the guests, and were easily spotted in the crowd with their white boutonnieres.

An unusually attractive selection of appetizers, crowned by two great heads of cheese, fell victim to the hundreds of registrants who had just completed a long and satisfying day. Needless to say, there was no lack of interesting things to discuss at this, certainly one of the most eventful of AOCS meetings.

General Chairman A. N. Wrigley spoke briefly to the crowd of his colleagues, announcing necessary adjustments in sessions, social events, and Ladies' Program. His efforts to apologize for any inconvenience being suffered by registrants were answered by an ovation that must have warmed his heart. It was quite clear, here at the DPI-ECPI Party as well as elsewhere during the meeting, that unanticipated and uncontrollable difficulties which might be expected to dampen the spirits of a less interested group, had only served to sharpen the appreciation for the efforts of a gallant committee.

Stringed Band Entertainers.



N. T. Joyner gives C. W. Hoerr his commission as a "Kentucky Colonel" at the Girdler-Votator Kentucky Breakfast.

Kentucky Breakfast Tradition Continued

The Kentucky Breakfast plans also underwent a few minor changes in overall arrangements, but the shift to a restaurant outside the hotel affected neither the menu nor the atmosphere of fine southern hospitality. This breakfast, a tradition with Girdler Catalysts and Votator Divisions of the Chemetron Corporation, features home-cured Kentucky hams, flown in especially for the occasion. (They may have been flown in to Philadelphia, but they were trundled from the Bellevue-Stratford to Kugler's Restaurant by more old-fashioned methods: volunteers loaded the hams—delicacies in flavor but definitely not in weight—onto hand trucks and delivered them several blocks away to the Kugler chefs.)

Highlighting the occasion, as always, was the presentation of the Kentucky Colonel Commission to President Hoerr. The Commission was conferred by N. T. Joyner, Executive Vice President, Votator Division, Chemetron Corporation.

Tuesday's Technical Sessions

Tuesday's technical sessions introduced the Symposium on Process Engineering led by R. H. Potts. The Symposium on Odors and Flavors continued throughout the day while sessions on Detergent Evaluation Methods, Chemical Modifications and Derivatives, and Triglycerides were also held. Tuesday was also a busy day for committee conferences

Annual Banquet at Kugler's Restaurant.

Head Table at Banquet, clockwise: George Rouser, A. R. Baldwin, Arthur Rose, Mrs. H. E. Carter, C. W. Hoerr, W. O. Lundberg, Mrs. Rose, H. E. Carter, Mrs. Hoerr, Raymond Reiser.

which included Dibasic Acids, Oxygen Bomb, Uniform Methods, Commercial Fatty Acids, Polymerized Acids and National Programming and Planning.

A Banquet To Be Remembered— and the Lipid Award

With the strike still in force, it was necessary to change Tuesday evening's Annual Banquet from the hotel to Kugler's Restaurant also. Nearly 800 superb filet mignon dinners were served on relatively short notice, with a fine complementary wine.

After the dinner, C. W. Hoerr introduced Arthur Rose, President of Applied Science Laboratories. Dr. Rose conferred the third AOCS Award in Lipid Chemistry to H. E. Carter of the University of Illinois for his research in antibiotic chemistry and the biochemistry of complex lipids. The full text of Dr. Rose's remarks is to be found in this issue of *JAOCS,* page 492A.

Upon receiving the Award, Dr. Carter observed that lipid chemistry is "coming of age." His AOCS colleagues obviously feel that he has done a great deal to speed the maturation process. The Award gives formal recognition to his work as a scientist, an educator, an administrator, and an important contributor to the activities of numerous scientific societies. Dr. Carter is head of the internationally recognized department of chemistry at the University of Illinois.

String Band Provides Unique Entertainment

For the evening's entertainment, Frank Scholnick called upon Charles Gresh and his orchestra. Then the Quaker City String Band marched out in very colorful costumes and gave several enjoyable moments of string band music that only Philadelphia has to offer—a display that will be remembered by all. Next, comedian Will Jordan took over and kept the crowd roaring with his personal imitations of movie stars. Before the audience could catch its breath, pop singer Trude Adams was in command, her beautiful voice capturing full attention. But at that moment, things began to go wrong; first, a blown amplifier fuse. With the ingenious mind of a restaurant employee, the entertainment was continued by replacing the fuse with some aluminum foil from a cigarette package. A few songs later, smoke began pouring from the amplifier and a transformer burned up before the electricity could be disconnected. But—never say die—with a replacement amplifier, dancing and singing were enjoyed until midnight.

Wednesday Concludes Sessions

Wednesday's activities were highlighted by sessions on general analytical procedures, biochemistry, computer applications, and several general papers. With the reading of the 118th paper at 3:20 p.m., a very full and rewarding technical program came to a close, concluding an unusual—but very successful—meeting. Soon after everyone had departed for their homeward destinations, the strike was settled, and Philadelphia hotel life returned to normal. Alas!

While the Men Were Busy . . . .

A busy and colorful program was planned for the ladies during the hours while their husbands were attending the technical sessions. Bright and early Monday morning following breakfast, the ladies boarded buses for a trip to Longwood Gardens where they enjoyed a conducted tour of this landmark on the du Pont Estate. On the return trip the buses stopped at the Red Rose Inn. A most delicious and filling lunch was enjoyed by all in the colonial atmosphere in the Inn which has been serving travelers on the Baltimore Pike since 1740. That evening husbands, wives, and friends socialized at the reception sponsored by Distillation Products Industries and Eastman Chemical Products, Inc.

Ladies' Continental Breakfast.

The feature activity Tuesday morning was a bus tour through historic Philadelphia. There were several stops to give the ladies a close look at the Liberty Bell, a rooftop view of "The Most Historic Square Mile in America" from atop the Penn Mutual Life Insurance Company Building, a tour through Betsy Ross' House, and a guided tour of the Powel House. Following the tour, an appropriate seafood luncheon was served at the Old Original Bookbinders Restaurant. That evening everyone was dressed in their finest attire for the Annual Fall Banquet.

Wednesday morning while the technical sessions were concluding, the ladies who were interested went on a tour of the Philadelphia Art Museum.

Despite the problems created by the strike, it is hoped by the Ladies Committee that all of the wives who accompanied their husbands went home with many pleasant memories of their visit to Philadelphia in October, 1966.

To Those of the Various Committees

Special thanks is given to all committees for doing an excellent job of providing registrants with the best in technical papers, exhibits, accommodations and entertainment. A. N. Wrigley as General Chairman selected a fine group of hard-working people, and W. C. Ault arranged an excellent Technical Program. Others who made this a successful Fall Meeting are Mrs. Abner Eisner, Ladies' Committee; F. G. Shea, Exhibits; Frank Scholnick, Entertainment; E. J. Saggese, Hotel; F. E. Luddy, Registration; G. A. Jacobson and Gerhard Maerker, Finance; T. H. Smouse, Publicity; and J. A. Kirkpatrick, Printing. General Advisors were Frank Naughton and A. M. Rossetto.

The hard work of all these people and those on their committees made a highly successful meeting which will be remembered by all. Our thoughts now turn toward the 1967 Spring Meeting at New Orleans.

• *Rose Address*

(Continued from page 492A)

vibrantly active area of biochemistry and physiological chemistry. It is appropriate that the AOCS be an active factor in this development through an award and a publication program.

Dr. Carter, famous and distinguished Lipid Chemist and scientific leader, and Herb, my good friend and co-worker, on behalf of all fifty-odd members of the staff of Applied Science Laboratories, Inc., I take pleasure in presenting you this $2500 check as the financial part of the 1966 AOCS Award in Lipid Chemistry. I do this in recognition of your major past accomplishments and in certain knowledge of other contributions to come. I congratulate you.

• *Fats and Oils Report*

Outlook for the 1966-67 Soybean Season

ALTHOUGH THE SOYBEAN marketing year which ended on August 31 was one of record-breaking proportions it now belongs to history and will be used in the future only for comparative purposes. On the contrary, growers, handlers, consumers and speculators are only concerned with the two big current questions which are: 1) how big is the crop now being harvested and 2) how strong will world demand be for both oil and meal?

Soybean Supplies

The soybean marketing year was previously on an October–September basis but beginning with September 1, 1965 the marketing year was changed to a September–August basis. Soybean oil and soybean meal both remain on an October–September basis. The carrying supplies of soybeans on September 1 were placed at 35.7 million bushels and to this must be added the crop which is just now about fully harvested. The final estimate of production will not be released until December 20 and this estimate will carry with it a final revision of the 1965 crop size so that the final revision of the current crop size will not be until December 1967. On October 11, the Crop Reporting Board of the USDA estimated crop size at 926.8 million bushels as of October 1. Added to the starting supplies of 35.7 million bushels this would make total supplies of 962.5 million bushels. It is interesting to note that in 6 or the past 10 seasons the December estimate has been lower than the October estimate and in the year of the largest increase (1959) production was up only 8 million bushels or 1.5%. A similar increase percentage-wise this season would still only produce a crop of about 940.7 million bushels.

Product Demand

Both soybean oil and soybean meal are parts of a much larger supply of fats and oils and protein feedstuffs. Since substitution in some uses is possible for soybean meal and oil, it is necessary to also take a look at the supply and demand of these substitutes as well as the factors which affect total protein feedstuffs and fats and oils demand. Soybean meal and its competitors will be considered first.

