ABSTRACTS

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

• Fats and Oils

A LIMITED SURVEY OF FATS AND OILS COMMERCIALLY USED FOR DEEP FAT FRYING. J. A. Thompson, M. M. Paulose, B. R. Reddy, R. G. Krishnamurthy and S. S. Chang (Dept. of Food Science, Rutgers, The State Univ., New Brunswick, N. J.). *Food Technol.* 21, 87A–89A (1967). A survey, by physical and chemical analyses, of fats and oils commercially used for deep fat frying indicated that their degree of deterioration is independent of their degree of unsaturation, but rather depends on how they are used. The degree of increase in viscosity, color, free fatty acids, peroxide value, and non-urea-adduct-forming esters and the decrease in iodine value and content of unsaturated fatty acids demonstrated that some food processors maintain their frying oils in good quality while others abuse and damage theirs. It is interesting that the fatty acid composition of the used fat and oil samples, as analyzed by gas chromatographic method, do not add up to 100%. In a severely damaged frying oil, they accounted for only 84%. This is probably due to the presence of polar and polymeric fatty acids which cannot be eluted under the normal conditions for analysis of fatty acid composition by gas chromatography.

HIGH OLEIC ACID SAFFLOWER OIL. R. H. Purdy and B. J. Campbell (Pacific Veg. Oil Corp., 1145 S. 10th St., Richmond, Calif.). *Food Technol.* 21, 31A–32A (1967). Recent varietal studies of the iodine value of safflower seed (*Carthamus tinctorius L.*) revealed introductions in which the proportions of oleic and linoleic acids are reversed. Breeding research has resulted in commercially feasible varieties with fatty acid compositions approximating 80% oleic, 15% linoleic and 5% saturated fatty acids. The oil obtained from the new varieties by laboratory extraction and refining is further characterized by low pour point, bland flavor and light color. Accelerated test methods suggest that oxidative stability is comparable to commercially available partially hydrogenated shortenings. Laboratory scale incorporation into food products indicates a potential application as a highly stable liquid food fat.

MASS SPECTRA OF UBIQUINONES AND UBIQUINOLS. R. F. Muraca, J. S. Whittick, G. Doyle Daves, Jr., Palle Friis and K. Folkers (Stanford Res. Inst., Menlo Park, Calif.). *J. Am. Chem. Soc.* 89, 1505–1508 (1967). Mass spectra for eight ubiquinones ranging in molecular weight from 250 to 862 have been obtained. These spectra reveal a highly characteristic fragmentation pattern; the dominant feature is the appearance of an intense peak at m/e 235 due to the formation of a highly stabilized cyclohexadienone-l-pyrylium ion. The region between m/e 235 and the peak owing to the parent ion reveals a rhythmic pattern of low-intensity peaks characteristic of the breakdown of the polyisoprenoid side chain. An additional feature of each spectrum is the presence of peaks (most notably at m/e 197 and at $M + 2$) arising from the hydroquinone species.

HOMOGENEOUS CATALYSIS IN THE REACTIONS OF OLEFINIC SUBSTANCES. VI. SELECTIVE HYDROGENATION OF METHYL LINOLEATE AND ISOMERIZATION OF METHYL OLEATE BY HOMOGENEOUS CATALYSIS WITH PLATINUM COMPLEXES CONTAINING TRIPHENYLPHOSPHINE, -ARSINE, OR-STIBINE. J. C. Bailar, Jr., and Hiroshi Itatani (W. A. Noyes Lab. Chem., Univ. Ill., Urbana). *J. Am. Chem. Soc.* 89, 1593–9 (1967). A series of complexes of the type $(R_3Q)_2MX_2$ ($R =$ alkyl or aryl; $Q = P$, As or Sb; $M = Ni$, Pd or Pt; $X =$ halogen or pseudohalogen) has been found to have unusual catalytic properties. In the cases of the Pt and Pd complexes these properties are greatly enhanced by the addition of $M'X_2$ or $M'X_4$($M' =$ Si, Ge, Sn, or Pb). The resulting complexes have the ability to catalyze the hydrogenation of methyl linoleate to the monoene stage, but no further. The hydrogenation is preceded by conversion of *cis* double bonds to *trans,* and by migration of the double bonds along the hydrocarbon chain to give a conjugated system. The hydrogenation is best brought about by elemental hydrogen, but it can be effected by methanol in the absence of hydrogen.

VII. HYDROGENATION AND ISOMERIZATION OF METHYL LINOLEATE WITH BIS (TRIPHENYLPHOSPHINE) NICKEL HALIDES. Hiroshi Itatani and J. C. Bailar, Jr. *Ibid.*, 1600–2. Isomerization and selective hydrogenation of methyl linoleate in benzene or tetrahydrofuran are effected by *bis* (triphenylphosphine) nickel halides in the absence of hydrogen under nitrogen pressure (to maintain comparable conditions) just as they are under hydrogen pressure, though to a lesser extent. The catalytic effects of *bis*-(triphenylphosphine) nickel halides parallel the order of decreasing electronegativity of the halide ions: $Cl^- > Br^- > I^-$. Hydrogenation under hydrogen pressure proceeds more rapidly in benzene solution than in tetrahydrofuran solution. However, hydrogenation in the absence of hydrogen proceeds more rapidly in THF than in benzene. Methyl oleate is converted to *trans* isomers but not to stearate under hydrogen pressure using these catalysts. However, methyl oleate is not affected in the absence of hydrogen. Isomerization of oleate is slower than hydrogenation and isomerization of linoleate.

AN EXPANDING ROLE FOR GAS CHROMATOGRAPHY: THE MEASUREMENT OF PHYSICAL AND CHEMICAL PARAMETERS. J. C. Giddings and K. L. Mallik (University of Utah). *Ind. Eng. Chem.* 59, 18–27 (1967). Although long overshadowed by a superb separating capability, the nonanalytical use of GC is rapidly emerging as a major discipline in its own right. An increasing number of equilibrium and transport properties can be made to influence elution profiles and can be characterized quantitively by the extent of that influence. The value of this approach stems in part from the same experimental characteristics that chromatographers have cultivated with care for more than a decade; detectors that respond with sensitivity and integrity, rapid equilibration and elution, versatility, automation, and separating power.

GROSS STRUCTURE OF THE FAT GLOBULE MEMBRANE OF COW'S MILK. H. C. Chien and T. Richardson (Dept. of Food Science and Ind., Univ. of Wisconsin, Madison). *J. Dairy Sci.* 50, 451–5 (1967). Washed cream was stirred at 25C and centrifuged to separate the cream and aqueous layers. Water was added each time as the process was repeated until the cream phase inverted. The butter was melted and the aqueous portion isolated. All aqueous portions were centrifuged at 50,000 G for 90 min at 4C. Supernatants were adjusted to pH 4.9 and the aggregated lipoproteins isolated. The outer layer of the membrane desorbed from the cream accounted for 54.4% of the membrane. It consisted of reddish-brown pellets high in protein, low in lipid, and fluffy-white supernatant aggregates low in protein and high in lipid. The inner layer accounted for 44.6% of the total membrane. Three lipoprotein aggregates were separated by centrifugation. A greenish-white pellet was high in protein and low in lipid. The supernatant aggregates were low in protein and high in lipid. An interfacial portion was high in protein and low in lipid. Phospholipids in all fractions consisted of lecithin, phosphatidyl ethanolamine, and sphingomyelin. Phospholipids were high in 16:0, 18:0, 18:1, 18:2, and long-chain saturated acids, whereas the neutral lipids were high in 14:0, 16:0, 18:0 and 18:1 acids. Slip points of the neutral lipids in all fractions varied from 30 to 47C.

CHROMATOGRAPHIC STUDIES OF THE POSITIONS OF THE DOUBLE BONDS OF UNSATURATED FATTY ACIDS. V. Koman and D. Anderle. *Chem. Zvesti,* 20, No. 5, 358–65 (1966) (in Slovak).—Samples of sunflowerseed oil hydrogenated in the laboratory were oxidatively cleaved by ozone and the resulting dicarboxyl acids were separated by paper chromatography, the results of which indicate that in the periods studied, significant shifts in the position of the unsaturated double bonds take place. Shifts in the double bonds in the chains of unsaturated fatty acids were observed also in the standards oxidised in various ways. (Rev. Current Lit. Paint Allied Ind. No. 269).

