ABSTRACTS

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

• Fats and Oils

QUANTITATIVE THIN LAYER CHROMATOGRAPHY. MICRODENSITOMETRY. E. Vioque and A. Vioque (Inst. de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **15**, 125–128 (1964). A quantitative microdensitometric procedure is described in which a 35 mm negative picture of the spots on a thin layer chromatogram is scanned by a recording microphotometer. The method was applied to a model mixture of fatty acids and to a model mixture of cholesterol esters, triglycerides, fatty acids, cholesterol, and phopholipids.

THE STABILITY OF OILS AND FATTY FOODS. III. FACTORS AFFECTING THE STABILITY OF RICE BRAN OIL. M. H. Chahine and A. S. Radwan (Nat. Res. Center, Ministry of Scientific Res., Dokki, Cairo, Egypt). *Grasas y Aceites* **15**, 129–140 (1964). (In English). The effect of bran heat treatment, refining, hydrogenation, deodorization, and free fatty acid content on the oxidative stability of rice bran oil was studied. The antioxidant properties of propyl gallate, NDGA, and ethoxyquin were compared at the 0.05% level in both the oil and its methyl esters. Stability was measured by following the rise in peroxide value during 60C storage. Propyl gallate was the most effective antioxidant for oil from unheated bran while NDGA was most effective with oil from heat-treated bran. Hydrogenation, deodorization, and free fatty acid level did not alter the relative effectiveness of the various antioxidants.

ISOLATION OF THE METHYL ESTER OF AN ALL-CONJUGATED ACID FORMED DURING THE ALKALI-ISOMERIZATION OF OCTADECATETRAENOIC ACID AND ITS POSITIONAL ISOMERS. Kazuo Fukuzumi and Takero Miyakawa (Nagoya University). *Kogyo Kagaku Zasshi* **67**, 2065–9 (1964). $\Delta^{6,9,12,15}$ Methyl octadecatetraenoate was prepared from mackerel pike oil, and then alkali-isomerized. From this mixture, the methyl ester of all-conjugated octadecatetraenoic acid was isolated by the urea-complex procedure, and its ultraviolet and infrared spectra were determined. Analysis was performed by GLC to determine the compositions of the dibasic and monobasic acids products obtained by the oxidative ozonolysis of the methyl ester. It has been concluded from the gas-liquid chromatograms that various position isomers are present in the methyl ester of all-conjugated octadecatetraenoic acids.

SHIFTING OF THE DOUBLE BOND IN METHYL EICOSAPENTAENOATE DURING HYDROGENATION. Kazuo Fukuzumi, Suketaka Ito and Hiroshi Yamamoto (Nagoya University). *Kogyo Kagaku Zasshi* **67**, 1240–3 (1964). $\Delta^{5,8,11,14,17}$ Methyl eicosapentaenoate was hydrogenated at room temperature by using palladium black as a catalyst and tetrahydrofuran as a solvent. Geometrical and positional isomers were determined using infrared spectroscopy and GLC. The monobasic and dibasic acids obtained by oxidative ozonolysis of the hydrogenated samples were analyzed by GLC in order to study on the shift of the double bond during the hydrogenation. It has been ascertained that the double bonds migrate appreciably, that the double bond at the 5 position does not migrate towards the ester carbonyl group, and that the $=CH-CH_2-CH_2-CH=$ group is not present in the hydrogenated products.

MONOMERIC DIHYDROPEROXIDE CONCENTRATES OBTAINED FROM AUTOXIDIZED PRODUCT OF METHYL DOCOSAHEXAENOATE. Kazuo Fukuzumi, Takero Miyakawa and Hidenori Morohira (Nagoya University). *Kogyo Kagaku Zasshi* **67**, 2070–3 (1964). Methyl docosahexaenoate of 97% purity was prepared from mackerel pike oil and its autoxidation products were concentrated by the countercurrent extraction procedure. By partition chromatography, the autoxidized concentrates were separated into three fractions. From the first fraction, methyl docosahexaenoate monomeric dihydroperoxide cencentrates were obtained for the first time, although the presence of the dihydroperoxide had been previously ascertained. The dihydroperoxide concentrates were identified by peroxide value, molecular weight, and ultraviolet and infrared spectra. The *trans-trans* conjugated dienes and *cis* nonconjugated double bonds absorptions appear as relatively strong bands, but the *cis-trans* conjugated one is weak.

RHEOLOGICAL PROPERTIES OF THE TWO-COMPONENT SYSTEM OF GLYCERYL TRISTEARATE AND GLYCERYL TRIOLEATE. Eiichi Fukada (Inst. Physical and Chem. Res., Tokyo) and Mitsunobu Masuzawa. *J. Soc. Materials Sci., Japan* **13** (128), 325–330 (1964). The rheological properties of mixture of glyceryl tristearate and glyceryl trioleate were investigated in comparison with their microstructure revealed by X-ray diffraction. The flow curves of various mixtures were measured by a Weissenberg rheogoniometer and the temperature dependence of viscoelasticity was studied by a forced oscillation apparatus. Two specimens were prepared. One is a simple mixture of triolein and tristearin, and the other is a mixture of tristearin and triolein which is melted and recrystallized at 0C. In each mixture the fraction of tristearin is from 5 to 45% by weight. All the flow curves for mixtures of 5 to 25% tristearin were typically non-Newtonian. The shear rate dependence of viscosity was much larger for the suspension body. The mixtures of 25 to 40% tristearin show entropy elasticity, that is, the elastic modulus increases with the rise of temperature and that a 45% tristearin mixture shows energy elasticity, that is the elastic modulus decreases with the rise of temperature. It is assumed that a network structure is present having cross-linked molecular chains such as exists in rubber. A number of small crystallites of tristearin would produce the cross-linking points. Heat treatment profoundly alters the physical properties of mixtures. Observation by X-ray diffraction shows that the degree of crystallinity increases slightly after the heat treatment and also that the habit of crystals changes from β type to β' type.

HYDROGENATION OF FATS: A REVIEW OF WORKS ACCOMPLISHED IN THE SOVIET UNION. B. Solomon (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* **11**, 605 (1965). This is a review of the current work done in Russia, particularly of B. N. Tjutjunnikov, *et al.* The review covers hydrogenation catalysts (preparation, activity, elaidizing effect, influence on hydrolysis and the formation of odors), hydrogenation selectivity, and the hydrogenation of oils for margarine (rapeseed, cottonseed, sunflower, corn, sorghum and whale).

TOCOPHEROL RELATIVE TO MARGARINES. M. Loury and Colette Bloch (Lab. J. Ripert, Inst. Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* **11**, 591 (1964). As a means of detecting adulteration of buttter with margarine, the authors suggest that soybean oil tocopherols be added to all margarines. The detection of adulteration would be a simple matter for most laboratories. The addition of tocopherols offers an added advantage since they would serve as an antioxidant.

COMPOSITION OF THE STEROL AND TERPENE FRACTIONS OF LIPIDS EXTRACTED FROM DIFFERENT PARTS OF THE THEOBROMA CACAO BEAN. M. Capella, E. Fedeli, M. Cirimele and H. Chaveron (Stazione Sperimentale Olii e Grass, Milan, Italy). *Rev. Franc. Corps Gras* **11**, 583 (1964). The terpene and sterol fractions of the unsaponifiable from fat extracted from hulls, sprants and cacao kernels have been separated by thin layer chromatography and analyzed by gas-liquid chromatography. The sterol fractions of three of the unsaponifiables studied are qualitatively identical. They contain beta-sitosterol, stigmasterol and campesterol. The terpene fractions offer greater differences. Phytol is the only respresentative of diterpenes. It was not found in the unsaponifiables from the hulls but was present in the other 2 unsaponifiables. The triterpenes of the sprant and kernel unsaponifiables are composed of cycloartenol, 24-methylene-cycloartenol and an unidentified terpene. The hull unsaponifiable contains only cycloartenol.

PHOSPHONOLIPIDS. E. Baer and N. Z. Stanacev (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Ontario, Canada). *J. Biol. Chem.* **239**, 3209–14 (1964). The first synthesis of a complex lipid containing phosphonic acid is reported. The phosphonolipid, *viz.* dipalmitoyl L-α-glyceryl (2-aminoethyl) phosphonate, was obtained in an over-all yield of approximately 40%, by the phosphonylation of D-α,β-dipalmitin with 2-phthalimidoethylphosphonic acid mono-chloride in the presence of triethylamine, and removal of the protective phthaloyl group of dipalmitoyl L-α-glyceryl (2-phthalimidoethyl) phosphonate by hydrazinolysis in 90% ethanol. The procedure is generally applicable to the synthesis of L-, D-, and DL-α-phosphonic acid analogues of cephalins containing either saturated fatty acids, unsaturated fatty acids, or both. Their stereochemical relationship to D- and L-glycer-aldehyde has been established. The preparation of 2-phthalimidoethylphosphonic acid and its monochloride is described.

GAS CHROMATOGRAPHY OF FREE FATTY ACIDS. J. G. Nikelly (Dept. of Chem., Philadelphia College of Pharmacy and Science, Philadelphia, Pa. 19104). *Anal. Chem.* 36, 2244–48 (1964). Most free fatty acid homologs and isomers from C_2 through C_{18} can be completely separated with little or no peak tailing on columns made with a polar liquid phase and an acidic additive coated on acid-washed glass microbeads. Washing the glass microbeads with dilute acid and using isophthalic acid in the liquid phase reduces or eliminates the adsorption and dimerization of the fatty acids. The columns can be operated isothermally or with temperature programming up to 180C to 190C.

GAS CHROMATOGRAPHIC SEPARATION OF 2,4-DINITROPHENYLHYDRAZONE DERIVATIVES OF CARBONYL COMPOUNDS. R. J. Soukup, R. J. Scarpellino, and Ellen Danielczik (Jell-O Research Laboratories, General Foods, Corp., White Plains, N. Y.). *Anal. Chem.* 36, 2255–56 (1964). Direct gas liquid chromatography of the 2,4-dinitrophenylhydrazone derivatives of a variety of carbonyl compounds has been accomplished using SF-96 (100) silicone oil as a liquid phase at temperatures from 200 to 250C. The compounds include alkyl phenyl ketones, alkyl aldehydes and ketones up to C_{12}, some terpene aldehydes and ketones, and aromatic aldehydes. The reagent, itself, does not interfere and recrystallization of the derivatives is not necessary.

