# 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

STUDIES ON BOMER NUMBER. I. INFLUENCE OF MIXING FOREIGN FATS INTO PORK FAT. Isao Niiya, Kazuko Takagi, and Taro Matsumoto. *Yukagaku* 13, 599–602 (1964). Lards, prepared from the abdomen and the back of Yorkshire hogs, were mixed with beef tallow, mutton tallow, horse fat, bear fat and hydrogenated lard, respectively, in various ratios. The Bömer numbers of the lard-mixtures and the back-lard with 20% of beef tallow or 20% of mutton tallow fall below 73, but the value remains above 73 when 20% of beef tallow is mixed in the abdomen-lard. Addition of these fats over this amount results in increased yield of precipitated glyceride with lowering of the Bömer number. Addition of 60% of horse fat or bear fat in the lard results in the Bömer number of 74.5 and 76.0, respectively, accompanied by the remarkable lowering of the amount of precipitated glyceride. Addition of more than the above amount showed no precipitation of glyceride. Bömer number falls to below 70 when 20% of hydrogenated lard is added, while the additional 40% of it decreased to 65. The yield of precipitated glyceride increases rapidly with an increase in the amount of hydrogenated lard added.

NEW METHOD FOR EXTRACTION OF MILK PHOSPHOLIPIDS. A. Duthie and S. Patton (Dept. of Dairy Sci., Pa. State Univ., Univ. Park). *J. Dairy Sci.* 48, 170–74 (1965). The whole milk sample was compounded with silicic acid, the mixture placed in a glass chromatographic column, and the phospholipid fraction eluted with 20% (v/v) formic acid in ethyl ether. Lipid phosphorus analysis and thin-layer chromatography were used for the comparison of phospholipid recovery from 10-ml aliquots of milk by each of three methods—the new, Mojonnier, and the modified Mojonnier. Five trials verified that the modified Mojonnier method and new silicic acid column chromatographic method recovered 10.2 and 12.2 mean per cent, respectively, more lipid phosphorus than the conventional Mojonnier procedure. When aliquot samples from the phospholipid extracts recovered by the three methods were compared by thin-layer chromatography, minor differences were evident in the lipid patterns, notably in improved recovery of a component corresponding to phosphatidyl serine by the SACC method and in superior recovery of lysophosphatides by the Mojonnier and modified Mojonnier methods.

GAS CHROMATOGRAPHY OF FREE FATTY ACIDS. J. G. Nikelly (Dept. Chem., Philadelphia College of Pharmacy and Science, Philadelphia, Pa.). *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.

USE OF A NEW PROCESS FOR THE DEOILING OF PEANUT MEAL. M. E. Kahave, Huguette Mercier, and Maryse Arizzi (Lab. Biol. Chem., Montpellier, Fr.). *Rev. Franc. Corps Gras* 11, 671 (1964). A higher yield of lipids from deoiled peanut meal was obtained using an azeotropic extraction method (water-alcohol-benzene) in contrast to conventional methods. The method is rapid, extracts are low in non-fatty components, and damage to the phosphatides is less than in classical methods.

RECENT PROGRESS IN SOYBEAN OIL PROCESSING. M. R. Guillaumin (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 11, 655 (1964). Soybean oil processing is discussed. Degumming with water, basic or acidic solutions is described. Almost all of the soybean oil phosphatides are removed when a dilute nitric acid solution is used and the resulting oil does not "break" at high temperatures. The refining of soybean oil so degummed requires only bleaching and deodorization. Oils obtained using a nitric acid treatment are of good quality and are free of any unpleasant odor or flavor. The quality is comparable to that of oils obtained by the conventional caustic soda refining.

ANALYSIS OF FATTY ACID MIXTURES. COMPARISON OF TWO "ABSOLUTE" METHODS OF DETERMINATION. J. Tinoco *et al.* *Anal. Biochem.* 3(6), 514–8 (1962). Using an internal standard, the recovery and assay of mixtures of fatty acids was examined and compared with a completely independent method of analysis. Gas chromatography was found to have many advantages over the chemical method. The absolute amounts of fatty acid were determined from peak area measurements. (Rev. Current Lit. Paint Allied Ind., No. 269).

ESTERIFICATION OF TALL OIL ACIDS WITH METHYL ALCOHOL. V. P. Sumarokov and Z. M. Volodutskaya. *Gidroliz Lesokhim. Prom.* 15(8), 12–14 (1962). The separation of tall oil acids is greatly facilitated by their preliminary esterification, because of the relative low b.p. of the esters as compared with the free acids. Moreover, the esters are considerably less corrosive than the acids. Experiments were carried out to determine conditions under which the acids of crude tall oil could be completely esterified. Wood MeOH was used as the esterification agent and $H_2SO_4$ as the catalyst. At a molar ratio of MeOH to acids of 17:1, 5–11% of the catalyst (based on the weight of esterification mixture) and a reaction time of 25–30 hr., a reduction of the A.V. from the initial 142 to 7–8 was obtained. This corresponded to 100% esterification of fatty acids and 90% esterification of rosin acids. The esterification mixture which contained the methyl esters and neutral substances of tall oil, was subjected to fractional distillation under 3–4 mm. Hg. Methyl esters of fatty acids, consisting essentially of linoleic and linolenic acid esters, were separated at below 190C. The fraction containing mainly methyl abietate was collected at 190–202C. The third fraction, distilling at 202–220C, contained a mixture of methyl esters of rosin acids. The total yield of esters was 58–62%, based on the weight of crude tall oil. The absence of S in the distillation residue presented indirect evidence for the absence of sulphonation during esterification. Densities, refractive indices and saponification, acid ester and I values and $CH_2O$ contents of the ester fraction are tabulated. (Rev. Current Lit. Paint Allied Ind., No. 270).

IDENTIFICATION OF ESTERIFIED OLIVE OILS. P. Capella, E. Fedeli, M. Cirimele and G. Jacini (Fats and Oils Exper. Stat., Milan, Italy). *Riv. Ital. Sostanze Grasse* 41, 635–40 (1964). It is known that in natural oils the unsaturated fatty acids tend to esterify preferentially the $\beta$ hydroxyl of the glycerine molecule, while in esterified or synthetic oils the distribution of fatty acids between the $\alpha$ and $\beta$ positions is eminently statistical. This fact has been utilized for the detection of olive oil adulteration by esterified oils. The monounsaturated glycerides of the oil are separated by TLC and the I.R. spectrum of this fraction at −30C is recorded. The I.R. spectrum of monounsaturated glycerides with the unsaturate in the $\alpha$ position is sufficiently different from the case where the unsaturate occupies the $\beta$ position, to allow detection of 20% or more esterified oil.

EFFECT OF OLIVE VARIETY ON THE FATTY ACID COMPOSITION OF OLIVE OIL. A. Cucurachi (Agr. Exp. Stat., Bari, Italy). *Riv. Ital. Sostanze Grasse* 42, 18–21 (1965). The same major fatty acids are found in oils obtained from several different varieties of olives, the only ones that are sometimes missing being those that are present in minor amounts ($C_{17}$, $C_{22}$, $C_{24}$). Fatty acids lower than $C_{16}$ are never evidenced. The relative amounts of the major acids are apparently different for different olive varieties, regardless of the climatic conditions under which the olive is grown. Probably most significantly different from variety to variety is the oleic/linoleic ratio (variable between 4 and 18 approximately).

STATISTICAL VARIABILITY OF ITALIAN OLIVE OIL COMPOSITION. G. Barbiroli (Univ. of Bologna, Italy). *Riv. Ital. Sostanze Grasse* 42, 9–17 (1965). The applicability of the Gaussian distribution law to large numbers of olive oil samples has been studied with respect to some characteristics of the oil such as free fatty acid content, refractive index, iodine value and thermosulfuric grade. It is concluded that on the basis of presently available data it is not generally possible to determine, by means of the Gaussian law, within what values the variability of these properties is comprised. Some of the distributions studied (e.g. free fatty acid content) have been found to be distinctly bimodal.

U.V. spectrophotometric characteristics of crude olive husk oils. A. Giuffrida and G. D'Arrigo (Fats and Oils Exper. Stat., Catania, Italy). *Riv. Ital. Sostanze Grasse* **42**, 22–27 (1965). The U.V. absorption of crude oils extracted from olive husks has been studied, especially in the region 254 to 284 mμ, with a view to identifying the presence of esterified oil. It is concluded that the absorption of crude husk oil, in the above region, is so high as to make it very difficult to recognize the presence of trienoic compounds, on which the identification of esterified oils by U.V. is based.

Determination of the fat content of cheese. P. Armandola. *Ind. Aliment.* **3**, 45–8 (1964). A modification of the Schmid-Bondzynski-Ratzlaff method for the determination of the fat content of cheeses is described. The modified method is said to be more rapid and to give identical results.

Probable effects of acid isomerization leading to interpretation errors in gas chromatograms. E. G. Mondino (Castelvetrano, Italy). *Olearia* **18**, 101–7 (1964). The operating conditions under which fatty acid methyl esters are prepared can sometimes lead to some as yet unknown reaction (probably isomerization), as a result of which vapor phase chromatograms no longer reflect the true fatty acid composition of the oil. Specifically, it is believed that the $C_{21}$ fatty acid, identified in some olive oils, does not exist in the oil but is probably another fatty acid formed from oleic acid by isomerization or by some other mechanism. This reaction is apparently caused by the sulfuric acid catalyst used and can be avoided by keeping its content lower than 1%, possibly lower than 0.5%.

Fatty acid composition of Italian olive oils from the Puglie province. A. Cucurachi (Agric. Exp. Stat., Bari, Italy). *Olearia* **18**, 108–12 (1964). A tabulation of gas chromatographic data is given for samples of Italian olive oils produced in the Puglie province.

A rapid method for the determination of the oil content of olives. M. Catalano (Univ. of Bari, Italy). *Olearia* **18**, 116–9 (1964). An approximate, rapid method for the determination of the oil content of olives is described. The method employs a butirrometer, requires about one hour elapsed time and gives results which, although lower than the true values, correlate well with them.

Spectrofluorometric studies on olive oil. G. Kaderavek, G. Volonterio and G. Gay (Univ. of Milan, Italy). *Riv. Ital. Sostanze Grasse* **41**, 579–84 (1964). It is possible through spectrofluorometric examination to distinguish virgin from esterified olive oils, since the latter present on a fluorescent band at 535 mμ when excited at 444 mμ, which is always absent in virgin olive oils. Mixtures of the two types of oil behave identically to the esterified oil.

Fatty acid composition of the flowers of Nerium Oleander spontaneous. B. Chiarlo (Univ. of Genoa, Italy). *Riv. Ital. Sostanze Grasse* **41**, 585–6 (1964). Gas chromatographic analysis of the residue of solvent extractions of Oleander flowers has revealed the presence of at least 25 components, 14 of which (corresponding to 90% by weight) are surely identified. Among the main components identified are: oleic (24%), palmitic (21.5%), linolenic (11%) and linoleic (10%).

Composition of crude olive husk oils. G. D'Arrigo and A. Giuffrida (Fats and Oils Exp. Stat., Catania, Italy). *Olearia* **18**, 113–5 (1964). Saturated fatty acids are preferentially bound to the α position of the glycerine molecule, the position which is preferentially attacked by lipase. It was therefore expected that refined olive husk oils with high initial acidity would have a significantly different fatty acid composition from that of natural olive oils. These differences in the ratio of saturates to unsaturates have been confirmed experimentally, however they are found to be too small to contribute a significant difference to the oil's properties.

