New Literature . . .

(Continued from page 26)

space, filter, mesh, extra fine wire and gasket wire cloth. (351 Verona Ave., Newark 4, N.J.)

DREW CHEMICAL CO. offers an 8-page Chemicals & Industrial Products brochure, listing cover products for the cosmetic and pharmaceutical industries; textile, marine and industrial water treatment; paper and catalytic chemical industries. (522 Fifth Ave., New York, N.Y. 10036)

ADDISON-WESLEY PUBLISHING CO., INC., has issued a 92-page catalog, describing technical books in the field of chemistry, earth science, engineering, life science, mathematics, modern foreign language, nuclear science and engineering, operational research and programming, physics, social sciences and programmed texts. (Reading, Mass.)

PERKIN-ELMER CORP. describes their complete line of gas chromatographs in a new brochure. Twenty-six models are listed—plus accessory items. (Instrument Marketing Div., Main Ave., Norwalk, Conn.)

FISHER SCIENTIFIC CO. has issued a new bulletin, TD-169, of technical data on Fluorolube® Inert Lubricants in laboratory quantities (less than 1 lb) Fluorolube Oil LG-160 and Grease GR-382. (717 Forbes Av., Pittsburgh, 19, Pa.)

ALLIED CHEMICAL CORP. has revised their Chemical Catalog to describe the 108 inorganic chemicals they offer. 32-pages—it gives the chemical name, trade name, code no., chemical structure, specifications and suggested uses. (National Aniline Div., 40 Rector St., New York, N.Y. 10006)

BUSS LTD. now has available a review and photographs of some plants and processes of their Oils and Fats Div., which were exhibited at the ACHEMA 64 trade show, held recently in Germany (Basle, Switzerland).

CIIA-BIPCA Congress Date Changed

Page 24 of our April 1964 Journal reported the 1st International Congress of Agricultural and Food Industries in Tropical and Sub-Tropical Regions, scheduled for November of this year. Meeting dates have now been definitely scheduled for Dec. 13–19, 1964 at Abidjan, Ivory Coast, Africa.

Fats and Oils Summer School Held in India

The Summer School in Chemistry and Technology of Oils and Fats was held at the Regional Research Laboratory, Hyderabad, India, June 15–17, 1964.

It encompassed demonstrations and lectures in such subjects as: separation of fatty acid mixtures, countercurrent distribution, GLC, pilot plant operation, analytical techniques, estimating phosphorus in organic compounds, UV absorption spectrophotometry, and many others.

Forty-five scientists participated in the three-day sessions.

OTA of India Co-Sponsors Oils and Fats Symposium

The 20th Annual Convention and Symposium on Oils and Fats—1964 will be held at New Delhi, India, Dec. 18–21, 1964, under the joint sponsorship of the Oil Technologists' Assoc. of India, the Soybean Council of America, Inc., and Vanaspati Manufacturers' Assoc. of India.

It will consist of two technical sessions (Augmentation of Oil and Fat Resources, and Utilization of Some Lesser Seed Oils) and a group discussion on subjects of economic importance to the development of the industry. Papers containing results of original investigations, plant studies and reviews on subjects falling within the broad scope of the Symposium are invited by Sept. 30, 1964.

Address correspondence to The Convener, Symposium on Oils & Fats, 1964, Oil Technologists' Assoc. of India, Ganesh Flour Mills Co. Ltd., P. O. Box No. 1025, Delhi-6, India.

NMR Spectroscopy . . .

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group of peaks (f) characteristic of polyethylene oxide. The length of the polyethylene oxide chain, which is an important factor in determining the surfactant properties of the compound, is readily calculated from the integral curve, as is the polyethylene oxide content. According to both Greff *et al.* and Crutchfield *et al.*, the values obtained by this method are accurate to ±1% and approx one half hour is sufficient to obtain and completely analyze the spectrum. For process control purposes where the nature of the compound is known, the integral curve would be sufficient to give all of the needed information and the analysis time could be easily reduced to five min/sample. Chemical and IR methods which have comparable precisions and time requirements are available for determining the polyethylene oxide content of surfactants. However, these methods do not yield the additional information on the structure of the balance of the compound which is obtained by the NMR analysis; and unless this structure is known, the polyethoxy chain length cannot be calculated.

In polyethoxyphenols for example (Fig. 3), the NMR spectra shows the length and extent of branching of the alkyl substituent (peaks a, b, c) and the position of substitution on the aromatic ring, (spectral region d) in addition to the polyethoxy content and chain length.

Erickson has recently applied high resolution NMR in a very interesting manner to the study of micellular structure and solubilizing mechanisms in the cetylpyridinium chloride-water-benzene system. The sharpness of the methylene resonance lines in the interior of the micelle shows this to behave as a liquid region rather than a microcrystalline region. The changes in chemical shifts of these methylene absorptions and of the orthohydrogens on the pyridine ring which occurred on the addition of benzene to the cetylpyridinium chloride-water system indicated that the benzene was solubilized on the micelle surface rather than in the interior of the micelle. It appears that this work may open a new approach to investigations of surfactant mechanisms.

NMR spectroscopy has been used in kinetic studies to follow the rate of formation of products or disappearance of reactants, and, in a recent paper in the *JAOCS*, Frankel *et al.*, report the application of NMR along with IR and UV spectroscopy to establish the structure of a reaction

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• *Names in the News*

D. C. Porter (1958) has joined the staff of Signal Chemical Manufacturing Co., Inc., Bedford, O., as Technical Director, a newly created position. Mr. Porter brings extensive experience in the field of detergency, dyestuffs and pharmaceutical chemicals to his new post.

D. C. Porter

Peter Kalustian

Peter Kalustian (1945) has been appointed Director of Special Products, Foods Div., Drew Chemical Corp., for the U.S. and Canada. He has been a member of the firm for over 30 years, and will be based in Drew's executive and sales offices in New York City.

H. H. Hachen, former Vice President of Sales, The Trubek Chemical Co., E. Rutherford, N.J., Div. of Universal Oil Products Co, retired recently after 33 years of service with the firm.

Emery Industries, Inc., Cincinnati, O., announces the following new sales management assignments: R. J. Roberts to Asst. Sales Manager; O. W. B'Hymer, Manager of Administration and Special Sales; and D. W. Prelesnik, Customer Sales Representative. Announcement was made by G. W. Boyd (1959), General Manager of Emery's Fatty Acid Div.

Amdrew Cheesar has been appointed Div. Mgr. of The R. J. Brown Company's Indianapolis plant—moving up from sales representative in that area.