FOAMING TENDENCIES OF FRYING OILS. V. FACTORS AFFECTING THE CHANGE IN FRYING PROPERTIES. Shizuyuki Ota, Akira Mukai, Naoki Iwata, Iwao Yamamoto, and Masaharu Morita (Food. Res. Labs., Ajinomoto Co., Tokyo). *Yukagaku* 13, 471–7 (1964). Linseed oil, safflower oil, olive oil, palm oil, soybean oil, rapeseed oil and castor oil (50 or 100 g. each) were heated in 300-cc. beakers at 200C or 220C for about 10 hours. In intervals of 30 minutes, a piece of potato was dipped into the oil and the state of foaming was recorded. Samples covered with one-half surface with foams were designated as half-foaming oils, and those covered with whole surface were designated as the whole-foaming oils. The viscosities of those samples were determined at 25 and 200C. Those foaming oils were fractionated by column chromatography into 3 fractions, using silica gel treated with *n*-hexane containing 5% isopropyl ether as the adsorbent. The foaming oil samples were eluted with 15% isopropyl ether in hexane to give the first fraction (F_1), 60% isopropyl ether in hexane to give the second fraction (F_2), and with ethyl ether to give the third fraction (F_3). Fraction F_3 was mainly composed of oxidative-polymers and was the main substance which caused foaming of thermally oxidized soybean oil in the preceding report. The rate of increase in viscosity was varied according to the type of oils and the heating conditions. In case of the same kind of oil, samples having the same viscosity showed the same foaming tendency, even though prepared under different conditions. The samples which showed the same foaming tendency but originated from different oils did not show the same viscosities. Thus, there was no relation between the rate of increase in viscosity or the absolute value of viscosity at 200C and the foaming tendencies of various oils. The half-foaming oils originating from various oils contained 8–10% of F_3 fraction and the whole-foaming oils contained 12–14% of F_3 fraction.

VI. PROTERTIES OF OXIDATIVELY POLYMERIZED FRACTIONS IN FOAMING OILS. Shizuyuki Ota, Naoki Iwata, Akira Mukai, and Masaharu Morita. *Ibid.*, 595–9. The foaming properties and the chemical properties of oxidized-polymerized fractions in foaming oils and their contents which caused durable foaming of oil by frying have been investigated. Linseed oil, soybean oil and olive oil (100 g. each) were heated for 4, 8 and 13 hours at 200C in 300-cc. beaker. These foaming oils were fractionated as described previously into 3 fractions. The chemical properties such as carbonyl, acid and hydroxyl values, and mean molecular weight fractions of F_1, F_2 and F_3 were measured. The F_2 and F_3 fractions from thermally oxidized linseed oil and olive oil were added to the original oils in various amounts, then the foaming tendencies of these oils were measured. The measurement of foaming tendencies was carried out by gas pumping method as in the preceding report. They were only small variations in the foam-foaming properties and in chemical properties of the F_3 fractions. The properties of F_2 fractionated from various oils also resembled each other and the foaming properties of F_2 were weaker than that of F_3. The F_1 fractionated from various oils showed no foaming tendency.

VII. THE INFLUENCES OF HEATING CONDITIONS ON THE DETERIORATION OF FRYING OILS. Shizuyuki Ota and Iwao Yamamoto. *Ibid.* 651–6. The factors which affect the rate of deterioration of oil during the deep fat frying, such as degree of heating, amount of steam blown into oils, kind of gases passed in oils and the kind of metal used as frying pans, have been investigated. For comparison of the effect of difference in amount of steam blown into oils, 700 or 1000 g. of soybean oil in iron frying pan was heated for 2.5 hours at 240C, the steam was blown in through a porous glass filter. The more steam was blown in, the higher was the deterioration of oil. Blowing of air and oxygen into oil affected greatly the rate of deterioration of oil, while blowing of steam or heating in the absence of air seemed to prevent the deterioration of oil. In the studies on the factors resulting from contamination of the oil by the fried soybean curd, tofu, there was practically no effect on the deterioration of oil except the color. Iron, stainless steel and aluminum frying pans showed no significant difference in the rate of deterioration of oil. A copper pan increased color and flavor deterioration.

CATALYTIC ACTION OF TRANSITION METAL CARBONYLS. III. CATALYTIC ACTIVITY IN IRON PENTACARBONYL IN THE HYDROGENATION OF UNSATURATED ALIPHATIC COMPOUNDS. Ikuei Ogata and Akira Misono (Univ. Tokyo). *Yukagaku* 13, 644–50 (1964). Hydrognation by iron pentacarbonyl in a homogenous system is discussed. The reduction of monoëne proceeds at the same initial rate as that of the diene. The catalyst is decomposed more rapidly in monoëne. It seems reasonable to assume that the π-diene iron tricarbonyl complex is not an essential type of catalyst but a stabilized type of catalyst species. The value for activation energy at about 60 kcal at 180–200C suggests that the rate determining step in this hydrogenation is thermal- and partial-decomposition of stable iron pentacarbonyl. The hydrogenation is strongly obstructed by addition of pyridine or fatty acid and only isomerization is accelerated. In the latter case, the catalyst is decomposed into iron soap. The effect of hydroxyl groups is not great. It is reasonable to assume that the active catalyst species is a type of $Fe(CO)_3$ which then takes up hydrogen from proper source such as molecular hydrogen or active methylene groups, and acts as iron carbonyl hydride, $H_2Fe(CO)_3$. Colloidal iron formed by the thermal decomposition of iron pentacarbonyl in saturated fatty acid ester at 250C displayed no catalytic activity.

FATTY ACID CONSTITUENT OF SENDAN (MELIA JAPONICA) SEED OIL FROM TOSA PROVINCE. Nenokikichi Hirao, Hiromu Kameoka, and Rikio Yamamoto (Kinki Uni., Osaka). *Yukagaku* 14, 51–4 (1965). The seeds contained 4.7% oil with d_4^{25} 0.9625, n_D^{25} 1.4796, acid no. 8.3, saponification no. 223.4 and iodine no 80.6. Saponification of the oil yielded 70% mixed acid, d_4^{30} 0.9369, n_D^{30} 1.4743, neutralization no. 213.6 and iodine no. 96.4. The presence of caprylic, capric, lauric, myristic, palmitic, stearic, oleic and linoleic acids was confirmed.

MANDARIN, WISTERIA AND HORSE-BEAN SEED OILS. Shigeru Hamada and Shei-ichi Ueno. *Yukagaka* 14, 23–4 (1965). Constants and properties of seed oils from mandarin (*Citrus aurantium* var. Unshu), wisteria (*Kraunihia floribunda*), and horse-bean (*Canarallia formis*) in order named were: d_4^{15} 0.9199, 0.9237, —; n_D^{20} 1.4717, 1.4730, 1.4779; acid no., 1.64, 2.52, 44.1; saponification no. 191.3, 195.8, 174.8; iodine no., 105.4, 114.4, 113.2; % of unsaponifiable substance, 1.22, 1.24, 11.11. Constants of unsaponifiable matter: m.p. 124.5–128.5C, 121–4C, 124–30C; iodine no. —, 146.3, 100.4. Saturated acid %: 57.04, 54.27, 66.22; unsaturated acid %: 42.97, 45.73, 33.38.

ESTIMATION OF THE IODINE VALUE WITH BROMINE CHLORIDE. Senjiro Maruta and Masako Shimizu (Inst. of Chem., Yamanashi Univ.). *Yukagaku* 13, 465–8 (1964). Weighed amount of water-soluble α,β-unsaturated acid (crotonic acid, acrylic acid, methacrylic acid and maleic acid) is taken in a glass flask, 5 cc water added, a reagent (2.7835 g potassium bromate and 3.9670 g potassium bromide made up to 1 liter with water) equivalent to 100–400% more than expected absorption of halogen added, acidified with hydrochloric acid, kept in the dark tightly stoppered, shaken for 5 minutes, 10 cc of 10% potassium iodide added and titrated with 0.1*N* sodium thiosulfate. Similarly, a water-insoluble sample such as cinnamic acid dissolved in 5–10 cc chloroform or carbon tetrachloride is treated with 10 cc bromine chloride-acetic acid solution and allowed to stand 1–120 minutes. Samples and iodine values came out as follows: crotonic acid, 295.5; acrylic acid, 304.9; methacrylic acid, 277.9; maleic acid, 212.3; cinnamic acid, 170.0; oleic acid, 82.6; methyl erucate, 72.1; olive oil, 82.5; rapeseed oil, 104.5 and sesame oil, 118.4.

LIPID OF EUPHAUSIACEA, EUPHAUSIA SUPERBA. II. PROPERTIES OF PHOSPHOLIPIDS. Hideo Tsuyuki, Uhei Naruse, Atsushi Mochizuki, and Shingo Ito (Dept. of Agr. and Veterinary Med., Nihon Univ., Tokyo). *Yukagaku* 13, 477–80 (1964). Properties of the phospholipids contained in *E. superba* from stomach of finback whale in the Antarctic Ocean were studied from the viewpoint of utilization of macroplankton. Mixed fatty acids from the phospholipids were identified by paper chromatography as their 2,4-dinitrophenylhydrazones for the saturated acids, and as their mercuric acetate complexes for the acids of greater unsaturation. Paper chromatography indicated the presence of myristic, palmitic, stearic, arachidic, behenic, palmitoleic, oleic, eicosenoic, docosenoic, linoleic and linolenic acids in the phospholipids. Silica gel column chromatography and silicic acid paper chromatography showed the presence of polyglycerophosphoric acid, phosphatidyl ethanolamine, phosphatidyl choline, phosphatidyl serine, sphingomyelin, and monophosphoinositide in the phospholipid fraction.