Control of lard purity by gas chromatography. P. Armandola (Univ. of Milan, Italy). *Riv. Ital. Sostanze Grasse* **41**, 587–93 (1964). The results of extensive gas chromatographic studies on pure and adulterated lards indicate that it is not possible, at present, to prove the adulteration of lard conclusively by gas chromatography alone. Such a proof must be sought through the interpretation of several analytical techniques.

Modern analytical methods for fatty substances. S. Anselmi (Istituto di Sanita', Rome, Italy). *Riv. Ital. Sostanze Grasse* **41**, 623–34 (1964). A survey of modern analytical methods (gas, paper and thin layer chromatography, I. R. and U.V., spectrofluorometry) and their application to fats and oils analysis.

The analysis of antioxidants in fats and oils. P. Armandola. *Ind. Alim.* **3**, 55–6 (1964). An analytical method is described, capable of detecting as little as 0.01% propyl gallate, NDGA, BHA or BHT in fats and oils.

Selection of a chromatographic solvent. J. A. Thoma (Dept. of Chem. Indiana Univ., Bloomington, Ind.). *Anal. Chem.* **37**, 500–508 (1965). Two complementary quantitative indexes of the resolving power of a chromatographic system, the ratios of the chemical potentials of transfer of related compounds and the ratio of the cross-sectional areas of the liquid phases, are proposed and evaluated. Graphical procedures are developed for determination of these chromatographic parameters for systems of homologous polymers and structurally related solutes. Criteria for the use of these parameters are outlined and when experimentally tested held for polar solutes and solvents.

Evidence of coupled eddy diffusion in gas chromatography. J. M. Harper and E. G. Hammond (Dept. of Dairy and Food Industry, Iowa St. Univ., of Science and Tech., Ames, Iowa). *Anal. Chem.* **37**, 486–489 (1965). A method was developed to calculate the eddy diffusion contribution to plate height in gas liquid chromatography at various gas velocities. The presence of a coupled eddy diffusion term, $A_c'$, was demonstrated. The maximum value of $A_c'$ as $U' \rightarrow \infty$ was shown to be equal to the conventionally determined constant, $A = 2\,\lambda d_p$ with the average value of $\lambda = 1.0$. The mass transfer coefficient, $C_c'$, a measure of resistance to diffusion in the interparticle gas space in coupled eddy diffusion, was shown to be inversely proportional to the diffusivity of the solute in the gas phase. The magnitude of $C_c'$ is somewhat larger than had been theoretically predicted for the resistance to lateral diffusion processes connecting unequal velocity channels within the packing.

Solid support characteristics and plate height in gas chromatography. J. M. Harper and E. G. Hammond (Dept. of Dairy and Food Industry, Iowa State Univ. of Science and Tech., Ames, Iowa). *Anal. Chem.* **37**, 490–495 (1965). Constants for a plate height-velocity equation were determined for stationary phase supports, made by lyophilizing a mixture of inorganic salts, and Chromosorb P. This allowed a study of the effect of porosity and pore size distribution on the equation constants. The value of the obstructive factor, $\gamma$, in the longitudinal diffusion coefficient, $B_c'$, increased with increases in intraparticle void. This suggests that $\gamma$ is the sum of intra- and interparticle contributions. The values of $C_g'$ decreased as the intraparticle void increased. This term should be a measure of resistance to mass transfer in the stagnant gas inside the particles, but it may also contain a contribution from the coupled eddy diffusion term.

Packed capillary columns in gas chromatography. I. Halász and E. Heine (Institut für Physikalische Chemie der Universität, Frankfurt am Main, Germany). *Anal. Chem.* **37**, 495–500 (1965). Packed capillary columns were produced by drawing out glass tubes which were loosely filled with a granular solid of narrow mesh range. Properties of these packed capillary columns are compared with those of classical packed columns. The packed capillary columns are especially advantageous if the stationary phase is a liquid coated, or uncoated, active solid, but it can be used with inactive support too.

Automated method for the colorimetric determination of acyl esters in serum. A. Antonis, D. S. Platt, and J. M. Thorp (Medical Unit, St. George's Hosp. Med. School, London). *J. Lipid Res.* **6**, 301–306 (1965). An automated procedure is described for the estimation of serum acyl esters. The method requires the preliminary extraction of serum with isopropanol. The lipid extract is then analyzed automatically by the colorimetric procedure based on the formation of ferric hydroxamates. The influence of a number of factors on the precision of the method is discussed.

## • Fatty Acid Derivatives

CONDENSATION OF OLEYL ALCOHOL WITH FORMALDEHYDE. Choichiro Hirai, Takeoki Nozaki and Taro Matsumoto (Nihon Univ., Tokyo). *Yukagaku 13*, 526–9 (1964). Condensation product of oleyl alcohol and paraformaldehyde in the presence of sulfuric acid as a catalyst was saponified, fractionated by chromatography and recrystallization gave a substance having the m.p. at 93–4C which is assumed to have tetrahydropyran-4-ol structure; analysis showed it to be $C_{20}H_{40}O_3$, infrared spectra indicated the presence of a hydroxyl group and an ether-like linkage. Therefore, the above substance is considered to be 3-heptyl-4-hydroxy-5-hydroxyoctyltetrahydropyrane or 3-octyl-4-hydroxy-5-hydroxyheptyltetrahydropyrane. Oxidation of this with chromic anhydride in acetic acid gave 3-heptyl-5-carboxyheptyltetrahydro-γ-pyrone or 3-octyl-5-carboxyhexyltetrahydro-γ-pyrone with m.p. 53–5C.

REACTION BETWEEN STEARYL ALCOHOL AND METHYLAMINE. Toshio Agawa, Hirotsugu Matsui, and Saburo Komori (Osaka Univ.). *Yukagaku* 13, 523–6 (1964). Attempts have been made to synthesize fatty amines from higher alcohols and lower amines. The reactions were carried out in autoclave with Cu-Cr-O catalyst. Initial hydrogen pressure of about 15 kg./sq. cm. gave good reaction. Stearyl alcohol and methylamine at 300C yielded 58% methylstearylamine, 24% dimethylstearylamine, and 13% distearylmethylamine.

OXIDATION OF β-ELEOSTEARIC ACID AND ITS METHYL ESTER WITH ORGANIC PERACIDS. Yasuo Suhara and Mutsuo Nyui (Gov. Chem. Ind. Research Inst., Tokyo). *Yukagaku* 13, 590–4 (1964). β-Eleostearic acid and its methyl ester were oxidized with peracetic, perbenzoic or monoperphthalic acid at below 30C. The oxidation products were viscous, and their densities were higher than 1. It was assumed that epoxy compound is not present in the oxidation products from the data of infra-red spectra and the result of hydrogenation with lithium aluminum hydride, although the products showed the reaction with hydrogen bromide from the Durbetaki's method of determination of oxyrane oxygen. From the data of infrared and ultraviolet spectra and from the acid, saponification and hydroxy values, the oxidation products were estimated as hydroxy-acyloxy compounds. Conjugated diene was found in some of products oxidized with perbenzoic or monoperphthalic acid, and conjugated triene was found in some of products oxidized with monoperphthalic acid from the data of infrared and ultraviolet spectra. The reactivity of peracids with eleostearic acid or its methyl ester was in the order of peracetic > perbenzoic > monoperphthalic acids.

INFLUENCE OF MONOGLYCERIDES ON GELLING OF CANNED BEANS AND STARCH EXTRACTED FROM BEANS. N. Hamad, R. Robinson and J. Powers (Food Tech. Dept., Univ. of Ga., Athens, Ga.). *Food Technol.* 19, 124–30 (1965). Canned dry-line Blackeye peas and Red Kidney, Pinto, Navy, Yellow Eye, Cranberry, Lima, and Great Northern beans were compared as to their tendencies to form excessively strong gels. The addition of monoglycerides to Great Northern and Pinto beans repressed gel formation. Navy beans rarely gelled. Below the gelatinization temperature (170–180F), 10% starch suspensions prepared from starch extracted from the different varieties of beans were less viscous than starch suspensions to which 1% or 10% dispersions of distilled monoglyceride had been added. Above the gelatinization temperature, the reverse was true. Upon cooling, starch suspensions to which 1% or 10% monoglycerides had been added were generally soft gels or free-flowing, whereas the starch alone formed a strong gel.

PROCESS FOR PREPARATION OF WATER-INSOLUBLE METAL SOAPS. K. Culemeyer (Th. Goldschmidt Aktiengesellschaft). *U.S. 3,168,540.* A process for the preparation of a metal soap comprises passing an ammonia water-emulsified, molten fatty acid into an aqueous suspension of a metal carbonate containing ammonia, the metal of which may be aluminum, lead or zinc, and separating the metal soap from the reaction mixture.

HYDROXYLATION PROCESS FOR OLEFINIC HIGHER FATTY ACID AND FATTY ACID ESTER. A. A. D'Addieco (E. I. duPont de Nemours & Co.). *U.S. 3,169,139.* The method comprises reacting the olefin, hydrogen peroxide and at least 0.01 mole of a lower aliphatic acid per mole of hydrogen peroxide in the presence of a cation exchange resin in its hydrogen form. The resin is the sulfonated copolymer of a monovinyl aromatic compound having about 1–6% of a polyvinyl aromatic hydro-carbon. The reaction is carried out at about 40–90C.

TREATMENT OF LACTYLATED GLYCERIDE ESTERS. M. Pader (Lever Brothers Co.). *U.S. 3,173,796.* In a process for improving the flavor of a preparation of a lactylated fatty acid ester of glycerol the improvement comprises: (a) agitating the preparation with an inorganic alkaline agent selected from the group consisting of alkali metal carbonates, alkali metal bicarbonates, and alkaline earth metal hydroxides under substantially anhydrous conditions at a temperature sufficient to facilitate the improvement in flavor but below the decomposition temperature of the ester; and (b) removing the solid material from the reaction mixture.

PROCESS FOR THE PRODUCTION OF SATURATED FATTY ALCOHOLS. W. Rittmeister (Dehydag Deutsche Hydrierwerke G.m.b.H.). *U.S. 3,173,959.* An ester (the reaction product of fatty acids having 6–22 carbon atoms and alcohols having 1–4 carbon atoms) is mixed with 25–300% of a low molecular weight alcohol (1–4 carbons). An excess of preheated hydrogen (at least 50–500 times the required theoretical amount) is passed in contact with the mixture to form a vapor phase. The vapor is then passed through a body of a solid high activity copper containing a hydrogenation catalyst selected from the group consisting of copper chromite, copper-barium chromite and copper-zinc chromite, carbonate and oxides. The quantity of catalyst is about 1.5 times the volume of the feed material. The reaction is conducted at temperatures between 200–300C at pressures of 100–1000 atmospheres. The saturated fatty alcohol product is separated.

## • Biochemistry and Nutrition

A METHOD FOR DETERMINATION OF PLASMA FREE FATTY ACIDS. P. D. S. Wood and H. S. Sodhi (Inst. for Metabolic Res., Highland-Almeda County Hosp., Oakland, Calif.) *Proc. Soc. Exp. Biol. Med.* 118, 590–594 (1965). A method for determination of free fatty acids in plasma is presented, together with tests for the validity of the procedures used. Total lipids are treated with excess ethereal $C^{14}$-diazomethane, and radioactivity due to $C^{14}$-methyl esters of fatty acids is isolated by silicic acid column chromatography, and counted. Similar treatment of known amounts of standard fatty acid yields a curve from which the plasma free fatty acid concentration may be obtained. Use of 0.5 ml of plasma per determination gives optimal results, but the method may be employed with 0.1 ml plasma or less.