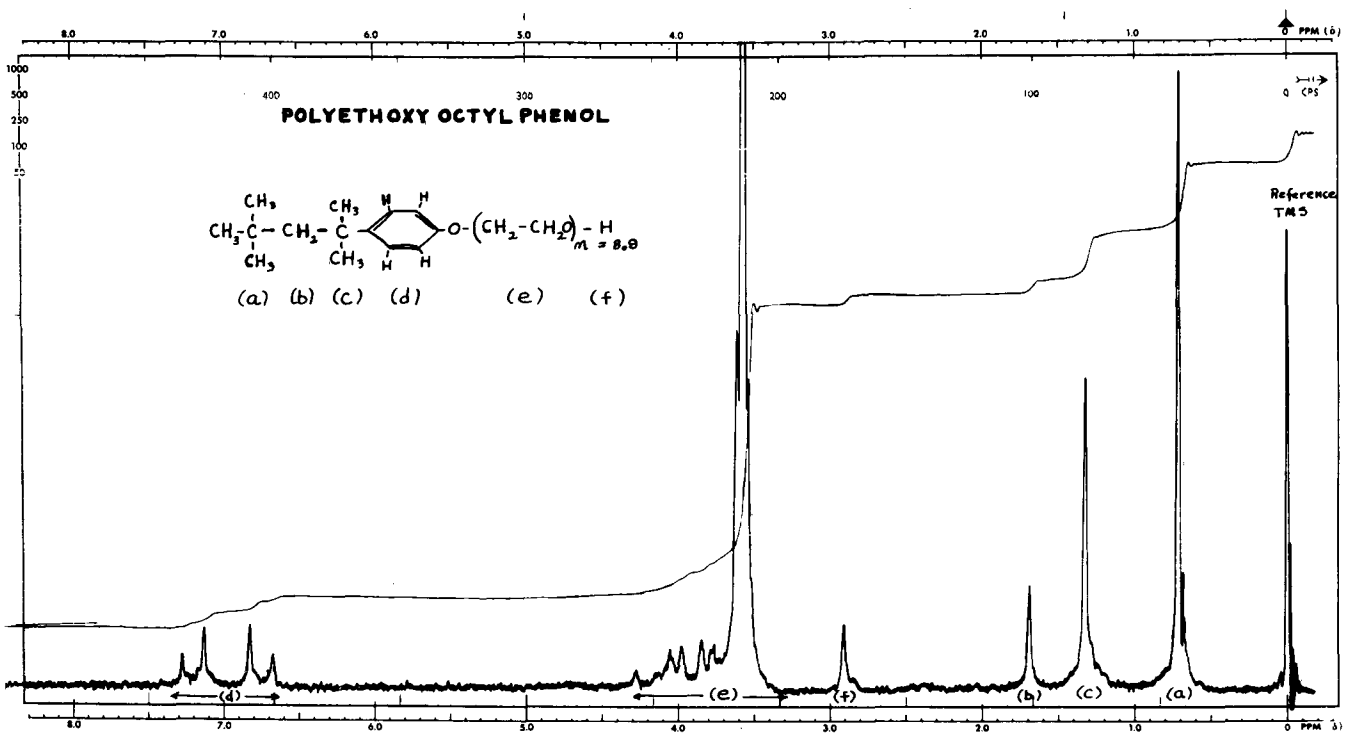

FIG. 3. High resolution NMR spectrum of a polyethoxyalkylphenol detergents

• *Industry Items*

STEPAN CHEMICAL CO., Northfield, Ill., has completed acquisition of Aromatic Products, Inc., manufacturers of perfume compounds and aromatic chemicals. They will work closely with Stepan's Maywood, N.J., Div. which manufactures aromatic chemicals, perfume and flavor compounds, protein chemicals and lithium specialties.

UNION CARBIDE CORP., New York, N.Y., will build a chemicals, olefins and plastic producing plant at Taft, La. It calls for the building of an ethylene unit and an ethylene oxide unit, scheduled for completion in 1966, with units to produce other chemicals and plastics to follow.

METROCHEM CORP., Louisville, Ky., subsidiary of Chemetron Corp., announces a new sulfonation process which lowers equipment costs—using undiluted sulphur trioxide commercially to sulfonate and sulfate detergent raw materials.

Baer Award . . .

(Continued from page 26)

He has held a full professorship since 1951.

"Dr. Baer is a Fellow of the Chemical Institute of Canada, the Royal Society of Canada and the American Association for the Advancement of Science. He is a member of the American Oil Chemists' Society, the American Chemical Society, the American Society of Biological Chemists, the Canadian Biochemical Society, the Canadian Associaiton for Applied Spectroscopy and the New York Academy of Sciences. He is an Associate Editor of the Journal of Lipid Research and the Canadian Journal of Chemistry.

"In the period from 1927–1964, Dr. Baer has published, alone or with fellow workers, over one hundred articles in the field of lipid chemistry. To attempt to comment on the tremendous amount of information contained therein would be presumptuous. Suffice it to say that because of his many published works, and perhaps even more because of his unpublished works, and because of his ability to teach, and because of his example as a person, he was awarded: in 1953, the First Glycerine Research Award; in 1961, the Neuberg Medal; and in 1962, the Chemical Institute of Canada Medal.

"On behalf of the AOCS and on behalf of the lipid chemists in the world, it is indeed my privilege today to present to Erich Baer of the University of Toronto, the first AOCS Award in Lipid Chemistry. We of the AOCS, and I am sure the Applied Science Laboratories, hope that you will accept this award because it is a sign of the recognition of your work by the many members in the lipid field, and because it cannot help but stimulate the efforts of those young men who hope some day to follow in your footsteps."

(Continued from page 52)

MITOCHONDRIAL STIMULATION OF FATTY ACID BIOSYNTHESIS. A. Bhaduri and P. A. Srere (Dept. of Biol. Chem., Univ. of Michigan, Ann Arbor, Mich.). *J. Biol. Chem.* **239**, 1357–63 (1964). In a soluble enzyme system from pigeon liver, the stimulatory effect of high concentrations of citrate (10 mM) on the biosynthesis of fatty acids from acetate could be replaced with pigeon liver mitochondria. If the mitochondria were subjected to heat or sonic oscillations, or if they were incubated anaerobically, the stimulatory effect was abolished. If the enzyme system was prepared so that adenosine triphosphate, coenzyme A, nicotinamide adenine dinucleotide phosphate, and HCO_3^- were required for fatty acid biosynthesis, then mitochondria could replace singly each of these requirements. Rat liver mitochondria could replace pigeon liver mitochondria, but rat heart and pigeon heart sarcosomes were unable to stimulate fatty acid synthesis in the system. The fatty acids synthesized in the reconstructed system (soluble enzyme and mitochondria) were located primarily in the mitochondria and contained a higher percentage of stearic acid than the fatty acids synthesized in a citrate-stimulated system.

POLAROGRAPHIC INVESTIGATION OF CONJUGATED FAT-SOLUBLE VITAMINS. E. J. Kuta (College of Home Economics, Dept. of Food and Nutrition, Cornell Univ., Ithaca, N. Y.). *Science* **144**, 1130–1 (1964). The half-wave potentials of all-*trans* β-carotene, all-*trans* retinol, 13-*cis* retinol, all-*trans* retinyl acetate, all-*trans* retinal, and vitamins D_2 and D_3 were related to the number of double bonds in conjugation. A minimum of three double bonds in conjugation was required before reduction took place at the dropping-mercury electrode. As the number of conjugated bonds increased in the fat-soluble vitamins, the initial reduction took place at a lower half-wave potential. All of the waves were linearly proportional to the concentration of the vitamins in the concentration range studied.