METHOD OF INFRARED MICROSPECTROSCOPY APPLICABLE TO LIPIDS. R. Fontanges, P. Heritier and P. Coeur. *Bull. Soc. Chim. Biol.* 46, No. 9/10, 1223–7 (1964). The lipids are separated by using ascending-solvent chromatography on a 0.5 mm. layer of silica gel G, and are detected by spraying only the edges of the plate with 0.05% rhodamine solution and examining the chromatogram under U.V. light. The unsprayed silica containing the lipid is scraped off, and extracted with 10 to 20 ml of a suitable solvent, and the extract is evaporated to dryness. The silver mirror of the Leitz infrared microapparatus is replaced by a 10-mm. square of glass silvered by using formaldehyde/ammoniacal $AgNO_3$. The lipid (in $CHCl_3$ solution) is applied to the silvered surface, and the solvent is evaporated. A mounting for the silvered glass with the sample deposited on it is described. Satisfactory spectra were obtained for about 100 µg of lipid. (Rev. Current Lit. Paint Allied Ind. No. 269).

Inhibitory action of palmitoyl ascorbate on the autoxidation of fats and oils. II. Information of the darkening of certain fats and oils. M. Rac *et al. Bilt. Bil Ulja Masti* 3(1), 1–4 (1966). Various reasons which might cause palmitoyl ascorbate to darken certain fats were examined. Modification of color of certain fats is due to components whose concentration is the highest in dry rendered fats. Modification of color by palmitoyl ascorbate does not occur if the fat is obtained by wet rendering or if the fat is completely refined. (Rev. Franc. Corps Gras).

The study of the autoxidation of several vegetable oils at elevated temperature. XII. Effect of temperature and diffusion on the modification of weight during the oxidation of rapeseed oil. J. Pokorny. *Sbornik V. S. C. T. Praze.* **E9**, 103–6 (1966). In contrast to most unsaturated oils, oxidizing rapeseed oil absorbs much less oxygen. This depends to a large extent on the thickness of the oil film. It has been demonstrated that diffusion plays an important role in the rate of oxidation of films with thickness of 1 mm, especially at elevated temperatures. (Rev. Franc. Corps Gras).

Importance of the U.V. absorption (190–220 mμ) for olive oil analysis. L. N. Ninnis and M. L. Ninni (Lab. of Bromatologie, Univ. of Athens, Athens, Gr.). *Rev. Franc. Corps Gras* 13, 671–676 (1966). It has been demonstrated that the 209–210 mμ region is a satisfactory U.V. region to detect the adulteration of olive oil with vegetable oil. In this region, vegetable oils show a specific absorption ($A_{210} = 56 - 78$) which is three times higher than olive oil ($A_{210} = 13.8 - 21.6$).

Decoloration of the miscella of soy bean oil. N. K. Nadirov *et al. Izv. Vysshikh Uchebn. Zavedenii Pischevaya Tekhnol.* 5(54), 69–71 (1966). Soybean oil miscella has been satisfactorily decolorized by the use of a local activated earth. Carotenoids, xanthophylls and chlorophylls are adsorbed better from the neutralized miscella. The type of solvent does influence the degree of decoloration of the miscella. (Rev. Franc. Corps Gras).

Study on the composition of glycerides of rapeseed oil. H. Grynberg, K. Ceglowska and H. Szcdepanska (Inst. of Gen. Chem., Varsovie, Poland). *Rev. Franc. Corps Gras* 13, 595–602 (1966). The composition of glycerides of rapeseed oil was studied by enzymatic hydrolysis and chromatographic methods. The composition of glycerides which occur to the extent of more than 0.1% was determined. Among the 108 glycerides found, 55 contained erucic acid and represented 87.4% of the total glycerides. The trierucin concentration was only 2.1%. The major part was constituted by dierucioolein, dieruciolinolein and dieruciolinolenin. The composition of glycerides determined with enzymatic method was corroborated by results of thin-layer chromatography.

On the extraction of vegetable oils using pulsating vibrations. M. I. Nijazov *et al. Pischevaia Tekhnol.* 4, (53), 86–7 (1966). Using pulsating vibrations for the extraction, it is possible to increase the oil yield 6–8% and to reduce solvent consumption. Oil loss in the cake is reduced 0.2–0.3%. (Rev. Franc. Corps Gras).

Studies on Indian rice bran and rice bran oil. II. Hydraulic pressing of rice bran. S. D. Thirumala Rao, D. Mrithyunjaya Rao and K. S. Murti (Oil Tech. Res. Inst. Anantapur, India). *Oils Oilseeds J. (Bombay)* 90, 4–8 (1966). The optimum conditions of hydraulic pressing of rice bran are, moisture level in bran 7–12%, temperature 100C, pressure 78–5000 p.s.i., pressing time 1 hour. Oil yields between 7–10% were obtained from brans containing 17–19% oil, 13–15% from bran with 27.4% oil and 12–14% oil from bran containing 26.9% oil. Pressure has little effect on yields of oil from bran. Cooking rice bran in conventional cookers renders it hard and coarse, making it a better starting material for solvent extraction.

Components of butter fat occurring in traces. IV. Isolation and identification of unsaturated aliphatic lactones. A. S. M. Van Der Zyden, K. DeJong, D. Sloot, J. Clifford and R. J. Taylor (Res. Lab. Lever Bros, Vlaardingen, Netherlands). *Rev. Franc. Corps Gras* 13(12), 731–735 (1966). A review of the authors' previous work was presented. By oxidative degeneration, it was shown that the lactone concentrates contain unsaturated compounds having a double bond outside of the lactone ring. Through the use of gas-liquid chromatography, IR, mass spectroscopy and ozonolysis, the presence of 9-tetradecen-4-olide, 9-dodecen-5-olid and 6-dodecen-4-olid was evidenced.

Modification of the U.V. spectra of vegetable oil with bleaching earths. I. Review. R. Guillaumin (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 14(1), 29–36 (1967). A review of the literature.

Determination of the composition of principal fractions of the unsaponifiables of cocoa butter. H. Chaveron (Lab. of Anal. and Res. on Chocolate, 194, Rue de Rivoli, Paris, Fr.). *Rev. Franc. Corps Gras* 14(1), 21–27 (1967). A constancy of the different unsaponifiable constituents of cocoa from various sources was determined. The biological dispersion of results has been studied and their limits of variations specified. The different fractions analyzed showed that the sterols represent about 0.15%, triterpenes about 0.015%, diterpenes about 0.03% and the aliphatic alcohols about 0.015% of the whole fat. The mean composition of these fractions, expressed in percentage for each one, is furnished.

Vibrations of rocking bands of methylenic groups for methyl esters and some glycerides derived from saturated normal aliphatic monoacids. R. Perrow, D. Gordant and J. Perichou (Lab. of Lipochem. of C.N.R.S., Thiais 94, Fr.). *Rev. Franc. Corps Gas* 14(1), 5–11 (1967). The distribution of the rocking bands of methylenic groups has been determined for methyl esters of normal aliphatic monoacids. It is shown that this distribution is identical to that observed for the corresponding acids and their salts, but relatively different from that of hydrocarbons. The array of curves relating the frequencies to the number of carbon atoms of the acyl chains for the different normal modes of vibration shows that a deviation from the theoretical distribution is more important as the number of oscillators is weaker. Various glycerides derived from higher fatty acids have been also investigated. The distribution of the bands appeared identical to that of the acids and methyl esters corresponding to the chain involved in these glycerides. Positional isomerism does not influence the distribution.

Enzymatic systems in oil seeds. Kind—Effects—Consequences. A. Uzyan (Ser. of Doc., Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 13(12), 755–763 (1966). Enzymatic reactions are the causes of many modifications of the lipids, proteins and carbohydrates of oilseeds during storage and processing. This review describes the general properties of enzymes, particularly the enzymes acting on the lipidic phase (lipases, lipoxydases, peroxydase, dehydrogenases, and phospholipases). The evolution of the enzymes and the products of their reactions during drying, storage, screw-pressing, solvent extraction and cooking (or toasting) of oilseeds or their products (oil and meal) are described.

Conditions of using tocopherol as an antioxidant in fats. M. Loury, C. Bloch and R. Fancois (Inst. of Fats and Oils (ITERG), Paris, Fr.). *Rev. Franc. Corps Gras* 13(12), 747–754 (1966). The authors describe the need to understand the mechanism of the effect of alpha tocopherol, especially how to develop a certain and lasting antioxidant effect. The literature is reviewed especially regarding catalytic inversion and effect of synergists upon the stabilization and promotion of the antioxidant effect. Research on synergists and the effect of synergists upon the antioxidant effect of alpha tocopherol is described.

Carbonyls in oxidizing fat. IX. Aldehydes isolated from autoxidized methyl arachidonate. R. Ellis, A. M. Gaddis and G. T. Currie (Meat Lab., East. Util. Res. and Dev. Div., Agr. Res. Ser., USDA, Beltsville, Md. 20705). *J. Food Sci.* 31(2), 191–95 (1966). The monocarbonyl compounds developed by oxidation of methyl arachidonate under mild conditions were measured by three methods of isolation: Girard T, Schwartz columns, and Pool and Klose columns. Aldehydes from scission of hydroperoxides of the pentadiene system furthest removed from the carboxyl group accounted for 80% of the total. Hexanal and heptanal were the largest aldehydes. All three methods were found to decompose some precursors.