UTILIZATION OF FAT-SOLUBLE VITAMINS BY RATS AND CHICKS FED CHOLESTYRAMINE, A BILE ACID SEQUESTRANT. C. H. Whiteside, R. W. Harkins, H. B. Fluckiger and H. P. Sarett (Dept. of Nutritional Res., Mead Johnson Res. Center, Evansville, Indiana). *Am. J. of Clin. Nutr.* 16, 309–314 (1965). The effects of dietary cholestyramine, an anion exchange resin, on the absorption and storage of vitamin A in rats and vitamin K in chicks were studied. The addition of 2 per cent cholestyramine to a high-fat diet containing growth-limiting levels of vitamin A reduced body weight gains of weanling rats. With larger intakes of vitamin A, dietary cholestyramine had no effect on weight gain, but reduced liver storage of dietary vitamin A or vitamin A given by stomach tube daily. The effect of cholestyramine on the liver storage of vitamin A was greater with vitamin A as palmitate than with vitamin A as acetate or alcohol, suggesting that hydrolysis of the vitamin A ester and absorption of vitamin A are affected. The addition of 2 per cent cholestyramine to a diet marginal in vitamin K activity slightly lengthened prothrombin times in chicks after two weeks, but not after four weeks. Subsequent depletion on a vitamin K-free diet showed that vitamin K stores were lower in chicks given cholestyramine.

VITAMIN A ACTIVITY OF FERMENTATION β-CAROTENE FOR SWINE. D. E. Ullrey, E. R. Miller, R. D. Struthers, R. E. Peterson, J. A. Hoefer, and H. H. Hall (Dept. of Animal Husbandry, Mich. State Univ., East Lansing, Mich.). *J. Nutr.* 85, 375–385 (1965). Two experiments were conducted with 171 weanling pigs to provide an estimate of the biopotency of fermentation

(Continued on page 308A)

(Continued from page 304A)

carotenoids produced by *Blakeslea trispora,* and to estimate the vitamin A and β-carotene requirement of the depleted 50-kg pig. Vitamin A depletion for 7 weeks lowered serum vitamin A concentration from 23 to 4 μg/ 100 ml, and lowered liver vitamin A concentration from 35 to 2 μg/g of dry tissue. Repletion levels of fermentation β-carotene ranged from 0.5 to 3.5 mg/kg of diet and all-*trans* vitamin $A_1$ palmitate from 250 to 2000 IU/kg of diet. Using total liver vitamin A after 9 weeks of repletion as the criterion, one mole of fermentation β-carotene had 11.5% of the biopotency of one mole of all-*trans* vitamin $A_1$ palmitate.

FATTY ACID METABOLISM BY IN VIVO LABELED ADIPOSE TISSUE IN ESSENTIAL FATTY ACID DEFICIENT RATS. O. Stein and Y. Stein (Dept. of Med. "B", Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). *Proc. Soc. Exp. Biol. Med.* **118**, 636–639 (1965). *In vivo* incubated epididymal fat pads of EFA deficient rats were labeled selectively with radioactive palmitic and linoleic acid. The comparative uptake of both fatty acids by the same pad and their dissimilation from the contralateral pad during 47 days after labeling were determined. No preferential uptake or disappearance of linoleic acid in the EFA deficient adipose tissue was found.

UPTAKE OF FREE FATTY ACIDS BY EHRLICH ASCITES TUMOR CELLS. A. A. Spector, D. Steinberg, and Akira Tanaka (Laboratory of Metabolism, Nat'l Heart Institute, Nat'l Institutes of Health, Bethesda 14, Md.). *J. Biol. Chem.* **240**, 1032–41 (1965). Free fatty acids (FFA) were rapidly transferred from albumin to Ehrlich ascites tumor cells. Within 1 minute, the cellular unesterified palmitate content approached an equilibrium value and increased only slightly during the next hour of incubation. A rapid uptake of tetramethylmyristate, a fatty acid analogue that is not oxidized and is only slowly esterified, also occurred, but the cellular unesterified tetramethylmyristate content continued to increase at a slow rate over the subsequent hour. The 1-minute uptake of radioactive FFA corresponded to a net uptake of titratable fatty acid. At least 50% of the cellular 1-minute FFA uptake was reversibly bound. The magnitude of FFA uptake was dependent on the extracellular FFA-albumin molar ratio ($\bar{v}$) but was not affected appreciably by the total concentration of FFA at a given $\bar{v}$. Cellular FFA uptake was roughly linearly related to the calculated concentration of unbound anion, the latter also being a function of $\bar{v}$. Little or no effect on 1-minute FFA uptake was noted from addition of metabolic inhibitors, lipolytic hormones, or glucose. Cells take p palmitate in the absence of albumin, the magnitude being comparable to that occurring in the presence of albumin in equilibrium with the same concentration of unbound palmitate.

COENZYME Q. LX. VITAMIN-LIKE ACTIVITY OF COENZYME Q. J. L. Smith, H. W. Moore and K. Folkers (Stanford Res. Inst., Menlo Park, Calif.). *Proc. Soc. Exp. Biol. Med.* **118**, 782–786 (1965). Vitamin-like activity for hexahydrocoenzyme $Q_4$ in the dystrophic rabbit is demonstrated. This activity for a quinone member of the CoQ group is comparable to the activity of α-tocopherol and $CoQ_4$-chromanol which has previously been demonstrated. By contrast, a sample of 2,3,5-trimethyl-6-phytylbenzoquinone, which was free of contamination with α-tocopherol, exhibited only a low order of activity in the dystrophic rabbit. The dystrophic rabbit failed to recover when coenzyme $Q_{10}$ was administered orally; it is apparent that the administered $CoQ_{10}$ failed to reach its mitochondrial and microsomal sites since a lower homolog, hexahydrocoenzyme $Q_4$, exhibits activity in the dystrophic rabbit. It is considered that $CoQ_{10}$, which is normally present in rabbit tissue, does inherently have this vitamin-like activity.

THE INFLUENCE OF AGE AND ATHEROSCLEROSIS ON THE CHEMISTRY OF AORTIC INTIMA. (Part 1. The lipids) Elspeth B. Smith (Courtauld Inst. of Biochem., Middlesex Hosp. Med. School, London). *J. Atheroscler. Res.* **5**, 224–240 (1965). The lipids in aortic intima have been studied in relation to age and to lesions of different type in an attempt to obtain information on their origin. In lesion-free intima unesterified cholesterol, phospholipid and triglyceride increase with age slowly and almost at the same rate, but cholesterol ester increases at a much faster rate, and becomes the major lipid component after age 35. The rise in ester cholesterol is highly correlated with age (r = 0.83) but shows no correlation with the atherosclerotic index of Holman *et al.* The cholesterol ester also shows a progressive change in fatty acid composition with age. There is a very large increase in the lipid content of both fatty and fibrous type lesions, but in composition the lipids are markedly different. That of the fatty streaks contains over 60% cholesterol ester which is of grossly abnormal fatty acid composition. That of fibrous plaques contains about 55% cholesterol ester with a fatty acid composition which is not unlike adult "normal" intima or low density serum lipoproteins.

INTERRELATION OF VITAMIN $B_6$ AND SEX ON RESPONSE OF RATS TO HYPERCHOLESTEROLEMIC DIETS. G. M. Shue and E. L. Hove (Div. of Nutr., Bur. of Scientific Res., Food and Drug Admin., Washington, D. C.). *J. Nutr.* **85**, 247–254 (1965). When weanling rats were fed purified diets with added cholesterol and cholic acid for 20 weeks, the blood cholesterol levels of females were two to three times higher than those of males. This effect was greatest when the diet contained a severely hypercholesterolemic fat (coconut oil), and least with cottonseed oil; lard was intermediate. Intermittent vitamin $B_6$ deficiency eliminated the sex difference in blood cholesterol in rats fed the hypercholesterolemic diets; the values for males increased, whereas the values for females decreased to a point where the sex difference was not significant. Coconut oil in the diet, especially combined with a vitamin $B_6$ deficiency, caused marked liver cirrhosis, enlarged adrenals, kidney damage and nodules and hyperplasia in the stomach, as well as a pronounced increase in sudanophilic lesions in the aorta.

COMPARATIVE STUDY OF IN VIVO AND IN VITRO GROWN MYCOBACTERIUM TUBERCULOSIS. III. LIPID COMPOSITION. W. Segal and W. T. Miller (Dept. of Chem., Regis College, Denver, Colorado). *Proc. Soc. Exp. Biol. Med.* **118**, 613–616 (1965). A comparative analysis of the lipid composition of *in vivo* and *in vitro* grown *M. tuberculosis* of the same strain (H37Rv) has revealed a statistically significant difference in per cent lipid content for each of 3 solvent fractionating systems, as well as in total lipid concentration. Preliminary examination, by means of gas-liquid chromatographic (GLC) analysis, of the fatty acids isolated from the ether-alcohol extracts did not show any striking difference between the two types. There is, however, a trend indicated in the direction of a greater percentage of longer chain fatty acids present in the lipids of the *in vitro* cultured tubercle bacilli. Palmitic and stearic acids are present in large amounts in both cases, plus a complex array of both normal and branched acids ranging from $C_{10}$ without interruption up to $C_{32}$. The presence of the $C_{27}$-phthienoic acid in the lipids of the *in vivo* organism, while indicated by GLC, cannot be demonstrated solely from this evidence.

ENZYMATIC STEREOSPECIFICITY IN THE CONVERSION OF OLEIC ACID TO 10-HYDROXY-STEARIC ACID. G. J. Schroepfer, Jr. (Div. of Biochem., Dept. of Chem., and Chem. Eng., Univ. of Ill., Urbana, Illinois). *J. Am. Chem. Soc.* **87**, 1411–1412 (1965). The enzymatic formation of 10-hydroxy-stearic acid from oleic acid is characterized by notable stereospecificity. The absolute configuration of the hydroxyl function at C-10 is D. During the course of the reaction solvent hydrogen is introduced at C-9 in the L-configuration.

A PLASMA FACTOR CAPABLE OF ALTERING TRIGLYCERIDE. B. A. Sachs and L. Wolfman (Endocrine Service, Med. Div., Montefiore Hosp. and Med. Center, New York City). *Proc. Soc. Exp. Biol. Med.* **118**, 751–753 (1965). A hitherto unknown factor has been found in human blood plasma capable of producing an increase in the Rf value of triglyceride in thin-layer chromatography. It has been shown that the factor is not protein-bound, appears in ultrafiltrates of plasma, and shows quantitative dose-response relationships. The activity is considered non-enzymatic.

FATTY ACIDS IN THE PELLICLES AND PLASTIDS OF LIGHT-GROWN AND DARK GROWN CELLS OF EUGLENA GRACILIS. A. Rosenberg, M. Pecker, and E. Moschides (First Div., Res. Service, Goldwater Memorial Hosp., New York City), *Biochemistry* **4**, 680–685 (1965). Green and etiolated cells of *Euglena gracilis* were collected late in the stationary phase of growth, disrupted, and separated into three fractions; pellicles, plastids, and the remainder of the cell. A higher percentage of long-chain polyenoic acids was found in the pellicle and in the plastid than elsewhere in the etiolated cell. In the green cell, trienoic fatty acids comprised the major fatty acid fractions. There was roughly equal concentration of trienoic fatty acids throughout the green cell, with twice as much 16:3 as 18:3, except in the chloroplast where there was an equal concentration of each. Arachidonic acid and its homologs were found in small quantity and only in the pellicle and in the plastid.