FORMATION OF VITAMIN E AND ARACHIDONIC ACID IN THE LIVER. K. Bernhard, S. Leisinger and W. Pedersen (Univ. of Basel, Switzerland). *Helvet. Chim. Acta* **46**, 1767–72 (1963). The liver lipids of rats fed on a vitamin E-free diet show much higher contents of arachidonic acid than control animals receiving a diet of α-tocopherol. This effect is attributed to the antioxidant activity of vitamin E on the chain lengthening reaction of linoleic acid.

STUDY OF THE FATTY ACID COMPOSITION OF THE CEREBROSIDES, SPHINGOMYELINE AND LECITHIN FROM THE HUMAN BRAIN. K. Bernhard and P. Lesch (Univ. of Basel, Switzerland). *Helvet. Chim. Acta* **46**, 1798–801 (1963). The fatty acid composition of several fatty components obtained from different regions of the human brain are reported. Appreciable differences have been found in the ratio of saturates to unsaturates in the various brain regions.

STUDIES ON RUMEN METABOLISM. I. EFFECT OF LIPIDS ON THE CONCENTRATION OF AMMONIA, TOTAL AND INDIVIDUAL VOLATILE FATTY ACIDS IN THE RUMEN. J. A. Robertson and J. C. Hawke (Massey University College of Manawatu, New Zealand). *J. Sci. Food Agr.* **15**, 274–82 (1964). The infusion of linseed oil or whale oil into the rumen of pasture-fed identical twin cows resulted in marked reductions in intake and in the concentrations of acetic and butyric acids in the rumen. Concentrations of propionic acid, however, remained at or above those found during the pre-treatment periods. Added linseed oil also resulted in an increase in the concentration of ammonia in the rumen.

II. IN VIVO HYDROLYSIS AND HYDROGENATION OF LIPID. J. C. Hawke and J. A. Robertson. *Ibid.*, 283–9. The hydrolysis and hydrogenation of grass and clover lipids and linseed oil have been followed in fistulated twin cows. Mono- and diglycerides, in addition to fatty acids, were found in the rumen liquor after infusion of linseed oil into the rumen. The proportions of linoleic acid found in rumen liquor 6.5 hour after infusion of linseed oil were above normal, but the proportions of linolenic acid had returned to about the pre-feeding level in this time. The free fatty acids were more saturated than the unhydrolyzed triglycerides, but the proportions of unsaturated fatty acids in the partially hydrolyzed glycerides were not greatly different from those of the triglycerides.

DETERMINATION OF ESTROGENS IN LOW AND HIGH TITER URINES USING THIN LAYER AND GAS LIQUID CHROMATOGRAPHY. H. H. Wotiz and S. C. Chattoraj (Dept. Biochemistry, Boston Univ. Med. Center, Boston, Mass.). *Anal. Chem.* **36**, 1466–72 (1964). A method is described which allows the determination of seven estrogens from human high or low titer urines. Preliminary thin layer chromatography (TLC) separates the estrogens into four groups: 1) estrone and 2-methoxyestrone, 2) the ring D-α-ketols and estradiol, 3) 16-epiestriol and 4) estirol. Further TLC of fraction 2 was found necessary to separate these estrogens from the neutral 17-keto-steroids. The latter are contained in the extract since isolation of phenols by means of alkali is ruled out for the analyses of the more labile metabolites. Following these preliminary procedures, gas liquid chromatography (GLC) permits rapid high resolution separation concomitant with high sensitivity quantification of the individual fractions. The use of a flame ionization detector is recommended because of its linearity over a large range, sensitivity and clean operation. Evidence for the specificity of the analysis is presented, based primarily on thin layer and gas liquid chromatographic data.

EFFECTS OF MEDIUM- AND LONG-CHAIN SATURATED TRIGLYCERIDES ON BLOOD AND LIVER CHOLESTEROL OF CHICKENS AND RATS. H. Fisher (Nutr. Lab., Rutgers, The State Univ., New Brunswick, N.J.) and H. Kaunitz. *Proc. Soc. Exp Biol. Med.* **116**, 278–80 (1964). Studies were carried out with chickens and rats to relate the ingestion of medium- and long-chain saturated triglycerides to the blood and liver cholesterol level. It was found that MCT significantly elevated the plasma cholesterol level of chickens compared with LCT. The reverse observation was made in rats where MCT was effective in lowering serum cholesterol. On the other hand, MCT-fed chickens and rats had a significantly lower liver cholesterol level than LCT-fed individuals. The significance of these findings with reference to the relationship between dietary fat and blood lipid concentration is discussed.

THE ENZYMATIC ACYLATION OF LYSOPHOSPHATIDYLINOSITOL. R. W. Keenan and L. E. Hokin (Dept. of Physiological Chemistry, Univ. of Wisconsin, Madison, Wis.). *J. Biol. Chem.* **239**, 2123–9 (1964). Pigeon pancreas microsomal and mitochondrial fractions were found to catalyze the formation of phosphatidylinositol from fatty acid thioesters of coenzyme A and lysophosphatidylinositol. A simple assay method was developed for following this reaction. Kinetic parameters of the acyla-

tion reaction were studied. Oleyl-coenzyme A was a better substrate than palmityl coenzyme A. Lysophosphatidylcholine was acylated more rapidly than lysophosphatidylinositol irrespective of the acyl coenzyme A derivatives tested.

COMPARATIVE EFFECTS OF CERTAIN ANTIOXIDANTS ON GESTATIONAL PERFORMANCE AND TERATOGENY IN VITAMIN E-DEFICIENT RATS. D. W. King (Dept. of Anatomy, State Univ. of Iowa, College of Med., Iowa City, Iowa). *J. Nutr.* 83, 123–32 (1964). In an effort to elucidate the mechanism of function of vitamin E, many substitutes with antioxidant activities have been used. Many of these nontocopherol substances, when fed to vitamin E-deficient animals, acted like a tocopherol in preventing, ameliorating or relieving deficiency symptoms. Three of these substances, N, N'-diphenyl-p-phenylenediamine (DPPD), N-propyl gallate (NPG), and 1,2-dihydro-6-ethoxy-2,2,4-trimethylquinoline (EMQ) reduced the incidence of congenital malformations in vitamin E-deficient rats.

ENZYMATIC ω-OXIDATION OF FATTY ACIDS. II. SUBSTRATE SPECIFICITY AND OTHER PROPERTIES OF THE ENZYME SYSTEM. M. Kusunose, E. Kusunose and M. J. Coon (Dept. of Biological Chem., Med. School, Univ. of Michigan, Ann Arbor, Mich.). *J. Biol. Chem.* 239, 2135–9 (1964). The properties of a soluble bacterial enzyme system which catalyzes the ω-hydroxylation of fatty acids have been studied. Octanoate, decanoate, laurate and myristate are the most active substrates, whereas palmitate and stearate are oxidized at lower rates and hexanoate is not oxidized. Apparent K_m values have been determined for four of these substrates. Evidence is presented that the hydroxylation reaction requires oxygen, reduced diphosphopyridine nucleotide, Fe^{2+} ions, and at least two enzymes. Other pyridine nucleotides and other metals are less effective. Evidence has also been obtained for a diphosphopyridine nucleotide-dependent ω-hydroxy fatty acid dehydrogenase.