The fatty acid composition of commercially hydrogenated fish oils. G. Lambertsen, H. Myklestad and A. R. Braekkan (Gov. Vitamin Lab., Norwegian Fisheries Res. Inst., Bergen, Norway). *J. Food Sci.* 31, 48–53 (1966). Five samples of industrially hydrogenated fats of marine origin were analyzed for fatty acid composition by the combined methods of group-separation by thin-layer partition chromatography followed by gas-liquid chromatography of each group. The following fatty acid pattern was found: saturated acids, 30–45%; monoenoic acids, 45–55%; and polyenoic acids, 10–20%. Most of the polyenoic acids were trienoic but some tetraenoic acids could be detected in low melting samples.

• Fatty Acid Derivatives

THE FORMATION OF ALKYL AND ALKENYL METHANESULFONATES AND THEIR REDUCTION TO HYDROCARBONS. W. J. Baumann, L. L. Jones, B. E. Barnum and H. K. Mangold (Univ. Minn., The Hormel Inst., Austin, Minn., U.S.A.). *Chem. Phys. Lipids* 1, 63–67 (1966). Methanesulfonates of saturated and unsaturated long-chain alcohols are conveniently obtained in good purity and high yields. They can be converted, quantitatively, to hydrocarbons by reduction with lithium aluminum hydride. The procedure is applicable to the preparation of alkanes and alkenes. *cis, trans*-Isomerization of double bonds does not occur.

THE OXO SYNTHESIS IN LIPOCHEMISTRY. I. PRELIMINARY STUDY OF THE HYDROFORMYLATION OF METHYL OLEATE. R. Lai, M. Naudet and E. Ucciani (Lab of Chem. of Fats and Oils, Fac. of Sci., Marseille, Fr.). *Rev. Franc. Corp Gras* 13(12), 737–745 (1966). The concomitant action of hydrogen and carbon monoxide on methyl oleate catalyzed by a cobalt salt was studied. The resulting reaction mixture contains such things as methyl stearate, aldehyde esters, acid esters, alcohol esters and estolides. The influence of procedure; temperature (130–190C), total pressure (pH_2/pCO, 4/1 to 1/4), and catalyst removal was studied. It was concluded that the reaction can be orientated to the preferential formation of aldehyde esters or alcohol esters.

SYNTHESIS OF HYDROXY ALLYLIC DERIVATIVES OF MONOUNSATURATED FATTY CHAINS. III. OXIDATION WITH MERCURIC ACETATE. A. Tubul, E. Ucciani and M. Naudet (Lab. of Chem. Fats and Oils, Fac. of Sci. Marseille, Fr.). *Rev. Franc. Corps Gras* 14(1), 13–19 (1967). Methyl oleate was oxidized with mercuric acetae in 6 different solvents to yield hydroxy allylic unsaturated acids. This study was designed to yield the optimum procedure and to study the composition of the reaction mixture.

EFFECT OF HIGHER FATTY ALCOHOL ON MINERAL OIL-METAL SOAP GEL. Atsuo Kobashi (First Technol. Res. and Dev. Centre, Japan Defense Agency). *Yukagaku* 16, 71–5 (1967). From the experiment, as an example of application to lubricating grease, it was verified that higher alcohol can be used as a peptizer or stabilizer of lubricating grease.

POLYAMIDES PRODUCED FROM POLYEPOXIDES, DIMERIC FATTY ACIDS AND POLYAMINES. E. DeLia, W. R. Pepis, D. J. Carlick and W. J. Kissel (Interchemical Corp.). *U.S. 3,308,076.* A resinous polyamide is produced by the reaction of one equivalent of polybasic acids with about one equivalent of an alkylene polyamine having the formula $H_2N(RNH)_nH$, where R is an alkylene radical and n is an integer from 1 to 5. The polybasic acids are obtained as products of the reaction between about one equivalent of a bis(4-hydroxyphenyl) dimethyl methane epichlorohydrin resin and about two equivalents of polymerized ethylenically unsaturated fatty oils, the polymerized acids of these oils or the polymerized esters of higher fatty acids with lower alkyl alcohols. The polyamides produced have an amine number in the range 0–200 and an acid number of about 0 to 10.

ANTI-CAKING AGENT. F. Oster (Societe' de Produits Chimiques d'Auby). *U.S. 3,305,491.* A cationic-anionic surface active composition which can prevent the caking of inorganic salts comprises a fatty amine salt of a C_8–C_{22} fatty acid admixed with at least one C_8–C_{22} free fatty acid.

MORPHOLIDES OF A MIXTURE OF EPOXIDIZED SATURATED AND MONOUNSATURATED FATTY ACIDS. F. C. Magne, E. L. Skau and R. R. Mod (U.S. Sec'y of Agric.). *U.S. 3,312,561.* A composition is claimed, consisting of the morpholides of a mixture of epoxidized fatty acids, saturated fatty acids and monounsaturated fatty acids and characterized by the following conditions: $S/(S+M+E)$ is less than about 50%, with S being the weight proportion of saturated acids, M the proportion of monounsaturated acids and E the proportion of epoxidized acids; the saturated acids contain between 12 and 18 C atoms; and the percentage of saturated acids containing at least 18 C atoms is less than about 17% of all the acids in the mixture.

• Biochemistry and Nutrition

BRAIN CERAMIDE HEXOSIDES IN TAY-SACHS DISEASE AND GENERALIZED GANGLIOSIDOSIS (G_{M1}-GANGLIOSODOSIS). Kunihiko Suzuki and Gloria C. Chen (S. R. Korey Dept. of Neurology, A. Einstein College of Med., New York 10461). *J. Lipid Res.* 8, 105–13 (1967). The carbohydrate composition was determined for ceramide hexosides isolated from brains of patients with Tay-Sachs disease and generalized gangliosidosis (hereby named G_{M1}-gangliosidosis). Gray matter of patients with each disease showed a characteristic abnormal ceramide hexoside pattern. In Tay-Sachs gray matter, ceramide trihexoside is the major component, whereas ceramide tetrahexoside is barely detectable. In G_{M1}-gangliosidosis, ceramide trihexoside is present only in small amount. These two major components have been characterized as the sialo derivatives of, respectively, the "Tay-Sachs ganglioside" (G_{M2}-ganglioside) and the normal major monosialoganglioside (G_{M1}-ganglioside).

ENDOGENOUS TRIGLYCERIDE TURNOVER IN LIVER AND PLASMA OF THE DOG. R. C. Gross, E. H. Eigenbrodt and J. W. Farquhar (Depts. of Med. and Surgery, Stanford Univ. School of Med., Palo Alto, Calif. 94304). *J. Lipid Res.* 8, 114–25 (1967). Radio-active glycerol and $S_f > 20$ lipoproteins labeled with it were used to study turnover of plasma $S_f > 20$ and hepatic triglyceride in anesthetized dogs. From specific activity vs time curves of these lipids after an injection of labeled material, a tentative and incomplete model for the kinetics of endogenous hepatic and plasma triglyceride was defined and partially validated. Pool sizes and turnover rates of triglyceride in liver and $S_f > 20$ lipoproteins of plasma were then calculated in seven dogs. Hepatic triglyceride was composed of two compartments: 60% metabolically inert and 40% metabolically active. Although communication between these hepatic compartments surely occurred during the time course of these studies, it was not sufficient to be detected by our present methods. The metabolically active compartmental turned over as a single pool but with two destinations: a quite variable proportion (an average of 61%) was secreted into plasma as $S_f > 20$ triglyceride and an average of 39% was presumably hydrolyzed within the liver.

SEX DIFFERENCES IN PLASMA CHOLESTEROL-ESTERIFYING ACTIVITY IN RATS. Lilla Aftergood and R. B. Alfin-Slater (Div. of Nutritional Science, School of Public Health, Univ. Calif., Los Angeles, 90024). *J. Lipid Res.* 8, 126–30 (1967). Esterification of free cholesterol was investigated after incubation at 37C of plasma from immature and adult rats of both sexes kept on stock, fat-free, or cholesterol-supplemented diets. According to measurements of the decrease in free cholesterol, plasma from the fat-deficient rats showed the highest cholesterol-esterifying activity. Esterification was higher in the mature female rats than in the mature males on stock or cholesterol-containing diets, although no sex differences were observed in the sexually immature young or in the fat-free animals. There were no sex differences in the fatty acid composition of the plasma sterol esters, phospholipids and triglycerides in the immature animals, but arachidonic acid increased at the expense of linoleic acid in the sterol ester fraction in the adult female (not, however, in the adult male). In the phospholipid fraction the higher ratio of palmitic to stearic acids in the male was confirmed. There was an increase in linoleic acid in all three plasma lipid fractions of the mature male after cholesterol feeding. It is suggested that cholesterol may inhibit the conversion of linoleate to arachidonate.