COLOR REVERSION OF REFINED AND DEODORIZED SOYBEAN OIL. II. CHARACTERISTICS FOR THE ILLINOIS SOYBEANS OF 1963 CROP. Sakan Tomita, Mamoru Komoda, Shin-ichi Enomoto and Noriji Onuki (Sugiyama Chem. Research Inst., Tokyo). *Yukagaku* 13, 530–3 (1964). The color reversion was very slight in refined and deodorized soybean oil, prepared by extraction with hexane from the 1963 crop of Illinois soybeans. The cause of this may be due to a low moisture content of 9.77% with severe drought during the growth and harvesting period. When soybeans of 9.77% moisture content are moistened to contain 13.8–14.0% water, color reversion becomes conspicuous. In case of dehydration of domestic soybeans with 13.8% moisture content to 10.1–10.3%, the maxiumu color developed on reversion was decreased considerably.

THERMAL DECOMPOSITION PRODUCTS OF CITRIC ACID ADDED INTO THE VEGETABLE OILS AND THEIR EFFECT ON THE STABILITY. Shinroku Masuyama, Kazuo Horikawa, and Satoru Yasuhara (Osaka Munic. Tech. Research Inst., Osaka). *Yukagaku* **13**, 533–43 (1964). The aqueous solution of citric acid was added into the vegetable oils (cottonseed oil and soybean oil) and heated at 180–240C and the products were tested by paper chromatography with chloroform-acetic acid-water solvent (volume ratio 30:15:1.2). Citric acid decomposed to citraconic anhydride through aconitic acid and itaconic acid by heating for 30 minutes at 180C. On heating at 240C, citric acid disappeared after 10 minutes and only a small amount of citraconic anhydride was detected after 30 minutes. No citric acid was detected after 30 minutes during the deodorization in vacuo at 210C with steam blowing. The stabilities were tested by A.O.M. for the oil added with citric acid before and after the deodorization. The A.O.M. stability was higher for the oil treated with the acid after the deodorization. In case of addition of the acid before the deodorization, itaconic anhydride formed which was ineffective as antioxidant.

STUDIES ON THE DETERIORATION OF FRYING OILS. VII. CHANGES IN THE CARBONYLS WITH ADVANCING DETERIORATION OF FRYING OILS. Hisashi Kumazawa (Nagoya Municipal Hyg. Inst., Nagoya, Japan). *Yukagaku* 13, 537–43 (1964). The change of carbonyls occurring in the frying with soybean oil at 190C has been investigated. The column and thin-layer chromatographic methods were employed for separation and identification of the carbonyls. Before the appearance of deterioration of oil by frying, the major portions of carbonyls were C_4, C_6 and C_{10-12}, but C_3, C_5 and C_7 carbonyls were formed as the deterioration of oil occurred. These monocarbonyls constituted only 20–30% of the total; the remainder were higher carbonyls formed from the glyceride. In the earlier stage of oxidation, the amount of saturated carbonyls was significantly larger than unsaturated but the unsaturated carbonyl content increased in the oil during oxidation. In the aeration test, the formation of unsaturated C_3 to C_7 carbonyls increased in both splashed oil and residual oil with the progress of oxidation. The carbonyls in splashed oil were 16–23% of the total and considerable amount of volatile carbonyls (20–28%) was detected in the oil.

MELTING POINTS OF JAPANESE MARGARINES AND SHORTENINGS. Isao Niiya and Taro Matsumoto (Japan Margarine & Shortening Makers Assocn., Tokyo). *Yukagaku* 13, 544–9 (1964). The melting points of products were measured monthly on 18 kinds of household margarine, 14 kinds of bakery margarine, and 14 kinds of shortening. The mean value (x), the maximum and minimum values range (R) and yearly standard deviation (δ) were calculated and these values were found to be the highest in shortening, followed in the order of bakery and household margarines, the value being x 35.55C, 34.55C, 33.52C, R 12.45, 11.24, 10.24C, and δ 4.13, 3.77, 3.29, respectively. Some of the household margarines showed hardly any difference in the melting point throughout the year. The salt content, saponification value, iodine value, and thiocyanate value were also measured.

FOAMS AND EMULSIONS—FORMATION, PROPERTIES, AND BREAKDOWN. J. J. Bikerman (Horizons, Inc.). *Ind. Eng. Chem.* **57**(1), 56–62 (1965). A descriptive survey of these phenomena, how to generate and destroy them, how they behave, and how they change with time. Foams are dispersions of a relatively large volume of gas in a relatively small volume of liquid. From the point of view of formation, there are three classes of emulsions: critical emulsions, emulsions produced by condensation, emulsions produced by dispersion.

GAS CHROMATOGRAPHIC SEPARATION OF 2,4-DINITROPHENYLHYDRAZONE DERIVATIVES OF CARBONYL COMPOUNDS. R. J. Soukup, R. J. Scarpellino, and Ellen Danielczik (Jell-O Res. Laboratories, General Foods Corp., White Plains, N. Y.). *Anal. Chem.* **36**, 2255–56 (1964). Direct gas liquid chromatography of the 2,4-dinitrophenylhydrazone derivatives of a variety of carbonyl compounds has been accomplished using SF-96 (100) silicone oil as a liquid phase at temperatures from 200 to 250C. The compounds include alkyl phenyl ketones, alkyl aldehydes and ketones up to C_{12}, some terpene aldehydes and ketones, and aromatic aldehydes. The reagent, itself, does not interfere with GLC and recrystallization of the derivatives is not necessary.

(Continued on page 254A)

(Continued from page 246A)

• Fatty Acid Derivatives

Investigations in the field of lipids. XXV. Synthesis of mixed vinyl ethers of the fatty series. E. N. Zvonkova, Yu. I. Semenova, L. I. Gus'kova, I. K. Sarycheva, and N. A. Preobrazhenskii (M. V. Lomonosov Moscow Inst. of Fine Chem. Technol.). *J. Gen. Chem.* (U.S.S.R.) 34 (11), 3659–62 (1964). Palmitic and stearic aldehydes were synthesized as starting materials for making mixed vinyl ethers. The diethyl acetals of both aldehydes were obtained by heating them with alcohol and orthoformic ester in the presence of toluene sulfonic acid. Conversion to the vinyl ethers was by distilling the diethyl acetals *in vacuo* with the addition of an acid catalyst. The structures of the resulting vinyl ethers were confirmed by comparing their infrared spectra with spectra of the corresponding acetals.

Epoxidation of 2-alkenylimidazolines. Toshiya Kataoka and Hiroshi Kakiuchi (Nissin Oil Mills, Yokohama, and Dept. Applied Chem., Yokohama Natl. Univ.). *Yukagaku* **13**, 642–4 (1964). Olive oil fatty acids, b_2 188–90C, neutralization no. 199.2 and iodine no. 90.2 and containing 5% palmitic acid, trace of palmitoöleic acid, 2.9% stearic acid, 83.8% oleic acid, 8.3% linoleic acid and trace of linolenic acid, and safflower oil fatty acids, b_3 194–8C, neutralization no. 199.7, iodine no. 157.6 and containing 3.4% palmitic acid, 1.5% stearic acid, 16.0% oleic acid, 9.1% linoleic acid and trace of linolenic acid were used as raw materials. 2-Alkenylimidazolines were formed from these by E. Waldmann's method. The yield of olive imidazoline was 98.3% with m.p. 54.5–60C, iodine no. 80 and nitrogen content 9.3%. The yield of safflower imidazoline was 98.8% with m.p. 41.5–6.0C, iodine no. 130 and nitrogen content 9.5%. Each of these two alkenylimidazolines was epoxidized with 7.5% peracetic acid-acetic acid solution as 30C. Oxiran oxygen content of epoxidized olive imidazoline was 4.3% (degree of epoxidation 90%) and that of epoxidized safflower imidazoline was 3.5% (degree of epoxidation 46%).

Studies on higher alcohols. III. Separation of the saturated and unsaturated alcohols by mercuric acetate adduct method. Akira Hashimoto, Kazuaki Shiro and Katsunori Mukai (Univ. of Osaka Pref. Coll. of Agr., Osaka, Japan). *Yukagaku* **13**, 586–9 (1964). Experiments were carried out with three groups of samples, mercuric acetate-adducted oleyl alcohol and stearyl alcohol, the adducted oleyl acetate and stearyl acetate, and the adducted sperm whale alcohol, using silica gel G as the adsorbent, and benzene, toluene, xylene and other solvents as the developing agents. Benzene, toluene and xylene were better developers than the other solvents tested. Acetylated alcohols gave better separation of saturated and unsaturated alcohols than untreated ones. Silica gel G was found to be a suitable adsorbent for this purpose.

• Biochemistry and Nutrition

Response of the liver to prolonged protein depletion. V. Neutral glycerides and cholesterol; production of fatty livers by certain amino acids fed in a protein-free ration. J. N. Williams, Jr. and Alice Hurlebaus (Nat'l. Institute of Arthritis and Metabolic Diseases, Nat'l. Institutes of Health, Bethesda, Md.). *J. Nutr.* **85**, 73–81 (1965). The influence of prolonged protein deprivation followed by protein repletion in the adult male rat upon liver neutral glycerides and cholesterol was studied. Neutral glyceride and cholesterol concentration increased for 8 weeks. Thereafter neutral glycerides decreased to normal and cholesterol to below normal after 14 weeks of deficiency. Attempts to alleviate the slightly fatty liver produced in the simple protein deficiency by including 0.3% DL-methionine in the protein-free ration produced a marked increase in these liver lipids. These excessive accumulations also reached a maximum after 8 weeks, followed by a decline towards normal. Reintroduction of protein into the rations at the terminal stages of protein deficiency caused a rebound of neutral glycerides and cholesterol to far above normal. Omission of the dietary source of lipids (corn oil) had no effect on the excessive accumulation of neutral glycerides or cholesterol produced by methionine in the protein-free ration.

VI. Total phospholipids and plasmalogens, and protection of phospholipids by methionine and cystine. *Ibid.*, 82–88. Adult male rats maintained with a protein-free ration for 100 days progressively lost phospholipids from the liver cells. The presence of 0.3% DL-methionine in the protein-free ration prevented maximal loss of cellular phospholipids. Plasmalogens were also lost during depletion but not to as great an extent as total phospholipids. Inclusion of methionine in the protein-free ration had no effect on the loss of plasmalogens, in contrast with the effect on total phospholipids. It was shown that the loss of plasmalogens was due entirely to the lowered food intake in protein deficiency, again in contrast with the total phospholipids. Study of other amino acids added individually to the protein-free ration for 8 wks. indicated that only methionine and cystine protected against loss of phospholipids.