GLYCEROL METABOLISM IN CHOLINE-DEFICIENT RATS. W. J. Longmore and A. B. Hastings (Scripps Clinic and Res. Foundation, La Jolla, Calif.). *J. Nutr.* 83, 103–6 (1964). The metabolism of glycerol-1,3-C^{14} by liver slices of choline-deficient and normal liver was compared. The uptake of glycerol and its conversion to glycogen was markedly decreased in the choline-deficient liver, whereas glycerol conversion to glucose and CO_2 was normal. The incorporation of glycerol into the glycerol moiety of liver phospholipids decreased in the choline-deficient tissue, whereas incorporation of inorganic P^{32} into the phospholipid remained normal or increased.

VITAMIN D_2 REQUIRED OF THE BABY PIG. E. R. Miller, D. E. Ullrey, C. L. Zutaut, B. V. Baltzer, D. A. Schmidt, B. H. Vincent, J. A. Hoefer and R. W. Luecke (Depts. of Animal Husbandry, Veterinary Pathology and Biochemistry, Michigan State Univ., East Lansing, Mich.). *J. Nutr.* 83, 140–8 (1964). The vitamin D requirement of baby pigs receiving a purified diet containing 0.8% of Ca, 0.6% of P and 350 ppm of Mg was studied in three 5-week trials using levels of vitamin D_2 from zero to 10,000 IU/kg of diet. All pigs receiving no dietary vitamin D_2 exhibited symptoms of either acute magnesium deficiency or rickets. Increasing the dietary Mg prevented tetany but not rickets in vitamin D-deficient pigs. Under the conditions of this study the minimal vitamin D_2 requirement of the baby pig is not greater than 100 IU/ kg of diet.

EFFECT OF TRIPARANOL ON SYNTHESIS OF FATTY ACIDS BY TETRAHYMENA PYRIFORMIS. W. O. Pollard, M. S. Shorb, P. G. Lund and V. Vasaitis (Poultry Sci. Dept., Univ. of Maryland, College Park, Md.). *Proc. Soc. Exp. Biol. Med.* 116, 539–43 (1964). Triparanol suppressed the synthesis of total lipids in 3 strains of *Tetrahymena pyriformis*. Strain differences were noted when triparanol inhibition was reversed with oleic acid or by prolonged incubation. Supplements of short-chained carboxylic acids influenced the effect of triparanol on the total lipids, the percentage composition of saturated and unsaturated fatty acids and the specific fatty acids synthesized. There was an increase in the content of odd-numbered and branched-chain saturated fatty acids synthesized with triparanol plus propionate or C-methyl *n*-butyrate supplements, and an increase in the percentage of oleic acid synthesized with triparanol plus acetate supplements. Triparanol may act by inhibiting the ability of *T. pyriformis* to demethylate and to dehydrogenate saturated fatty acids in formation of unsaturated fatty acids.

INFLUENCE OF DIETARY PHYTOL, ISOPHYTOL AND SQUALENE ON THE TOCOPHEROL CONTENT OF LIVER TISSUE. W. J. Pudelkiewicz, G. Olson, L. D. Matterson and J. R. Suden (Poultry Sci. Dept., Storrs Ag. Exp. Sta., Univ. of Connecticut, Storrs, Conn.). *J. Nutr.* 83, 111–4 (1964). Phytol, isophytol, and squalene were fed to 18-day-old vitamin E-depleted chicks for either 48 or 72 hours at levels ranging up to 1% of the diet and the effect of these compounds on the absorption of d, α-tocopherol was examined. No appreciable effect was noted on the tocopherol content of liver tissue when phytol was fed at levels of 0.01, 0.04, 0.125, 0.16 and 0.25% of the diet. However, at 0.50 and 1.0% of the diet, approximately a twofold and a threefold increase, respectively, was observed. Isophytol had the opposite effect, showing approximately a 40% decrease in the liver tocopherol values. Squalene also had an adverse effect, but not to the same extent as did isophytol. An anomalous situation occurred with plasma tocopherols and phytol intake. Increasing levels of phytol resulted in decreases in plasma tocopherol concentrations for both the tocopherol-supplemented and non-supplemented diets.

EFFECT OF DIETARY PROTEIN LEVEL ON CHOLESTEROLEMIA, THROMBOSIS, ATHEROSCLEROSIS AND HYPERTENSION IN THE RAT. S. Renaud and C. Allard (Institut de Cardiologie de Montréal, Montreal, Canada). *J. Nutr.* 83, 149–57 (1964). The thrombotic syndrome induced in the rat by a hyperlipemic diet containing laboratory chow, sodium cholate, butter and cholesterol was prevented by increasing the protein content of the diet, without affecting the cholesterolemia. With a purified diet, decreasing the protein level increased the cholesterolemic response; thrombosis could be produced under these conditions, provided that the dietary casein was decreased to approximately one-half of its normal level for the rat. With purified diets, the thrombi were located at various sites: 1) in small vessels; 2) in large coronary arteries with massive infarction ensuing; or 3) in the cardiac cavities. Aortic fatty streaks and even atherosclerotic plaques were consistently observed within 7 months with hyperlipemic purified diets, irrespective of the dietary level of protein. The dietary level of protein appears to markedly influence the experimental production of thrombosis, atherosclerosis and hypertension in the rat, although not in the same direction.

PHOSPHOLIPID PATTERNS IN LIVERS ACCUMULATING FAT. F.Snyder and W. Lewis (Oak Ridge Inst. of Nuclear Studies, Med. Div., Oak Ridge, Tenn.). *Proc. Soc. Exp. Biol. Med.* 116, 459–62 (1964). Fatty livers produced by cerium injection have shown 3 main alterations in the liver phospholipid pattern separated on silicic acid columns: 1) the appearance of a secondary peak in the polyglycerol phosphatide fraction (eluted with chloroform:methanol, 8:1); 2) a small but consistent increase in the phosphatidic acid-polyglycerol phosphatide fraction; and 3) a decrease in the lecithin fraction for all fatty livers measured in this study.

IN VITRO ACTIVATION OF LIPOLYTIC ACTIVITY IN THE SERUM OF DOGS BY BILE SALTS. W. L. Traxel and V. S. LeQuire (Dept. of Anatomy, Vanderbilt Univ., School of Med., Nashville, Tenn.). *Proc. Soc. Exp. Biol. Med.* 116, 388–92 (1964). The inactive precursor of a lipolytic enzyme which requires bile salts for activation *in vitro* has been identified in serum from dogs and cats and bile from dogs. It is absent from the serum of humans, rabbits, rats and goats. The activated enzyme has been referred to as cholate activated lipase (CAL). Both CAL and its inactive precursor are heat labile. The pH optimum of CAL is 8.0–8.3. CAL rapidly hydrolyzes long and short chain fatty acid triglyceride. Eserine and hexestrol are inhibitors of CAL. Comparison of the effect of various potential inhibitors on CAL with their effects on pancreatic lipase and postheparin lipase suggests that the lipolytic enzymes from these three sources are not identical.