SEPARATION OF 24- AND 25-DEHYDROCHOLESTEROLS; AND THE IMPURE STATE OF COMMERCIAL DESMOSTEROL PREPARATIONS. J. A. Svoboda and M. J. Thompson (Entomol. Res. Div., Agr. Res. Service, U.S.D.A., Beltsville, Md. 20705). *J. Lipid Res.* 8, 153–4 (1967). Chromatographic methods for the separation of 24- and 25-dehydrocholesterols are described. The purities of three commercial samples of 24-dehydrocholesterol examined by thin-layer and gas-liquid chromatography were only 42, 79, and 80%, respectively; a commercial sample of radioactive 24-dehydrocholesterol was shown to contain 40% 25-dehydrocholesterol.

ABSENCE OF EFFECT OF TOCOPHEROL ON ACUTE ORAL TOXICITY OF SODIUM SELENITE IN THE RAT. Sue G. Morss and H. S. Olcott (Dept. of Nutritional Sciences, Inst. of Marine Resources, Univ. of California, Berkeley). *Proc. Soc. Exp. Biol. Med.* 124, 483–5 (1967). The acute oral toxicity of selenite-selenium in the rat is approximately 12.5 mg/kg (LD_{50}); this level is not changed by simultaneous administration of tocopherol as *d-α*-tocopherol acetate at 725 mg/kg.

PATHWAYS FOR THE SYNTHESIS OF GLYCEROPHOSPHATIDES IN ESCHERICHIA COLI. Ying-Ying Chang and E. P. Kennedy (Dept. of Biolog. Chem., Harvard Med. School, Boston, Mass.). *J. Biol. Chem.* 242, 516–9 (1967). Presently available evidence indicates that phosphatidic acid is an essential intermediate in the biosynthesis of glycerophosphatides in *Escherichia coli.* Two alternative pathways for the synthesis of phosphatidic acid in *E. coli* have been proposed, one involving the acylation of L-glycerol 3-phosphate, and the second the direct phos-

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phorylation of α,β-diglyceride, catalyzed by the enzyme diglyceride kinase. If the latter pathway occurs to a significant extent in living cells of *E. coli*, one would expect to find a metabolically active pool of diglyceride in this organism. Pulse experiments with radioactive glycerol have failed to reveal the presence of such a pool, under conditions in which a very rapid synthesis of phosphatidic acid is taking place. Cell-free extracts of such cells, however, have been found to contain diglyceride kinase. Diglyceride kinase has been shown to be highly stereospecific, catalyzing the phosphorylation of diglycerides with the formation of derivatives of L-glycerol 3-phosphate only. Some implications of these findings for the physiological function of diglyceride kinase are discussed.

THE FATTY ACID COMPOSITION OF THE PHOSPHATIDES OF NORMAL AND MALIGNANT EPIDERMIS. C. Carruthers (Dept. of Biochem. Res., Roswell Park Memorial Inst., Buffalo, New York). *Cancer Res.* **27**, 1–6 (1967). The fatty acid composition of the lecithins, phosphatidyl serines, phosphatidyl ethanolamines, ceramides and sphingomyelins of normal and hyperplastic mouse epidermis, squamous cell carcinomas of mice, and tissue-culture-grown squamous cell carcinoma cells of man was determined by gas chromatography. The degree of saturation of the fatty acids of the lecithins, phosphatidyl ethanolamines and ceramides obtained from squamous cell carcinomas was appreciably greater than that obtained from these phosphatides of normal mouse epidermis. Fatty acids of the carcinoma phosphatidyl serines were slightly more saturated whereas those of the sphingomyelins were more unsaturated than were the fatty acids of these phosphatides obtained from epidermis. The fatty acid composition of the phosphatides of squamous carcinoma cells of man grown in tissue culture was vastly different from that observed in normal and hyperplastic mouse epidermis and squamous cell carcinomas of mice. Aside from the increase or decrease in the degree of saturation of the fatty acids of the various phosphatides in the squamous cell carcinomas, there were many significant changes in the levels of individual fatty acids in the malignant transformation of epidermis.

VOLATILE COMPONENTS OF ROASTED PEANUTS. THE MAJOR MONOCARBONYLS AND SOME NONCARBONYL COMPONENTS. M. E. Mason, Bobby Johnson and M. C. Hamming (Dept. of Biochem., Agricultural Expt. Station, Oklahoma State Univ., Stillwater, Okla.). *J. Agr. Food Chem.* **15**, 66–73 (1967). Condensates obtained from roasted Spanish peanuts using high vacuum distillation and cryogenic trapping procedures possessed typical roasted peanut aroma. Analyses using gas chromatographic and qualitative chemical techniques revealed the presence of several aldehydes. Analysis of the total condensates and carbonyl compounds regenerated from their 2,4-dinitrophenylhydrazones using a combination gas chromatograph-mass spectrometer (GC-MS) and thin-layer chromatographic analysis of the 2,4-DNPH derivatives resulted in the positive identification of acetaldehyde, isobutyraldehyde, benzaldehyde and phenylactaldehyde, and tentative identification of 2- and 3-methylbutanal and 3-methyl-2-butanone. Ethyl acetate, toluene, and N,N-dimethylformamide were tentatively identified but their presence in the carbonyl regenerates remains unexplained.

DIETARY CARBOHYDRATE AND FAT, SERUM LIPOPROTEINS, AND HUMAN ATHEROSCLEROSIS. J. A. Little, H. M. Shanoff and A. Csima (Dept. of Medicine, St. Michael's and Sunnybrook Hosp., Univ. Toronto, Canada). *Am. J. Clin. Nutr.* **20**, 133–8 (1967). Serum lipids and lipoproteins were correlated with the habitual diets of healthy Canadian men and men with coronary heart disease. It had been shown previously that the serum lipids and lipoproteins were significantly higher in the coronary group and there were no important differences in the diets. In the coronary group, total dietary fat correlated positively with serum cholesterol, phospholipid, and S_f 0–20 lipoproteins. Total carbohydrate and sucrose had no important correlation with these serum fractions or with S_f 20–400 lipoproteins. This suggests that, in the habitual diets of coronary-prone men, fats influence the serum lipid levels more than do carbohydrates. In the control group, the same dietary factors tended to have a negative correlation with serum lipids and lipoproteins. Coronary patients appear to be metabolically different with a susceptibility to hyperlipidemic foods.

INFLUENCE OF DIETARY FAT AND PROTEIN ON METABOLIC AND ENZYMATIC ACTIVITIES IN ADIPOSE TISSUE OF MEAL-FED RATS. G. A. Leveille (U.S. Army Med. Res. and Nutr. Lab., Fitzsimons General Hosp., Denver, Col.). *J. Nutr.* **91**, 25–34 (1967). The influence of dietary protein and fat on the response of adipose tissue to meal-feeding (a single daily 2-hour meal) has been investigated in the rat. Meal-feeding stimulated the incorporation of pyruvate carbon into fatty acids and the oxidation of pyruvate by isolated adipose tissue. This response to meal-feeding was completely abolished by feeding a high fat diet. The activities of glucose 6-phosphate dehydrogenase and malic enzyme were higher in adipose tissue and liver of meal-fed rats consuming a high carbohydrate diet, but were unchanged in tissue of rats meal-fed a high fat diet. The activities of glucose 6-phosphate dehydrogenase and malic enzyme were depressed in adipose tissue of rats fed the high fat diet, whereas only glucose 6-phosphate dehydrogenase activity was depressed in liver of nibbling rats consuming the high fat diet. Adipose tissue from rats fed the high fat diet was able to convert significantly more pyruvate-2-^{14}C to glyceride-glycerol than tissue from rats fed the high carbohydrate diet. The possible significance of this observation is discussed.

INFLUENCE OF DIETARY FAT LEVEL ON THE ENZYMATIC AND LIPOGENIC ADAPTATIONS IN ADIPOSE TISSUE OF MEAL-FED RATS. G. A. Leveille (U.S. Army Med. Res. and Nutr. Lab., Fitzsimons General Hosp., Denver, Col.). *J. Nutr.* **91**, 267–74 (1967). The effect of increasing dietary fat levels on the response to meat-eating (restriction of food ingestion to a single daily 2-hours meal) in the rat was investigated. The studies were conducted with diets supplying fat up to levels which would approximate the percentage of fat calories supplied in human diets. Male rats were fed diets containing 10, 20 or 30% fat, these levels supplying from 21 to 52% of the ingested calories. Increasing the level of fat from 10 to 30% appeared to facilitate the adjustment of food consumption in meal-fed rats. The activities of the enzymes studied and of fatty acid synthesis from acetate-1-^{14}C or glucose-U-^{14}C were increased by meal-feeding in rats fed diets containing 10 or 20% fat levels, but not in animals consuming 30% fat diets. The activities of glucose 6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase and malic enzyme and the lipogenic capacity decreased with increasing levels of dietary fat in adipose tissue of both meal-fed and nibbling rats.