METABOLISM OF N-BUTYRATE BY THE ADULT GOAT. H. A. Ramsey and C. L. Davis (Dept. of Dairy Science, Univ. of Illinois,

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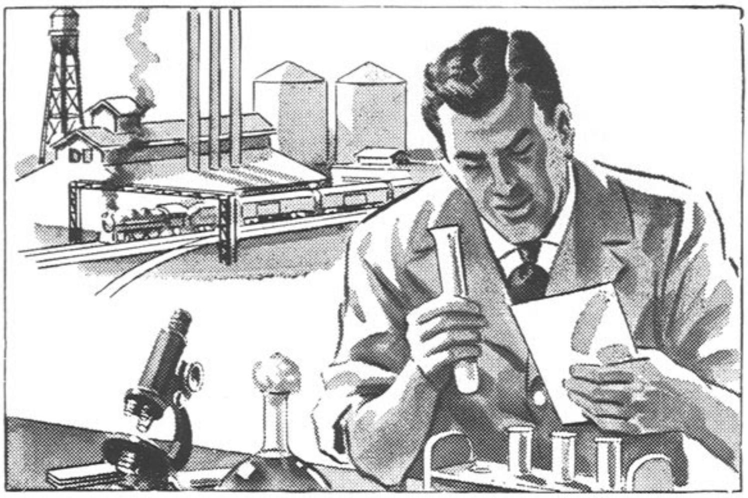

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Urbana). *J. Dairy Science* **48**, 381–390 (1965). n-Butyrate-1-$C^{14}$ was injected intravenously into four adult goats. Observations were made on the subsequent incorporation of $C^{14}$ into liver and muscle glycogen and into various organic acids of blood, taken either from the jugular vein or simultaneously from both the carotid artery and ruminal vein. Though several acids were labeled with $C^{14}$, $\beta$-hydroxybutyrate exhibited the highest specific activity. Ruminal vein blood contained over twice as much $\beta$-hydroxybutyrate as did blood from the carotid artery. The concentration of n-butyrate in ruminal vein blood was frequently lower than that of iso-butyrate, even though the ratio of these two acids in the rumen fluid was approximately 7:1. This suggests that $\beta$-hydroxybutyrate is a normal intermediate in the metabolism of n-butyrate absorbed from the rumen and that the rumen epithelium is a major site of this conversion. The lactate of ruminal vein blood was slightly greater in concentration but several times higher in specific activity than lactate of arterial blood. Glucose from both liver and muscle glycogen was labeled with $C^{14}$ predominantly in Carbons 3 and 4, the ratio of labeling between these two carbons being approximately 1:1.

INHERITANCE OF LINOLEIC AND OLEIC ACIDS IN MAIZE. C. G. Poneleit and D. E. Alexander (Dept. of Agronomy, Univ. of Illinois, Urbana, Ill.). *Science* **147**, 1585–1586 (1965). Gas-liquid chromatographic analysis of methyl esters of fatty acids of individual maize seeds of parental and segregating populations suggests that desaturation at the $\Delta^{12-13}$ position in oleic acid is under simple Mendelian control. High linoleic acid content is recessive to low.

THE EFFECT OF A MEAT-ENRICHED DIET ON THE DEVELOPMENT OF EXPERIMENTAL ATHEROSCLEROSIS IN RABBITS. J. Polcak, F. Melichar, D. Sevelova, I. Dvorak and M. Skalova (Second Med. Clinic, Med. Faculty, J. E. Purkyne Univ., Brno, Czechoslovakia). *J. Atheroscler. Res.* **5**, 174–180 (1965). The effect of a standard diet enriched with 20 g meat on experimental cholesterol-induced atherosclerosis in rabbits was followed-up in a number of experiments of 4 and 8 months' duration. The serum-levels of cholesterol, phospholipids and total lipids and the cholesterol content of the tissues were significantly lower when given a meat-enriched standard diet than with a standard diet alone. Also the atherosclerotic changes in the aorta were less marked. The authors conclude that addition of meat to the diet has an inhibiting effect on the development of experimental atherosclerosis in rabbits.

FATTY ACIDS IN BLUE-GREEN ALGAL MAT COMMUNITIES. P. L. Parker and R. F. Leo (Inst. of Marine Sci., Univ. of Texas, Port Aransas). *Science* **148**, 373–374 (1965). The concentrations of the major fatty acids were determined for the varied layers of an algal mat community. The living mat contains substantial amounts of the unsaturated acids, while the underlying layers become progressively depleted in unsaturated molecules. A similar progressive increase in the ratio of saturated to unsaturated acids was detected in a sediment core from a hypersaline lagoon.

DIETARY EFFECT OF MAGNESIUM ON CHOLESTEROL-INDUCED ATHEROSCLEROSIS OF RABBITS. M. Nakamura, S. Torii, M. Hiramatsu, J. Hirano, A. Sumiyoshi and K. Tanaka (Res. Inst. of Angiocardiology and Dept. of Pathol., Kyushu Univ. Med. School, Fukuoka, Japan). *J. Atheroscler. Res.* **5**, 145–158 (1965). The dietary effect of various amounts of magnesium on cholesterol-induced atherosclerosis of rabbits was investigated. There was a significant enhancement of the lipid deposition in the aorta of rabbits fed a magnesium-deficient diet containing cholesterol. However, this study failed to demonstrate any retarding effect from the feeding of magnesium excess diets on aorta lipid deposition.

FATTY LIVERS OF WEANLING RATS FED A LOW PROTEIN THREONINE-DEFICIENT DIET. I. EFFECT OF VARIOUS DIET FATS. L. Morris, D. Arata and D. C. Cederquist (Dept. of Foods and Nutr., Michigan State Univ., East Lansing, Mich.). *J. Nutr.* **85**, 362–366 (1965). Weanling albino rats were fed a diet containing 9% casein and 30% fat with and without supplements of threonine. The fat source in the diet was provided by corn oil, olive oil, cottonseed oil, hydrogenated vegetable oil, or corn oil hydrogenated to an iodine value of 74. Animals were maintained with their respective diets for 2 to 4 weeks. Feeding weanling rats a threonine-deficient diet containing 30% corn oil resulted in the appearance of fatty livers. Replacing the corn oil in this diet with either cottonseed oil or hydrogenated vegetable oil caused a significant reduction in liver fat concentration. Substituting olive oil for corn oil slightly increased liver fat levels. In every instance, the addition of threonine lowered liver fat levels. When hydrogenated corn oil was substituted for corn oil in threonine-deficient diets, liver fat concentrations decreased markedly after 2 weeks; this effect persisted after 4 weeks. Since all diets within a series were isocaloric and since no significant differences in food intake or growth were observed among any of the deficient groups, the "protective" action of some diet fats is apparently not mediated through a more equitable balance between the amino acid and calorie ratio.

COMPARISONS OF CASEIN AND SOY PROTEINS UPON MINERAL BALANCE AND VITAMIN $D_2$ REQUIREMENT OF THE BABY PIG. E. R. Miller, D. E. Ullrey, C. L. Zutaut, J. A. Hoefer (Depts. of Animal Husbandry and Biochem., Michigan State Univ., East Lansing, Mich.). *J. Nutr.* **85**, 347–354 (1965). Comparisons were made of the effects of dietary protein source (casein versus isolated soy protein) upon growth, serum mineral level, skeletal development, mineral balance and vitamin $D_2$ requirement of the baby pig. The data indicate that the vitamin $D_2$ requirement of the baby pig receiving purified diets containing isolated soybean protein is greater than the 100 IU/kg requirement level of casein diets and may be several times this level depending upon the criteria selected, the level of isolated soybean protein in the diet and the method of isolation of the soybean protein.

LIPID CLASSES OF BOVINE SPERMATOZOA. L. D. Miller and D. T. Mayer (Dept. of Agricultural Chem.) and C. P. Merilan (Dept. of Dairy Husbandry, Univ. of Missouri, Columbia). *J. Dairy Sci.* **48**, 395–397 (1965). A modified silicic acid technique was developed for separation of the lipids of bovine

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(Continued from page 320A)

spermatozoa into seven distinct classes: saturated hydrocarbons, cholesterol esters, free cholesterol, triglycerides, diglycerides, monoglycerides, and phospholipids. The average lipid content of lyophilized spermatozoa was 11.05%. Monoglycerides and diglycerides were found in exceptionally large quantities, but no unsaturated hydrocarbons of free fatty acids could be detected.

EFFECT OF DIETARY CHOLESTEROL UPON SERUM LIPIDS IN RURAL GUATEMALAN INDIAN CHILDREN. J. Mendez (Inst. of Nutr. of Central America and Panama (INCAP), Guatemala, C. A.). *Am. J. of Clin. Nutr.* **16**, 304–308 (1965). School children from a rural Indian community in the highlands of Guatemala were divided into three groups. Group 1 (the egg group) received 2 boiled eggs and 2 glasses of Incaparina daily. The cholesterol content of this supplement was 600 mg. Group 2 (the cholesterol group) received 600 mg. of crystalline cholesterol daily, plus 2 glasses of Incaparina containing 15 ml. of cottonseed oil each. Group 3 (the control group) received only the Incaparina with the same amount of oil. A significant increase in serum cholesterol levels was observed in group 1 at the end of four weeks; no increase was observed in the other groups. Although the increase in serum cholesterol levels observed in group 1 was significant, the increase was small, indicating that probably this Indian group has an intrinsically low responsiveness to dietary manipulations.

EFFECT OF PRENATAL DIET ON SERUM CHOLESTERYL ESTER FATTY ACIDS IN NEWBORN AND ADULT RATS. A. Lopez-Santolino, O. N. Miller, and J. E. Muldrey (Dept. of Biochem., Tulane Univ. School of Med., New Orleans, La.). *Proc. Soc. Exp. Biol. Med.* **118**, 829–834 (1965). Experiments were conducted to study the effect of prenatal diet on the serum CEFA pattern of newborn rats and their mothers. Evidence was obtained confirming the existence of a typical "fetal" CEFA pattern in the newborn rats characterized by a high oleate: linoleate (O/L) ratio (1.5 to 5.0), and of a typical "adult" CEFA pattern in the mother characterized by an O/L ratio of less than unity (0.2 to 0.6). These characteristic "adult" and "fetal" CEFA patterns were found to be maintained in spite of moderate alterations in the fatty acid composition of the prenatal diets, but could not be maintained in the face of the exaggerated imbalance of diets supplying only single fatty acids. Based on the data obtained, it was postulated that homeostatic mechanisms exist which function so as to maintain the characteristic adult and fetal CEFA patterns in the face of stresses consisting of variations in the dietary fatty acid composition.

EFFECT OF DIETARY FAT ON PLASMA AND LIVER LIPIDS OF PROPYLTHIOURACIL-TREATED RATS. Ching-Tong Liu (Dept. of Physiology and Biophys., Univ. of Tenn., Med. Units, Memphis, Tenn.). *J. Nutr.* **85**, 426–428 (1965). The administration of 0.03% propylthiouracil to rats resulted in an increase in plasma cholesterol and phospholipid levels. No change was observed in liver cholesterol and total lipids. The induced hypercholesterolemia was not lowered by feeding a supplement of 20% cottonseed oil. However, further increased concentrations of plasma cholesterol and phospholipid were observed in the hypothyroid rats maintained with a diet containing 20% hydrogenated coconut oil. In the normal animals, the plasma cholesterol concentrations were augmented by the addition of dietary fat. The liver cholesterol and total lipids increased in all animals when their diets were mixed with unsaturated fatty acids.