EFFECT OF EXCLUSION OF HEPATIC CIRCULATION ON OXIDATION OF OCTANOIC ACID IN THE RAT. V. D. Valdivieso and A. D. Schwabe (Depts. of Med., Harbor Gen. Hosp., Torrance and Univ. of Calif. Center for Health Sci., Los Angeles, Calif.). *Proc. Soc. Exp. Biol. Med.* 116, 290–2 (1964). The oxidation of intravenously administered carboxyl-labeled octanoic acid was estimated in 2 groups of rats by continuously measuring and recording the expired $C^{14}O_2$ in a carbon-14 analyzer. In 5 normal rats and average 27.4% of the administered dose of radioactivity was recovered in the expired air in one hour. In 5 rats in which the liver had been excluded from the circula-

tion an average of 23.7% was recovered. These results suggest that extra-hepatic tissues of the rat are capable of oxidizing octanoic acid at nearly the same rate as the intact animal.

PREPARATION OF BRAIN POLYPHOSPHOINOSITIDES. E. E. Kerr, G. A. Kfoury, and L. G. Djibelian (Dept. of Biochemistry, American Univ. of Beirut, Beirut, Lebanon). *J. Lipid Res.* 5, 481–3 (1964). A description is given of the preparation of mixed tri- and diphosphoinositides of brain by a sequence of three procedures, no one of which alone effects complete purification. About 7% of the phosphorus in the product represents diphosphoinositide when ox brain is obtained within an hour of slaughter.

A COMPARISON OF THE METABOLISM OF ELAIDIC, OLEIC, PALMITIC AND STEARIC ACIDS IN THE RAT. R. H. Coots (Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio). *J. Lipid Res.* 5, 468–72 (1964). A comparison has been made of the metabolism of 1-C^{14}-labeled oleic, elaidic, palmitic and stearic acids in the rat. Each acid was fed as a component of randomly rearranged soybean oil. All the acids were more than 96% absorbed. The rate of catabolism and the extent to which elaidic acid was excreted in the respiratory CO_2 were essentially the same as those of oleic acid and both of these acids were similar to palmitic acid. Oleic, elaidic and palmitic acids were catabolized to CO_2 to a greater extent than was stearic acid. Elaidic acid seemed to be incorporated into the lymph phopholipids to a slightly greater extent than was oleic acid during the peak of absorption; otherwise, elaidic acid was similar to oleic acid in its absorption and distribution among the lymph lipids. Stearic acid was incorporated into the lymph phospholipids to a considerably greater degree (~8%) than were the other acids (~2–3%). The major transport of each fatty acid was via the lymph glycerides, being ~90% for stearic acid and ~97% for the other acids.

THE UPTAKE OF DOUBLE LABELED CHYLOMICRONS BY GUINEA PIG MAMMARY GLAND AND LIVER. O. W. McBride and E. D. Korn (Lab. of Biochemistry, Section on Cellular Physiology, Nat'l. Heart Inst., NIH, Bethesda, Md.). *J. Lipid Res.* 5, 459–67 (1964). The uptake of cholesterol-H^3-palmitate-C^{14}-chylomicrons by mammary tissue and liver has been examined. The cholesterol and glyceride components of chylomicrons were taken up at the same rate by both liver and mammary tissue, as demonstrated by the unchanged ratio of C^{14}/H^3 in the tissue lipids compared to the chylomicrons. However, following injection of glycerol-C^{14}-palmitate-H^3-chylomicrons, the H^3/C^{14} ratio of the lipids of mammary tissue was much the serum lipids, or of the liver lipids, indicating that appreciable hydrolysis of chylomicron glycerides occurred during their uptake by mammary glands. This is consistent with the hypothesis than lipoprotein lipase is involved in the uptake of chylomicron glyceride by mammary gland.

UPTAKE OF FREE FATTY ACIDS AND CHYLOMICRON GLYCERIDES BY GUINEA PIG MAMMARY GLAND IN PREGNANCY AND LACTATION. O. W. McBride and E. D. Korn (Lab. of Biochemistry, Section on Cellular Physiology, Nat'l. Heart Inst., NIH, Bethesda, Md.). *J. Lipid Res.* 5, 453–8 (1964). Mammary tissue of lactating guinea pigs was shown to take up both free fatty acids and chylomicron glycerides from plasma approximately twenty times more rapidly than mammary glands from midpregnant animals. The rates of removal of both forms of lipid by lactating mammary gland are comparable with those of liver. Free fatty acids cross the placental membrane and are rapidly taken up by fetuses at midpregnancy. There is no transfer of chylomicron glyceride across the placental membrane.

THE ROLE OF LIVER AND ADIPOSE TISSUE IN THE PATHOGENESIS OF THE ETHANOL-INDUCED FATTY LIVER. M. Poggi and N. R. Di Luzio (Dept. of Physiology, Univ. of Tennessee Medical Units, Memphis, Tenn.). *J. Lipid Res.* 5, 437–41 (1964). *In vivo* incubation of paired epididymal fat pads with medium containing palmitic-1-C^{14} acid was employed to label adipose tissue triglycerides. The administration of a single dose of ethanol to normal rats so treated produced an elevation of liver triglyceride, judged by comparison with control rats given glucose isocalorically. The radioactivity of liver triglyceride was proportionately elevated, while the specific activity was unchanged. The loss of radioactive triglyceride from adipose tissue was not significantly different in the ethanol group from that in the controls.

LOCALIZATION AND BIOSYNTHESIS OF 7-DEHYDROCHOLESTEROL IN RAT SKIN. J. L. Gaylor and F. M. Sault (Graduate School of Nutrition, Cornell Univ., Ithaca, N.Y.). *J. Lipid Res.* 5, 422–31 (1964). By differential assay, the concentration of 7-dehydrocholesterol in the dead keratin layer, the epidermal mucosa, the sebaceous glands and associated appendages of the epidermis, and the dermis of rat skin was determined; 85% of the 7-dehydrocholesterol was isolated from slices of skin that contained surface keratin and sebaceous glands. Slices of skin were incubated with labeled acetate *in vitro*. Labeled 7-dehydrocholesterol was separated from other labeled skin sterols as the hydrolyzed 5α, 8α Diels-Alder adduct. Approximately 80% of the labeled 7-dehydrocholesterol was isolated from slides of rat skin that contained sebaceous glands.

CHOLESTEROL TURNOVER IN THE AMERICAN COCKROACH, PERIPLANETA AMERICANA (L.). H. E. Vroman, J. N. Kaplanis and W. E. Robbins (Entomology Res. Div., Ag. Res. Svc., USDA, Beltsville, Md.). *J. Lipid Res.* 5, 418–21 (1964). Turnover of cholesterol in the American cockroach, *Periplaneta americana* (L.), was investigated by feeding cholesterol-4-C^{14} in the diet and examining periodically the specific radioactivity of the total carcass cholesterol. It was found that the movement of cholesterol into and out of the roach tissues was much slower than has been reported for mammals. The ester cholesterol pool was found to equilibrate slowly with the free cholesterol pool. At least 40% of the carcass cholesterol was found to be exchangeable with the dietary cholesterol.