A HISTOCHEMICAL STUDY OF EMBRYONIC RAT LIVER IN AVITAMINOSIS E. Dorothy Wei King and Kusum Verma (Dept. of Anatomy, Univ. of Iowa, College of Med., Iowa City, Iowa). *J. Nutr.* **90**, 159–73 (1967). The histological and histochemical differences between the vitamin E-sufficient and -deficient rat livers during teratogenesis were investigated. To obtain abnormal embryos, after mating, female rats of the Holtzman strain that had been maintained with a vitamin E-deficient ration since weaning, were given 2 mg of dl-α-tocopheryl acetate by gavage on the tenth day of gestation. The same dose was given daily during the first 5 days of gestation to the control group to ensure normal embryogenesis. Normal and abnormal embryos were collected from day 15 of gestation onward and were prepared by appropriate methods to show histochemically the amount of acid and alkaline phosphatase, cholinesterase, lipase, lipid, lipofuscin, glycogen, mucopolysaccharide and iron. The results revealed that deficient livers often showed massive, central necrosis and an increase in the size of the Kupffer cells. Although cholinesterase, lipase, lipid and glycogen were reduced in the deficient livers, acid and alkaline phosphatase, iron and mucopolysaccharide were increased. The abnormal livers also showed deposition of lipofuscin, especially on the erythrocytes. It was concluded that prenatal vitamin E deficiency affected the normal, chemical development of the embryonic liver.

THYROID AND PITUITARY PATHOLOGY IN IODINE-DEFICIENT RATS FED FRESH AND OXIDIZED FATS AND OILS. H. Kaunitz and Ruth Johnson (Dept. of Pathol., College of Physicians and Surgeons, Columbia Univ., N.Y., N.Y.). *J. Nutr.* **91**, 55–62 (1967). To study the long-term effects of feeding fresh and mildly oxidized cottonseed oil, olive oil, corn oil, soybean oil, chicken fat, beef fat, butter and lard on thyroid pathology in iodine deficiency, these fats were fed at a level of 20% in an iodine-deficient diet to male rats of the Columbia-Sherman strain. The incidence of thyroids weighing more than 100 mg was significantly higher in the rats fed vegetable oils even though the iodine intakes of all groups were approximately the same. This was interpreted as being due to the presence of goiterogenic substances in vegetable oils rather than to increased iodine requirements in the rats fed these oils. Pituitary tumors occurred in approximately 30% of the rats dying spontaneously after 600 days of age. Among the rats fed animal fats, the percentage of pituitary tumors among rats with thyroids weighing 100 mg or more was significantly higher in rats with smaller thyroids. The percentage of tumors associated with heavy thyroids was significantly lower in the animals fed vegetable oils, although the overall tumor inci-

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dence was the same as in the rats fed animal fats. Therefore, whatever the cause of the increased incidence of large thyroids among the animals fed vegetable oils, the materials responsible did not affect the incidence of pituitary tumors.

INFLUENCE OF CYCLOPROPENOID FATTY ACIDS ON THE CHOLESTEROL METABOLISM OF COCKERELS. K. C. Goodnight, Jr. and A. R. Kemmerer (Dept. of Agricultural Biochem., Univ. of Arizona, Tucson). *J. Nutr.* 91, 174–8 (1967). Cyclopropenoid fatty acids, as in *Sterculia foetida* oil and cottonseed oil, were fed to White Leghorn cockerels to determine whether these acids altered cholesterol metabolism. Corn oil was fed as a control. These cyclopropenoid fatty acids were found to cause increased plasma cholesterol, aortic atherosclerosis, liver weight, volume of bile in the gall bladder, bile acids in the bile, and bile acid excretion. The liver cholesterol concentration of the test cockerels was less than that of the controls. There was no difference in sterol retention, weight gain or feed efficiency.

METABOLIC RESPONSE OF WHITE RATS TO BALANCED AND IMBALANCED PROTEIN FED WITH DIFFERENT CARBOHYDRATES IN 15% AND 5% FAT DIETS. Elizabeth Gaertner and Catherine Carroll (Dept. of Home Ec., Univ. of Arkansas, Fayetteville, Ark.). *J. Nutr.* 91, 69–78 (1967). This study was designed to investigate effects of different dietary carbohydrates (fed with 2 levels of fat) on liver lipid changes in male, weanling rats subjected to threonine deficiency; and to observe influences of the amino acid imbalance on responses of certain glycolytic enzyme systems to carbohydrate source. In rats fed low protein, threonine-deficient diets containing 15% of corn oil, moderate amounts of excess lipid accumulated in livers regardless of carbohydrate source (glucose, fructose, or an equal mixture of glucose and fructose). However, when similar diets containing only 5% of corn oil were fed, the effect of threonine deficiency on lipid content of liver depended on the type of dietary carbohydrate; with glucose, no increase in liver lipid; with fructose or sucrose, marked fatty infiltration.

LONG-TERM STUDIES ON THE HYPOLIPEMIC EFFECT OF DIETARY CALCIUM IN MATURE MALE RATS FED COCOA BUTTER. A. J. Fleischman, H. Yacowitz, T. Hayton and M. L. Bierenbaum (Health Res. Inst., Fairleigh Dickinson Univ., Madison, N.J.). *J. Nutr.* 91, 151–8 (1967). To determine whether the hypolipemic action of elevated dietary calcium previously noted in a 2-week experiment was a transient or a persistent effect, 32 mature male Holtzman-strain albino rats were divided into 5 groups, one being fed commercial rat pellets with 5% fat and 1.15% calcium, and the others a corn-soya ration containing 18% added cocoa butter and 2% added cholesterol for 5 months. Dietary calcium was varied at 0.08, 0.2, 1.2 and 2% of diet. Serum total lipids, phospholipids, cholesterol and triglycerides decreased significantly with increasing dietary calcium, often to levels equal to or below those of the control diet. Liver, heart and aortic lipids were unaffected. Fecal lipids increased significantly between the 0.2% and 1.2% calcium level, primarily because of an increase in the free fatty acids. Fecal bile acids rose significantly at the 0.2% calcium level, with no further increase on increased calcium. 3-β-Hydroxysterol excretion increased as calcium increased and was, at the higher calcium levels, found to equal all the exogenous cholesterol, whereas fecal lipid excretion was found to account for the weight gain differences between the various calcium levels. Histological examination of the kidneys indicated no pathological condition attributable to high dietary calcium.

EFFECT OF VITAMAN A ON 7,12-DIMETHYLBENZ(α)ANTHRACENE-INDUCED PAPILLOMAS IN RHINO MOUSE SKIN. R. E. Davies (Temple Univ. Health Sciences Center, Philadelphia, Penna.). *Cancer Res.* 27, 237–41 (1967). Rhino mice fed a diet containing 100 IU of vitamin A per gm of feed produced fewer papillomas than did similar mice fed a diet deficient in vitamin A, following a single tropical dose of dimethylbenzanthracene. The differences were due at least in part to more rapid loss of papillomas in the vitamin-A-supplemented animals. Within a single dietary group the rate of loss was linearly dependent on the total number of papillomas produced, but this rate was substantially higher in supplemented animals. Both appearance and loss of papillomas were linear functions of time, in supplemented animals, whereas the rates in nonsupplemented animals appeared to be of higher orders.

EFFECT OF DIETHYLSTILBESTEROL AND CHOLESTEROL ON THE FATTY ACID COMPOSITION OF LIVER LIPID FRACTIONS IN COCKERELS. R. A. Chung, E. Davis, R. Munday and J. Ning (Carver Res. Found. of Tuskegee Inst., Tuskegee, Alabama). *Poultry Sci.* 46, 109–14 (1967). Cockerels were given the following treatments: corn oil (CO), CO + cholesterol (C), CO + diethylstilbestrol (DES), CO + C + DES, hydrogenated coconut oil (HCO), HCO + C, HCO + DES, and HCO + C + DES. The fatty acid composition of the cholesterol ester (CE), triglyceride (TR) lecithin (LE) and phosphatidyl ethanolamine (PEA) fractions of the liver was determined. The DES treated birds were similar to the C treated birds in that oleic acid increased and arachidonic acid decreased in all fractions regardless of whether CO or HCO was consumed, except that the oleic acid decreased in the CE fraction with DES + CO. On the contrary, palmitic acid increased and linoleic acid decreased with DES as compared with C, except that linoleic acid also decreased in the CE fraction with HCO + C and in the TR fraction with CO + C. The greatest change was with HCO and in the LE fraction with DES, and with HCO in the CE fraction with C. The DES + C treated birds followed same pattern of fatty acid composition changes as the DES treated birds regardless of whether CO or HCO was consumed.