A COMPARISON OF THE DISPOSITION OF INTRAVENOUSLY-INJECTED, ALBUMIN-BOUND STEARIC ACID-1-C$^{14}$ AND PALMITIC ACID-1-C$^{14}$ IN THE RAT. P. Kapiloff, W. J. Lossow, and I. L. Chaikoff (Dept. of Physiol., Univ. of Calif., Berkeley). *Proc. Soc. Exp. Biol. Med.*, **118**, 800–803 (1965). Stearic acid-1-C$^{14}$ or palmitic acid-1-C$^{14}$ was injected intravenously into rats in the form of albumin-bound free fatty acids. At various intervals thereafter livers, hearts and samples of adipose tissue, skeletal muscle and plasma were taken for determination of total C$^{14}$ and its distribution among glycerides, phospholipids, cholesterol esters and free fatty acids. At all intervals the ratio (C$^{14}$ in phospholipid/C$^{14}$ in glycerides) was greater after injection of C$^{14}$-labeled stearic acid than after that of labeled palmitic acid. This indicates that preferential incorporation of stearic acid into phospholipids is not limited to incorporation during absorption from the intestines into lymph.

RETINOYL BETA-GLUCURONIC ACID: A MAJOR METABOLITE OF VITAMIN A IN RAT BILE. P. E. Dunagin, Jr., E. H. Meadows, Jr., J. A. Olson (Dept. of Biochem., Univ. of Florida College of Med., Gainesville). *Science* **148**, 86–87 (1965). The major metabolite in rat bile of injected C$^{14}$-retinoic acid was purified by ion-exchange and silicic acid chromatography; it has the spectrum of methyl retinoate, releases retinoic acid upon basic hydrolysis or by treatment with β-glucuronidase, and contains glucuronic acid. The metabolite was characterized by treatment with diazomethane followed by hexamethyldisilazane, or with periodate followed by semicarbazide, and the products were chromatographed. The metabolite has been tentatively identified as retinoyl β-glucuronide.

INCORPORATION OF PLASMA CHOLESTEROL-4-C$^{14}$ INTO EGG YOLK CHOLESTEROL. W. E. Connor, J. W. Osborne and W. L. Marion (Dept. of Internal Medicine and Radiation Research Lab., Univ. of Iowa, College of Medicine, Iowa City, Iowa). *Proc. Soc. Exp. Biol. Med.* **118**, 710–713 (1965). These data indicate that the laying hen transfers cholesterol-4-C$^{14}$ from the blood across the ovarian membranes into developing yolks. Eggs laid after administration of cholesterol-4-C$^{14}$ intravenously contained up to 45.8% of the administered isotope confined completely to the cholesterol fraction of the yolk. Many individual eggs contained from 5–10 μc of cholesterol-4-C$^{14}$. The specific radioactivity of yolk cholesterol always had a well defined temporal relationship to the specific radioactivity of cholesterol in the blood. While exact quantitative data are not yet available, the results of these experiments suggest that most, if not all, of the cholesterol in the egg yolk originates from the blood.

RELATIONSHIP BETWEEN CHOLESTEROL AND VITAMIN A METABOLISM IN RATS FED AT DIFFERENT LEVELS OF VITAMIN A. S. V. Bring, C. A. Ricard, and M. V. Zaehringer (Home Econ. Research, College of Agr., Univ. of Idaho, Moscow, Idaho). *J. Nutr.* **85**, 400–406 (1965). The relationship between cholesterol and vitamin A metabolism was studied in 3 replications using a total of 225 weanling male rats. Following vitamin A depletion, each animal was assigned at random to an experimental group, receiving one treatment from each of the following 3 variables: 0.0 or 0.5% cholesterol mixed in the basal purified diet; 10, 150 or 1000 IU vitamin A acetate daily administered orally; and fed 7, 18 or 28 days. Increasing the dietary vitamin A decreased the serum and liver total cholesterol concentrations when cholesterol was fed. The rats given 10 IU vitamin A daily had significantly higher ($P < 0.01$) liver total cholesterol values than those given either 150 or 1000 IU. Cholesterol-fed rats given 10 IU also had significantly higher ($P < 0.01$) mean serum cholesterol values than those given 1000 IU. Dietary cholesterol significantly lowered ($P < 0.05$) mean liver vitamin A concentrations on a dry weight basis. Liver vitamin A and free cholesterol were found to be positively correlated ($P < 0.01$) on either a percentage or per liver basis.

PARALYSIS INDUCED BY FEEDING SYNTHETIC GLYCERIDES TO CHICKS. S. Brambila and F. W. Hill (Dept. of Poultry Husbandry, Univ. of Calif., Davis). *Proc. Soc. Exp. Biol. Med.* **118**, 845–847 (1965). Feeding mixed triglycerides synthesized from soybean oil fatty acids as the sole non-protein energy source is a simplified diet produced severe growth retardation, incoordination, and a crippling leg paralysis in young chicks. The possibility that these effects may be due to the lack of an unidentified essential nutrient is discussed.

LIPOPROTEIN IMMUNIZATION AND INDUCED ATHEROSCLEROSIS IN RABBITS. J. M. Bailey and R. Tomar (Dept. Biochem., School of Med., George Washington Univ., Washington, D. C.). *J. Atheroscler. Res.* **5**, 203–214 (1965). Groups of rabbits were immunized with β-lipoproteins isolated from serum of normal and cholesterol-fed chickens. Precipitin titers in excess of 5000:1 were developed against antigen protein from cholesterol-fed birds. Plasma lipid levels increased in immunized animals and increase paralleled development of precipitin titers. Rabbit serum was analyzed by chromatography on DEAE cellulose ion exchange resin. Cholesterol in normal serum was found almost exclusively in proteins having the electrophoretic characteristics of α-globulins. Following immunization, significant quantities of cholesterol were found in γ-globulins in rabbits on both normal and on cholesterol-supplemented diets. Immunized and control animals were fed a diet supplemented with 2% cholesterol for 12 weeks. Development of atherosclerosis in thoracic aorta was not significantly different in normal and immunized rabbits. Lipid levels in serum and tissues also were not significantly reduced by the prior immunization procedure. When immunization was carried out subsequent to cholesterol feeding, intensity of atherosclerotic plaques did not decrease in 6 weeks following transfer to normal diet whereas serum lipids returned to normal at same rate in control and immunized animals during this period.

FATTY ACID AMIDES OF ETHANOLAMIDE IN MAMMALIAN TISSUES. N. R. Bachur, Karel Masek, K. L. Melmon and S. Udenfriend

(Nat'l Heart Institute, Nat'l Inst. of Health, Bethesda, Maryland). *J. Biol. Chem.* **240**, 1019–24 (965). A method for the isolation, purification, and quantitative assay of fatty acid ethanolamides from natural sources is described. In rats and guinea pigs from which food has been withheld, the amide is found in brain, liver, and skeletal muscle, the level being highest and most constant in brain. Verification of the structure of the isolated palmitoylethanolamide was obtained through gas-liquid chromatography, infrared spectroscopy, and hydrolysis and analysis of the component fatty acid and amine. Evidence was presented to rule out the artificial production of palmitoylethanolamide.

Effect of simple and complex carbohydrates upon total lipids, nonphospholipids, and different fractions of phospholipids of serum in young men and women. M. A. Antar and M. A. Ohlson (Dept. of Internal Medicine, State Univ. of Iowa, Iowa City, Iowa). *J. Nutr.* **85**, 329–337 (1965). Eight young, healthy persons, were fed experimental diets for 4 dietary periods of 4 weeks each. Total fats, proteins, and carbohydrates constituted 40, 16 and 44% of total calories of the basic diet, respectively. The ratio of complex to simple carbohydrates was 1:4 in periods 1 and 3 and this was reversed in periods 2 and 4. Serum total lipids, nonphospholipids, and different fractions of phospholipids (ethanolamine phosphatides, inositides, lecithins, lysolecithins, and sphingomyelins) were determined using silicic acid column chromatography. Serum total lipids, phospholipids, and nonphospholipids were found to be significantly reduced with the high cereal diet and increased with the high sugar diet when the total calories and fats were held constant.

Evidence for a contribution by the intestinal wall to the serum cholesterol of the rat. C. A. Lindsey, Jr., and J. D. Wilson (Dept. of Internal Medicine, Univ. of Texas Southwestern Med. School, Dallas, Texas). *J. Lipid Res.* **6**, 173–181 (1965). Rats were fed cholesterol in order to block hepatic cholesterol synthesis, and their intestinal lymph ducts were cannulated. Experiments with these rats showed that cholesterol synthesized in the intestinal wall enters into the circulating cholesterol pool. The quantitative significance of this source of serum cholesterol has not been established.

Effect of very low-density lipoproteins on lipid transfer in incubated serum. A. V. Nichols and L. Smith (Donner Lab., Lawrence Radiation Lab., Univ. of Calif., Berkeley, Calif.). *J. Lipid Res.* **6**, 206–210 (1965). Incubation of human serum solutions low in glyceride content for 16 hr resulted in a net increase of cholesterol esters in all three major human serum lipoprotein classes, namely the very low-density lipoproteins of d 1.006 (VLDL), low-density lipoproteins of d 1.006–1.063 (LDL) and high-density lipoproteins of d 1.063–1.21 (HDL). Transfer of glycerides from the VLDL to the LDL and HDL was also observed during incubation. Reductions in lipoprotein unesterified cholesterol and phospholipids occurred during incubation and indicated the presence of serum fatty acid transferase activity in these solutions. When serum was incubated in the presence of high concentrations of VLDL lipoproteins, the increase in cholesterol esters was found only in the VLDL fraction. The VLDL apparently took up newly-formed cholesterol esters produced by serum fatty acid transferase activity, and accepted some cholesterol esters initially bound to the LDL and HDL. When the transferase was inhibited with sodium *p*-hydroxymercuribenzoate, some of the cholesterol esters initially bound to the LDL and HDL were still transferred to the VLDL. The HDL class was then the principal contributor of the cholesterol esters. These observations indicate that reciprocal transfer of cholesterol esters for glycerides in human serum lipoproteins can occur.

Lipids of the spleen in Gaucher's disease. W. D. Suomi and B. W. Agranoff (Dept. of Biol. Chem. and Mental Health Res. Inst., Univ. of Mich., Ann Arbor, Mich.). *J. Lipid Res.* **6**, 211–219 (1965). Thin-layer chromatography (TLC) was used to analyze lipids of eight spleens of patients with Gaucher's disease. Four non-Gaucher spleens were also analyzed. Phospholipid concentrations are not increased in Gaucher spleens, while several classes of neutral lipids are moderately increased.

Establishment of erythro configuration of ceramides from beef brain and chicken liver. V. Groom and M. Sribney (Depts. of Biochem. and Psychiatry, Yale Univ. School of Medicine, New Haven, Connecticut). *J. Lipid Res.* **6**, 220–221 (1965). The sphingosine moiety of ceramides isolated from beef brain and chicken liver has been characterized as having the erythro stereochemical configuration. This is in agreement with the configuration of sphingosine as found in cerebrosides and sphingomyelin.