Soybean Meal

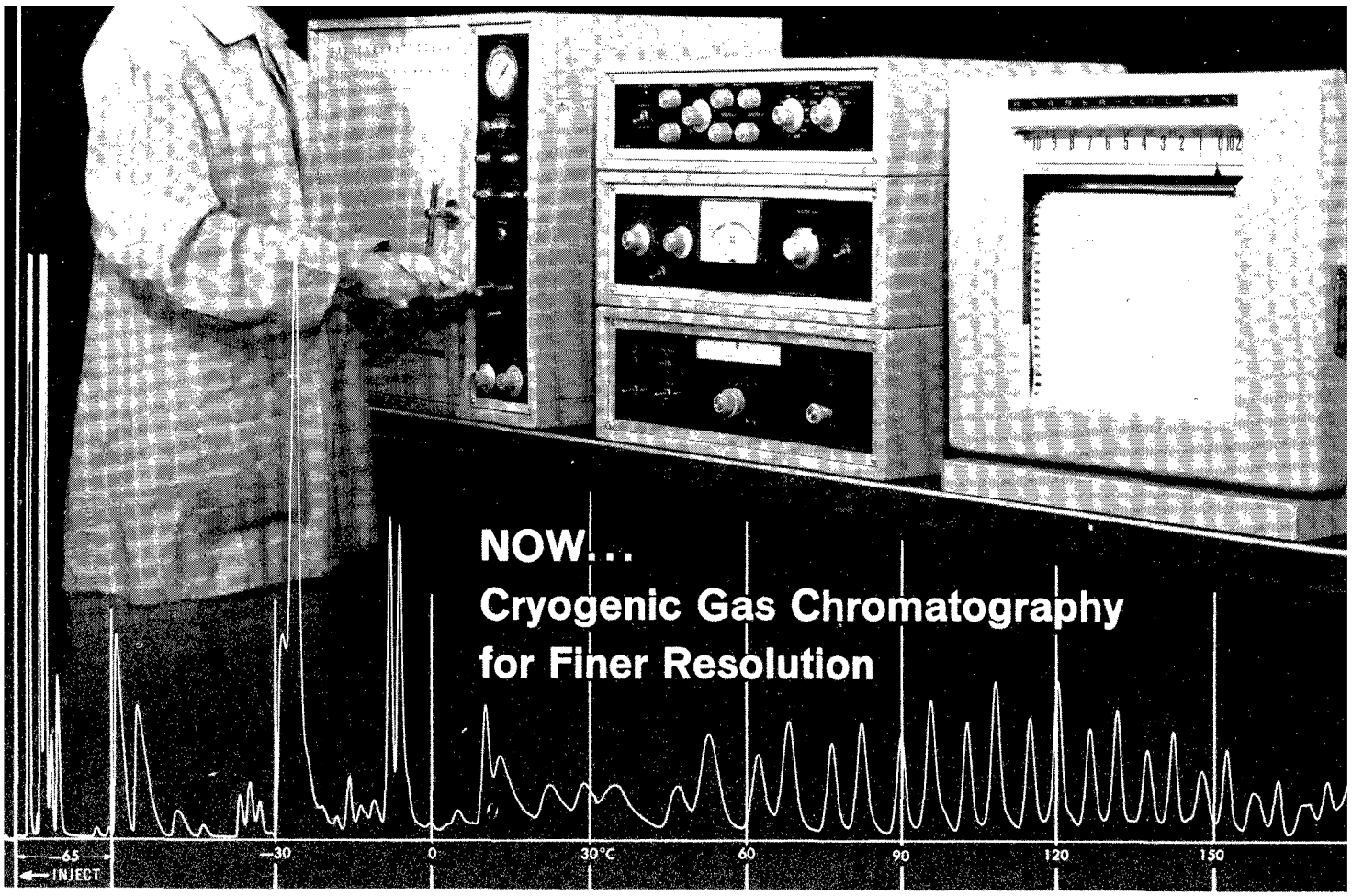
Both grain and animal protein availability are expected to be essentially unchanged from last season except for a slight increase in fish meal supplies. Urea usage should also be a little higher and the slightly higher use of both fishmeal and urea will help offset an expected 28% reduction in cottonseed meal production. Thus to determine soybeal meal requirements only cotton meal and soybean meal statistics were considered. The following table reveals one of the several methods of logic which an analyst may employ in an attempt to project soybean meal requirements for the current season:

TABLE I
(000's Short Tons)

725,000	—cotton meal reduction of 28%
—160,000	—urea and fishmeal substitution & unreplaceable cottonmeal use
—30,000	—increased imports of cotton meal
535,000	—cotton meal true shortfall
260,000	—increased domestic meal use
315,000	—increased exports of meals
1,110,000	—true increased soybean meal requirements
12,935,000	—estimated 1965/66 soymeal production
14,045,000	—Total 1966/67 soybean meal production requirement

The 725,000 short ton reduction in cotton meal production is not likely to be replaced fully by soybean meal since roughly 10% or 70,000 tons of the cotton meal reduction is in California, which presents a geographical disadvantage to replacing some cotton meal with soybean meal. In addition, the quantity of protein fed per animal unit on a national basis may only hold steady in response to the deteriorating relationship between livestock and feed prices. Imports of cottonseed meal from Mexico should also increase due to a surplus oilseed production in that country this season. Thus, the true shortfall in cotton meal production may be closer to 535,000 short tons. The number of protein-consuming animal units in the USA this season is expected to be up 2% so that domestic use of both cotton and soybean meals may be expected to be up about 2% or 260,000 short tons from the nearly 13 million short tons fed last season. The 10-year average increase in the combined exports of soybean and cottonseed meals has been 16% which would be 418,000 short tons above our estimated combined exports of 2,610,000 short tons last season. However, I have only used an increase of 12% or 315,000 short tons because the higher average price levels this season should act as a deterrent. Also, the reported stagnation in East European numbers of protein-consuming animal units, last season's unusually large percentage increase in exports and a probale increased world availability of fish meal should act as additional deterrents. The arguments for at least some increase in meal exports are based upon another slight increase in West European protein-consuming animal units, poor fodder crops in Western Europe and a probable decrease in European supplies of two major competitive materials, i.e., groundnut meal and copra cake and

(Continued on page 528A)



The finer resolution apparent in the lower chromatogram is a result of the Barber-Colman Subambient Temperature Programming System. The system is extremely useful in flavor analysis, pyrolysis, hydrocarbons and fixed gas applications.

The above pyrograms of polyethylene reveal the increased resolution obtainable with cryogenic gas chromatography. The upper chromatogram, with a large unresolved peak, is the type normally obtained with pyrolysis runs. The lower chromatogram, started at −65°C, reveals additional peaks between column temperatures of −65 and +20°C.

Barber-Colman's introduction of this major advance offers you a convenient cryogenic system capable of programming temperatures from −65°C to 400°C accurately and easily. Complicated, mechanical, slow cooling methods are eliminated. Subambient Temperature Programming offers you:

- Increased Resolution — permits separations not otherwise possible (e.g. Ar from O_2 or separations dependent upon unstable silver nitrate).
- Rapid, efficient, convenient cooling.
- Accelerated return to initial temperatures when performing above-ambient temperature programming.
- Full control of both heater and coolant from −65 to 400°C in either isothermal or programming mode.
- Lower temperatures permit use of highly selective phases of relatively high volatility.
- When programming is required, you can: use shorter columns; use lower initial and final temperatures; save analysis time; reduce column bleed; extend column life.

When purchasing your next gas chromatograph, specify a Barber-Colman Series 5000 Selecta-System with a Model 5080-100 temperature programmer and an A-6033 Subambient kit. For further information on Cryogenic Chromatography Systems, contact any of Barber-Colman's 50 sales and service offices or contact us in Rockford. See the Yellow Pages.

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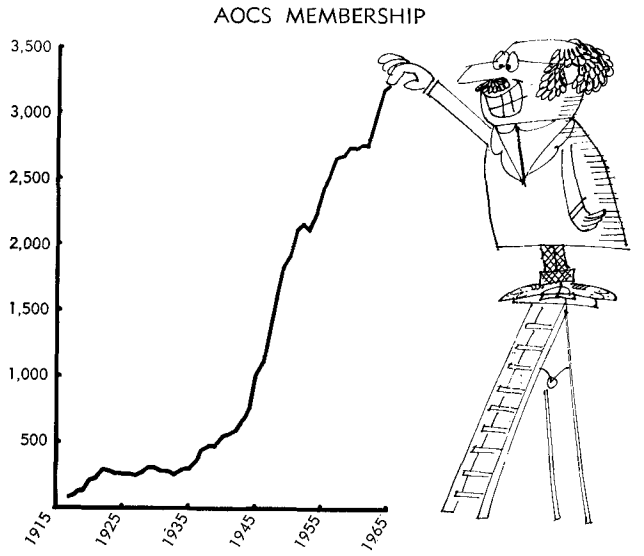

We can always get a bigger ladder!

Increase the Returns on Your Investment!

To make a profit you must make an investment. This is as true for professional advancement as it is for economics. And it is true for the return on your investment in time and effort in the American Oil Chemists' Society. You get a minimum return by interpreting "membership" as simply a matter of paying dues and waiting for your copies of the *Journal* and *Lipids* to arrive. However, if you give of yourself, your "investment" will be more than returned. By participating in meetings and in committee work, you and your colleagues will proft by the improved services made available as a direct result.

This investment—full participation—is the key to new motivation, to continuing personal advancement and to Society growth.

This page and the facing pages are devoted to a particular kind of participation—the effort to interest qualified people in our Society's activities. This quest has been in progress since the founding of the Society, as is clearly indicated by the steady upward trend depicted on the graph above. However, not only quantity but quality is imperative. Seeking out those men and women who have both the professional skill and the capacity for full participation is the key to maintaining leadership in the fats and oils field by the American Oil Chemists' Society.

RAYMOND R. EISER, Chairman
Membership Committee

• *Non-Members:*

An official application blank for membership in the American Oil Chemists' Society is inserted here, inviting you to "professional association with the outstanding scientists and technologists interested in fats and fat-like substances." The list of new members on the opposite page represents those of your colleagues who have been welcomed to the Society within the past 30 days. The AOCS would like the opportunity to place your name on this list also. Should you have difficulty in locating the required sponsorship, the AOCS Membership Committee will assist you.

• *Members:*

Your new colleagues in AOCS are listed on the opposite page. The large number of new members testifies to the ever-expanding interest in these related fields of interest, and it further affirms the success of the Society in promoting growth among its members. *The enclosed membership card doesn't belong in this issue of the Journal: it should be placed as soon as possible in the hands of a qualified candidate for membership!*