EFFECT OF CHOLESTEROL WITH DIFFERENT DIETARY FATS OF THE FATTY ACID COMPOSITION OF EGG YOLK AND VARIOUS BODY TISSUES. R. A. Chung, E. Davis, R. Munday, U. Tsao and A. Moore (Carver Res. Foun. of Tuskegee Inst., Tuskegee Inst., Tuskegee, Alabama). *Poultry Sci.* 46, 133–41 (1967). New Hampshire hens were fed diets supplemented with corn oil (CO), hydrogenated coconut oil (HCO), CO + cholesterol (C), or HCO + C. The fatty acid composition of the yolk, thigh, abdominal adipose, liver and plasma lipids were determined. C when fed with CO decreased the proportions of stearic and palmitic acids and increased the proportions of oleic and linoleic acids of yolk lipids whereas C when fed with HCO decreased the proportions of oleic and linoleic acids. The fatty acid composition of the thigh and abdominal adipose lipids were unaffected by C regardless of dietary fat. The greatest fatty acid changes due to C were found in the cholesteryl ester fraction of the yolk, liver and plasma lipids. Regardless of dietary fat, C increased the proportion of linoleic acid in the yolk, liver, and plasma lecithin and in the liver phosphatidyl ethanolamine. In general, the greatest changes resulted when C was consumed with CO rather than with HCO.

GROWTH INHIBITION OF *Dermestes maculatus* BY PHYTOSTEROLS. P. Budowski, I. Ishaaya and M. Katz (The Hebrew Univ. of Jerusalem, Rehovot, Israel). *J. Nutr.* 91, 201–7 (1967). The effect of a β-sitosterol preparation, stigmasterol and ergosterol on the larvae of the zoophagous beetle *Dermestes maculatus* was studied. When the diet contained optimal amounts of cholesterol, an essential nutrient for the larvae, the phytosterols partially inhibited growth and delayed pupation. The cholesterol content of the larvae was also depressed. Stigmasterol had the strongest growth-depressing effect, whereas the sitosterol preparation depressed larval cholesterol to the greatest extent. In the absence of dietary cholesterol, sitosterol (but not stigmasterol nor ergosterol) was able to support partial growth and to induce pupation. The inhibitory action of phytosterols on the development of *D. maculatus* is interpreted as due to interference with the uptake of cholesterol by the larvae. It appears to be analogous to the anti-cholesterolemic action of plant sterols in mammals and birds.

EFFECT OF VITAMIN E DEFICIENCY ON COLLAGEN METABOLISM IN THE RAT'S SKIN. R. G. Brown, Grace Button and J. T. Smith (Dept. of Nutr., Univ. of Tennessee, Knoxville, Tenn.). *J. Nutr.* 91, 99–107 (1967). The effects of avitaminosis E on collagen metabolism in the skin of rats were studied. Hides from littermate male rats raised with vitamin E-sufficient or vitamin E-deficient diets were fractionated into neutral salt-soluble, acid-soluble and insoluble collagen. The rate of gel formation at 37C, pH 7.4, of both crude and purified neutral-salt and acid-soluble collagen solutions from the skin of these animals was measured together with the stability of those gels to 4C temperatures for various time periods. Animals

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raised with the vitamin E-deficient diets had a greater percentage of soluble collagen in their skins. The neutral salt-soluble collagen solutions from the deficient group did not form gels as readily as did those from their controls nor were these gels as stable to 4C temperature. These results suggest a defect in the formation of intermolecular and intramolecular crosslinkages in the collagen from the vitamin E-deficient group.

EFFECTS OF GLUCOSE SUPPLEMENTATION OF HIGH LIPID DIETS BASED ON FREE FATTY ACIDS FOR THE GROWING CHICKEN. S. Brambila and F. W. Hill (Dept. of Poultry Husbandry at Univ. of California, Davis). *J. Nutr.* **91**, 261–6 (1967). Three experiments were conducted with chicks to evaluate the effects of glucose supplementation in diets high in soybean oil fatty acids (SOFA). Semi-purified diets based on isolated soybean protein were used. The high fatty acid diet supplied 68% of total metabolizable calories as SOFA and the remaining 32% as protein. Supplemental glucose replaced an equicaloric amount of SOFA. Cellulose was added to maintain a mealy texture. The addition of glucose to the high fatty acid diet increased both food intake and growth. Over the range 1.5% to 18% glucose calories, the voluntary food intake provided nearly a constant amount of SOFA approximating 42 g/chick for the first 2 weeks. In contrast, the lipid intake of chicks fed the diets high in soybean oil was almost 60 g/chick. This suggests that food intake is regulated to avoid exceeding a limit on SOFA intake. The level of glucose in the blood of chicks fed the high SOFA diet was subnormal during the absorptive condition but increased to normal post-absorptive values after a fasting of 18 hours. Chicks fed diets high in SOFA were very lean, whereas those receiving the high soybean oil diet deposited as much fat as the reference group fed a high carbohydrate diet. The fatty acid composition of depot fat from chicks receiving the high lipid diets was highly unsaturated and resembled closely that of soybean oil.

EFFECTIVENESS OF VITAMIN E IN REVERSING STERILITY OF MALE CHICKENS FED A DIET HIGH IN LINOLEIC ACID. G. H. Arscott and J. E. Parker (Dept. of Poultry Sci., Oregon State Univ., Corvallis, Oregon). *J. Nutr.* **91**, 219–22 (1967). To determine whether sterility of adult male chickens fed a diet high in linoleic acid and low in vitamin E was permanent or could be reversed by supplemental vitamin E, 3 groups of 8 White Leghorn males were fed for a 40-week experimental period as follows: group 1, a high linoleic acid (7.3%)-high vitamin E (166.3 mg/kg) diet; group 2, a high linoleic acid-low vitamin E (4.3 mg/kg) diet; and group 3, treated as group 2 from zero to 28 weeks and as group 1 from 28 to 40 weeks. The following results were obtained: 1) The adverse effect of the high linoleic acid-low vitamin E diet on fertility and semen concentration was confirmed. 2) The addition of vitamin E to the high linoleic acid diet at 28 weeks restored fertility to the level obtained from males receiving vitamin E throughout the trial. 3) Semen concentration was improved following the addition of vitamin E to the diet at 28 weeks. 4) No meaningful differences on semen volume, hatchability of fertile eggs, feed consumption, mortality, or body and testes weights were observed with males fed the various diets. The results indicate that the low fertility and semen concentration of male chickens fed a diet high in linoleic acid but low in vitamin E are reversible following vitamin E supplementation.

HYPOCHOLESTEROLEMIC ACTIVITY OF A NOVEL STEROID IN RATS FED HIGH-FAT DIETS. A. Arnold, J. P. McAuliff and A. J. Merola (Sterling-Winthrop Res. Inst., Rensselaer, N.Y.). *J. Atheroscler. Res.* **7**, 111–15 (1967). 17-(3-Hydroxy-1-propynyl)-3-methoxyestra-1,3,5(10)-trien-17β-ol-17α-hydrocinnamate, noted earlier to be hypocholesterolemic in rats maintained on one of the usual commercial laboratory feeds, was also hypocholesterolemic in rats fed high fat, low-protein diets.

NUTRITIVE VALUE FOR RATS OF CERTAIN BY-PRODUCTS OF THE CORN REFINING INDUSTRY. D. A. Christensen, L. E. Lloyd and E. W. Crampotn (Dept. of Animal Science, Macdonald College, Province of Quebec, Canada). *J. Nutr.* **91**, 137–42 (1967). Experiments with growing rats were carried out to evaluate the egg replacement value and growth-promoting ability in relation to their amino acid content of by-products and a combination of by-products from wet milling of corn. In the first experiment, 8 diets containing 12.4% crude protein derived entirely from whole dried egg, corn steepwater solids, corn gluten, corn germ oilmeal, corn fine bran, zein, zein-extracted gluten, or reconstituted starch-free corn were fed to 170 g rats. Despite a superior chemical potential based on chemical score and essential amino acid index, the protein quality of corn germ oilmeal, as measured by egg replacement values, was lower than that of all of the other proteins except corn fine bran. Reconstituted starch-free corn protein was equal to corn gluten and zein-extracted gluten which were the best individual protein sources. In the second experiment protein from the same sources, excluding corn fine bran, was fed to weanling rats in diets containing 17% crude protein. Growth efficiency of protein utilization confirmed the results of the first experiment in that corn germ oilmeal would not support growth and the reconstituted starch-free corn produced the most rapid and efficient gains of the corn proteins tested.

• Drying Oils and Paints

A COMPARATIVE STUDY OF SOME CATALYSTS FOR THE DEHYDRATION OF CASTOR OIL. M. Waheeduddin, M. A. Siva Samban and J. S. Aggarwal (Reg. Res. Lab, Hyderabad, India). *Paintinda* **16**, 24–26 (1966). Tungstic acid and phosphotungstic acids have been studied in comparison with other catalysts for the dehydration of castor oil. While tungstic acid gives dehydrated castor oil of monomeric grade which dried with reduced after-tack, phosphotungstic acid, even at low processing temperatures, yields a bodied dehydrated castor oil. The effect of dehydration under normal atmospheres, inert atmospheres and vacuum has been studied.