In vitro esterification of cholesterol by pancreatic juice and by acetone powder extracts of small intestine: the effect of unsaturated fatty acid upon esterification with saturated fatty acids. S. N. Shah, W. J. Lossow, and I. L. Chaikoff (Dept. of Physiology, Univ. of Calif., Berkeley, Calif.). *J. Lipid Res.* **6**, 228–232 (1965). The esterification of cholesterol by rat pancreatic juice and by extracts of acetone powders of rat small intestine was studied with palmitic, stearic, oleic, linoleic, and linolenic acids. When each fatty acid was tested individually, the extent of esterification was highest with oleic acid and lowest with the two saturated fatty acids. The esterification of cholesterol with palmitic and stearic acids by the intestinal extracts and with palmitic acid by pancreatic juice was greatly increased by the addition of either oleic or linoleic acid to the incubation mixture. It is suggested that the difference between esterification of cholesterol with saturated fatty acids and esterification with unsaturated fatty acids, as well as the inhancement of the esterification with saturated fatty acids by the addition of an unsaturated fatty acid, is accounted for by micellar solubilization of cholesterol and of saturated fatty acid in the presence of an unsaturated fatty acid and bile salts.

Particle size and composition of dog lymph chylomicrons. A. Yokoyama and D. B. Zilversmit (Dept. of Physiology, Univ. of Tennessee Medical Units, Memphis, Tenn.). *J. Lipid Res.* **6**, 241–246 (1965). Chyle from the thoracic duct of dogs fed cream or corn oil was fractionated into chylomicrons of different particle size: 140 mμ, 140–200 mμ, and 200 mμ. The composition of chylomicrons was studied before and after washing with saline solutions. In general the percentages of protein, phospholipid, cholesterol, and cholesterol ester were greater in the small chylomicrons than in the larger ones. Washing the chylomicrons did not appear to affect their composition. Chylomicrons collected at different times during fat feeding showed significant differences in phospholipid and cholesterol concentrations. Storage of lymph at 4C was accompanied by alterations in phospholipid and cholesterol concentrations of the chylomicrons. The composition of chylomicrons is consistent with the hypothesis that at some stage during their formation the nontriglyceride components are present on the surface of the oil droplet.

## • Drying Oils and Paints

ELECTRICAL INSULATING VARNISH. C. K. Sung, T. W. Park and B. S. Lee. *Bull. Sci. Res. Inst.* 4(1), 20–5 (1959). The varnish is based on 5 pts. of a drying oil mixture, containing 85% tung oil and 15% linseed oil, with 4 pts. of an oil-soluble phenolic resin. The applied coating is stoved at 160C for 1 hr. Information on breakdown potential, flexibility, relative hardness and acid, alkali, oil and moisture resistance is given. (Rev. Current Lit. Paint Allied Ind., No. 268)

AUSTRALIAN PRODUCTION STATISTICS—PAINTS AND OTHER SURFACE COATINGS, MAY, 1963. Anon. *Austral. Paint J.* 9(6), 34 (1963). The data are classified by type of product and states in which they were produced (Victoria, Queensland, *etc.*). Similar information is given each month. (Rev. Current Lit. Paint Allied Ind., No. 268).

SURFACE COATINGS IN THE CHEMICAL COMPLEX. W. P. Georgans. *Austral. Paint J.* 9(6), 22–4 (1963). A discussion of the relationship between the chemical and paint industries, with statistics on the Australian production and consumption of different types of paint and the growth in the consumption of $TiO_2$. (Rev. Current Lit. Paint Allied Ind., No. 268).

POLYMERIZATION OF DRYING OILS. H. Wexler (Continental Can Co., Chicago, Ill., 60620). *Chem. Rev.* **64**, 591–611 (1964). An excellent review.

USE OF OXIDATION IN THE SYNTHESIS OF DRYING OILS FROM TALL OIL MODIFIED WITH CYCLOPENTADIENE. A. A. Subbotin. *Lakokras. Mat.* **1963** (6), 18–21 (1963). Tall oil was reacted with cyclopentadiene, esterified and oxidised with air. The resulting drying oil was found to have good wetting properties in relation to the common pigments and be suitable as a thinner for thick oil-bound paints. (Rev. Current Lit. Paint Allied Ind., No. 268).

EFFECT OF WATER ON PAINT FILMS. II. [ADHESION]. III. WATER VAPOUR PERMEABILITY. IV. BLISTERING OF EXTERIOR HOUSE PAINTS. G. Gärdenäs and E. Wåhlin. *Färg och Lack* **10** (2), 20–36; (3), 71–4; (4), 83–5 (1964). Alkyd paints, oil paints and polyvinyl acetate latex paints have been studied by measuring the force required to pull off steel cylinders, which have been glued on to the paint film. Alkyd paints retain most of the adhesion even after 10 days' treatment in a moisture cabinet, which is not the case with oil paints and polyvinyl acetate latex paints. Most of the adhesion is restored after drying the panels in air. Intercoat adhesion and cohesion in some cases is lower than the adhesion to the substrate. **III.** The water vapour permeability has been studied using the Payne cup method, the paint films being applied to Cellophane. Alkyd paints show very low permeability, 1.1–1.3 mg./cm.$^2$ day. Oil paints 2.0–2.5 mg./cm.$^2$ day and polyvinyl acetate latex paints 20–25 mg./cm.$^2$ day. **IV.** The blistering tendency of oil paints, alkyd paints and polyvinyl acetate latex paints has been investigated by subjecting wood panels to 100% relative humidity on the unprotected side while keeping the painted side at 65% relative humidity. Three out of four oil paints did show blistering, whereas with the alkyd and polyvinyl acetate latex paints no blistering was observed during the 10 days' testing period. (Rev. Current Lit. Paint Allied Ind., No. 269).

FORMATION OF TRIMER ACIDS IN THE THERMAL POLYMERIZATION OF LINSEED OIL. E. Fedeli, P. Capella, A. F. Valentini and G. Jacini (Fats and Oils Exper. Stat., Milan, Italy). *Riv. Ital. Sostanze Grasse* **41**, 647–51 (1964). The presence of trimer acids in the thermal polymerization of linseed oil has been proved by chromatographic analysis. The kinetics of formation of trimer acids indicates that these are not formed by further polymerization of dimer acids. The interrelation between polyunsaturates and the formation of dimer and trimer acids is discussed.

GENERAL DEVELOPMENT AND PRESENT TRENDS FOR PAINTS. A. Cailliez. *Peint Pig. Vernis* **40**, (4), 189–96 (1964). Difficulties of introducing new products and developments during the last war and the following decade are discussed. Present-day problems and trends are considered in relation to certain recent statistics. The probable future for different media, solvents, latex and pigments is discussed and zinc-rich paints singled out for special mention. (Rev. Current Lit. Paint Allied Ind. No. 271).

STATISTICS—READY MIXED PAINTS AND RAW MATERIALS. Anon. (Central Bureau voor de Statistiek (Netherlands)). *Verfkroniek* **37** (4), 128–9 (1964). Import and export figures for 1963 between the Netherlands and other countries for different types of paints, lacquers, printing inks, *etc.*, and their raw materials are set out in detail. (Rev. Current Lit. Paint Allied Ind. No. 271).

NEW CONJUGATED SAFFLOWER OIL. L. Cummings and W. Rathjen. *Am. Paint J.* **48** (49), 16, 18 (1964). Safflower oil containing 18–19% conjugation is now available and this may be used to prepare alkyds suitable for modification with methyl methacrylate/styrene mixtures to give films of improved properties. (Rev. Current Lit. Paint Allied Ind. No. 272).

UNDERSTANDING PAINT, XI–XVI. W. R. Fuller. *Am. Paint J.* **48**, (1964), No. 33, 86 (11 pp.); No. 54, 61 (12 pp.); No. 55, 90 (10 pp.); No. 56, 60 (4 pp.); **49**, No. 1, 59 (13 pp.); No. 2, 66 (10 pp.). A comprehensive survey of the paint industry, covering both the properties, chemistry and uses of the different raw materials and the formulation and uses of different types of paints. (Rev. Current Lit. Paint Allied Ind., No. 272).

UTILISATION OF COTTONSEED OIL FOR PREPARATION OF OLEORESIN VARNISHES. M. Aslam. *Pakist. J. Sci. Ind. Res.*, **6**, 188–91 (1963). Cottonseed oil has been successfully used for the preparation of tack-free coating compositions by a simple open kettle cooking process. Best results were obtained by judicious control of (*a*) cooking temp., (*b*) amount of catalyst, (*c*) extent of cooking and (*d*) proportion of resin. These varnishes compare favourably with those prepared from linseed oil. (Rev. Current Lit. Paint Allied Ind. No. 272).

MARKET FOR DRYING OILS. Anon. *Tropical Products Inst. Report No.* **5**, 1963, 56 pp.—A very good account of the use of the major drying oils in paints, *etc.*, is given. Many tables of statistics, production, prices, uses and consumption of the drying oils are included, also sales of paints and varnishes in the U.K. (Rev. Current Lit. Paint Allied Ind. No. 272).

## • Detergents

STUDIES ON SODIUM ALKYLBENZENE SULFONATES. IV. SULFONATION OF HIGHER MONOALKYLBENZENES IN RELATION TO STRUCTURAL FACTOR OF THE ALKYL CHAIN. Yasushi Kimura, Syuhei Tanimori, and Terunosuke Shimo (Lion Fat and Oil Co., Tokyo). *Yukagaku* **14**, 63–6 (1965). The relative rate of sulfonation of linear dodecylbenzenes and *n*-hexylbenzene at 18C with 20% oleum has been determined by a unique method of applying gas chromatography. The relative reaction rate of linear dodecylbenzenes decreases as the position of aromatic nucleus is shifted toward the center of the alkyl group. The rate of 6-phenyl isomer is about 40% less than that of 1-phenyl isomer. The rate of *n*-hexylbenzene, having the half-length of alkyl chain, is about 60% more than that of *n*-dodecylbenzene. Also, there is more pronounced selectivity in the sulfonation of higher monoalkylbenzene owing to the steric hinderance of the alkyl chain. Selective sulfonation was eliminated by heating at 50C and a new product with lower boiling point was obtained.

PREPARATION OF UNSATURATED HIGHER ALCOHOL UNDER HIGHER HYDROGEN PRESSURE (300–430 KG./CM$^2$) USING ZN-AL-O CATALYST. Isao Ikeda, Motoaki Tanaka, and Saburo Komori (Osaka Univ.). *Yukagaku* **14**, 58–62 (1965). High yields (90–95%) of unsaturated alcohol were obtained from methyl esters of rice bran oil at 330C with pressure at 300–430 kg./cm$^2$ by use of 3–5% Zn-Al-O catalyst. Hydrogen at high pressure gave a higher yield of alcohol than at low pressure. Reduction product can be used immediately as the raw material for surface-active agent manufacture without purification on account of its high alcohol content.