Malate-vitamin K reductase, a phospholipid-requiring enzyme. A. Asano, T. Kaneshiro and A. Brodie (Dept. of Microbiol., Univ. S. California School of Med., Los Angeles, Calif.). *J. Biol. Chem.* **240**, 895–905 (1965). Fractionation of crude lipids from *Mycobacterium phlei* over a silicic acid column revealed the presence of two active fractions. One was active when tested as a mixed micelle with Asolectin and corresponded to vitamin K_9H. The other fraction was not active with Asolectin, but was active when added in micelles with vitamin K_1. The latter fraction was shown to contain phospholipids by phosphorus analysis, thin layer chromatography, and infrared spectroscopy. The effectiveness of phospholipid compounds for enzymatic activity was also studied with purified phospholipids from other sources. All the methods of enzymatic assay indicated a requirement for low concentration of phospholipids.

The β-galactoside permease system and the metabolism of phospholipids in Escherichia coli. A. Tarlov and E. Kennedy (Dept. of Biological Chem., Harvard Med. School, Boston, Mass.). *J. Biol. Chem.* **240**, 49–53 (1965). The effect of the functioning of the β-galactoside permease system on the metabolism of phospholipids in resting cells of *Escherichia coli* strains ML 30 and 308 has been investigated. In confirmation of a previous report by Nikaido, the uptake of β-galactosides is accompanied by an increased labeling of glycerophosphatides from P_i^{32} in the medium. Further investigation, however, has revealed that the effect is not specific for P_i^{32} but can also be demonstrated with serine-3-C^{14} and glycerol-1,3-C^{14}. The uptake of galactosides by these resting cells is accompanied by a transitory general increase in phospholipid synthesis, presumably as a result of the relaxation of intracellular control mechanisms.

Effect of thiamine deficiency and thiamine repletion on neutral glyceride, total and free cholesterol, phospholipids, and plasmalogens in rat liver. B. Miller, C. Anderson, G. Vennart, J. Williams, Jr. and C. Piantadosi (Depts. of Biochem. and Pathology, School of Med., Univ. of N. C., Chapel Hill, N. C.). *J. Nutr.* **85**, 21–28 (1965). Intraperitoneal injection of 1 mg thiamine in severely thiamine-deficient rats is followed by a 3- and 20-fold elevation of liver total cholesterol and neutral glycerides, respectively. These elevations continue up to 8 and 20 times normal after a second thiamine injection. Phospholipid levels per gram of liver or per 100 g of body weight fall to below normal during development of thiamine deficiency. After a single thiamine injection, phospholipids tend to return to normal, whereas plasmalogens increase to far above normal levels. A second injection of thiamine decreases phospholipids to below normal, which then return nearly to normal. Plasmalogens return nearly to normal without fluctuating after a second thiamine injection.

Effect of season and stage of lactation on certain polyunsaturated fatty acids of milk fat. Carolyn Boatman, D. Hotchkiss, and E. Hammond (Dept. of Dairy and Food Industry, Iowa State Univ., Ames). *J. Dairy Sci.* 48, 34–37 (1965). Milk samples from individual cows selected to represent various stages of lactation were analyzed monthly over a year by the alkali isomerization-spectrophotometric and lipoxidase procedures for their polyunsaturated fatty acid content. Linoleate was found to decrease during the first few months of lactation. Other polyunsaturated fatty acids did not vary with stage of lactation. Linoleate decreased when the cows were put on pasture. Nonconjugated trienoate and conjugated dienoate increased when the cows were on pasture.

Plasma and liver cholesterol levels in chicks fed medium chain triglycerides (MCT) and cholestyramine. C. H. Whiteside, H. B. Fluckiger and H. P. Sarett (Dept. of Nutritional Research, Mead Johnson Res. Center, Evansville, Ind.). *Proc. Soc. Exp. Biol. Med.* 118, 77–79 (1965). Substitution of medium chain triglycerides (MCT) for coconut oil in a 15% fat diet fed to young chicks resulted in a lower plasma and liver cholesterol levels, lower liver fat levels, and less body weight gain than were observed in chicks continued on the coconut oil diet. Plasma cholesterol was lower with corn oil than with MCT, but liver cholesterol was lower with MCT. Addition of cholestyramine to these diets reduced plasma and liver cholesterol levels with each of the dietary fats, but reduced liver fat only with the diet containing MCT. Cholestyramine did not significantly affect body weight gains.

Phosphonolipids of fresh milk and of sterile whole milk concentrate. H. W. Sprecher, F. M. Strong, and A. M. Swanson (Depts. of Biochem. and Dairy and Food Industries, College of Agric., Madison, Wis.). *J. Agr. Food Chem.* 13, 17–20 (1965). Phospholipids obtained from whole milk were fractionated into cephalin, lecithin, sphingomyelin, and a minor inositol-containing component. The fatty acid composition of the various constituents was determined by gas chromatography. Phospholipids, isolated from sterilized milk concentrate which had developed a pronounced stale flavor, contained about 3-times the amount of phosphorus present initially in the inositol-containing lipid. Close agreement of the fatty acid composition with that found in the phospholipids from fresh whole milk indicates that the staling reaction does not involve oxidative attack on phospholipid unsaturated fatty acids.

Phospholipids II. Synthesis of dialkyl L-α-glyceryl-(2-aminoethyl) phosphonates. E. Baer and N. Z. Stanacev (Banting and Best Dept. of Med. Res., Univ. Toronto, Toronto 5, Ontario, Canada). *J. Biol. Chem.* 240, 44–48 (1965). Several diether phosphonolipids, members of a new class of complex, phosphorus-containing lipids with a structural resemblance to cephalins, have been synthesized. They were obtained by esterifying 2-phthalimidoethylphosphonic acid via its monochloride with the respective D-α, β-di-O-alkyl glycerol in the presence of triethylamine, and removing the protective phthaloyl group of the dialkyl L-α-glycerol-(2-phthalimidoethyl) phosphonate by hydrazinolysis. The preparation of the ditetradecyl-, dihexadecyl-, and dioctadecyl L-α-glycerol-(2-aminoethyl)-phosphonates is described. They are highly stable compounds which, in contrast to ester glycerol phospholipids, require strong mineral acids and temperatures above 80F for their hydrolysis.

Metabolism of acetate by sheep liver homogenates. E. D. Mayfield, J. L. Smith, and B. C. Johnson (Dept. of Animal Science, Univ. of Ill., Urbana). *J. Dairy Sci.* 48, 93–98 (1965). The metabolism of acetate has been studied in sheep liver homogenates. Contrary to previous reports, acetate was oxidized by fresh liver homogenates, and acetyl-CoA was oxidized by both fresh and frozen-stored liver homogenates in the presence of the cofactors NAD and carnitine. With these two cofactors, oxidation plateaus after 20–30 min. unless a 4-carbon TCA cycle acid, such as succinate, is present as a primer, in which case the straight line rate of oxygen uptake continues for 60–80 min. Direct measurement of acetyl-CoA formation showed this to be the limiting step in utilization of acetate by sheep liver, and the step lost in frozen-stored liver homogenates.

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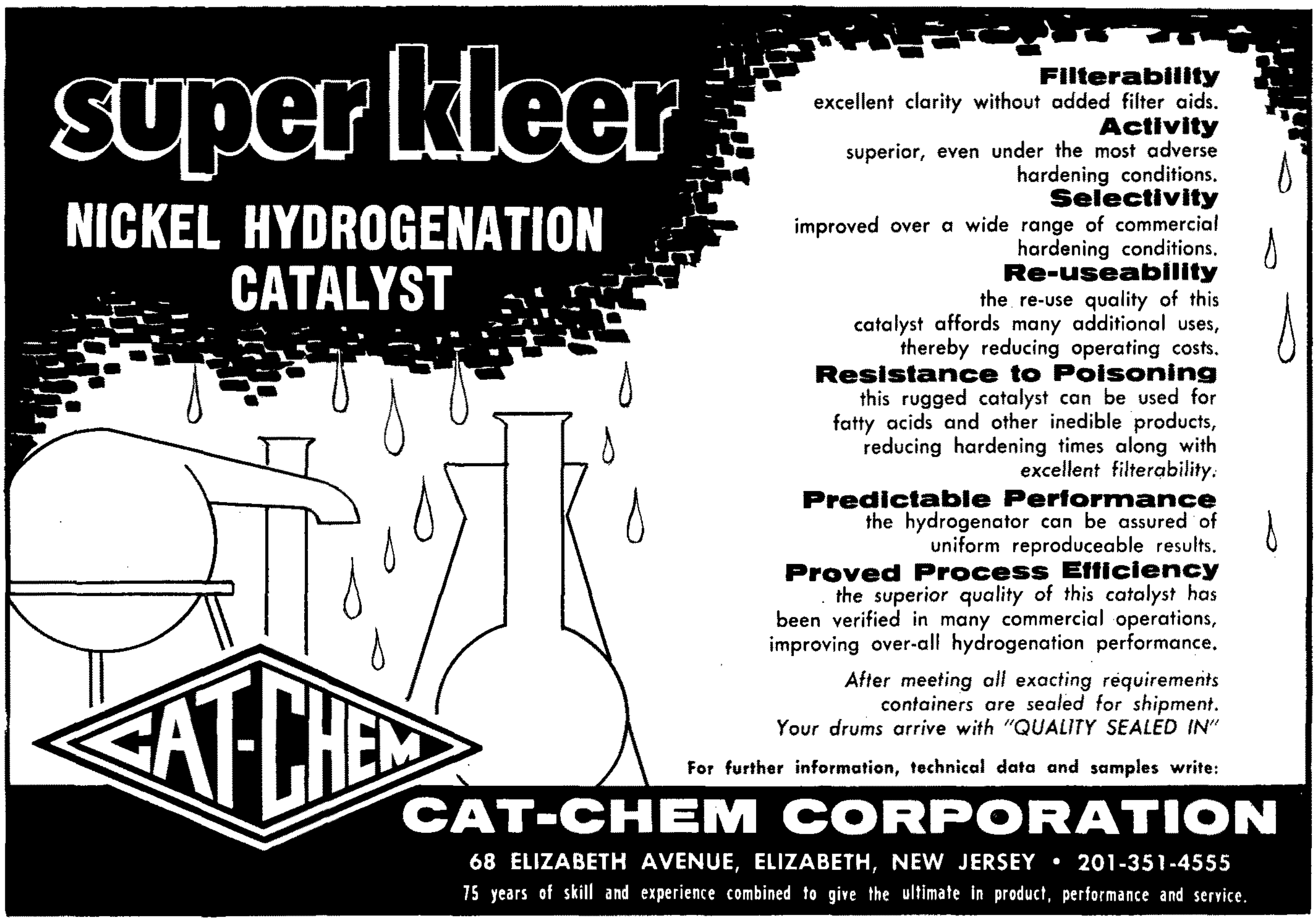