THE EFFECT OF BILE AND BILE SALTS ON THE UPTAKE AND CLEAVAGE OF β-CAROTENE INTO RETINOL ESTER (VITAMIN A ESTER) BY INTESTIONAL SLICES. J. A. Olson (Dept. of Biochemistry, Univ. of Florida, College of Med., Gainesville, Fla.). *J. Lipid Res.* 5, 402–8 (1964). Bile of the rat and of other species stimulates the uptake of β-carotene from a micellar solution of Tween 40 (polyoxyethylene anhydrosorbitol monopalmitate) and its cleavage into retinol ester by intestinal sections of the rat incubated *in vitro*. Sodium glycocholate and several other conjugated bile acids substitute completely for bile. Glycocoholate also stimulates β-carotene cleavage by intestinal sections of the chicken, hamster and lamb, but not of the turtle or oppossum. The stimulatory effect of several bile acids tested in a medium containing Tween 40 is roughly proportional to the number of hydroxyl groups present. With the exception of cholic acid, only conjugated bile acids have this activity. The binding of β-carotene to the intestine occurred rapidly and could not be readily correlated with the formation of retinol ester.

INCORPORATION OF ACETATE-C^{14} INTO INDIVIDUAL FATTY ACIDS OF RAT LIVER TRIGLYCERIDES AND PHOSPHOLIPIDS. J. D. Evans and L. N. Norcia (Depts. of Physiology and Biochemistry, Temple Univ. School of Med., Philadelphia, Pa.). *J. Lipid Res.* 5, 395–401 (1964). Control rats and those made hyperthyroid or hypothyroid by dietary means, showed the same general pattern of C^{14} incorporation into liver lipid fractions following intraperitoneal injection of $C^{14}H_3COONa$, although the synthesis of phospholipids was apparently decreased in both hyper- and hypothyroid states. Liver triglyceride linoleate was greatly depleted in the hyperthyroid state.

ACTIVITY OF MICROBIAL LIPASES ON NATURAL FATS AND SYNTHETIC TRIGLYCERIDES. J. A. Alford, D. A. Pierce and F. G. Suggs (Eastern Utilization Res. and Dev. Div., USDA, Beltsville, Md.). *J. Lipid Res.* 5, 390–4 (1964). The positional and fatty acid specificities of lipases from several different microorganisms have been examined by gas-liquid chromatographic analysis of the free fatty acids following action on mixed triglycerides of known composition. Three types of lipases were found. Lipases of the first type, obtained from several microorganisms, attacted primarily the 1-position of the triglyceride in a manner similar to that of pancreatic lipase. Some fatty acid preference was also observed. The ability of the lipolytic enzymes from *Staphylococcus aureus* and *Aspergillus flavus* to attack the 2-position as well as the 1-position suggested another type of activity. The lack of any appreciable effect of diisoprophylfluorophosphate in 10^{-4} *M* concentrations on this hydrolysis indicated it was not an esterase. The third type of lipase was from *Geotrichum candidum* and it preferentially hydrolyzed the oleate ester from the triglyceride regardless of its position.

THE STRUCTURES OF THE FREE UNSATURATED FATTY ACIDS OF HUMAN SKIN SURFACE FAT. N. Nicolaides, R. E. Kellum and

P. V. Woolley III (University of Oregon Medical School). *Arch. Biochem. Biophys.* 105, 634–9 (1964). The position of the monoenoic free fatty acids of human skin surface fat were determined by preparative and analytical gas chromatography, coupled with hydrogenation and ozonolysis techniques. Straight and branched monoenoic fatty acids from C_{13}–C_{26} chain length were found, with their major position of unsaturation at 6, 7 or removed from this position by an integral number of C_2 units.

SERUM PHOSPHOLIPIDS OF PIGS GIVEN DIFFERENT AMOUNTS OF LINOLEIC ACID. 1. FATTY ACID COMPOSITION OF THE KEPHALIN, LECITHIN, LYSOLECITHIN AND SPHINGOMYELIN FRACTIONS. W. M. F. Leat (University of Cambridge). *Biochem. J.* 91, 437–43 (1964). The fatty acid composition of the serum phospholipids of pigs reared on various amounts of dietary linoleate (0.07–3.67% of total calories) has been examined. In the lecithin fraction decreasing the dietary linoleate resulted in a decrease in the percentages of linoleic acid and arachidonic acid and an increase in that of eicosatrienoic acid. In the kephalin fraction there was a fall in arachidonic acid which greatly exceeded the increase in that of eicosatrienoic acid. Fatty acids of the lysolecithin and sphingomyelin fractions were least affected by changes in dietary linoleate. When dietary linoleate was decreased to less than 1% of the calories, the percentage of lecithin in serum phospholipids increased at the expense of lysolecithin and sphingomyelin. The author suggests that the role of arachidonic acid is concerned with the correct functioning of kephalins which are known to be major components of cell membranes.

2. LOCATION OF EICOSATRIENOIC ACID IN LECITHIN. *Ibid.*, 444–7. The composition of the fatty acids attached at the α- and β-positions of the serum lecithin and the fatty acids of lysolecithin of pigs suffering from essential fatty acid deficiency have been examined. About 95% of the eicosatrienoic acid and arachidonic acid in lecithin was located at the β-position of the molecule. It is concluded that the increased turnover rate of lecithins in essential fatty acid deficiency cannot be explained by the eicosatrienoic acid being attached to the lecithin at a position different from that of arachidonic acid.

BLOOD LIPIDS. 4. THE ISOLATION OF 3,7,11,15-TETRAMETHYLHEXADECANOIC ACID (PHYTANIC ACID) FROM OX-PLASMA LIPIDS. A. K. Lough (Rowett Research Institute, Aberdeen). *Biochem. J.* 91, 584–8 (1964). Phytanic acid was isolated from ox-plasma lipids. The identity of the acid was established by a study of the products obtained by oxidative degradation and confirmed by showing that it was indistinguishable in respect to its gas-liquid-chromatographic properties and infrared absorption spectrum from an authentic specimen of the acid. The gas-liquid-chromatographic behavior of branched chain acids is discussed as also is the possibility that plasma phytanic acid may be derived from the phytol moiety of feed chlorophyll.

• Drying Oils and Paints

SYNTHESIS OF ALKYD VARNISH RESINS MODIFIED WITH AROMATIC MONO-BASIC ACIDS. V. N. Izyumov and T. L. Koposova. *Lakokras. Mat.* 1963, No. 4, 2–5. A series of new varnish compositions have been prepared on the basis of a pentaerythritol alkyd modified with *di-tert.*-butylbenzoic acid and linseed oil or synthetic fatty acids. The coatings obtained were found to be moisture and weathering resistant, hard and elastic. (Rev. Current Lit. Paint Allied Ind.)

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(Continued from page 66)

LINSEED AND SAFFLOWER GROWING IN QUEENSLAND. V. J. Wagner. *Austral. Paint J.* 9, No. 4, 17, 20 (1963). The yield of linseed varies from 3.2–12.1 bushels/acre, which is regarded as very low. However, there is room for considerable development in the State, which already produces over 90% of the Australian crop. Widespread studies to improve the yield and the crop itself are being carried out. (Rev. Current Lit. Paint Allied Ind.)

QUALITY OF QUEENSLAND GROWN LINSEED AND SAFFLOWER SEED OILS. M. J. Price. *Austral. Paint J.* 9, No. 4, 17, 20 (1963). A report of a paper presented at the 5th Australian O.C.C.A. Convention, 1963. The work done to examine the correlation between refractive index and iodine value over three seasons for both linseed and safflower seed oils is outlined. A strong correlation was established and further studies may confirm that this is a cheap and rapid method of estimating iodine values, provided the varietal effect is considered. (Rev. Current Lit. Paint Allied Ind.)