THE INFLUENCE OF CATALYSTS ON THE GLYCEROLYSIS OF LINSEED OIL. D. H. Solomon and J. D. Swift (Div. of Applied Mineralogy, C.S.I.R.O., G.P.O. Box 4331, Melbourne, Victoria, Australia). *J. Oil Chem. Assoc.* **49**, 915–927 (1966). The reaction between glycerol and linseed oil was studied in the presence of lead naphthenate and sodium hydroxide catalysts. The influence of processing variables on the chemical composition of the products formed was discussed; contrary to some previous studies on this system, it was concluded that the reaction does not reach an equilibrium composition under practical conditions. The significance of this conclusion was discussed in relation to tests suitable for the control of the "monoglyceride" stage in alkyd resin production. The influence of variations in the chemical composition of glycerolysis products on the molecular weight distribution and properties of alkyd resins was reviewed.

GAS CHROMATOGRAPHY—ITS APPLICATION AND POTENTIAL IN THE ANALYSIS OF COATING MATERIALS. J. K. Haken (Dept. of Polymer Sci., Univ. of New South Wales, Kensington, N.S.W., Australia). *J. Oil Col. Chem. Assoc.* **49**, 993–1002 (1966). The acceptance of gas chromatography in the analysis of coating materials is discussed and the potential of the technique is reviewed. Applications include the examination for purity of volatile materials such as solvents, fatty acids and polyols, together with the identification of such materials available in the free state or chemically combined in oils, alkyds and the like. The identification of polymers by gas chromatography of pyrolysis products is an example of the way in which the techniques may be extended by combination with other procedures. Interesting developments include ionization detectors for liquid-liquid chromatography which will allow examination of less volatile materials after separation by column chromatography, separation of glycerides and the resolution of geometric isomers of fatty esters which will be of value in elucidating the mechanism of oil oxidation and film formation.

• Detergents

EFFECT OF CHARGED INTERFACES ON THE IONIC DISTRIBUTION IN SOAP SOLUTIONS. H. L. Rosano and M. E. Feinstein (City Coll. of City Univ. of New York, N.Y.). *Rev. Franc. Corps Gras* **13**, 661–670 (1966). Potentiometric titrations of fatty acids below and above the critical micelle concentration (C.M.C.) in presence or absence of solvent have shown the marked influence of molecular aggregate surfaces and charged oil-water interfaces on the bulk pH. The buffering action of acetic acid-acetate occurs approximately at pH 4.2. In contrast, the titration of micellar potassium laurate solutions by HCl exhibits a buffering action near pH 9.3. It was found that this buffering action is due to the presence of the ionized soap micelles. The titration of potassium laurate solutions below the C.M.C. shows a buffering action at approximately pH 7 due to the presence of ionized acid-soap solution, above the C.M.C. the bulk pH is shifted upward by two or three units. The ionized molecules being absorbed at the oil-water interface deplete the bulk hydrogen ion concentration. New cationic glass electrodes were also used to determine the activity of sodium and potassium ions in submicellar and micellar solutions. Ionized micelles were found to bind counter-ions. The extent of binding depends primarily on the nature of the long chain ion and the counter ions. These results demonstrate the marked effect of charged interfaces on the ionic distribution in solution.

Synthesis and some surface active properties of fatty acid derivatives of propane sultone. III: Fatty alcohol and fatty acid derivatives. Hisao Hirai, Yuzo Ishikawa, Kyoichi Suga and Shoji Watanabe (Chiba Univ., Chiba-shi). *Yukagaku* 16, 75–80 (1967). Surfactants having propane sulfonate group were prepared from C_{10-18} fatty alcohols and C_{10-18} fatty acids. Surface active properties of their aqueous solutions were examined on surface tension, foaming power, foam stability and CMC at 50C. In comparison with sodium alkylsulfate, the propane sultone derivatives showed lower Kraft point and cloud point, excellent surface tension and foaming power even at lower concentrations. The foam stability of these derivatives was similar but those of fatty acid derivatives were slightly inferior. The CMC values of propane sultone derivatives were lower than those of sodium alkylsulfates, and relationships between CMC and the number of carbon atoms in the alkyl chain, and those of log CMC and the length of surface active ion were given by equations. It was suggested that the hydrophilic groups such as $-O-$ or $-COO$ decreased the lipophilic property of hydrocarbon chain in regard to the CMC value.

Studies on the phase diagrams of ternary systems of essential oils, nonionic surfactant and water. Kazutoshi Kenjo (Takahashi Tōyodō Co., Tokyo). *Yukagaku* 16, 126–34 (1967). Phase diagrams of ternary systems consisting of decaoxyethylene nonylphenyl ether (NP-10), essential oils and water have been studied. From the phase diagrams obtained, six essential oils were classified into two groups—the first group of high polarity being ethyl phenyl acetate, geraniol and isoeugenol methyl ether, the second group of lower polarity being α-ionone, α-amyl cinnamic aldehyde and limonene. In the ternary system containing essential oil of the first group, the phase diagram showed that the hardening region decreases gradually and eventually disappears and the phase diagram becomes similar to that of an aqueous binary system of a surfactant containing a lesser amount of ethylene oxide. The phase diagram of the ternary system containing an essential oil of the second group showed no disappearance of hardening regions and also the appearance of a new hardening region with the decrease in ratio of NP-10 to essential oil. The latter phase diagram was quite different with that of binary system of aqueous surfactant.

Evaluation of dishwashing detergents. R. C. Taylor, J. C. Reid and B. M. Wolsky (Arco Chemical Co., Philadelphia). *Soap Chem. Specialties* 43, 52–9 (1967). The results of performance evaluations conducted on several dishwashing formulations using five different test methods are reported. It is shown that the effect of several variables, such as amount and type of foam builders, LAS side chain length, etc., can be judged quite differently according to the type of test method used. A good dishwashing detergent, it is concluded, will perform well in all tests. The use of more than one evaluation procedure permits a better understanding of performance and is more likely to detect weakness of the detergent in removing a particular type of soil.

Alkylbenzyldimethylammonium chlorides. R. A. Cutler, E. B. Cimijotti, T. J. Okolowich and W. F. Wetterau (Sterling Drug, Inc., Rensselaer, N.Y.). *Soap Chem. Specialties* 43, 84–92 (1967). Several physical characteristics of odd and even chain homologues of alkylbenzyldimethylammonium chloride are discussed. Data are presented on melting point, solubility, surface tension and critical micelle concentration of twelve different homologues, differing by the number of carbon atoms on the alkyl side chain.

Surfactants in household aerosol products. A. Livingstone (GAF Corp.). *Soap Chem Specialties* 43, 131–5, 162–4 (1967). A review.

New trends in synthetic detergents. J. Rubinfeld and H. D. Cross, III (Colgate-Palmolive Co., Jersey City, N.J.). *Soap Chem. Specialties* 43, 41–4, 102–4 (1967). When branched chain alkyl benzene sulfonate (ABS) was still used in the U.S. detergent industry, the alkyl chain distribution that was found to outperform the more commonly used tetrapropylene chain was referred to as tridecylbenzene (TDB), and contained 5% C_{11}, 35% C_{12}, 10% C_{13}, 10% C_{14}, 30% C_{15} and 4% C_{16}. This distribution had much better foaming in soft and hard water than dodecylbenzene. With the change to biodegradable detergents, it was possible to match the performance of TDB in heavy duty products by using a linear alkylbenzene with a 258–266 mol. wt., having at least 70% C_{13} and C_{14}, 5% max. C_{11}, 20% max. C_{12} and 5% max. C_{15}. The 5- and 6-phenyl content should be above 40% and the 2-phenyl content less than 20%. In light duty products, a lower mol. wt. is preferred (231–241). By comparison to the switch from ABS to LAS the biodegradability issue has not led to similar radical changes in the alcohol based surfactants, since the performance of oxo alcohol derivatives has generally been as good as that of surfactants based on natural fatty alcohol derivatives. Other new types of surfactants currently being introduced or considered for introduction in commercial washing products are also reviewed.

Problems concerning the chemical analysis of surfactants. G. Mangeney (Internat. Detergency Committee, Paris, France). *Riv. Ital. Sostanze Grasse* 43, 547–51 (1966). A review.

Present international agreements concerning the technical performance testing of surface active agents. E. Gőtte (Internat. Detergency Committee, Paris, France). *Riv. Ital. Sostanze Grasse* 43, 540–6 (1966). A review is given of the current status of surfactant performance testing, especially with regard to the development of internationally accepted, standard test methods.