• *New Members*

Active

James B. Antes, Chemist, Conemaugh Valley Memorial Hospital, Johnstown, Pa.
Bernard George Arnold, Research Biochemist, Gillette Medical Research Institute, Washington, D.C.
Angus Sellers Baker, Chemist Supervisor, West Virginia Pulp & Paper Company, North Charleston, S.C.
Mostafa Banijamali, Production & Control Manager, Behshahr Industries, Tehran, Iran.
John F. Benner, Assistant Professor, Kentucky Cooperative Tobacco Investigations, University of Kentucky, Lexington, Ky.
Alexander Bilyk, Research Chemist, Eastern Regional Research Laboratory, Philadelphia, Pa.
Robert G. Briggs, Research Assistant, Albany Medical College, Albany, New York.
W. Hearon Buttrill, Chemist, USDA Consumer & Marketing Service, Beltsville, Md.
Robert Woodrow Carlson, Research Chemist, Archer Daniels Midland, Minneapolis, Minn.
William King Crowder, Group Leader, Process Development, Atlas Chemical Industries, New Castle, Del.
Frank K. Dering, Research Chemist, Wilson & Co. Inc., Chicago, Ill.
Rex Ellis, Research Chemist, US Department of Agriculture, Beltsville, Md.
Charles L. Ettinger, Chemist, US Department of Agriculture, Beltsville, Md.
Etienne Henri Furet, Vice President, Chemapec Inc., Hoboken, N.J.
Emil Gersten, Chemist, Distillation Products Industries, Rochester, N.Y.
Allan Henry Gilbert, Chief Detergents Solid Section, Lever Brothers Co., Edgewater, N.J.
Clemens T. Glotzhober, Technical Director, Delsoy Products Corp., Dearborn, Mich.
Beverly R. Goins, Medical Technologist, University of Illinois, Chicago, Ill.
Robert D. Good, Assistant Manager Food Processing Dept., Blaw-Knox Co., Pittsburgh, Pa.
Bartley A. Greenwell, Sales Engineer, De Laval Separator Co., Chicago, Ill.
Gordon G. Halvorsen, Manager Technical Services, Grefco Inc., Torrance, Calif.
James William Hendrix, Research Plant Pathologist, US Department of Agriculture, Lexington, Ky.
Fred P. Heydrick, Microbiologist, Fort Detrick, Frederick, Md.
Edward L. Kean, Assistant Professor, Western Reserve University School of Medicine, Cleveland, Ohio.
Jerome L. Knittle, Assistant Professor, Rockefeller University, New York, N.Y.
Walter Lehrer, Director Quality Control, Food Fair Stores, Inc., Philadelphia, Pa.
Bor Shiun Lu, Associate Food Technologist, University of California at Davis, Davis, California
William D. McDaniel, R & D Alkyd Chemist, Perfection Paint & Color Co., Indianapolis, Ind.
Hayward C. McKerson, Senior Chemist, General Mills, Inc., Kankakee, Ill.
Charles T. McLees, Physician, Medical College of Virginia, Richmond, Va.
Raymond James McMenamy, Quality Control Manager, Anderson Clayton & Co., Sherman, Texas
Ana Olivia Medrano, in charge of Quality Control, Eldorado S.A., San Salvador, El Salvador, Central America
Bradford Miller, Research Associate, University of North Carolina, Chapel Hill, N.C.
Leo Morris, Research Chemist, Moffett Technical Center, Argo, Ill.
Joseph Albert Palmer, Senior Plant Chemist, Corn Products Co., Argo, Ill.
Alfred Ray Peterson, Research Biologist, Lever Brothers Research, Edgewater, N.J.
James Hugh Ritchie, Foreman, Canada Packers Ltd., Montreal, Canada
Lester Barry Salans, Assistant Physician, Rockefeller University, New York, N.Y.
Wayne F. Samuelson, Chief Chemist, DCA Foods Industries Inc., Ellicott City, Md.
William J. Sheppard, Senior Research Economist, Battelle Memorial Institute, Columbus, Ohio
Andrew MacDonald Small, Assistant to Oil Refinery Superintendent, Canada Packers Ltd., Toronto, Canada
Harry Werner Sommer, Project Engineer, Hunt Foods and Industries, Fullerton, Calif.
Denzil Stuart Steele, Oil Refinery Foreman, Canada Packers Ltd., Montreal, Canada
Robert E. Thomas, Assistant General Superintendent, Plains Cooperative Oil Mill Inc., Lubbock, Texas
Alan S. Todd, Biochemist, Bristol Laboratories, Syracuse, N.Y.
Robert Wyman Walker, Assistant Professor, University of Massachusetts, Amherst, Mass.
Curtis J. Wilder, Food Technologist, Lamb-Weston Inc., Portland, Ore.
Stanislaw Marian Zalewski, Adiunkt (lecturer and research), Warzaw Agricultural University, Warszawa, Poland

Individual Associate

Melvin Michael Kaminsky, Chemist, Corn Products, Bayonne, N.J.
Humberto Danilo Zarzavilla, Chemical Engineer, Cia Panamena de Aceites, Panama City, Panama
Calvin Talbott Zehnder, Assistant Chief Engineer, Votator Division, Chemetron Corporation, Louisville, Ky.

Active Junior (first year free)

Jack William Blanchard, University Fellow, Georgetown University, Washington, D.C.
Peter O. Egwim, graduate student, Hormel Institute, Austin, Minn.
Carl E. Eybel, medical and graduate student, University of Illinois, Chicago, Ill.
Michael Guarnieri, Fellow, The Ohio State University, Columbus, Ohio
Lawrence T. Sennello, Research Assistant, University of Illinois, Urbana, Ill.

• *Local Section News*

Northeast Section

The Northeast Section will hold the December meeting on Dec. 6, 1966, at the Military Park Hotel in Newark, New Jersey. The speaker will be W. A. Pons, a chemist with the Southern Utilization Research Development Division, USDA (Southern Regional Research Laboratory, New Orleans, La.).

The talk will be a general view of the toxic fungal metabolites known as aflatoxins. The review will cover the origin of the problem, the structure and isolation of aflatoxins, their toxicity and associated biological effects, analytical methods for their inactivation or removal from agricultural products.

(Continued from page 518A)

meal. If we assume that the total 1966/67 soybean meal production requirements are for 14,045,000 short tons and that the average yield of meal per bushel of soybeans crushed will be 47.6 pounds, then we will have to crush *590 million bushels* of soybeans this season to maintain unchanged ending stocks on October 1, 1967.

Soybean Oil

Slight increases in the production of corn oil and edible tallow should about offset small decreases in butter and peanut oil production. Cottonseed oil production will be down about 28% or roughly 520 million pounds and will only be slightly offset by the 6% or roughly 110 million pound increase in lard production. Thus soybean oil must make up for 410 million pounds of the cottonseed oil deficiency as well as provide for the normal annual increase in domestic consumption of fats and oils which is usually 1 to 2% per year in line with the population increase. Per capita consumption during the past season was on the high side and I would guess this year's increased domestic usage may not exceed 1.25%. During the past season domestic use was just over 10 billion pounds for all fats and oils and an increase of 1.25% would be about 125 million pounds. The cottonseed oil deficiency of 410 million pounds and the increased domestic usage of 125 million pounds will require 535 million pounds more soybean oil if stocks on October 1, 1967 are the same as October 1, 1966. At an average yield of 10.8 pounds per bushel this would require an increase of 49.5 million bushels in domestic crushings of soybeans this season. The September 1965 to August 1966 crush is officially reported at 538.5 million bushels and the September 1966 is estimated at about 6 million bushels greater than September 1965 so that October–September crushings were probably about 544.5 million bushels. An increase of 49.5 million bushels this season would result in crushings of *594 million bushels* for the old October–September season or about *588 million bushels* for the new September–August season. It is expected that the yield of oil per bushel of soybeans crushed this season will be slightly above last season so that this could allow for a slight buildup in stocks or for a slight increase in P.L. 480 export shipments.

Soybean Exports

Early indications are that there will be a normal to less-than-normal increase in world oilseed production this season. World production of cottonseed will be down and export availabilities of copra are expected to decline. World groundnut production is expected to be about unchanged but exportable supplies are expected to decrease due to the poorer crops of West Africa. Mediterranean olive oil production is expected to be up less than 5% despite a sharp increase in the Spanish crop. Rapeseed production is about the same as last season but exportable supplies will be lower due to a sharp decrease in the Swedish rapeseed crop. Safflower seed production was up sharply in Mexico and about unchanged in the USA. Sunflower and soybean production are both higher. These projections would appear to imply another year of very strong demand for USA soybeans. The average increase in soybean exports over the past 10 years has been about 15% per year which would be about 38 million bushels this season. Added to the September 1965–August 1966 exports of 251 million bushels this would make 1966–67 exports of 289 million. However, at this early date it would seem more prudent to project increased exports of about 75% of the normal increase as exporters indicate that first quarter sales are not heavy and the increase this past season of 22% was so high that it is natural to expect a leveling off this season. Thus, if soybean prices were to remain below $3.00 for the first half of this season, total exports of at least 279 million bushels would appear likely.

Conclusion

At current price levels there is a potential demand for an increase of nearly 50 million bushels in domestic crushings and 30 million bushels in exports. Using 57 million bushels for feed, seed and residual this implies a total demand of about 924 million bushels or not much less than the currently indicated production.

PATRICK J. MALONE
Fats & Oils Analyst
Merrill Lynch, Pierce, Fenner & Smith, Incorporated

Federal Water Budget Reaches $92 Million

The total Federal budget for water resources research this fiscal year is $92 million. Of this amount, the Interior Department's Office of Water Resources Research (OWRR) now has a $6.5 million appropriation, which will be increased to $20 million in 1971.

R. R. Renne, OWRR Director, has pointed out that the nation uses only about a fourth of its annual fresh water supply and actually consumes only about 7% of it. He has stated that the problem is not one of quantity but of "how to get the right amount of water, of the right quality, at the right time, at the right place, at the right cost." (*Water in the News,* October, 1966).

NEW BOOKS

ENCYCLOPEDIA OF PHYSICS, by R. M. Besançon (Reinhold Publishing Corporation, p. xii + 832, 1966, $25).

This book consists of alphabetically arranged articles on various topics in physics. It is one of a series of 14 one-volume encyclopedias offered by the same publisher, with titles ranging from "Biological Sciences" to "X-rays and Gamma Rays." Its one-volume format distinguishes it from other works with similar titles, such as the multilingual "Encyclopedia of Physics" in 54 volumes, or the "Encyclopedic Dictionary of Physics," all in English in 9 volumes.

In comparison with these, the Besançon Encyclopedia can be called "concise," despite its more than 800 pages and the large size (7 by 10 inches) of each of them. This can be a definite advantage for a user who wants a brief introduction to a topic, rather than an exhaustive treatment. Still, the articles are by no means superficial. Their average length is over two pages and they are liberally cross-referenced, so that the first article, "Aberrations," refers the reader to that on "Lens" and other articles on optics; the last article, "Zeeman and Stark Effects" refers to "Atomic Spectra," "Spectroscopy" and others. In consequence of their individual length the entire volume contains just over 300 articles, but an extensive index lists about 4,000 entries, so the scope of the volume can be seen to be very broad.

According to the Editor, the Encyclopedia is intended to be useful to the nonspecialist, either the physicist seeking information outside his own area of special interest, or the nonphysicist in need of a brief but authoritative account of some area of physics. It is, of course, impossible to judge how well this goal is reached without extensive use of the volume, but a random sample of articles of various lengths and levels of depth would indicate that within its stated limitations, it should be quite useful.

A prospective user should be aware, however, that there is a limitation common to most books of this sort, which this one has not managed to avoid. Unfortunately, a user must have at least part of the answer to his question or he may not be able to find the right place to look for the rest, even though it may indeed be in the Encyclopedia. For instance, suppose one wishes to read about "quarks." The word is not listed in the index, nor are quarks mentioned in the text by name. However, the article on "Strong Interactions" does speak of a "triplet of particles of nearly equal mass . . . [with] fractional charges." A sophisticated enough reader might be able to deduce that this was what he was after, provided he had located the

proper article in the first place. As pointed out above, this difficulty is by no means unique with this Encyclopedia; it simply means that, paradoxically, greater perseverance in looking for the proper article is demanded of less sophisticated readers. Bearing this in mind, it is likely that anyone needing authoritative and concise information about a field of physics in which he is not working directly will find this source with uncommon utility.