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THE PARTIAL PURIFICATION AND CHARACTERIZATION OF A BACTERIAL FATTY ACYL COENZYME A SYNTHETASE. E. J. Massaro and W. J. Lennarz (The John Hopkins Univ. School of Med., Baltimore, Md.). *Biochemistry* 4, 85–90 (1965). The presence of a long-chain fatty acyl CoA ester synthetase has been demonstrated in extracts of *Bacillus megaterium*, strain M. The enzyme is localized in the cytoplasmic portion of the cell and has been purified over 20-fold by $(NH_4)_2SO_4$ fractionation, adsorption on alumina gel, and DEAE-cellulose chromatography. The purified enzyme requires ATP and Mg^{2+}, and manifests maximal activity toward dodecanoic acid. The branched-chain fatty acid, 12-methyltetradecanoic acid, which is the major fatty acid present in the lipids of this organism, is a relatively poor substrate for the fatty acyl CoA ester synthetase.

DELAY OF SEXUAL MATURITY OF THE FEMALE RAT BY STERCULIA FOETIDA OIL. E. T. Sheehan and M. G. Vavich (Dept. of Agricultural Biochem., The Univ. of Arizona, Tucson, Ariz.). *J. Nutr.* 85, 8–12 (1965). Groups of weanling 21-day-old female albino rats of the Sprague-Dawley strain were fed 4% safflower or corn oil diets or these diets partially substituted with *Sterculia foetida* oil, for periods of 16 or 20 weeks to determine the influence of this rich (35%) source of the cyclopropenoid fatty acid, sterculic, on sexual maturity of the female rat. Oil diets containing 1% corn or safflower and 3% *S. foetida* oil significantly delayed opening of the vagina, increased the length and decreased the frequency of estrous cycles as compared with 4% corn or safflower oil diets. Comparison of *ad libitum* with paired-feeding indicated that rate of growth was not a factor under the conditions used. At termination of the experiments highly significant differences in body, liver and ovaries-oviduct-uterus weights were observed in a comparison with the groups pair-fed 1% safflower-3% *S. foetida* oil and 4% safflower oil. Heart, kidney and brain weights were not significantly different. Feed utilization of groups fed *S. foetida* oil was consistently poorer with both *ad libitum* and paired-feeding.

THE STEROSPECIFIC CONVERSION OF STEARIC ACID TO OLEIC ACID. G. Schroepfer, Jr. and K. Bloch (J. B. Conant Lab., Dept. of Chem., Harvard Univ., Cambridge 38, Mass.). *J. Biol. Chem.* 240, 54–63 (1965). Four stereospecifically labeled monotritiostearic acids were prepared from the enantiomorphic pairs of 9-hydroxyoctadecanoate and 10-hydroxyoctadecanoate. The four labeled stearic acids were incubated with growing cultures of a strain of *Coryne-bacterium diphtheriae*, and the oleic acid produced by the organism was isolated in each case. Loss of tritium occurred with the 9-D- and 10-D-tritiostearic acids, but not with the two L-tritio compounds. The conversion of stearate to oleate is therefore stereospecific with respect to the removal of hydrogen at carbon atoms 9 and 10. Isotope effects observed in the formation of oleate suggest that hydrogen removal at carbon atom 9 precedes hydrogen removal at carbon atom 10 of stearate.

COMPONENTS WITH REDOX POTENTIALLY IN THE NEUTRAL LIPID FRACTION FROM BEEF HEART MITOCHONDRIA. G. Sottocasa and F. Crane (Wenner Gren Institute, Univ. of Stockholm). *Biochemistry* 4, 305–10 (1965). Four components have been regularly observed in the neutral lipid fraction from mitochondria which show the ability to undergo reversible oxidation and reduction. The first is coenzyme Q. The second is found in the fraction which contains α-tocopherol. The third is a compound which shows higher R_F values on thin-layer chromatograms than any of the known redox components, but the identity of the compound is not clear. The fourth shows low R_F on thin-layer chromatography and has the ultraviolet spectrum of a benzoquinone. The relation of these components to previous studies of the effects of lipids on the electron transport system is discussed.

ON THE MECHANISM OF β-OXIDATION OF LONG CHAIN FATTY ACIDS BY LIVER MITOCHONDRIA FROM NORMAL AND ALLOXAN-DIABETIC RATS. J. A. Jones and M. Blecher (Schools of Med. and Dentistry, Georgetown Univ., Wash., D.C.). *J. Biol. Chem.* 240, 68–70 (1965). Three suspected intermediates in the β-oxidation of palmitate, trans-α, β-hexadecenoate, DL-β-hydroxypalmitate, and β-ketopalmitate, were chemically synthesized labeled with C^{14} in their carboxyl groups, and were shown to be oxidized to carbon dioxide and to acetoacetic acid by liver mitochondria obtained from normal and diabetic rats. Oxidation of β-ketopalmitate-1-C^{14} to carbon dioxide, which occurred in normal mitochondria to an extent which was 12- to 29-fold greater than that of the other three substrates, was increased almost 100% in liver mitochondria obtained from diabetic animals; the oxidation of palmitate-1-C^{14} was also increased above normal in diabetic liver mitochondria.

EFFECT OF A DIET DEFICIENT IN LIPOTROPIC FACTORS ON THE LIPOPROTEINS OF RAT SERUM. J. C. Forbes, O. M. Petterson and R. A. Rudolph (Dept. of Biochem., Medical College of Va., Richmond). *Proc. Soc. Exp. Biol. Med.* **118**, 59–62 (1965). The cholesterol and triglyceride content of the high- and low-density lipoproteins of rats on a choline deficient diet for at least 3 weeks has been compared with that of controls on the same diet supplemented with choline. The deficient animals showed only about one-half the concentration of these lipids in the low-density lipoprotein fraction compared with the controls. Supplementation of the diet of the deficient animals with choline raised the concentration of these lipids to normal after a few days. The cholesterol content of the high-density lipoproteins seemed not to be affected by the deficiency state. The triglyceride content, however, was depressed.

EFFECT OF AGE AND DIETARY FAT ON THE LIPIDS OF CHICKEN MUSCLE. J. E. Marion (Food Processing Dept., Ga. Exp. Station, Exp., Ga.). *J. Nutr.* **85**, 38–44 (1965). The influence of age, and type and level of dietary fat on muscle lipids of young chickens was studied. Total lipid and phospholipid levels in breast muscle were not significantly influenced by dietary fat, but were each significantly lowered with age. Phospholipids were generally higher in amounts of stearic acid and long-chain polyunsaturated fatty acids than neutral lipids, whereas neutral lipids contained higher quantities of oleic and linoleic acids. Each lipid fraction tended to assume the fatty acid pattern of the dietary fat with neutral lipids being affected far more than phospholipids. Age had comparatively little effect on the fatty acid content of neutral lipids, but tended to reduce the level of linoleic acid in phospholipids while increasing levels of polyunsaturated fatty acids having 20 or more carbons. The concentration and fatty acid composition of thigh muscle lipids showed approximately the same dietary-induced changes as those noted for breast muscle lipids.

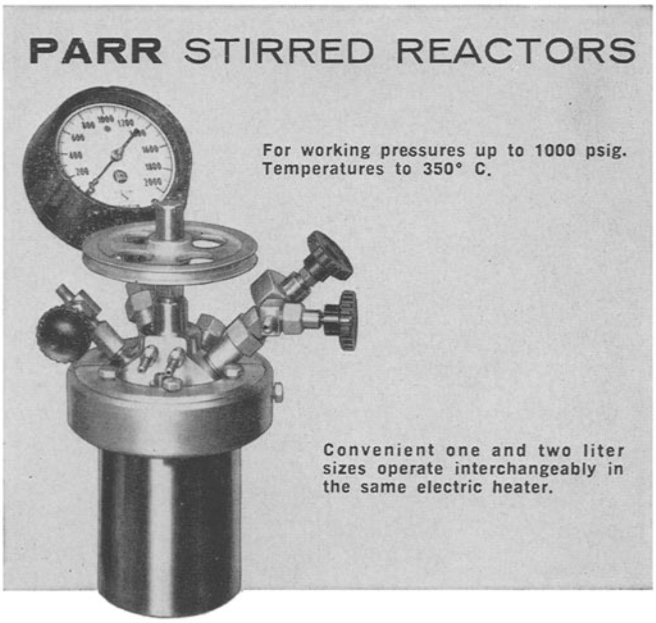
OBSERVATIONS ON CEREBROSIDE METABOLISM IN VIVO. J. Kanfer (Nat'l. Institute of Neurological Diseases and Blindness, Nat'l. Institutes of Health, Bethesda, Md.). *J. Biol. Chem.* **240**, 609–12 (1965). Cerebrosides specifically labeled with either radioactive glucose or stearic acid were administered intracerebrally and intraperitoneally, to 10 day-old rats. The distribution of the radioactivity in the various sphingoglycolipids of the brain, kidney, liver, and spleen was determined 24 hours after injection. Under the conditions employed it appears that glucocerebroside does not serve as a precursor of the more highly glycosylated sphingoglycolipids. Stearic acid-labeled cerebroside was degraded to ceramide by spleen and liver and, to a lesser extent, by brain tissue.