GAS-CHROMATOGRAPHY IN PAINT RESEARCH. PYROLYSIS OF SOME FILM-FORMING POLYMERS AND COPOLYMERS. Z. Hippe. *Polimery* 8, No. 11, 414–5 (1963). Experimental results are given and technique described for the analysis of 17 film-forming polymers and copolymers. The substance to be analysed (1.5 to 2.0 mg) is subjected to controlled pyrolysis in a carrier gas stream and the resulting pyrolytic products then separated by normal gas chromatography. The chromatograms obtained might be of use for the identification of polymers. (Rev. Current Lit. Paint Allied Ind.)

• Detergents

CLASSIFICATION OF EMULSIFIERS. G. Carriére (Unilever N.V., Rotterdam, Netherlands). *Riv. Ital. Sostanze Grasse* 41, 165–70 (1964). A listing is given of commercially available emulsifiers and their applications.

SECONDARY ALCOHOL ETHOXYLATES AS DEGRADABLE DETERGENTS. R. C. Myerly, J. M. Rector, E. C. Steinle, C. A. Vath and H. T. Zika (Union Carbide Corp., South Charleston, W. Va.). *Soap Chem. Specialties* 40 (5), 78–80, 82, 170–1 (1964). The performance characteristics exhibited by various surface active derivatives of secondary alcohols make them valuable ingredients of detergent compounds. Formulations containing ethoxyl sulfates form high foam both with and without ABS in waters of all degrees of hardness. The nonionics produce low foam formulations showing high levels of cotton detergency. All surface active derivatives of secondary alcohols are biodegradable by tests which measure both their disappearance by loss of surface active properties and the extent to which they are degraded.

DETERGENT SULFONATION WITH SO_3. W. Carasik and J. R. Hughey (Ultra Chemical Co.). *Soap Chem. Specialties* 40(6), 49–52 (1964). Increasing demand for high active, low salt alkyl benzene sulfonates in liquid detergent and other specialty cleaning compounds, emulsifiers and various industrial uses has centered attention on the routes for producing these materials by sulfur trioxide sulfonation. The pros and cons of various process Ballestra process, Chemithon process, Allied Chemical process, and the SO_2–SO_3 process) are analyzed.

FORMULATING WITH DICHLOROISOCYANURATES. J. S. Thompson (FMC Corp.). *Soap Chem. Specialties* 40(6), 45–8, 122–3 (1964). Chlorinated isocyanurics are economical and concentrated sources of available chlorine for sanitizers, bleaches, and detergents. Three principal forms are currently available—trichloroisocyanuric acid, sodium dichloroisocyanurate and potassium dichloroisocyanurate. The characteristics and possible applications of each form are discussed.

CLEANSING COMPOSITION. D. C. Wood and C. R. Pacifico (Whirlpool Corp.). *U.S. 3,134,738.* A cleansing composition for fabrics and rugs consist of: 12 weight % of lauryl dimethyl amine acetate, 2% of polyethylene glycol having an average molecular weight of substantially 400, 0.5% of a chlorinated moth-proofing agent (dichlorobenzyl triphenyl or pentachloro-dihydroxy-triphenyl-methane sodium sulfonate), 0.1% of 2,2′-dihydroxy-4-methoxybenzophenone, 0.1% of 4,4′-dibenzoyl diamine stilbene 2,2′-disulfonic acid, and the remainder water.

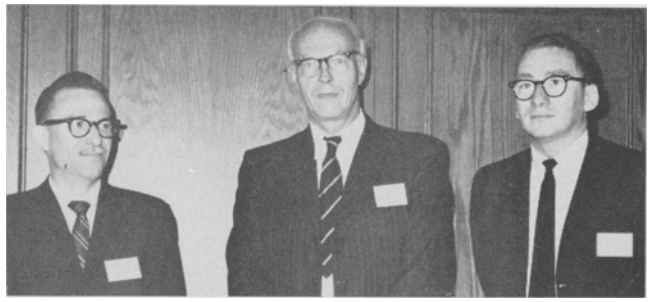
Lipid Symposium . . .

(Continued from page 34)

ing apolar bonding, i.e. through fatty acid carbon chains to protein, demonstrate that the mitochondrial membrane structure is very different from that of the stable type of membrane typified by brain myelin. The membranous structure of myelin and the membrane of the mitochondria are very different in lipid composition and general properties. The mitochondria are very fluid and metabolically active subcellular particles containing large amounts of unsaturated fatty acids, have a low content of cholesterol and sphingolipids are absent, while the myelin sheath of the nervous system is a stable structure that does not undergo any appreciable regeneration and is characterized by the presence of relatively saturated fatty acids and large amounts of sphingolipid and cholesterol.

F. A. Vandenheuvel, Department of Agriculture, Ottawa, Can., reviewed his formulation of the molecular structure of brain myelin and presented a new and exciting detailed model of the cell membrane of *Halobacterium cutirubrum*. This formulation included a detailed structure of protein (of the keratin type) and lipid composing the bimolecular leaflet with water molecules placed between protein and lipid. Dr. Vandenheuvel used this model as the basis for the formulation of an hypothesis for the mechanism of active transport of sodium and potassium.

The final portion of the program was devoted to special functions of lipids. Aaron Marcus discussed the role of human blood platelets in blood coagulation. Blood platelets provide phospholipid that is essential for proper blood coagulation and Dr. Marcus has shown that the phospholipids of platelets are most active as a mixture. No single lipid class is solely responsible for the clot promoting activity and lipids are most active in blood coagulation when associated with proteins. Dr. Marcus isolated platelet membranes and showed them to be more active than platelet granules in blood coagulation. The isolation of the fatty acids known as the prostaglandins that cause smooth muscle



BIOLOGICAL MEMBRANES, afternoon, George Rouser, Chairman. L. to R.: Dr. Rouser, Hugh Sinclair, S. Fleischer.

to contract was described by Sune Bergström of the Karolinska Institute, Stockholm, Sweden. Dr. Bergström reviewed the difficult isolation procedures and the characterization of these substances occurring in minute amounts in several animal tissues, particularly the prostate gland, by a combination of techniques in which mass spectrometry played a major role. The prostaglandins are hydroxy fatty acids that were described as arising from polyunsaturated fatty acids (linoleic and arachidonic acids) in animal tissues. These substances are active in very small amounts and may be important in the control of blood pressure, uterine contraction, etc. Martin Jacobson described the isolation and characterization of various lipids, particularly fatty alcohols, that are present in insects and serve as attractants. These insect attractants are active at exceptionally low levels and apparently only a few molecules are required for activation of the receptor site. These highly active substances are of practical importance since the attractants can be used in the control and eradication of insects. It was noted that nothing is known of the mechanism of action of the insect attractants.

Hugh Sinclair of Magdalen College, Oxford, England, presented a special poetic summary of the Symposium in which he exerted his ability for a penetrating analysis of the overall progress in various areas in the form of a humorous and enlightening poem to the cadence of Hiawatha. It will appear in a later issue.

IMPROMPTU SESSION, F. A. Vandenheuvel, Chairman. L. to R.: Dr. Vandenheuvel, G. Feldman, W. R. Supina, C. C. Sweeley.