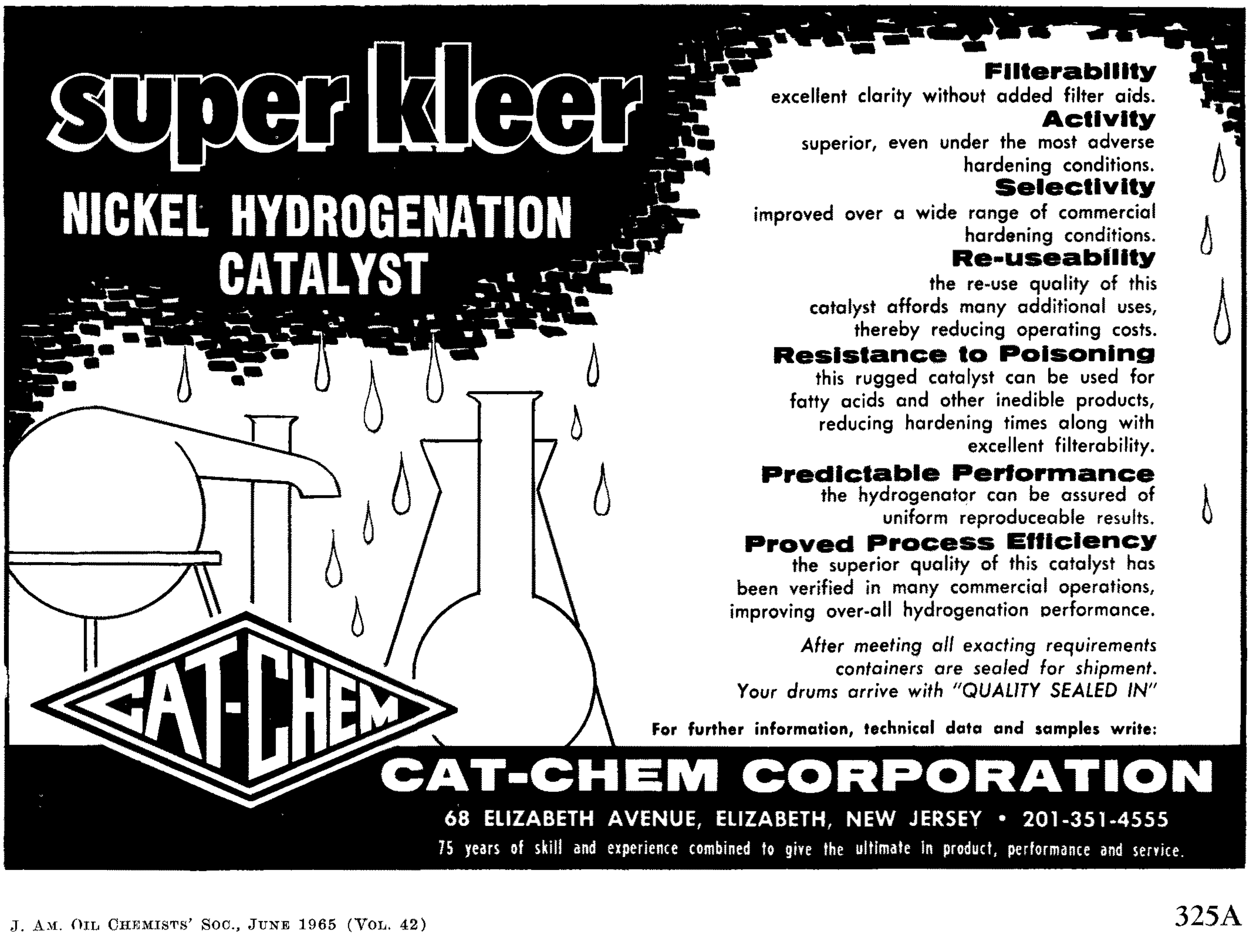
APPLICATION OF SURFACTANTS ON WOOL INDUSTRY. III. CONSIDERATION ON WOOL SHRINKAGE IN DETERGENT SOLUTION. Chikaaki Sakai and Saburo Komori. *Yukagaku* **14**, 66–71 (1965). In order to explain the phenomenon of wool shrinkage in detergent solution, the change of physical properties of a single wool fiber was investigated and it was observed that the lubrication caused by the sorption of detergent on wool surface seemed to be the main factor. Aqueous solutions of surface-active agents having aromatic group in their molecule, such as alkylbenzenesulfonate and butyl naphthalenesulfonate, increased the friction of fiber and retarded its shrinkage. In the presence of fatty alcohol, the shrinkage of wool was accelerated from its lubrication effect.

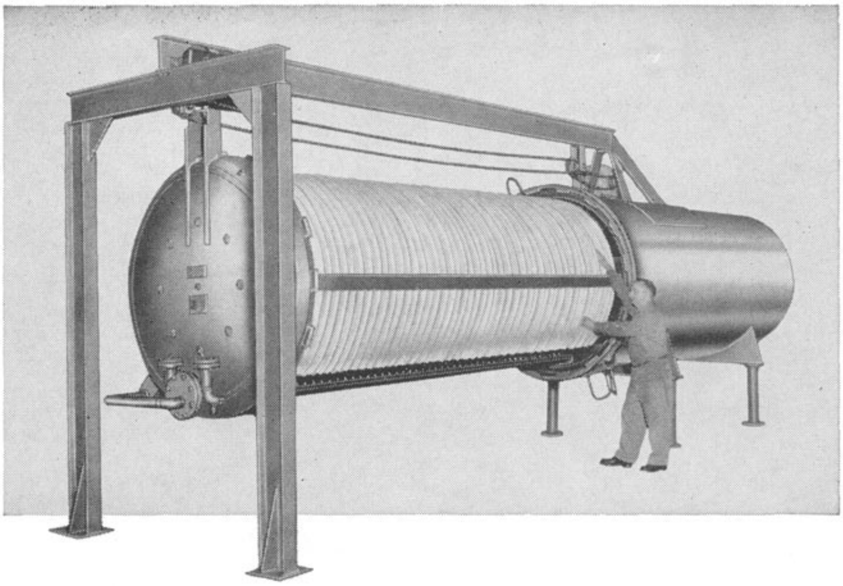
SURFACE TENSION OF AQUEOUS SOLUTION OF POLYVINYL ALCOHOL ESTERIFIED WITH FATTY ACID IN THE HOMOGENEOUS SYSTEM. Sadao Hayashi, Chiyoko Nakano, and Takuhiko Motoyama (High Polymer Chemical Industries, Ltd., Osaka). *Yukagaku* 14, 24–6 (1965). Polyvinyl alcohol was esterified with formic, acetic, and propionic acids, respectively, in water containing hydrochloric acid as a catalyst. The surface tensions of these esterified products were greater in order of formic acid $<$ acetic acid $<$ propionic acid ester.

STUDIES ON ANTISTATIC PROPERTY OF SURFACE ACTIVE AGENTS. Takashi Yamamoto, Ikuo Katsura and Seiji Sumida (Nippon Oils and Fats Co., Amagasaki-shi, Japan). *Yukagaku* 13, 480–6 (1964). Surface electrical resistivity of fibers treated with surfactant solutions and specific conductivity of the solutions were measured as well as the effect of added electrolyte on the orientation of surfactants on the fibers. Surface electrical resistivity was decreased as the concentration of surfactant increased. In the vicinity of the critical micelle concentration of surfactant it increased then decreased at higher concentrations. Inorganic salts added to surfactant solutions did not increase electrical conductivity of the fibers but contributed to the change of the micelle state of surfactant solutions. Addition of sodium chloride to the solutions of cationic surfactants resulted in an increase sorption of surfactant by the fibers. Sodium hydroxide was not effective. Antisattic treatment is enhanced by use of cationic surfactants together with electrolytes having the tendency to salt out cationic surfactants and to make micelle molecular weight larger. Antistatic effect of fibers treated with organic solvent was less than that treated in water because of low molecular weight of micelle. Piles of Nylon, Dacron, cotton and glass fibers treated with surfactants were dispersed in benzene-water and the orientation to fibers of the surfactant was studied. Piles treated with sodium dioctyl phosphate, which is the only antistatic agent of anionic surfactants, dispersed in benzene or at the interface. Orientation of surfactant to fibers may explain the effectiveness of cationic surfactants and of sodium dioctyl phosphate.

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO OIL CHEMISTRY. I. CHROMATOGRAPHY OF SYNTHETIC SURFACTANTS BY SILICA PLATES. Toru Takagi and Kazuo Fukuzumi (Nagoya Univ., Nagoya, Japan). *Yukagaku* 13, 520–2 (1964). Seventeen kinds of synthetic surfactants were chromatographed on silica-coated plates. Chloroform-methanol-water system was selected for developing. The surfactants gave sharp spots when free components were developed but not the salts. Anionic surfactants gave peculiar fluorescence by ultraviolet light after spraying of sulfuric acid and heating. $\alpha$-Sulfo-fatty acid was separated from other sulfonic acids and sulfates. Polyoxyethylene surfactants were separated into major components and polyethylene oxide. Cationic surfactants were detected by Dragendorff reagent and platinum chloride-potassium iodide reagent. These procedures are useful to detect impurities in synthetic surfactants and to check progress of the reaction in the manufacturing process.

STUDIES ON THE SURFACE TENSION OF LOWER POLYOXYETHLENE ETHERS OF LAURYL-, CETYL-, OLEYL-ALCOHOL AND NONYLPHENOL. Shoichiro Watanabe (Kitasato Univ., Tokyo). *Yukagaku* 13, 603–7 (1964). The surface activities of polyoxyethylene ethers having definite length of oxyethylene chain have been investigated. Mono-, di-, tri-, tetra- and penta-oxyethylene ethers of lauryl, cetyl and oleyl alcohols and nonylphenol were synthesized. Those were dissolved or suspended in water and the surface tension of the solutions was measured. With the exception of cetyl ethers and mono- and di-oxyethylene lauryl ethers, the surface tension-concentration curves of the solutions showed the same characteristics as those of usual surfactants.





Namely, there was little change in the surface tension at higher concentration, while it increased rapidly as the concentration decreased in the range below critical micelle concentration. The surface tension of the solutions of paired ethers containing lauryl-oleyl, oleyl-nonylphenyl, and nonylphenyl-lauryl, having tetraoxyethylene chain, respectively, was in a range between those of individuals of the pair.

DETERGENTS VIA NEW ROUTE. C. Y. Shen and C. F. Callis (Monsanto Co.). *Soap Chem. Specialties* 41(2), 64, 68, 70, 109–12, 114 (1965). The alkaline hydrolysis of trimetaphosphate opens the way to new technology in processing conventional spray-dried detergents as well as novel types of products. Detergents made by this route usually contain more sodium tripolyphosphate and less degradation products than those made directly from STPP. The apparent viscosity of a STMP slurry is less than that of a corresponding STPP slurry. Slurries of high solids concentration and high density can be made from TMPP, allowing processes and formulation for a much lower drying load than is required by present spray tower practice. STMP provides a uniform source of phosphate with chemical properties that are easier to control than are the properties of STPP. STMP shows no tendency to lump in the crutching operation.

DETERGENT MARKET IN WESTERN EUROPE. G. L. Hollis (Imperial Chemical Industries, Ltd.). *Soap Chem. Specialties* 41 (2), 55–8, 90 (1965). This is the first part of an article discussing the rise of synthetics and the markets in Western Europe, the introduction of biodegradable detergents in the United Kingdom and Western Europe, and the future of syndet materials.

DETERGENT BRIQUETTE. D. F. Percival and W. A. Sweeney (California Research Corp.). *U.S. 3,172,859.* A water-soluble briquette comprises an intimate admixture compacted in the presence of 5 to 20% of water at a pressure in the range of 250 to 700 pounds per square inch. The briquette consists of, by weight, 15–80% water-soluble normal primary alkyl sulfonate detergent salt selected from the group consisting of the alkali metal, alkaline earth metal and ammonium salts, the alkyl group containing 10–20 carbon atoms and averaging 12–18 carbon atoms; 25–75% water-soluble inorganic condensed sodium phosphate detergent builder; and the 5–20% of water which was present during the compacting step.