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Plan Mid-America Spectroscopy Symposium

During the week of May 15–18, 1967, the Chicago Section of the Society for Applied Spectroscopy in cooperation with the Chicago Gas Chromatography Discussion Group will be hosts for the 18th Annual Mid-America Symposium on Spectroscopy. The meeting will be conducted at the Chicago-Sheraton Hotel.

The meeting will consist of selected and invited papers from all major areas of theoretical and applied spectroscopy and chromatography. All papers are welcome; abstracts of 125–150 words are required by Feb. 1, 1967. It is anticipated that approximately 150 technical papers will be presented, encompassing the fields of activation analysis, emission, atomic absorption, infrared and UV-visible spectroscopy, mass spectroscopy, NMR, Raman, nuclear particle spectroscopy, X-ray and gas chromatography. Special sessions and panel discussion groups on separation techniques and air and water pollution will be held. Another feature of the Symposium will be a session on structures of ice, water and aqueous solutions; Henry Frank, Mellon Institute, will be the keynote speaker for that session.

Approximately 40 exhibitors will be displaying the latest instrumental developments. There will be one hour instrument seminars describing special applications and techniques.

• *Industry Item*

The Glidden Company plans to construct a major new research center in Strongsville, Ohio, a suburb of Cleveland, at an estimated cost of $4,000,000, W. G. Phillips, president, announced recently.

The new center, in which all research and development activities of the company's Coatings and Resins and Durkee Food Groups will be located, is to be named the Dwight P. Joyce Research Center in honor of the company's former board chairman who served Glidden since 1921.

ISF-AOCS Meeting in Chicago, 1970

AOCS Bid Accepted

Plans for a joint meeting of the International Society for Fat Research and the American Oil Chemists' Society in Chicago, Sept. 27 to Oct. 1, 1970, are well under way. About two years ago, the AOCS Governing Board voted unanimously to invite the ISF to hold its 1970 meeting jointly with the AOCS fall meeting. Accordingly, when J. C. Harris was president in 1965, he sent a formal invitation to ISF President J. Holló, who organized the meeting held in Budapest, Hungary, October 10–16 of this year. W. O. Lundberg, a past president of AOCS, and a sponsor of ISF when it was organized more than eleven years ago, was appointed a special chairman to represent AOCS in coordinating the planning of the program, general arrangements, and other activities relative to the organization of a successful joint meeting.

1968 Meeting in Rotterdam

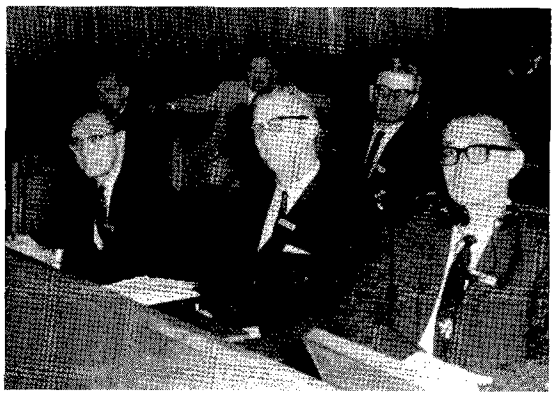
A general assembly of ISF members was held at the Budapest meeting on Oct. 12, 1966, during which it was decided that the 1968 ISF meeting would be held in Rotterdam, with J. Boldingh, director of the Unilever Laboratories in Vlaardingen, to serve as president.

Following this decision, Dr. Lundberg and A. R. Baldwin, the latter also a past president of AOCS, an original sponsor of ISF, and editor of both JAOCS and Lipids, reaffirmed the Governing Board's invitation, and described tentative plans and arrangements already made for the 1970 joint meeting. There was unanimous agreement in the assembly that the invitation should be accepted. No alternative proposals for 1970 were made.

Steering Committee Formed

Dr. Lundberg requested that a steering committee representing ISF be appointed to work with him and other AOCS representatives in organizing the joint meeting. F. Bradley, secretary-general of ISF, will consult with representative ISF members with a view to establishing such a committee within a month or two following the Budapest meeting.

The enthusiasm for the joint meeting displayed by ISF members who have been consulted personally and by correspondence has been genuine and generous. All AOCS members are urged to make plans now to attend the 1970 fall meeting, and to contribute ideas and suggestions concerning how AOCS as the host organization may make the joint meeting successful, interesting, and as rewarding as possible for ISF and AOCS members alike.



Representing AOCS in Budapest are the following (left to right, front row): A. R. Baldwin, W. O. Lundberg and C. Litchfield.

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and Niemann-Pick's disease. The fastest-moving ganglioside band in these two conditions contains neither hexosamine nor glucose.

LIPID COMPOSITION OF FAT PARTICLES FROM NORMAL MAN AND PATIENTS WITH IDIOPATHIC HYPERTRIGLYCERIDEMIA. D. Porte, Jr., D. D. O'Hara and R. H. Williams (Dept. of Med., Univ. of Washington, Seattle, Washington). *J. Lipid Res.* **7**, 368–71 (1966). Lipemic plasma from normal and hyperlipemic patients has been fractionated on columns of 3% (w/v) aqueous polyvinylpyrrolidone (PVP) and the lipid composition of the separated fat particles ($S_f >)400$) measured. Plasma from patients with carbohydrate-induced lipemia on fat-free diets contained particles with a greater percentage of cholesterol and phospholipid than either normal primary particles or secondary particles. These "hyperlipemia" particles remained in the lower half of 3% PVP columns, which allowed easy separation from primary (top) particles. In the same hypertriglyceridemic patients primary (top) particles with the usual lipid composition were isolated from plasma 8 hr after ingestion of 200 g of corn oil, but 24 hr after the meal, primary (top) particles isolated in the same way contained a higher percentage of cholesterol than normal primary particles. It is concluded that the lipid composition of primary particles is variable and reflects the length of time these particles have been in the general circulation.

TURNOVER OF CHOLESTEROL-4-C^{14} AND CHOLIC ACID-24-C^{14} BY RABBITS FED A DIET CONTAINING LACTOSE. N. Iritani and W. W. Wells (Biochem. Dept., School of Med., Univ. of Pittsburgh, Pitts., Penna.). *J. Lipid Res.* **7**, 372–78 (1966). Rabbits fed 0.35% of cholesterol in diets containing either 29.35% of lactose or sucrose were studied for 14 weeks. The rabbits fed lactose had higher plasma and liver cholesterol concentrations than those fed sucrose. The half-life of cholesterol was 19.0 days and 35.0 days for rabbits fed sucrose and lactose, respectively. The half-life, pool size, and daily production of deoxycholic acid were 9.7 days, 1.29 g, and 74.1 mg for rabbits fed sucrose; and 14.2 days, 1.40 g, and 49.1 mg, for those fed lactose. Cholesterol was the major neutral sterol in the feces of the rabbits fed lactose, whereas coprostanol (5β-cholestan-3β-ol) dominated the corresponding fraction in those fed sucrose.

CEREBROSIDE GALACTOSIDASE OF BRAIN. A. K. Hajra, D. M. Bowen, Y. Kishimoto and N. S. Radin (Mental Health Res. Inst., Univ. of Michigan, Ann Arbor, Mich.). *J. Lipid Res.* **7**, 379–86 (1966). The galactoside bond in cerebroside was found to be cleaved by an enzyme in rat and pig brain. Emulsified stearoyl-C^{14} psychosine was used as the substrate and the extent of cleavage was studied by isolating and counting the stearoyl sphingosine (ceramide) formed. Cholic acid was found to be required for activation of the enzyme, which has a pH optimum of 4.5. Similar cerebrosidase activity was found in spleen, kidney and lung of rat; liver and heart showed very slight activity. The partially purified enzyme from pig brain also formed ceramide from ceramide lactoside, ceramide glucoside, and cerebronoyl psychosine. The enzyme was active toward *o*-nitrophenyl galactoside and could be fractionated by Sephadex chromatography into a fraction active toward the nitrophenyl galactoside only and a fraction active toward both this substrate and ceramide galactoside. Human spleen, normal and Gaucher, exhibited cerebrosidase activity.

AUTOXIDATION AS A CAUSE OF ALTERED LIPID DISTRIBUTION IN EXTRACTS FROM HUMAN RED CELLS. J. T. Dodge and G. B. Phillips (Dept. of Medicine, College of Physicians and Surgeons, Columbia Univ., New York, N. Y.). *J. Lipid Res.* **7**, 387–95 (1966). A characteristic alteration in the distribution of human red cell phospholipids represents an artifact due to autoxidation of the lipid extract. This alteration is manifested on silicic acid chromatography by a decrease mainly in the phosphatidyl ethanolamine and phosphatidyl serine fractions (probably because of their abundance of highly unsaturated fatty acids) and an increase in the phospholipid recovered with the more polar fractions, sphingomyelin and lysolecithin. No evidence was found for "lysocephalin" formation or plasmalogen breakdown in dry lipid extracts after autoxidation by exposure to air at room temperature for 24–35 hr. On thin-layer chromatography, however, the ninhydrin-positive streaking in the autoxidized samples may be erroneously attributed to the presence of "lyso" derivatives. When the alterations in lipid distribution described above are found, the possibility of this artifact should be considered.

LIPID COMPOSITION OF RAT MAMMARY CARCINOMAS, MAMMARY GLANDS AND TISSUES: ENDOCRINE INFLUENCES. E. D. Rees, Amy Shuck and Hazel Ackermann (Dept. of Med., Univ. of Kentucky College of Med., Lexington, Kentucky). *J. Lipid Res.* **7**, 396–402 (1966). The lipids of mammary glands and mammary carcinomas from rats in various hormonal states were studied and compared with each other, with adipose tissue, and with a new transplantable sarcoma derived from cultured mammary carcinoma cells. When large doses of estradiol-17B were administered to the host, cells of a few carcinomas became engorged with triglyceride containing an increased proportion of C-10 to C-14 fatty acids. The lipid composition of retroperitoneal adipose tissue resembled that of the mammary tissue of virgin rats; this indicates similarity between retroperitoneal fat and the adipose component of mammary gland. Relative to the dry nonfat material present, the phospholipid content of adipose tissue was greater than that of the other tissues. Generally, differences in lipid composition between tissues were in amounts of triglyceride present and proportions of fatty acids in the triglyceride fraction. The ratios of cholesterol and cholesterol ester to phospholipid were similar in normal and neoplastic tissues. The amounts of free fatty acid, monoglyceride, and diglyceride were roughly proportional to the amount of triglyceride present.