RESPONSE OF LIVER NUCLEIC ACIDS AND LIPIDS IN RATS FED *Cycas circinalis* L. ENDOSPERM OR CYCASIN. J. N. Williams, Jr. and G. L. Laquer (Nat'l. Institute of Arthritis and Metabolic Diseases, N.I.H., Bethesda, Md.). *Proc. Eoc. Exp. Biol. Med.* **118**, 1–4 (1965). The feeding of ground *Cycas circinalis* L. endosperm or cycasin, a glycoside isolated from the cycad endosperm, both of which produce liver and kidney tumors in rats and liver tumors in guinea pigs, produces an almost identical loss of RNA and phospholipids from rat liver cells. The ground endosperm is considerably more active, based on its cycasin content, than is cycasin. These changes correlate closely with loss of cytoplasmic basophilia, as observed with the light microscope, and with loss of ribosomes from the parallel arrays of the lipoprotein-rich endoplasmic reticular membrane, as observed with the electron microscope. No effect of DNA concentration occurred. Liver cholesterol and neutral glycerides were increased by cycasin feeding.

EFFECT OF EXCLUSION OF PANCREATIC JUICE ON DIGESTION AND MUCOSAL ABSORPTION OF FAT IN DOGS. L. Knoebel and J. Ryan (Dept. of Physiology, Indiana Univ. School of Med., Indianapolis). *Proc. Soc. Exp. Biol. Med.* **118**, 161–67 (1965). The role of pancreatic juice in fat digestion and absorption was investigated by studying the intestinal intraluminar and mucosal lipid changes which occur after feeding cottonseed oil triglycerides to normal dogs and dogs deprived of pancreatic juice by partial pancreectomy. As based on the low concentrations of intraluminar free fatty acids and monoglycerides, intestinal digestion of cottonseed oil by the depancreatized dogs was considerably less than normal. It is concluded that, relative to pancreatic lipase, other sources of gastrointestinal lipase activity contribute only to a minor extent to the hydrolysis of fat. The composition of mucosal lipids of dietary origin, which consisted primarily of higher glycerides, was the same for normal and depancreatized dogs. This result suggests that intercellular esterification of the absorbed products of fat digestion is normal in the absence of pancreatic juice.

FATTY LIVERS PRODUCED IN ALBINO RATS BY EXCESS NIACIN IN HIGH FAT DIETS. Lora Rikans, Dorothy Arata and Dena Cederquist (Dept. of Foods and Nutr., College of Home Economics, Michigan State Univ., East Lansing, Mich.). *J. Nutr.* **85**, 107–12 (1965). A study was conducted to determine the extent to which choline metabolism is involved in the production of fatty livers in rats fed diets high (40%) in fat and high (0.1%) in niacin. Fatty livers produced in animals fed excess niacin and non-protective levels of choline could be reversed by the addition of choline to the diet. Data from determination of N^1-methylnicotinamide excretion, serum alkaline phosphatase activity, and liver lipids suggested that the appearance of fatty livers in animals fed excess niacin resulted from an induced choline deficiency.

INTRACELLULAR DISTRIBUTION AND CHARACTERIZATION OF THE LIPIDS OF STREPTOCOCCUS FAECALIS. Marie Vorbeck and G. Marinetti (Dept. of Biochem., The Univ. of Rochester School of Med. and Dentistry, Rochester, N. Y.). *Biochemistry* **4**, 296–305 (1965). The lipids of *Streptococcus faecalis* cells have been studied with respect to their intracellular distribution and nature. Subcellular fractions were prepared by enzymatic disintegration with muramidase followed by differential centrifugation of the released cell constituents. The membrane fraction contained 94% of the total cell lipid with the remainder in the protoplasm fraction. The major components obtained by silicic acid column chromatography were identified as phosphatidyl glycerol, amino acid esters (lysine, glycine, and alanine) of phosphatidyl glycerol, monoglucosyl diglyceride, and a glycosyl diglyceride containing both glucose and galactose. Phosphatidic acid and diphosphatidyl glycerol (cardiolipin) were minor components.



METABOLISM OF ARTERIAL TISSUE WITH SPECIAL REFERENCE TO ESTERASE AND LIPASE. Nelicia Maier and H. Haimovici (Henry and Lucy Moses Res. Lab. and the Vascular Service, Surgical Div., Montefiore Hospital, NYC). *Proc. Soc. Exp. Biol. Med.* **118**, 258–61 (1965). Esterase was demonstrated in normal aortic tissue of dog, rabbit and man. Its activity was determined in various layers of the 3 aortic segments (arch, descending thoracic, abdominal) as well as in liver and serum. Absence of lipase, except for dog serum, was constantly demonstrated. Of the 3 aortic layers studied (innermost intimamedia, media, adventitia), the adventitia displayed the lowest activity, about ⅙th that of the other two. Intima-media showed no difference in activity between the 3 aortic segments in dog, or between descending thoracic and abdominal in rabbit or man, whereas a higher activity was noted in rabbit's arch. A species difference seems to exist, aortic intima-media showing the lowest values in man, and highest in rabbit's arch. A species difference was also noticed with regard to liver and serum, the former showing the highest activity in rabbit and lowest in dog, whereas serum showed similar activity in dog and man, and much greater in rabbit.

THE EFFECT OF CARNITINE ON THE RATE OF INCORPORATION OF PRECURSORS INTO FATTY ACIDS. R. Bressler and R. Katz (Dept. of Med., Duke Univ. Medical Center, Durham, N. C.). *J. Biol. Chem.* **240**, 622 27 (1965). The effect of carnitine on the rate of incorporation of precursors into long chain fatty acids was studied in guinea pig liver homogenates and *in vivo*. Carnitine stimulated the incorporation into fatty acids of those compounds which give rise to intramitochondrial acetyl coenzyme A (pyruvate, glucose, acetate). Citrate, which gives rise to primarily extramitochondrial acetyl coenzyme A, was not affected by the addition of carnitine. The role of acetylcarnitine in the translocation of the active acetyl group of acetyl coenzyme A from intra- to extramitochondrial sites is discussed.

EFFECT OF PROSTAGLANDIN E_1 ON BLOOD PRESSURE, HEART RATE AND CONCENTRATION OF FREE FATTY ACIDS OF PLASMA IN MAN. S. Bergstrom, L. A. Carlson, L. Eklund and L. Oro (Chem. Dept. I, Karolinska Institutet, Depts. of Clinical Physiology and Internal Med., Stockholm, Sweden). *Proc. Soc. Exp. Biol.*

(Continued on page 264A)

• *Names in the News*

A. C. McConnell (1961) has been transferred from the Woodson-Tenent Laboratories, Des Moines, Iowa, to the firm's laboratory at Little Rock, Ark. He will be manager in charge of research, feeds, drugs, residues, fertilizers, and miscellaneous analyses. J. T. Moore, who has been with the Little Rock Laboratory for 23 years, has been made assistant manager in charge of the cottonseed and soybean division.

R. M. Pettit has been employed as a sales representative of the Fatty Acid Division of Emery Laboratories, Inc. From his headquarters in Dallas, Texas, he will cover northern Texas, Oklahoma, southern Arkansas, and northern Mississippi. Prior to joining Emery, he was associated with Cardinal Chemical Company as a chemical development engineer.

H. E. Mammen has been appointed director of new product development in the marketing section of UOP Chemical Co., division of Universal Oil Products Co. Mr. Mammen joined the parent company in 1940, and was director of technical services of UOP Chemical a year ago.

K. P. Kamman, Jr., and M. G. Flom have joined the Fatty Acid Division Research Staff of Emery Industries, Inc. Mr. Kamman was previously associated with Cities Service Company; Mr. Flom, with Hormel Institute.

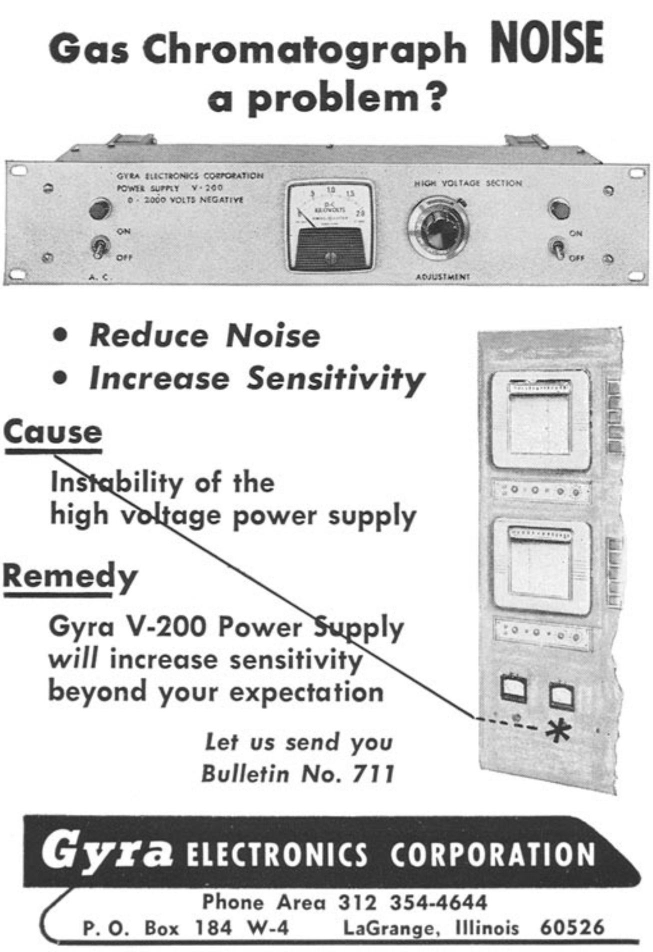
Ralph Righter has been appointed Manager-Sales/Service, a new position at Groen Mfg. Co., Elk Grove Village, Ill. Mr. Righter served Stouffer Foods Corporation in Cleveland for eight years prior to his association with Groen.