DETERGENT COMPOSITIONS COMPRISING INORGANIC ESTERS OF EPOXYHYDROCARBON POLYMERS. D. R. Jackson (Wyandotte Chemicals Corp.). *U.S. 3,173,877.* The described detergent composition consists of about 36% by weight of a disodium polyoxypropylene glycol disulfate in which the molecular weight of the polyoxypropylene base is at least 1250, about 55% of sodium tripolyphosphate, and about 9% of sodium carboxymethylcellulose.

EFFECT OF THE MOLECULAR STRUCTURE OF SURFACTANTS ON THEIR AEROBIC BIOLOGIC DEGRADATION. H. Kölbel, P. Kurzendörfer and M. Zahiruddin (Univ. of Berlin, Germany). *Tenside* 1, 7–18 (1964). The effect of specific structural groups on the biologic degradability of anionic surfactants of the alkyl aryl sulfonate type has been investigated. Among the surfactants studied were: *n*-alkyl sulfonates, *p*-*n*-alkyl benzene sulfonates, *p*-*n*-alkyl diphenyl sulfonates, 2,6-*n*-alkyl naphthalene sulfonates, *p*-2,2-bis(*n*-alkyl)-ethyl benzene sulfonates and *p*-N-methyl-N-acyl aniline sulfonates. All biological tests were conducted by Henkel's closed flask test, with cultures of *E. coli* ($10^3$ to $10^4$ organisms/ml.), at an initial surfactant concentration of $10^{-5}$ mol/l and initial oxygen concentration of 8–10 mg/l. During the course of the test surfactant and $O_2$ concentrations, pH, $KMnO_4$ titration and microorganism concentration were all measured. Alkyl sulfonates are the most degradable among the surfactants tested, since they not only disappear completely in 5–6 days, but are completely oxidized in a period of 14–20 days, regardless of chain length. Alkyl benzene sulfonates, alkyl diphenyl- and alkyl naphthalene sulfonates are also completely degraded in 7–15 days but do not oxidize completely (the max. $O_2$ consumption is only 20–40% of theoretical). The optimum chain length of the alkyl group is in most cases 10–14 C atoms. The *p*-2,2-bis-(*n*-alkyl)-ethyl benzene sulfonates are very little degraded, with only the $C_{12}$ chain being completely destroyed in 35–40 days. The sodium *p*-N-methyl-N-acyl aniline sulfonates disappear completely in 8–14 days (optimum chain length 12–16 C atoms) but are *not* completely oxidized.

BIOLOGIC BEHAVIOR OF SURFACTANTS. A. DeJong (Unilever Res. Lab., Vlaardingen, The Netherlands). *Riv. Ital. Sostanze Grasse* 41, 547–9 (1964). Fish appear to be very sensitive to the presence of surfactants in their environment. $LD_{50}$ values of 3–5 ppm are reported for linear alkyl aryl sulfonates, while

(Continued on page 327A)

## *AOCS Short Course*

(Continued from page 296A)

of Lipid Mixtures on Liquid-Solid Chromatographic Columns—Gary Nelson

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Analytical Fractionation of Complex Lipid Mixtures (Column Chromatography, Thin-Layer Chromatography and Associated Techniques)—George Rouser

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For further information contact the Director, C. Freeman Allen, Department of Chemistry, Pomona College, Claremont, California.

## Rensselaer Polytechnic Plans June Short Course in Color Technology

Through the Department of Chemistry, Rensselaer Polytechnic Institute will offer for the first time, a special comprehensive short course in The Principles of Color Technology, from June 21–25, 1965. This course is intended to provide both theory and practice in the description, specification and measurement of color. It will be of particular interest to industrial personnel responsible for color matching and color control.

Address application for admission to Prof. A. A. K. Booth, Director, Division of Special Programs, Rensselaer Polytechnic Institute, Troy, New York 12181.

## • *Obituaries*

H. E. Moore (1934), of New Orleans, Louisiana, died recently, it was learned at the AOCS headquarters in Chicago.

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tetrapropylene benzene sulfonate and fatty alcohol sulfates are far less toxic. Bacteria and other microorganisms in water seem to be able to survive rather high surfactant concentrations. Concentrations above 5 ppm in irrigation water may affect plant growth, especially when the organic matter content of the soil is low. Mice, rats, rabbits and dogs consumed between 50 and 30,000 ppm surfactants in their daily diet for up to two years without any discernible effects on their health. Men have consumed water with 100 ppm surfactants for several weeks without any sign of chronic harm to their health. There is at present very little chance that the surfactant concentration in the diet of man will exceed 2 ppm.

THE DIRECT CONDENSATION OF FATTY ACIDS AND TAURINE. E. Elbel (Farbwerke Hoechst A.G., Frankfurt/Main, Germany). *Tenside* 1, 26–28 (1964). The condensation of fatty acid chlorides with N-methyl taurine in the presence of NaOH leaves considerable amounts of NaCl in the end product. Attempts to avoid this by using a direct condensation reaction with fatty acids in the past were only partly successful, mainly because of side reactions leading to the formation of very hygroscopic by-products, such as the monosodium salt of N-methyl ditaurine. This difficulty can be overcome by the use of salts of volatile fatty acids as neutralization media in the direct condensation process. Sodium formate and acetate have both been successfully used in the preparation of detergents of the Hostapon T type, the resulting acid being then driven off by distillation. The end product of this process exhibits very little hygroscopicity.

MEASUREMENT OF THE SURFACE TENSION OF AQUEOUS SURFACTANT SOLUTIONS. G. Schwen (Ludwigshafen/Rhein, Germany). *Tenside* 1, 46–50 (1964). The surface tension of aqueous solutions of surface active agents depends not only on chemical composition, concentration, electrolyte level and temperature, but also on time. Experimental methods are therefore required to take the time variable also into consideration. A new quasistatic method for measuring surface tension, called the capillary pressure method, is described. The results of three series of experiments are reported, in which surface tension was measured for four different surfactants, varying concentrations of a non-ionic surfactant and varying amounts of electrolyte. The time dependency of surface tension was followed up to 25 min., at which time it had generally reached a constant, minimum value.

SURFACTANTS IN TEXTILE INDUSTRY EFFLUENTS. M. Kehren (Holzschlag, Germany). *Tenside* 1, 109–11 (1964). The situation of the textile industry in Germany is reviewed with respect to the German law on detergent biodegradability.

THE ADVENT OF SURFACTANTS. A. Chwala (Vienna, Austria). *Tenside* 1, 41–45 (1964). A historical review of the development of surface active agents.

THE ANALYSIS OF SURFACTANTS, I. D. Hummel (Univ. of Cologne, Germany). *Tenside* 1, 50–9 (1964). This paper gives a comprehensive survey on qualitative and quantitative methods of surfactant analysis, with special reference to spectroscopic and ion exchange methods. Besides extensive literature survey there are reported experimental results on the identification of surfactants which have not so far been published. In Part 1 of this paper the author deals with qualitative methods for testing surface activity and the charge of surface active ions as well as analytical methods for anionic and cationic surfactants.

III. *Ibid.*, 116–25. The third part of this paper deals with methods for the quantitative analysis of surfactants. These include gravimetric, volumetric, colorimetric and absorption-spectroscopic methods as well as special methods for the quantitative analysis of mixtures. More recently developed methods, such as I.R. and U.V. spectroscopy, ion exchange, as well as new titrimetric methods are given special attention. It is the object of these critical discussions to make the choice of a suitable analytical method easier.

AMINE OXIDE SURFACTANTS. H. Lindner (Berlin-Lichterfelde, Germany). *Tenside* 1, 112–5 (1964). The reaction of tertiary fatty amines (e.g. lauryl dimethyl amine) with hydrogen peroxide solutions is discussed. This is a reversible reaction, which can also cause the decomposition of the amine oxide under some conditions, e.g. at elevated temperatures. Different views on the molecular structure of these compounds are discussed, as well as the surface active properties of their aqueous solutions. The excellent cleaning and foaming properties of amine oxides, especially at low temperatures, make them well suited for use in detergents, dishwashing liquids, hair shampoos and textile finishing.

THE NATURE OF HYDROTROPY AND ITS SIGNIFICANCE IN INDUSTRIAL CHEMISTRY. H. Ratts (Inst. für Textilchemie, Stuttgart, Germany). *Tenside* 2, 1–6 (1965). Examples of the various branches of industrial chemistry in which hydrotropic substances can be used are given from the fields of organic technology, dyestuff synthesis, dyeing and printing, pharmaceuticals and cosmetics, cellulose production, tanning, prevention of calcium soap formation and swelling of high molecular weight substances. The nature of hydrotropy consists in the formation of adducts between the materials to be dissolved and the hydrotropic substance. The tendency to adduct formation and the property of the adduct to dissolve in water are closely dependent on the chemical constitution of the hydrotropic agent. This connection is illustrated by numerous examples.

ATTEMPTS AT SEPARATING SUCROSE MONOESTERS BY TLC AND DETERMINATION OF CAPILLARY PROPERTIES OF POSITIONAL ISOMERS. W. Wachs and K. Gerhardt (Univ. of Berlin/Charlottenburg, Germany). *Tenside* 2, 6–10 (1965). With the aid of thin layer chromatography, industrial sucrose-fatty acid esters were separated into their mono-, di- and triesters. It was also possible to separate the fraction of sucrose monoesters obtained into three groups (altogether seven individual compounds) of positional isomers. The various industrial compounds examined showed, in some cases, considerable differences in their monoester isomer concentration.

CHEMICAL ASPECTS OF MICROBIC OXIDATION. L. Canonica (Univ. of Milan, Italy). *Riv. Ital. Sostanze Grasse* 41, 505–10 (1964). Some of the chemical reactions by which microbes oxidize synthetic detergents are reviewed. It is pointed out that the chemistry of these reactions and the ultimate degradation products formed are still largely unknown and that the ultimate criterion for detergent biodegradability will have to be that of preventing the accumulation in the soil of possibly injurious transformation products rather than that of merely eliminating the surface activity of the detergent molecule.

MICROBIOLOGIC DEGRADATION OF DETERGENTS. V. Treccani (Univ. of Milan, Italy). *Riv. Ital Sostanze Grasse* 41, 511–4 (1964). Present knowledge in the area of detergent biodegradability is reviewed.

DETERGENT MARKET IN WESTERN EUROPE. G. L. Hollis (Imperial Chemical Industries, Ltd.). *Soap Chem. Specialties* 41(3), 68, 72, 74, 121–2 (1965). The author discusses the possibilities for the use of various types of detergents in the Western European market.

THE DEVELOPMENT OF HIGH QUALITY BIODEGRADABLE DETERGENTS. W. V. Barnes (Intern. Shell Chem. Co., London, England). *Riv. Ital. Sostanze Grasse* 41, 543–7 (1964). Experiments are described which were conducted in Great Britain in connection with the use of Dobane JN soft detergent, a straight chain alkyl benzene sulfonate. Processes for manufacturing biodegradable detergents are discussed.

BIODEGRADABLE SUCROGLYCERIDES. L. Nobile (Ledoga S.p.A., Milan, Italy). *Riv. Ital. Sostanze Grasse* 41, 501–5 (1964). Ethylene oxide adducts of sucroglycerides have been found to be resistant to acid and alkaline hydrolysis but are easily biohydrolized. In thirty minutes' time the molecule is split into glycerol, sugar, fatty acid and glycolic chains, which are all normal metabolic products and therefore constitute themselves a very good culture for the microorganisms.

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