THE FORMATION OF NATURALLY OCCURRING BILE ACIDS FROM CHOLESTEROL BY RAT LIVER MITOCHONDRIA IN VITRO. K. A. Mitropoulos and N. B. Myant (Hammersmith Hospital, London). *Biochem. J.* **99**, 51–2P (1966). Lithocholic, chenodeoxycholic and α- and β-muricholic acids have been identified among the products of the metabolism of cholesterol-4-C^{14} incubated with mitrochondria from rat liver. Other compounds present included esterified and free cholesterol, 26-hydroxycholesterol and 3β-hydroxycholestenoic acid. These results are consistent with the following sequence for the metabolism of cholesterol by rat-liver mitochondria: cholesterol→26-OH-cholesterol→3β-OH-cholestenoic acid→3β-OH-Δ^5-cholenoic acid→lithocholic acid→3α,6β-dihydroxy-5β-cholanoic acid→β-muricholic, with chenodeoxycholic acid and α-muricholic acid lying on an alternative pathway between lithocholate and β-muricholate.

SQUALENE AND 26-HYDROXYCHOLESTEROL IN THE HUMAN ATHEROMATOUS PLAQUE. G. Steel, C. J. W. Brooks and W. A. Harland (Western Infirmary, Glasgow). *Biochem. J.* **99**, 51P (1966). Grossly diseased human aortas were examined within 24 hour post-mortem. Squalene, 26-hydroxycholesterol and cholesterol were identified.

THE STEREOSPECIFIC BIOSYNTHESIS OF PLANT STEROLS AND α- AND β-AMYRIN. H. H. Rees, E. I. Mercer and T. W. Goodwin (Univ. College of Wales, Aberystwyth). *Biochem. J.* **99**, 726–34 (1966). A preparation of pea seedlings has been obtained that will incorporate 2-C^{14}-mevalonate into squalene, α- and β-amyrin and the phytosterols. The $C^{14}H^3$ ratio in α- and β-amryn biosynthesized in the presence of labeled mevalonate is the same as in the starting material and in squalene; this gives experimental support to the mechanism for the cyclization of squalene proposed by Ruzicka for the formation of these pentacyclic triterpenoids. The $C^{14}H^3$ ratio for β-sitosterol was 5:3, the same as that in cholesterol in liver. As the absence of H^3 from C-3 in β-sitosterol was demonstrated, H^3 must be present in the side chain and thus the H at C-24 is not lost during alkylation of the side chain; it probably migrates to C-25.

RELEASE OF ENZYMES FROM LYSOSOMES BY IRRADIATION AND THE RELATION OF LIPID PEROXIDE FORMATION TO ENZYME RELEASE. E. D. Wills and A. E. Wilkinson (St. Bartholomew's Hospital, London). *Biochem. J.* **99**, 657–66 (1966). Acid phosphatase, cathepsin and beta-glucuronidase are released from rat-liver lysosomes by irradiation *in vitro*. Enzyme release is detectable after a dose of 1 krad and increases with dose up to 100 krads. Maximum radiation effects were observed when the lysosomes were kept for 20 hours at 4 or 20C after irradiation. Nitrogen atmosphere considerably decreases enzyme release from lysosomes. Enzyme release is enhanced by

ascorbic acid and decreased by vitamin E. Irradiation causes formation of lipid peroxides in lysosomes, and enzyme release increases with lipid peroxide formation. The authors suggest that lipid peroxide formation leads to rupture of the lysosome membrane and allows release of the contained hydrolytic enzymes.

MECHANISMS OF LIPID PEROXIDE FORMATION IN ANIMAL TISSUES. E. D. Wills. *Ibid.*, 667–76. Homogenates of rat liver, spleen, heart and kidney form lipid peroxides when incubated *in vitro* and actively catalyze peroxide formation in emulsions of linoleic or linolenic acids. In liver, catalytic activity is distributed throughout the nuclear, mitochondrial and microsomal fractions and is present in 100,000g supernatant. Activity is weak in the nuclear fraction. Ascorbic acid increases the rate of peroxidation of unsaturated fatty acids catalyzed by whole homogenates of liver, heart, kidney and spleen at pH 6.0 but not at pH 7.4. Catalysis of peroxidation of unsaturated fatty acids by the mitochondrial and microsomal fractions of liver is inhibited by ascorbic acid at pH 7.4 but the activity of the supernatant fraction is enhanced. Inorganic iron or ferritin are active catalysts in the presence of ascorbic acid. Lipid peroxide formation in linoleic or linolenic acid emulsions catalyzed by tissue homogenates is partially inhibited by EDTA but stimulated by *o*-phenanthroline. Cystein or glutathion inhibits peroxide formation catalyzed by whole homogenates, mitochondria or hemo-protein. Inhibition increases with increase of pH.

CHROMATOGRAPHIC EVIDENCE FOR THE OCCURRENCE OF OLEIC ACID METABOLITES IN ERYTHROCYTES FROM ESSENTIAL FATTY ACID-DEFICIENT RATS. B. L. Walker (Univ. of Guelph). *Arch. Biochem. Biophys.* 114, 465–71 (1966). Rats were made EFA-deficient by feeding a synthetic diet containing 10% hydrogenated coconut oil as the fat. Methyl esters, prepared from the erythrocyte lipids of these rats, were fractionated by thin-layer chromatography on silver nitrate-impregnated silica gel. The fractions, which differed in degree of unsaturation were analyzed by gas liquid chromatography. Three peaks, not previously reported in chromatograms of erythrocyte fatty acids, were detected and tentatively identified on the basis of the chromatographic data and of the metabolic interrelationships existing between the various acids of EFA-deficient animals. These acids are believed to be 18:2ω9, 22:3ω9, and 22:4ω9 (X:YωZ, where X is the number of carbon atoms in the acid, Y is the number of double bonds, and X is the number of carbon atoms after the methyl-terminal double bond). Inability to detect these compounds on chromatograms of total methyl ester mixtures is due to the similarity of their retention times with those of more commonly occurring esters.

STUDIES ON LIPOGENESIS IN VIVO. EFFECT OF DIETARY FAT OR STARVATION ON CONVERSION OF C^{14}-GLUCOSE INTO FAT AND TURNOVER OF NEWLY SYNTHESIZED FAT. G. R. Jansen, C. F. Hutchison and M. E. Zanetti (Merck Institute for Therapeutic Research). *Biochem. J.* 99, 323–32 (1966). Lipogenesis was studied *in vivo* by giving mice 250 mg meals of U-C^{14}-glucose and measuring the disposition and incorporation of label. About 48% of the label was eliminated as CO_2 in the first two hours. At 60 minutes after administration, 1.0, 1.9 and 11.9% of the administered dose was recovered as liver glycogen, liver fatty acid and carcass fatty acid, respectively. Of the labeled glucose converted into fat in the epididymal pads about 90% was present as glyceride fatty acid and 10% as glyceride glycerol. Hepatic synthesis of fatty acid was depressed by dietary fat to a much greater extent than was synthesis outside the liver. Both feeding with fat and starvation decreased the proportion of the label taken up by adipose tissue present as fat (triglyceride) and increased the proportion of triglyceride label present as glyceride glycerol. These results are consistent with the hypothesis that the primary action of both these conditions in decreasing fat synthesis is to inhibit synthesis of fatty acids. Turnover of body fat labeled *in vivo* from U-C^{14}-glucose was estimated from the decline in radioactivity measured over the first 24 hours of the experiment. The half-life of liver and extrahepatic fatty acids (excluding epididymal fat) was 16 hours and 3 days, respectively. In contrast, no measurable decrease in radioactivity of the fatty acids of epididymal fat was observed for 7 days after administration of the radioactive glucose.

(Continued on page 534A)

• *New Products*

LABCONO, Kansas City, Mo., has a new line of fire retardant and chemical resistant fiberglass hoods. The new hoods feature larger motors, bigger all-fiberglass blowers, automatic air by-pass and many other engineering and design improvements.

INTERNATIONAL CRYSTAL LABORATORIES, Irvington, N.J., has announced a new line of flow cells for use in UV, visible and near IR spectrophotometers. Cell path length extends from less than 1 mm to 100 mm. Cell material is available in quartz, IR transmitting quartz, and glass.

BIO-RAD LABORATORIES, Richmond, Calif., has added polyacrylamide gels with fast flow rates and improved resolution to the Bio-Gel P series of porous polyacrylamide beads. The spherical beads separate materials by differences in molecular weights when used in chromatographic columns.

KOMLINE-SANDERSON ENGINEERING CORPORATION, Peapack, N.J., has introduced a continuous screw conveyer centrifuge for continuous process application. Especially suited to crystalline, powdery and short-fibrous materials, it provides efficient liquid-solid separation with minimum retention time.

MALLINCKRODT CHEMICAL WORKS, St. Louis, Mo., has a new line of solvents for use in GLC work, column, thin-layer, and paper chromatography, with total residue-after-evaporation at about 0.5 ppm. Mallinckrodt also has new precoated TLC plates with a separation time of between 15 and 30 minutes.

(Continued from page 533A)

STUDIES ON LIPOGENESIS IN VIVO. EFFECTS OF STARVATION AND RE-FEEDING, AND STUDIES ON CHOLESTEROL SYNTHESIS. G. R. Jansen, M. E. Zanetti and C. F. Hutchison. *Ibid.*, 333–40. Studies *in vivo* have been carried out on hepatic and extrahepatic cholesterol synthesis and also on the effects of starvation and re-feeding on both cholesterol and fatty acid synthesis. In rats and mice fed on a stock diet, extrahepatic tissues accounted for about 4 times as much newly-synthesized cholesterol as did the liver. The liver appeared to be somewhat more important in the rat than the mouse. Feeding with cholesterol greatly decreased and cholestyramine greatly increased hepatic cholesterol synthesis without much effect on extrahepatic synthesis. Mice starved for up to 7 hours did not lose any of the ability to convert to U-C^{14}-glucose meal into fat, whereas 18 hours of starvation resulted in an 80% loss of fatty acid synthesis in liver and carcass, an 80% loss in liver cholesterol synthesis and a 65% decrease in carcass cholesterol synthesis; 18 hours of food deprivation also decreased the proportion of counts in epididymal fat pads present as fat and increased the proportion present as glyceride glycerol. Re-feeding for up to 7 hours restored fatty acid synthesis from a radioactive glucose meal to about 50% of the values for non-starved mice but had no effect on hepatic cholesterol synthesis. The altered distribution of counts in the epididymal fat pads caused by starvation was restored to normal after feeding for 1 hour.