The program featured speakers from the U.S. and other countries (Canada, England, Finland, Germany, Italy, Israel and Sweden) and was attended by persons from South America and Denmark as well. Special features of the program were the showing of two motion pictures on general laboratory techniques prepared by O. S. Privett, a special panel discussion on quantitative GLC moderated by F. A. Vandenheuvel, with Gerald Feldman and C. C. Sweeley as discussants, and discussions and demonstrations of procedures for diethylaminoethyl (DEAE) cellulose column chromatography of polar lipids by Rouser.

A highlight of the Symposium was the presentation of the first American Oil Chemists' Society Award in Lipid Chemistry to Erich Baer for his work on the chemical synthesis of glycerol phospholipids. Details of the award, together with President Stillman's presentation address, are found on page 13.

NMR Spectroscopy . . .

(Continued from page 58)

intermediate. They proposed a structure for the iron carbonyl-fatty acid complex formed during the homogenous hydrogenation of methyl linoleate when using an iron pentacarbonyl catalyst in which the iron carbonyl is attached through *pi*-bonding to a conjugated dienoid structure in the fatty acid chain.

There is considerable interest at present in examining "new oils" which may contain unusual types of fatty acids obtained from such sources as "exotic" plant seeds. It is hoped that some of these plants may be cultivated to yield commercial oils with new properties for food use and new potentials for chemical derivatives. High resolution NMR spectroscopy has already been used to establish the cyclopropene ring structure in sterculic and malvalic acids isolated from *sterculia foetida* seeds (and known to be present as well in cottonseed oil), and Hashimoto et al. have recently studied the type of unsaturation present in a number of highly unsaturated fish oils. They found no evidence of terminal unsaturation or of divinylethane structures, but rather the divinylmethane type of structure present in linseed oil.

While the work mentioned above was done on highly purified samples of individual fatty acids isolated from the natural oil, it would appear that NMR spectroscopy can provide enough information on intact or natural oils to make it useful for initial screening of new oils and for checking the source and purity of commercial oils. Some of the information obtainable from the NMR spectrum of linseed oil in less than an hour's time is shown in Figure 4. The degree of unsaturation expressed as Iodine Number and Average Molecular Weight were accurately calculated (using the equations containing connections for C-13 splitting developed by Johnson and Shoolery), and a number of different types of olefin structures can be identified. The divinylmethane structure in the linolenic acid chain gives rise to peaks (e) and (h), and peaks (c) and (a) show the presence of a double bond two carbons from a terminal methyl group. The absence of appreciable amounts of methyl esters, epoxidized oils, cyclopropene rings, hydroxyl groups, free glycerine etc. can also be established. The positions at which some of these groups would absorb are indicated in Figure 4.

Conclusion

The preceeding examples illustrate the fact that NMR spectroscopy has already made important contributions to fat and oil chemistry.

As more chemists become familiar with its possibilities, and NMR spectrometers become more common in the laboratory, NMR spectroscopy will play an increasingly important role in solving the increasingly sophisticated research and control problems with which the fat and oil chemist is challenged today.

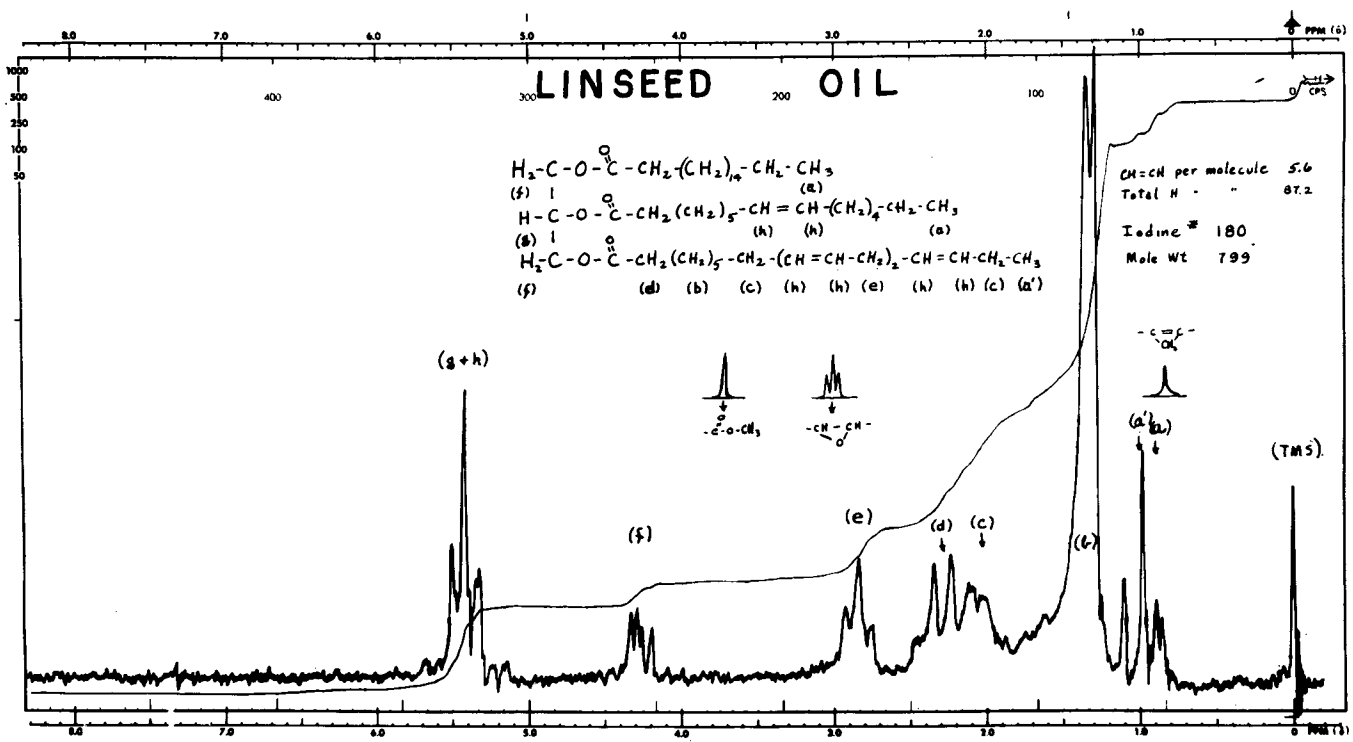


FIG. 4. High resolution NMR spectrum of linseed oil showing structural assignments and the position of possible impurity peaks.

Glycerine Production Stationary

According to the U. S. Dept. of Commerce, production of crude glycerine (including synthetic) for the month of June was 26.9 million lb, the same as the level reported for May, but down 0.8 million lb from June last year.

At the end of June, producers' stocks of crude and refined glycerine totalled 54.2 million lb, up 5.1 million lb from the end of May, and up 7.4 million lb from June, 1963.

JUNE
(Million lb)
PRELIMINARY

Glycerine 100% Basis	Factory Production		Producers' Stocks	
	June 1964	% Change from May 1964	End of June 1964	% Change from May 1964
Crude	26.9*	0	23.1	+ 7.9
Refined, all grades	26.7	+12.7	31.1	+12.3
			54.2	+10.4

* Includes synthetic glycerine.

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