L. C. Miller has been named Assistant Manager—Operations, of the Austin Company, Chicago Division. O. J. Bolduc has been appointed Assistant Division Manager—Process.

(Continued from page 262A)

Med. 118, 110–12 (1965). Infusions of PGE$_1$ (prostaglandin E$_1$) to human subjects caused an increase in heart rate and in concentration of FFA and glycerol in plasma. When PGE$_1$ was infused intravenously together with norepinephrine, the norepinephrine-induced increase in blood pressure was reduced and the bradycardia was abolished. The increase in concentration of FFA and glycerol in plasma caused by norepinephrine was, however, only slightly reduced by PGE$_1$.

INTERACTION OF FERRIHEMOGLOBIN WITH PEROXIDIZED SERUM LOW DENSITY LIPOPROTEINS. T. Nishida and H. Nishida (Burnsides Research Lab., Univ. of Ill., Urbana, Ill.). *J. Biol. Chem.* 240, 225–33 (1965). Oxidative destruction of ferrihemoglobin in the presence of peroxidized serum low density lipoproteins was performed under various conditions with the aid of centrifugal, spectrophotometric, and chemical methods. The use of peroxidized lipoproteins rather than of peroxidizing unsaturated fatty acids or lipohydroperoxides in these experiments was advantageous in two respects. First, the resultant mild conditions aided study of the initial phase in the oxidative destruction of ferrihemoglobin. Second, the procedure rendered possible the separation of hematin from the no longer intact ferrihemoglobin in the associated form with lipoproteins. Destruction of ferrihemoglobin in the presence of peroxidized lipoproteins under nitrogen was found to be initiated by the catalytic action of ferrihemoglobin on the decomposition of lipohydroperoxides in the lipid moiety of the lipoproteins. The free radicals thus formed by the lipohydroperoxide decomposition seemed to disrupt preferentially the iron-protein bond without causing extensive destruction of the protein group. Ultracentrifugation of such a ferrihemoglobin-peroxidized lipoprotein mixture in the presence of sodium chloride sufficient to provide a solvent density ensuring quantitative flotation of lipoproteins and sedementation of ferrihemoglobin resulted in flotation of freed heme in association with lipoproteins.



THE CHOLESTEROL-LOWERING EFFECT OF COMMERCIAL DIET FED TO GERMFREE AND CONVENTIONAL RATS. B. S. Wostmann and Dorrine F. Kan (Lobund Lab., Univ. of Notre Dame, South Bend, Indiana). *J. Nutr.* 84, 277–82 (1964). Germfree and conventional rats were fed laboratory-made semi-purified diets, a commercial diet fortified for heat sterilization, and semi-purified diets incorporating the lipid fraction isolated from the commercial diet. In both germfree and conventional animals total serum and liver cholesterol values in animals fed the commercial diet were, on the average, 20 to 30% lower than the levels for the animals maintained with the semi-purified formulas. Upon changing from the semi-purified to the commercial diet, serum cholesterol values in both animal groups decreased by approximately the same amount. These changes were completely reversible. When the lipid fraction extracted from the commercial diet was used to replace the corn oil in the semi-purified formula, similar results were obtained. In all experiments where germfree and conventional animals were compared, the data showed a striking similarity. The results suggest that the commercial diet contains a cholesterol-lowering lipid fraction which acts directly on cholesterol metabolism and not via an effect on the intestinal microflora.

TOXICITY OF SATURATED FAT. S. B. Tove (Nutr. Sect., Dept. of Animal Science, Univ. of N. Carolina, Raleigh, N. Carolina). *J. Nutr.* 84, 237–43 (1964). When diets containing high levels (20 to 40%) of either palmitate or stearate are fed to weanling mice, poor growth and high mortality result. Adult mice are similarly affected, although less severely. The addition to the diet of 4% of fats rich in either oleate or linoleate prevents the toxicity, whereas linolenic, palmitoleic and petroselinic acids are much less effective. The toxicity is increased slightly by the addition of cholesterol and very markedly when lactose constitutes the principal dietary carbohydrate. Depot fat levels of the dietary saturated fatty acid increase only slightly, particularly when compared with the changes observed when unsaturated fatty acids are fed. Digestibility studies preclude ascribing these effects to poor assimilation of the dietary fat.

EFFECT OF DIETARY FATTY ACIDS ON ASSIMILATION OF FATTY ACIDS BY ADIPOSE TISSUE IN VITRO. R. L. Anderson and S. B. Tove (Nutr. Sec., Dept. of Animal Sci., Univ. of N. Carolina, Raleigh, N. Carolina). *J. Nutr.* 84, 244–48 (1964). To study the effect of fatty acid composition of adipose tissue on assimilation of fatty acids *in vitro*, epididymal fat pads from mice fed various fats were incubated with C^{14}-labeled myristic, palmitic, stearic, oleic, and linoleic acid, each in combination with 9,10-H^{3}-palmitic acid. Although feeding the various fats produced wide differences in fatty acid composition of the adipose tissue, there was no effect of dietary treatment on the incorporation of the labeled fatty acids into either the triglycerides or the β-position of the triglycerides. In each case the H^{3}:C^{14} ratio was lower for the fatty acids at the β-position than the triglycerides as a whole, thus providing evidence for the desaturation of plamitic acid prior to esterification at the β-position.

EFFECT OF BENGAL GRAM ON EXPERIMENTALLY INDUCED HIGH LEVELS OF CHOLESTEROL IN TISSUES AND SERUM IN ALBINO RATS. K. S. Mathur, S. S. Singhal and R. D. Sharma (Dept. of Med., Sarojini Naidu Med. College, Agra, India). *J. Nutr.* 84, 201–4 (1964). Bengal gram *(Cicer arietenum)*, a protein-rich cereal which forms the staple diet of people of low socioeconomic status in Northern India, was found to have a marked hypocholesterolemic effect in cholesterol-cholic acid-fed rats. It prevented, as well as reversed, the experimentally induced high levels of cholesterol in both tissues and serum. Both its protein and fat fractions were found to cause this effect. Increased excretion of cholesterol as bile acids and neutral sterols and decreased synthesis in liver are the probable mechanisms of its action.

THE ROLE OF POLYUNSATURATED FATTY ACIDS IN NUTRITION. F. A. Kummerow (Burnsides Research Lab., Univ. of Ill., Urbana, Ill.). *Food Technol.* 18(6), 839–43 (1964). A review of some of the research that has been done concerning polyunsaturated fats and oils in the diet is presented. Sources and biological need of these dietary fats is discussed. Also conditions under which the lipid content of the blood can be altered is presented as well as the relationship between absorption of these dietary fats and the lipid carriers in the blood serum. Although much knowledge has been gained concerning the role of the polyunsaturates in the diet, no evidence has been shown which directly relates them to the reduction of heart diseases.

ABSORPTION OF SHORT CHAIN FATTY ACIDS IN MAN. A. M. Dawson, C. D. Holdsworth, and Joan Webb (Dept. of Medicine, Royal Free Hospital, London, England). *Proc. Soc. Exp. Biol. Med.* **117**, 97–100 (1964). The relative rates of absorption of 7 short chain fatty acids from jujunum and colon of man have been compared with their partition into chloroform from an aqueous solution. The longer the chain length the faster the acids were absorbed. This probably reflected their greater solubility in lipid as shown by their partition into chloroform.

SERUM VITAMIN E LEVELS IN A NORMAL ADULT POPULATION IN THE WASHINGTON, D.C., AREA. J. B. Bieri, L. Teets, B. Belavady and E. L. Andrews (Lab. of Nutr. and Endocrinology, Nat'l. Inst. of Arthritis and Metabolic Diseases, National Insts. of Health, Bethesda, Md.). *Proc. Soc. Exp. Biol. Med.* **117**, 131–33 (1964). Serum tocopherol levels in 61 female and 71 male normal adult employees of the National Institutes of Health averaged 1.06 mg/100 ml. No samples were below 0.50 mg/100, and 93.9% were above 0.70 mg/100 ml. A significant correlation was found between serum tocopherol and carotenoids for both males and females.

SERUM VITAMIN E LEVELS IN THE RURAL POPULATION OF EAST PAKISTAN. M. M. Rahman, S. Hossain, S. A. Takulkdar, K. Ahmad, and J. G. Bieri (Dept. of Biochem. and Nutr., Univ. of Dacca, Dacca, East Pakistan). *Proc. Soc. Exp. Biol. Med.* **117**, 133–35 (1964). Serum tocopherol values were determined on 79 adult males, 23 adult females, 19 pregnant or lactating females and 31 children. Of the total, 21% had values below 0.5 mg/100 ml. Children and pregnant or lactating females had 29% and 26% respectively, in this low range. Serum vitamin A and carotenoid levels were also determined and significant numbers of low values were found.

THE PHOSPHOLIPIDS OF THE HEPATIC CELL. FUNCTIONAL INTERPRETATION OF THEIR RENEWAL. I. NATURE. SPECIFICITY OF THEIR CONSTITUENT FATTY ACIDS. M. Pascaud (Centre de Recherches sur la Cellule Normale et Cancéreuse, Villejuif et Lab. de Zoo.-Biochemie, Ecole Normale Supérieure, Paris). *Biochim. Biophys. Acta* **84**, 517–527 (1964). The phospholipids of the rat hepatic cellular fractions exhibit a great similarity both in regard to their type (essentially lecithins and phosphatidylethanolamines), and their constituent fatty acids, preponderantly stearic and arachidonic acids. This similarity is related to a common physiological significance.

II. RENEWAL OF THE PHOSPHOGLYCERIDE FATTY ACIDS. *Ibid.*, 528–537. Study at the subcellular level of the renewal of the hepatic phospholipid fatty acids by the endogenous fatty acids shows particularly the activity of the free fat phosphoglycerides. The renewal of only the fatty acids, in the phosphoglyceride molecule satisfies a function of intracellular transfer of fatty acids. The slower renewal of the intact molecule, joined to the renewal of the proteins, suggests a mechanism of disintegration and rebuilding of the membranes (endoplasmic reticulum and mitochondria) which leads to equilibration of the cellular lipoproteins and permits entrance to the metabolites.