RELATIONSHIP BETWEEN SERUM CHOLESTEROL AND BODY FATNESS. AN EPIDEMIOLOGIC STUDY. H. J. Montoye, F. H. Epstein and M. O. Kjelsberg (Dept. of Epidemiology, Univ. of Michigan School of Public Health, Ann Arbor, Michigan). *Am. J. Clin. Nutr.* **18**, 397–406 (1966). Serum total cholesterol was determined in more than 6,500 male and female subjects ranging in age from four to past eighty, comprising most of the inhabitants of the community of Tecumseh, Michigan. Several indices of body fatness were utilized, including measurements of triceps and subscapular skinfold thickness, and relative weight (the ratio of observed over predicted weight, predicted weight being calculated from a regression of body weight on height, biacromial and bicristal diameters). A low but statistically significant relationship was found between serum cholesterol levels and body fatness, even at an early age and particularly among male subjects.

STIMULATION BY INSULIN OF PROTEIN SYNTHESIS IN ISOLATED FAT CELLS. L. V. Miller and P. M. Beigelman (Dept. of Med., Univ. of S. California Med. School, Los Angeles). *Proc. Soc. Exp. Bio. Med.* 122, 73–5 (1966). Insulin, in physiological concentration, stimulates synthesis of protein from amino acids by individual fat cells of rat epididymal adipose tissue.

STUDIES ON MICROSOMAL PHOSPHOLIPIDS THAT INHIBIT GULONOLACTONE OXIDASE. P. B. McCay (Dept. of Biochem., Univ. of Oklahoma School of Med., Oklahoma City, Oklahoma). *J. Biol. Chem.* **241**, 2333–9 (1966). Fractions of rat liver microsomal phospholipid that inhibit gulonolactone oxidase are described. The inhibition was shown to be complete and occurs rapidly after the reaction has proceeded at the control rate for 20 to 30 min. It could be totally reversed by the addition of tocopherol, Mn^{++}, Co^{++}, or ethylenediaminetetraacetate. The inhibitory activity of the phospholipid was lost by enzymic cleavage of the β-acyl fatty acid moiety or by hydrolysis of the bases associated with the phosphatidyl group. Diglycerides derived from the lipid retained significant inhibitory properties. The inhibition is apparently accompanied by alterations of unsaturated fatty acids resulting in formation of chromogenic substances that react with thiobarbituric acid. When the degree of unsaturation of the inhibitor phospholipid is reduced, both the inhibitory properties and formation of chromogens are proportionally decreased.

SKELETAL MUSCLE LIPIDS. E. J. Masoro, L. B. Rowell, R. M. McDonald and B. Steiert (Regional Primate Res. Center at the Univ. of Washington, Univ. of Washington School of Med., Seattle, Wash. 98105). *J. Biol. Chem.* **241**, 2626–34 (1966). The extent to which the intracellular lipids of monkey gastrocnemius and soleus muscles are used as a fuel for contractile activity in postabsorptive state was investigated. Under conditions *in vivo*, one set of the gastrocnemius and soleus muscles was caused to undergo vigorous contractile activity for 5 hours while the contralateral muscles served as quiescent controls. The concentration of the various classes of phospholipids and triglyceride in the skeletal muscle was not affected by contractile activity. The significance of this finding is discussed. The conclusion is drawn that intracellular muscle lipids are not used as a net source of fuel for the increased energy metabolism of contracting muscle even after prolonged periods of fasting. It is further concluded that the lipid fuel used by skeletal muscle during contractile activity is derived entirely from sources outside the muscle cell. The question of the effect of muscle activity on the turnover of muscle lipid esters was also studied by means of isotopic tracer techniques. The data provide no evidence that the rate of turnover is increased during muscular activity, and the conclusion is tentatively drawn that the rate of turnover of skeletal muscle lipids is not influenced by contractile activity.

METABOLISM OF ALPHA-ALKOXY GLYCERYL MONOETHERS IN RAT LIVER, IN VIVO AND IN VITRO. F. Snyder and R. C. Pfleger (Medical Div., Oak Ridge Inst. of Nuclear Studies, Oak Ridge, Tenn.). *Lipids* 1, 328–34 (1966). An investigation of the metabolism of ^{14}C and ^{3}H labeled α-isomers of C-16 and C-18 alkoxy monoethers, administered intravenously and added to liver slices, showed extensive cleavage of the ether bond in rat liver. Approximately 99% cleavage of the C-16:0 ether bond and approximately 94% cleavage of the C-18:0 ether bond occurred in rat liver within 6 hours after intervenous injection. With doubly labeled chimyl alcohol (^{3}H and ^{14}C), acetylation and subsequent acetolysis demonstrated that less than 0.92% of the phosphatides and less than 1.52% of total lipid radioactivity were in the form of alkoxy ethers. Long-chain fatty alcohols and fatty acids were the principal products of the ether cleavage in the liver. The relative rate of ^{14}C incorporation from chimyl alcohol and batyl alcohol into triglycerides and phospholipids, respectively, demonstrates that the palmitic (from chimyl alcohol) and stearic (from batyl alcohol) acids formed after cleavage enter the free fatty acid pool. The liver contained most of the radioactive label in the lecithin and cephalin of the microsomal fraction. Incubation of the labeled batyl or chimyl alcohols with liver slices resulted in the same products as in the *in vivo* experiments. Less than 1.4% of the C-16 and C-18 alkoxy esters was oxidized to $^{14}CO_2$ during a 3-hour incubation. In view of the extensive cleavage of the ether bond by liver, the hemopoietic and radioprotective activities reported for the alkoxy ethers should be reevaluated in terms of their metabolic products.

EFFECT OF ISOESSENTIAL FATTY ACID LIPIDS FROM ANIMAL AND PLANT SOURCES ON CHOLESTEROL LEVELS IN MATURE MALE RATS. C. E. Elson, L. R. Dugan, Jr., L. J. Bratzler and A. M. Pearson (Dept. of Food Science, Michigan State Univ. East Lansing, Mich.). *Lipids* 1, 322–24 (1966). Isopolyunsaturated lipids isolated from plant and animal sources were included in the diets of mature male rats. Liver and blood serum cholesterol lowering effects were noted only in the lipid from the vegetable source. The cholesterol lowering effect of vegetable oils may be seriously decreased if the EFA are not esterified in the beta position on the glyceride.

LIPOPROTEIN SYNTHESIS. I. RAT PLASMA LIPOPROTEIN COMPOSITION AND SYNTHESIS FROM RADIOACTIVE PRECURSORS. E. G. Trams, Elise Ann Brown and C. J. Lauter (Lab. of Neurochem., Nat. Inst. of Neurological Diseases and Blindness, Nat. Inst. of Health, Bethesda, Md.). *Lipids* 1, 309–15 (1966). The *in vivo* synthesis of rat plasma lipoproteins was studied by the use of isotopic protein and lipid precursors. Labelled amino acids, palmitic acid and tripalmitin were administered by stomach tube and the radioactivity in the plasma lipoproteins was determined following preparative ultracentrifugal isolation at densities of 1.006, 1.019, 1.063 and 1.21 g/ml. Isotopic amino acids were not incorporated in proportion to the relative abundance with which they occurred in the lipoproteins. Triglyceride feeding markedly stimulated isotope utilization, especially in the low density fractions. Methionine, though only present in small amounts, was extensively utilized and it is suggested that this amino acid may play a significant role in the synthesis of lipoproteins, other than the role of a methyl donor for phosphatidylcholine.

LOW TEMPERATURE DIRECT METHYLATION OF LIPIDS IN BIOLOGICAL MATERIALS. L. R. Dugan, Jr., Gertrude W. McGinnis, and D. V. Vadehra (Dept. of Food Science, Michigan State Univ., East Lansing, Mich.). *Lipids* 1, 305–8 (1966). The procedure

for low temperature methylation of fatty acids in lipids by sulfuric acid-methylation of fatty acids of lipids in biological materials without prior extraction of the lipids. Successful application requires a solution or a suspension of fine particles of the lipid bearing material in ether. Concentrated sulfuric acid is added to the solution or suspension at low temperatures followed by addition of absolute methanol. The acid is neutralized by methanolic KOH and the esters extracted. Application of the method to prepare methyl esters of lipids in cream, blood serum, swine liver and kidney tissue, and cells of yeast on *Staphylococcus aureus* show that fatty acid composition based on this method compares with that determined by methylation of extracted lipids.

EFFECT OF DIET HANDLING ON NUTRITIONAL STUDIES WITH USED FRYING FATS. J. C. Alexander (The Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio). *Lipids* 1, 254–57 (1966). A four-week experiment to study the significance of careful diet handling was carried out with weanling rats fed purified rations containing 15% of various fats. Fresh soybean oil was the fat in the control diet and the other fats, which had been used to prepare food by a commercial-type deep-frying operation, were soybean oil, partially hydrogenated soybean oil with iodine value (I.V.) 70, partially hydrogenated soybean oil with I.V. 108, and cottonseed oil. A purified diet was fed *ad libitum*. Treatment of the dietary groups in regard to preparation and handling of the rations proved to be highly significant. That is, as opposed to weekly mixing and twice weekly feeding of the diets, daily preparation and feeding along with the use of antioxidants and refrigeration of the ingredients resulted in a much superior growth rate and a higher efficiency of feed conversion. Since this very significant response became apparent in less than four weeks, the importance of careful handling to minimize secondary effects within the diet must be emphasized. The fresh soybean oil control, and all of the used frying fats gave similar results.

PHOSPHOLIPASE A PROPERTIES OF SEVERAL SNAKE VENOM PREPARATIONS. L. J. Nutter and O. S. Privett (Univ. of Minnesota, The Hormel Inst., Austin, Minn.). *Lipids* 1, 258–62 (1966). The hydrolytic properties of the venoms of seven species of snakes, *Crotalus adamanteus, Ancistrodon contortrix, Naja naja, Bothrops atrox, Ophiophagus hannah, Crotalus atrox* and *Vipera russeli,* were studied with purified lecithins and mixtures of lecithins of known fatty acid and class composition as substrates. The relative rates of hydrolysis of the fatty acids by the above venoms were studied by analysis of the products of the reaction at intervals during the course of the reaction. Of the seven venoms studied, that of *O. hannah* was the only one which did not give some degree of preferential rate of hydrolysis of individual fatty acids. In general, saturated fatty acids were liberated faster than unsaturated fatty acids; differences in the rates of the hydrolysis of individual saturated and unsaturated fatty acids were also observed. Individual classes of lecithin were also hydrolyzed at different rates. For the determination of the distribution of the fatty acids between the α- and β-position of lecithin, the reaction should be carried to completion. If the reaction requires a prolonged time to go to completion, it should be carried out under nitrogen to prevent autoxidation.