Laboratory evaluation of cotton detergency. The behavior of some commercially available artificially soiled test cloths in comparison to naturally soiled cloths. G. W. Fernley and E. L. Shepherd (Shell Res. Ltd., Egham, England). *Riv. Ital. Sostanze Grasse* 43, 572–80 (1966). Using a commercially available test cloth soiled with a mixture of cottonseed soil, mineral oil and carbon black, it was found that the cotton detergency of polyphosphate built formulations based on linear alkyl benzene sulfonates (LAS) varied in an unexpected manner with variations in polyphosphate content and water hardness. For a given concentration of active detergent a maximum in detergency occurred under conditions corresponding to the presence of an amount of unsequestered calcium ions approximately stoichiometrically equivalent to the LAS. This maximum in detergency occurred at a point far removed from the usual ratio of polyphosphate to active detergent found in commercial, high sudsing, heavy duty powders, which raised some doubts as to whether the results obtained with this particular artificially soiled cloth correlated well with practice. Detergency evaluations carried out with naturally soiled cloth did not confirm this phenomenon but showed that detergency increased in a regular manner with increasing polyphosphate content until complete sequestration of the calcium ions was accomplished. It was therefore concluded that the results obtained with this artificially soiled test cloth were not a reliable guide to the practical performance of built LAS formulations. A number of alternative commercially available artificially soiled test cloths were examined, the results with some of them correlating reasonably well with those obtained using natural soil, not only for built LAS formulations but also for built formulations based on other types of surfactants.

Statistical analysis of the sources of variability in detergency evaluation, I. A. Arpino, A. Bertini, G. Poles and A. Zanella (Montecatini-Edison S.p.A., Milan, Italy). *Riv. Ital. Sostanze Grasse* 43, 552–71 (1966). The detergent power of various washing products was measured in the Launder-ometer using standard cotton fabric uniformly soil with China ink and olive oil (Empa type), using reflectance changes as a measure of detergency. The components of variability in the method were investigated by statistical analysis, showing that the standard deviation of the experimental error is lower than 3% of the observed values. However, when the variability between different testing laboratories is also included, the total standard deviation can reach 13% of the experimental results. Suggestions are given for future work to improve the precision of the method and to arrive at a satistically valid method for measuring detergent power.

The manufacture and possible applications of mono- and diglyceride mixtures of natural fatty acids as emulsifiers for cosmetic preparations. N. Eberle and I. Franke (VEB Chem. Werke Buna, Ammendorf, Germany). *Tenside* 4, 12–15 (1967). The large scale manufacture of mono/diglyceride mixtures and the composition of the resultant blends are described. These mono/diglyceride mixtures have an HLB value of about 3 and are therefore classified as water/oil emul-

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Classified Advertising

Treasurer's Report . . .

(Continued from page 293A)

Surplus	120,753.22
Total Liabilities and Surplus	$243,501.29
Surplus January 1, 1967	
American Oil Chemists' Society	$105,943.62
Journal of the American Oil Chemists' Society	23,845.53
Lipids	9,035.93
Surplus December 31, 1966	$120,753.22

Respectfully submitted,
A. F. Kapecki, Treasurer

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• *GLC Short Course . . .*

(Continued from page 252A)

Thursday, August 3

Morning Session: Chairman—Jack Gill, Varian Aerograph Co.

Column Technology—Robert Schwartz, United Gas Corporation

Relationship of Solute Structure to Retention Behavior—W. J. A. VandenHeuvel, Merck and Co.

Tentative Identification of the Components of Complex Fatty Acid Mixtures Based on Retention Data—Robert Ackman, Fisheries Research Board of Canada

Afternoon Session: Chairman—Robert Ackman, Fisheries Research Board of Canada

Quantitative Gas Chromatography in the Structural Characterization of Glyceryl Phosphatides—Arnis Kuksis, University of Toronto

Quantitative Gas-Liquid Chromatography of the Twenty Natural Protein Amino Acids—D. W. Stalling, University of Missouri

Preparative Gas Chromatography—J. A. Schmit, Hewlett-Packard Co.

Evening Session: The Use of Motion Pictures to Document Research and Analytical Procedures—Donald Macon, Baylor University College of Medicine

Friday, August 4

Morning Session: Chairman—Nicholas Pelick, Supelco, Inc.

Gas Chromatography of Hydrocarbons—Robert Schwartz, United Gas Corporation

Mass Spectrometry Coupled to Gas Chromatography—James McCloskey, Baylor University College of Medicine

Determination of the Structure of Lipids by Hydrogenation, Ozonolysis and Hydrogenolysis—Morton Beroza, USDA

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(Continued from page 266A)

sifiers. They can also be used as emulsifiers for oil/water emulsions if combined with other surfactants. Creamy, stable emulsions can be prepared in which the water content is between one-third and ten times the amount of the mono/diglyceride mixture. These emulsions can be used as the basis for various cosmetic preparations having a very soft feel and good mildness to the skin. They can also be used for deodorants, lipsticks and liquid emulsions.

PRACTICAL USES OF SURFACTANTS. F. Püschel (German Acad. of Science, Berlin, Germany). *Tenside* 4, 1–8 (1967). An extensive survey is made of the nature, properties and uses of surface active agents, with special reference to their most important fields of application: in detergent and scouring agents, in the textile, leather and paper industries, mining (flotation), in the chemical industries (as wetting, dispersing and emulsifying agents), in the plastics, paint and varnish and petroleum industries, in the preparation of lubricants and for metal working, in building, in the pharmaceutical industry, medicine and cosmetics and in the foodstuffs industry.

ENZYMATIC DETERGENTS. A. Suter (Milan, Italy). *Riv. Ital. Sostanze Grasse* 43, 581–4 (1966). A review is given of the enzyme-containing detergent products which have recently appeared and gained acceptance in the European markets. The development of proteolytic enzymes which are relatively stable to moderately high temperatures and pH has enabled detergent manufacturers to formulate washing products with greatly improved detergency.

BIODEGRADABLE SURFACTANTS FOR THE TEXTILE INDUSTRY. K. A. Booman, J. Dupre and E. S. Lashen (Rohm and Haas Co.). *Am. Dyestuff Rept.* 56, 30–6 (1967). Laboratory tests indicate that secondary alcohol ethoxylates and alkylphenol ethoxylates are biodegradable. A field study on secondary alcohol ethoxylates showed that the acclimation required for optimum degradability in laboratory tests actually occurs in the field. The use of acclimated microorganisms is very important in order to obtain meaningful laboratory biodegradation results. The most reliable test methods are those which are most closely related to actual waste treatment conditions, such as the river water die-away test or the semi-continuous activated sludge test. Where sewage treatment facilities are adequate, neither LAS, secondary alcohol ethoxylates or alkylphenol ethoxylates should cause foaming in waterways.

AQUEOUS DISPERSION OF MODIFIED DRYING AND SEMI-DRYING OILS CONTAINING WATER-SOLUBLE DRIER. F. H. W. Wachholtz and C. Korf (Rijswijk, Netherlands). *U.S. 3298,848.* An aqueous dispersion is claimed, consisting of: (a) a water dispersible, organic coating vehicle selected from the group consisting of modified drying and semi-drying oils containing carboxyl groups at least partially neutralized with a nitrogen containing base, the vehicle being highly dispersed in water and capable of oxidative polymerization, and (b) a water soluble drier, consisting of a compound of a heavy metal such as iron, cobalt, nickel, vanadium, chromium, manganese, copper, zirconium and molybdenum. The amount of the water soluble metal compound in the dispersion is such that the metal constitutes from 0.01 to 3% by wt. of the coating vehicle.

DETERGENT COMPOSITIONS. L. I. Osipow, F. J. Brashear and W. Rosenblatt (State of Nebraska). *U.S. 3,305,488.* A detergent composition is claimed, consisting essentially of 4–50% organic detergents, 0–96% inorganic alkaline builders and carboxymethylcellulose and 0–96% water. The organic detergent consists of 25–75% of a 10-hydroxy-stearate soap, the remainder being either an anionic or a nonionic organic non-soap detergent.

PRODUCTION OF ALKALI METAL ALKYL SULFONATES. R. T. Adams and E. E. Johnson (Chevron Res. Co.). *U.S. 3,306,931.* A process for preparing alkali metal sulfonates comprises continuously feeding terminal olefins with 10 to 20 C atoms, aqueous alkali metal bisulfite and a 2-propanol-water solvent to a reaction zone. The preferred composition ratios in the feed are: bisulfite to olefin, 4:5 to 2:1 (molar); 2-propanol-water solvent to olefin, 4:1 to 5:3 (wt.); 2-propanol to water, 1:4 to 9:4 (wt.). The reaction is conducted at 80–200F and a pH of 5 to 8, while passing an oxygen-containing gas through the reacting mixture and mixing to provide a homogeneous reaction system, and while continuously withdrawing alkali metal alkyl sulfonate from the reaction zone.

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