ESSENTIAL FATTY ACID DEFICIENCY AND CHOLESTEROL ESTERIFICATION ACTIVITY OF PLASMA AND LIVER IN VITRO AND IN VIVO. M. Sugano and O. W. Portman (Harvard School of Public Health). *Arch. Biochem. Biophys.* **109**, 302–15 (1965). The esterification of cholesterol *in vitro* and *in vivo* was studied in rats fed diets containing and deficient in essential fatty acids (EFA). EFA deficiency resulted in increased cholesterol esterification activity *in vitro*, and this appeared to reflect an increase in enzyme concentrations. There was a decrease in plasma lipid phosphorus during the period of cholesterol esterification. There was heterogeneous labeling of different subclasses of cholesterol esters when cholesterol-4-C^{14} was used as the substrate, the more unsaturated fatty acid esters having the highest relative specific activities. EFA deficiency resulted in decreased cholesterol esterification activity by hepatocytic organelles. EFA-deficient rats showed increased rates of esterification of radiocholesterol in plasma and increased rates of elimination of radiocholesterol from the plasma after intravenous injection of labeled lipoproteins. This was associated with higher concentrations of total radioactivity in the livers of EFA-deficient rats. Although liver and plasma free cholesterol specific activities rapidly equilibrated, the specific activities of the cholesterol esters and individual subclasses of cholesterol esters of plasma were greater than the activities of corresponding fractions from liver. The authors propose that the differences in plasma and liver esterification activities induced by EFA deficiency are secondary to alterations in the stability of hepatocytic organelles.

EFFECT OF TWO FATS ON BLOOD LIPIDS IN YOUNG MEN. Ellen H. Morse, E. P. Lewis, Sr., Susan B. Merrow, Elise M. Widlund, and C. A. Newhall (University of Vermont). *J. Am. Dietet. Assoc.* **46**, 193–6 (1965). Serum cholesterol, lipid phosphorus, total fatty acids, and serum triglycerides were determined for 11 young men on the same diet except for the dietary fat. After 10 days on a mixture of the 2 test fats which provided 37% of the total daily calories, one group received butter and the other a margarine made of liquid corn oil and partially hardened corn oil (P/S ratio of 1.7). Determinations made at the end of each week for comparison of the two fats showed: average serum cholesterol of the butter-fed group was significantly higher than that of the margarine-fed group throughout the period; serum lipid phosphorus was significantly higher for the butter group at the end of the 3rd, 4th, and 5th weeks; total fatty acids were higher at the end of the 1st, 3rd, and 4th weeks; and serum triglycerides were higher at the end of the 1st and 3rd weeks. The difference in serum cholesterol levels was greatest at the end of the 3rd and 4th weeks.

α-TOCOPHEROL DIMER AND PROCESS FOR ITS PREPARATION. D. R. Nelan (Eastman Kodak Co.). *U.S. 3,173,927.* A process for preparing an α-tocopherol dimer comprises: oxidizing α-tocopherol with a water-soluble ferricyanide salt whereby an oxidation product is formed; and reducing the oxidation product with a mild reducing agent such as ascorbic acid or cysteine.

EFFECT OF POLYUNSATURATED EGGS ON SERUM CHOLESTEROL. Helen B. Brown and I. H. Page (Cleveland Clinic Foundation). *J. Am. Dietet. Assoc.* **46**, 189–92 (1965). Ordinary (13% polyunsaturated fatty acids) and modified eggs (45% polyunsaturates) were compared in a diet known to be effective in reducing serum cholesterol. Saturated fatty acid content in both types of eggs was about 35%. In a series of 18-day quantitative dietary tests, 5 normal men were fed a vegetable oil diet with: (a) no eggs, (b) 2 ordinary eggs, and (c) 2 modified eggs. All 3 diets were similar in total fat and fatty acid composition with cholesterol contents of 210, 715, and 845 mg respectively. Serum cholesterol was reduced by 19% with the diet without eggs and was unchanged by the two egg-containing diets.

CHEMICAL AND NUTRITIONAL ASPECTS OF OXIDIZED AND HEATED FATS. C. H. Lea (Low Temperature Research Station, Cambridge). *Chem. Ind. (London)* **1965**, 244–8. The author reviews ways of impairing the nutritional value of a fat (thermal polymerization, oxidation); nature of oxidized fat toxicity (depression of growth, destruction of vitamins, possibly carcinogenesis, atherosclerosis); substances and mechanisms responsible for toxicity (peroxides, secondary oxidation products produced by further oxidation, fission, dehydration, or polymerization).

CULINARY COMPOSITION CONTAINING EDIBLE ACIDIC LIPID ANHYDRIDES. J. B. Martin and N. B. Howard (Procter & Gamble Co.). *U.S. 3,168,405.* The described composition comprises flour having been absorbed on it from 0.1% to 8%, by weight of the flour, of an acidic lipid anhydride of the general formula: $R_m(-CO.O-)_n(-CO.O.CO-)_pX_q$. R is selected from a group consisting of aliphatic hydrocarbon radicals having from 11 to 21 carbon atoms; X is a residue having from 1 to 6 carbon atoms derived from a group consisting of mono- and polyhydric alcohols, mono- and polycarboxylic acids, and hydroxy mono- and polycarboxylic acids; $m = 1$ to 6; $n = 0$ to 10; $p = 1$; $q = 0$ to 6. When $n = 0$, $q = 0$ and $m = 2$. No carbon in R is attached to more than 2 other carbons.

PREPARATION OF CRYSTALLINE VITAMIN D_3 AND VITAMIN D_3 BENZOATE. K. R. Bharucha and F. M. Martin (Canada Packers Ltd.). *U.S. 3,168,535.* A process for the production of crystalline vitamin D_3 benzoate comprises: (1) esterifying vitamin D_3 material in an organic solvent medium with a reagent providing a benzoyl group to provide a reaction mixture containing vitamin D_3 benzoate; (2) separating vitamin D benzoate from the reaction mixture by crystallization from a solvent; (3) purifying the separated vitamin D benzoate by chromatography; and (4) crystallizing the purified vitamin D_3 benzoate from a solvent.

(Continued on page 274A)

(Continued from page 272A)

• Detergents

SULFATION OF STRAIGHT-CHAIN ALCOHOLS AND ETHOXYLATES WITH SULFUR TRIOXIDE. C. Sheely, Jr. and R. Rose (Continental Oil Co., Ponca City, Okla.). *Ind. Eng. Chem. Product Res. Dev.* 4, 24–28 (1965). The sulfation of straight-chain alcohols and ethoxylates with sulfur trioxide was investigated using a 1-gallon reactor designed and built for this work. Process conditions—such as temperature, sulfur trioxide-air conditions, degree of sulfation, and sparger mass velocities—were evaluated as to their effect on product quality. For example, ether sulfate color can be lowered by increasing the sparger mass velocity. By keeping the sulfation temperature about 5F above the freezing point of the material in the reactor, the unsulfated and salt content of alcohol sulfates could be reduced. Neutralization of the sulfated material is discussed.

DETERGENCY AND BIODEGRADABILITY OF ALCOHOL-BASED SECONDARY SULFATES. J. Livingston, Jr., R. Drogin and R. Kelly (Esso Res. and Engineering Co., Linden, N. J.). *Ind. Eng. Chem. Product Res. Dev.* 4, 28–32 (1965). Sodium alkyl sulfates were prepared by the sulfation of linear secondary alcohols. The sulfates were prepared from discrete carbon number alcohols and evaluated individually for foaming ability and cotton detergency. At the optimum molecular weight, the sulfates were equivalent to or better than tetrapropyl benzene sulfonate in foaming and cotton detergency. Individual sulfates were also evaluated for wetting power, biodegradability, and hydrolytic stability. The sulfates were as biodegradable and almost as hydrolytically stable as primary fatty sulfates.

STUDIES ON SODIUM ALKYLBENZENESULFONATES. II. WATER HARDNESS AND BUILDER EFFECTS ON THE MICELLAR SOLUBILIZATION AND DETERGENCY OF DODECYLBENZENESULFONATES. Yasushi Kimura, Syuhei Tanimori, and Terunosuke Shimo (Lion Fat & Oil Co., Tokyo). *Yukagaku* 13, 656–61 (1964). The solubilizing activity and detergency of some kinds of sodium dodecylbenzenesulfonate have been determined. In case of solubilizing of Orange-OT at 25C, linear type dodecylbenzenesulfonates are superior to tetramer types, except *n*-dodecylbenzenesulfonate which is restricted by its poor solubility. In hard water, the solubilizing activity of the sulfonates of both types shows a maximum at an appropriate hardness range, and then decreases in the solubilizing activity at higher hardness almost to zero. The addition of sodium sulfate increases their solubilizing activities and the substitution of a part of sulfate with sodium tripolyphosphate causes the maxima to be shifted to higher hardness ranges. In case of dodecyl-6-benzenesulfonate which clearly shows the shift phenomenon, the maxima was found at a calcium/tripolyphosphate equivalent ratio of 0.6–0.7, without any relation to the concentration of sulfate and phosphate. The detergency measured by soiled glass plate method at 25C is also enhanced at appropriate hardness ranges and the enhanced range of detergency moves toward higher hardness level by the addition of phosphate or the detergency is not decreased until higher hardness levels are reached.

III. HYGROSCOPICITY AND AGGLOMERATIVITY OF DODECYLBENZENESULFONATES. Yasushi Kimura, Syuhei Tanimori, Tohio Nagai, and Terunosuke Shimo. *Ibid.* 14, 19–23 (1965). Hygroscopicity and agglomerativity of sodium dodecylbenzenesulfonate-sodium sulfate system were determined at 35C, 48.5–92.0 and 80.0–90.0% relative humidity, respectively. The seven sulfonate containing the various structures given in the preceeding report were used, and the test materials were prepared by spray-drying with sodium sulfate. The hygroscopicity increases as the aromatic nucleus is located nearer the center of the alkyl chain. There is a correlation between hygroscopicity and agglomerativity of dodecylbenzenesulfonate-sodium sulfate systems.

• *Obituary*

Henry E. McLaughlin (1961) died March 2, 1965. He had been employed by the Newport Industries Co., and made his home in Pensacola, Fla.