QUINONES AND QUINOLS AS INHIBITORS OF LIPID PEROXIDATION. A. Mellors and A. L. Tappel (Dept. of Food Science and Tech., Univ. of California, Davis, Calif.). *Lipids* 1, 282–84 (1966). The influence of biological quinonoid compounds upon oxidative polymerization of lipids has been compared with that of simple quinones and antioxidants. A new procedure for the accelerated production and measurement of oxidative polymerization was used for this comparison. The biological quinones were found to be relatively ineffective as retarders of oxidative polymerization. Heme-catalyzed lipid peroxidation, as measured by oxygen uptake, was inhibited by ubiquinone and ubiquinol, both having about one fourth of the antioxidant capacity of α-tocopherol. The peroxidation of mitochondrial lipid *in vitro* was inhibited by the presence of exogenous ubiquinone indicating that this compound may contribute towards the protection of the organelle *in vivo*.

AN ETHANOLAMINE PLASMALOGEN ARTIFACT FORMED BY ACETONE EXTRACTION OF FREEZE-DRIED TISSUE. F. M. Helmy and M. H. Hack (Dept. of Med., Tulane Univ. School of Med., New Orleans, La.). *Lipids* 1, 279–82 (1966). Extraction of freeze-dried tissues by acetone results in the *in vitro* production of an acetone derivative (imine) of the ethanolamine phosphatides. Some of the properties of the acetone imine of ethanolamine plasmalogen are discussed.

LIPID SYNTHESIS IN PERIPHERAL NERVE FROM ALLOXAN DIABETIC RATS. S. G. Eliasson (Dept. of Neurology, Washington Univ., School of Med., St. Louis, Missouri). *Lipids* 1, 237–40 (1966). Decreased conduction velocity in the peripheral nerves of rats is noted after induction of diabetes. The slowing of nerve conduction is accompanied by a decrease in the *in vitro* incorporation of radioactive precursors into some of the myelin lipids isolated from nerve segments. Cerebroside synthesis is more depressed than that of any other fraction. A change in the type of cerebrosides synthesized is seen with a pronounced decrease in the rate of incorporation of saturated fatty acids.

METABOLISM OF ^{14}C-LABELLED OLEIC ACID, ERUCIC ACID AND NERVONIC ACID IN RATS. K. K. Carroll (The Collip Med. Res. Lab., Univ. of Western Ontario, London, Ontario, Canada). *Lipids* 1, 171–5 (1966). 1-^{14}C-Oleic acid, 2-^{14}C-erucic acid and 2-^{14}C-nervonic acid were administered to rats by tail vein and the distribution of radioactivity in liver lipids was determined at intervals from 15 min to 6 hr after injection. High levels of activity were found after short time intervals which were mainly associated with triglycerides in the case of oleic acid and with free fatty acids in the case of erucic acid and nervonic acid. The activity in these lipids decreased with time and was later exceeded by that in more polar lipids. In rats given erucic acid or nervonic acid, sphingolipids were more highly labelled than glycerophosphatides. Nervonic acid showed little tendency to form a complex with serum albumin and erucic acid complexed less readily than palmitic acid.

PHOSPHOLIPIDS OF HUMAN SERUM. J. H. Williams, M. Kuchmak and R. K. Witter (Lipid Standardization Lab., Communicable Disease Center, Atlanta, Georgia). *Lipids* 1, 89–97 (1966). Phospholipids extracted from normal human serum were fractionated into lecithin, lysolecithin, sphingomyelin, phosphatidyl ethanolamine, lysophosphatidyl ethanolamine, phosphatidyl serine, and phosphatidyl inositol. Identification of each was established by thin-layer chromatography and infrared spectrophotometry. The content of plasmalogen was determined in both lecithin and phosphatidyl ethanolamine fractions. The composition of fatty acids and fatty aldehydes in isolated phospholipids is presented. The degree of unsaturation as re-

flected in the average content of double bonds per molecule of the fatty acids in phospholipids was: lecithin 1.2, choline plasmalogen 2.1, lysolecithin 0.6, sphingomyelin 0.2, phosphatidyl ethanolamine 2.8, lysophosphatidyl ethanolamine 1.0, phosphatidyl serine 1.0, and phosphatidyl inositol 1.8. Both choline and ethanolamine plasmalogen aldehydes were predominantly saturated. Molecular weight of each phospholipid was calculated from determined fatty acid and fatty aldehyde compositions; the phosphorus factor for each phospholipid was computed. On a weight percent basis, lecithin, sphingomyelin, and lysolecithin accounted for 95% of the total phospholipids. The ethanolamine-containing phospholipids accounted for 2.5%, and the remainder was divided among phosphatidyl inositol, choline plasmalogen and phosphatidyl serine.

A COMPARISON OF ACYLTRANSFERASE ACTIVITIES IN VITRO WITH THE DISTRIBUTION OF FATTY ACIDS IN LECITHINS AND TRIGLYCERIDES IN VIVO. W. E. M. Lands (Univ. of Michigan, Ann Arbor, Mich.). M. L. Blank, L. J. Nutter and O. S. Privett. *Lipids* **1**, 224–29 (1966). The location and configuration of a double bond in a fatty acid influences the rate of its acyltransferase-catalyzed esterification to form lecithin and its distribution *in vivo* between the primary and secondary positions of triglycerides and lecithins. Saturated acids of shorter chain length are transferred at rates similar to the long chain unsaturated acids. The positional distributions of acids in the diglyceride units of liver triglycerides appear to be similar to that found in the lecithins. Acyltransferase activities measured *in vitro* have a considerable predictive value in terms of the ultimate distribution of fatty acids in glycerolipids *in vivo*.

LIPID PEROXIDATION IN RAT TISSUE HOMOGENATES: INTERACTION OF IRON AND ASCORBIC ACID AS THE NORMAL CATALYTIC MECHANISM. A. A. Barber (Dept. of Zoology, Univ. of California, Los Angeles, Calif.). *Lipids* **1**, 146–51 (1966). Iron and ascorbic acid appear to be the normal catalytic components responsible for the lipid peroxidation reaction in aerobically incubated rat tissue homogenates. The amounts of each present in the catalytically-active fractions of rat liver, brain, testis, and kidney are appropriate to explain the lipid peroxidation reaction measured. Utilization of ascorbic acid as part of the normal catalytic mechanism is indicated by the following: The catalytic activity of the tissue soluble phase occurs only in the small molecule fraction eluted from Sephadex, and ascorbic acid occurs only in this fraction; the extent of catalysis by the small molecule fractions of the soluble phases from several tissues is proportional to their ascorbic acid content; and pH effect on lipid peroxidation is the same for both soluble-phase and ascorbic acid catalysis. Utilization of iron as part of the normal catalytic mechanism is indicated by EDTA inhibition studies and by measurements of pH effects. Previous studies have demonstrated the lack of catalytic activity by cations other than iron for the lipid peroxidation reaction in homogenates. Lipid peroxidation is inhibited at high tissue concentration and the inhibition is due to components occurring in the large molecule fraction of the soluble phase.

CHARACTERIZATION OF FATTY ACIDS FROM ROOT AND SHOOT LIPIDS OF CAPSICUM SPECIES. J. M. Lyons and L. F. Lippert (Dept. of Vegetable Crops, Univ. of California, Riverside, Calif.). *Lipids* **1**, 136–40 (1966). Lipids were extracted from the roots and shoots of four species of the *Capsicum* (pepper) genus and separated into three fractions: triglycerides; free fatty acids, mono- and diglycerides; and phospholipids. The component fatty acids were determined by subjecting the methyl esters to gas-liquid chromatography. The predominant fatty acids obtained were palmitic (16:0) and linoleic (18:2), with lesser amounts of linolenic (18:3), stearic (18:1), and oleic (18:0). Differences existed in the neutral lipid fractions which might be of value from taxonomic interests; however, the phospholipids from each of the species and plant parts did not differ so greatly. A comparison of the amount of unsaturated fatty acids in the phospholipid fractions indicates that differences exist which might be of value in determining the relative sensitivity of the several species to chilling temperatures.

ABSORPTION OF DI- AND TRIGLYCERIDES BY INTESTINAL SLICES IN VITRO. Elaine Bossak Feldman and B. Borgström (Dept. of Physiolog. Chem., Univ. of Lund, Lund, Sweden). *Lipids* **1**, 128–31 (1966). The uptake by hampster intestinal rings of labeled 1,3-diolein and triolein in bile salt emulsions was studied. About 6% of triolein was taken up from emulsions containing glycerides and fatty acid in 6mM sodium taurodeoxycholate. Lesser uptake was noted when triolein was emulsified with lecithin, cholesterol and bile salt; lowest uptake (3%) was observed from triolein-lecithin-cholesterol emulsions prepared without bile salt. Absorption of 1,3-diolein from bile salt emulsion was greater and acylation to triglyceride was observed. Diglycerides and triglycerides in small quantity may be absorbed intact from a micellar phase.

INFLUENCE OF TEMPERATURE ON THE FATTY ACID PATTERN OF MOSQUITOFISH (GAMBUSIA AFFINIS) AND GUPPIES (LEBISTES RETICULATUS). W. G. Knipprath and J. F. Mead (Lab. of Nuclear Med. and Radiation Biol., School of Med., Univ. of California at Los Angeles, Los Angeles, Calif.). *Lipids* **1**, 113–17 (1966). Adult male mosquitofish were adapted to 14–15C and 26–27C water temperature over a 14-day period and the fatty acids from their total lipids analyzed by gas-liquid chromatography. Newly born guppies were raised at the same temperature for eight weeks and analyzed in the same way. Some fish in the warm water group were subjected to a sudden drop in temperature and the changes of the fatty acids studied after two and eight days, and after two and four weeks. In all fish the tendency is toward higher unsaturation at lower temperature, but the acids involved in the change differ with the species of fish. A distinct difference is also obvious when guppies are raised at, or when they are adapted to the low temperature. The diet, too, influences the kind and amount of fatty acid synthesis and deposition.

THE POLYPHOSPHOINOSITIDES AND OTHER LIPIDS OF PERIPHERAL NERVES. A. Sheltawy and R. M. C. Dawson (Inst. of Animal Physiol., Babraham, Cambridge). *Biochem. J.* **100**, 12–18 (1966). A detailed lipid analysis of the peripheral nerves of the crab, lobster, cow, hen, rabbit, sheep and monkey is presented. The myelinic lipids (cholesterol, sphingomyelin, ethanolamine plasmalogen and phosphatidylserine) occurred in the highest proportion in the lipids of vertebrate myelinated nerves, whereas the percentage of lecithin was greatest in non-myelinated nerve fibers of both vertebrates and invertebrates. Triphosphoinositide was found in all nerves examined, and its concentration in the extracted lipids supports the concept that it is predominantly localized in the myelin sheath.

CHANGES IN BREAKFAST MENU AND BLOOD LIPIDS. J. J. Barboriak, R. C. Kory, L. H. Hamilton and Frances P. Kelley (Wood Veterans Admin. Center, Milwaukee, Wisc.). *J. Am. Dietet. Assoc.* **49**, 204–7 (1966). Changes in blood lipid levels following substitution of eggs for cereal in the breakfast menu, and vice versa, were studied in 20 men living in a Veterans Administration Domiciliary Unit. The composition of the remaining meals was not modified. Subjects who received the cereal breakfast for 6 weeks and were then switched to the egg breakfast showed a significant 11% increase in plasma cholesterol and temperory reduction in plasma triglycerides. The switch-over from the egg breakfast to the cereal breakfast was followed by a temporary reduction in plasma cholesterol and an increase in triglycerides. These results indicate that relatively minor increases in dietary carbohydrate might affect fasting triglycerides, suggesting the need for a careful control of carbohydrate intake in studies dealing with changes in plasma triglycerides.

COMPARATIVE BIOLOGICAL EFFECTS OF FEEDING LINSEED OIL HEATED UNDER DIFFERENT CONDITIONS. B. Polteau, J. Leclerc and J. Causeret (INRA, Jouy-en-Josus, Fr.). *Rev. Franc. Corps Gras* **13**, 379–384 (1966). Diets containing 20% by weight of linseed oil heated at 275C for 12 hours with nitrogen bubbling through the oil, or linseed oil heated at 220C for 40 hours, with or without nitrogen bubbling, were given to rats for two months. Decrease in growth, liver and kidney lesions were observed in all cases, as compared to animals receiving a diet containing 20% fresh linseed oil. A high mortality among animals fed linseed oil heated at 275C was observed. Dry fecal matter is greatly increased. Nitrogen retention diminished. Urinary excretion of calcium decreased.

DIETARY FAT AND FATTY ACID COMPOSITIONS OF RAT LEUCOCYTES AND GRANULES. B. P. Yu, F. A. Kummerow and T. Nishida (Burnsides Res. Lab., Univ. of Ill., Urbana, Ill.). *J. Nutr.* **89**, 435–40 (1966). To study the effect of dietary fats on fatty acid constituents of polymorphonuclear leucocyte and granule lipids, rats were fed diets which contained either 15% corn oil, 15% hydrogenated coconut oil or no fat for 40 weeks, and polymorphonuclear leucocytes were separated from the peritoneal exudate after injection of a saline containing glycogen. The dietary alterations did not significantly influence the percentages of lipid components in the leucocytes and granules, but their fatty acid patterns showed a marked response. A lower content of linoleic and arachidonic acids in leucocyte and granule lipids from rats fed essential fatty acid-deficient diets, a hydrogenated coconut oil or a fat-deficient diet, was

accompanied by a higher content of palmitoleic, oleic, and eicosatrienoic acids. The fatty acid patterns of both granule phospholipids and non-phospholipids responded to the dietary alterations to a lesser degree than total leucocyte lipids.

METABOLISM OF TRANS ACIDS IN THE RAT: INFLUENCE OF THE GEOMETRIC ISOMERS OF LINOLEIC ACID ON THE STRUCTURE OF LIVER TRIGLYCERIDES AND LECITHINS. O. S. Privett, L. J. Nutter and F. S. Lightly (Univ. of Minn., The Hormel Inst., Austin, Minn.). *J. Nutr.* 89, 257–64 (1966). Studies were made on the structures of the liver lecithins and triglycerides of essential fatty acid (EFA)-deficient male rats of the Sprague-Dawley strain fed 5% supplements of *cis,cis*-linoleate, *cis*-9,*trans*-12-linoleate or *trans*-9,*trans*-12-linoleate or various mixtures of each of these compounds with *cis,cis*-linoleate or linolenate for 18 to 20 days. Enzymatic hydrolysis of lecithins with phospholipase A and triglycerides with pancreatic lipase showed that the *cis,cis* and *cis*-9,*trans*-12 isomers of linoleic acid were esterified predominately in the secondary positions, and that the *trans,trans* isomer was esterified predominately in the primary positions in these compounds. The saturated fatty acids were esterified predominately in the primary positions in all molecular species; the *trans,trans* isomer of linoleic acid was esterified predominately in the primary positions in all molecular species except those containing saturated fatty acids. The *cis,cis* isomer of linoleic acid was esterified predominately in the β-position in all molecular species in which it was a constituent. Oleic acid and *cis*-9,*trans*-12-linoleic acid were distributed in the β-position with saturated or *trans,trans*-linoleic acid, and in the α-position with all other polyunsaturated fatty acids.

N-CYCLOHEXYL LINOLEAMIDE: METABOLISM AND CHOLESTEROL-LOWERING EFFECTS IN RATS. H. Nakatani, H. Fukushima, A. Wakimura (Pharmaceuticals Div., Sumitomo Chem. Co. Ltd., Kasugade-cho, Konohana-ku, Osaka, Japan) and Michio Endo. *Science* 153, 1267–69 (1966). More than half of orally administered N-cyclohexyl linoleamide-carboxyl-^{14}C was recovered from feces of rats, and 30 to 50% of the absorbed ^{14}C activity was excreted in urine. N-Cyclohexyl linoleamide had an inhibitory effect on the absorption of cholesterol from the thoracic duct and caused a decrease in the deposition of cholesterol in the livers of rats that had been fed cholesterol.

MITOCHONDRIAL MEMBRANE GHOSTS PRODUCED BY LIPID PEROXIDATION INDUCED BY FERROUS ION. II. COMPOSITION AND ENZYMATIC ACTIVITY. R. C. McKnight and F. E. Hunter, Jr. (E. Mallinckrodt Dept. of Pharmacol., Washington Univ. School of Med., St. Louis, Mo.). *J. Biol. Chem.* 241, 2757–65 (1966). Treatment of dilute suspensions of rat liver mitochondria with Fe^{2+} results in the formation of lipid peroxides, an extensive fall in turbidity, and the loss of 65% of the mitochondrial protein and 39% of the mitochondrial lipid into the suspending medium. These changes occur with little alteration in the number or size of the mitochondrial particles. The formation of mitochondrial membrane ghosts is suggested.

PURIFICATION AND PROPERTIES OF A LIPASE FROM RAT ADIPOSE TISSUE. J. T. Mann, III and S. B. Tove (Nutr. Biochem. Section, Dept. of Animal Sci., N.C. State Univ., Raleigh, N.C.). *J. Biol. Chem.* 241, 3595–99 (1966). A highly purified lipase was prepared from the particulate fraction of rat adipose tissue. Although the lipase catalyzes the hydrolysis of diglycerides and triglycerides of both long and short chain fatty acids, monoglycerides are not hydrolyzed. The enzyme has a marked specificity toward fatty acids esterified to the primary hydroxyl groups and hydrolyzes α,β-diglycerides 10 times more rapidly than α-α'-diglycerides. Thus, action of this enzyme would tend to promote the formation of β-monoglycerides in adipose tissue and catalyze the exchange of free fatty acids at the α positions of the triglycerides of adipose tissue.

EFFECT OF DIETARY LINOLEATE ON CHICK LIVER FATTY ACIDS: DIETARY LINOLEATE REQUIREMENT. E. G. Hill (The Hormel Institute, Univ. of Minn. Austin, Minn.). *J. Nutr.* 89, 465–70 (1966). Studies were conducted with chicks to determine changes in polyunsaturated fatty acids in liver lipids when the chicks were fed increasing amounts of dietary linoleate, and from this data the dietary requirement of the chick for linoleate was estimated. Increasing dietary amounts of linoleic acid fed to chicks as supplements of corn oil in a diet low in essential fatty acids (EFA) resulted in increased amounts of linoleate and arachidonate (18:2ω6 and 20:4ω6) and decreased amounts of eicosatrienoate (20:3ω9) in liver lipids, a characteristic of EFA deficiency. The ratio of trienoate to tetraenoate was plotted to estimate the requirement of the chick for linoleate, which was found to be 2.0% of dietary calories. The requirement estimated from the rate constant equation by computer methods was found to be the same. Equations were derived to allow an estimate of the dietary linoleate intake, based on fatty acid composition of the liver lipid.

ACYLATION OF GLYCEROL 3-PHOSPHATE IN BACTERIAL EXTRACTS. STIMULATION BY CARRIER PROTEIN. H. Goldfine (Dept. of Bacteriol. and Immunology, Harvard Med. School, Boston, Mass.). *J. Biol. Chem.* 241, 3864–66 (1966). The conversion of ^{14}C-glycerol 3-phosphate to lysophosphatidic acid in the presence of palmityl coenzyme A is catalyzed by particles plus a soluble protein fraction from sonic extracts of *Clostridium butyricum*. This conversion is markedly stimulated by the addition of 10^{-5}M acyl carrier protein isolated from *E. coli*.

STUDIES ON COENZYME Q. THE BIOSYNTHESIS OF COENZYME Q_9 IN RAT TISSUE SLICES. P. H. Gold and R. E. Olson (Dept. of Biochem. and Nutr., Grad. School of Public Health, Univ. of Pittsburgh, Penna.). *J. Biol. Chem.* 241, 3507–16 (1966). Unequivocal proof that individual rat tissues carry out the biosynthesis of coenzyme Q_9 (CoQ_9) from naurally occurring small molecules has been provided by the demonstration of incorporation of radioactivity from acetate-1-^{14}C, DL-mevalonate-2-^{14}C, L-phenylalanine-U-^{14}C, and uniformly labeled tyrosine-U-^{14}C into CoQ_9 in rat liver, kidney, heart and intestine slices. The rates of synthesis of CoQ_9 and cholesterol in various tissues were variable, although the rate of the over-all synthesis of cholesterol exceeded that of CoQ_9 by a ratio of 350:1 in rat liver slices and 15:1 in rat kidney slices.

THE BIOSYNTHESIS OF CELL WALL LIPOPOLYSACCHARIDE IN ESCHERICHIA COLI. III. THE ISOLATION AND CHARACTERIZATION OF 3-DEOXYOCTULOSONIC ACID. M. A. Ghalambor, E. M. Levine and E. C. Heath (Rackham Arthritis Res. Unit and Dept. of Microbiology., Univ. of Michigan, Ann Arbor, Mich.). *J. Biol. Chem.* 241, 3207–15 (1966). An acidic component of the cell wall lipopolysaccharide of *Escherichia coli* 0111-B_4 was isolated from mild acid hydrolysates of the polymer. It was concluded that this compound was 3-deoxy-D-manno-octulosonic acid.

ENZYMATIC HYDROLYSIS OF SPHINGOLIPIDS. I. HYDROLYSIS AND SYNTHESIS OF CERAMIDES BY AN ENZYME FROM RAT BRAIN. S.

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