Milling, curing, and testing procedures were the same as those reported elsewhere (7). The plasticizers were rated as compatible if formulations showed no signs of exudation or contact smearing within the observed 90 days of shelf aging.

Discussion

The results of the plasticizer screening tests for the hydrogenated and unhydrogenated tung oil adducts compounded with Buna-N rubber are presented in Table I. Milling of all of the eight experimental softeners appeared satisfactory. However the hydrogenated tung oil adducts of methyl vinyl ketone and of acrylonitrile became incompatible after shelf aging for periods of 14 and 21 days, respectively. The tung oil adducts of dimethyl maleate, methyl acrylate, and acrylonitrile, and the hydrogenated dimethyl maleate and methyl acrylate adducts yielded rubbers which met the low-temperature flexibility requirements (−40°C.) of the automotive industry. The tung oil adducts before hydrogenation were superior to their hydrogenated counterparts and to the control, dibutyl sebacate, in plasticizing efficiency, *i.e.*, lower modulus, reduced hardness, and greater elongation. In all cases hydrogenation of the tung oil adducts resulted in a slight impairment of their plasticizing efficiency. Moreover the hydrogenated tung oil adducts of methyl vinyl ketone and of acrylonitrile caused severe impairment as seen by their early exudation from their molded stocks. Only the hydrogenated and unhydrogenated derivatives of dimethyl maleate and methyl acrylate yielded stocks that were comparable to the control in volume change. It was observed that all the compositions containing the adduct, when subjected to accelerated aging tests, exhibited better modulus, elongation, and weight-loss properties than did the composition containing the control softener.

Summary

Eight derivatives of tung oil, namely, the methyl vinyl ketone, dimethyl maleate, methyl acrylate, and acrylonitrile adducts, and their hydrogenated products, were prepared and screened as softeners for Buna-N rubber with dibutyl sebacate as the control. Five of the eight products evaluated yielded stocks that met the low-temperature flexibility requirements (−40°C.) of the automotive industry. In all cases the stocks prepared from the unhydrogenated derivatives were superior in plasticizing efficiency to the stocks prepared from their hydrogenated counterparts or to those prepared from the control.

Acknowledgments

The authors express their appreciation to Marian C. Willis and Alva F. Cucullu for their analytical assistance.

REFERENCES

1. Semon, W. L., in "Synthetic Rubber," edited by G. S. Whitby, C. C. Davis, and R. F. Dunbrook, pp. 794–837, John Wiley and Son Inc., New York, 1954.
2. Hoffmann, J. S., and Bickford, W. G., "New Tung Oil Derivatives," U. S. Dept. Agr., *ARS-72-7*, 1–16 *(1956)*.
3. Hoffmann, J. S., O'Connor, R. T., Magne, F. C., and Bickford, W. G., J. Am. Oil Chemists' Soc., *32*, 533–538 (1955).
4. Hoffmann, J. S., O'Connor, R. T., Magne, F. C., and Bickford, W. G., J. Am. Oil Chemists' Soc., *33*, 410–414 (1956).
5. Placek, L. L., Mod, R. R., Magne, F. C., and Bickford, W. G., J. Am. Oil Chemists' Soc., *35*, 584–586 (1958).
6. Placek, L. L., Magne, F. C., and Bickford, W. G., J. Am. Oil Chemists' Soc., *36*, 651–652 (1959).
7. Fore, S. P., Pastor, H. P., Hughes, J. P., and Bickford, W. G., "Derivatives of Jojoba Oil as Plasticizers for Vinyl Polymers and Buna-N Rubber," J. Am. Oil Chemists' Soc., in press.

[Received March 10, 1960]

ABSTRACTS . . . . R. A. REINERS, Editor

ABSTRACTORS: Lenore Petschaft Africk, R. R. Allen, S. S. Chang,
Sini'tiro Kawamura, F. A. Kummerow, Louise R. Morrow, and E. G. Perkins

• Fats and Oils

Dimorphecolic acid—a unique hydroxydienoid fatty acid. C. Smith, Jr., T. Wilson, E. Melvin, and I. Wolff (Northern Regional Res. Lab., Peoria, Illinois). *J. Am. Chem. Soc.* 82, 1417–1421 (1960). Dimorphecolic acid, the chief constituent fatty acid of *Dimorphotheca aurantiaca* seed oil, is characterized as an optically active 9-hydroxy-*trans*,*trans*-10,12-octadecadienoic acid.

The epoxy acids of Chrysanthemum coronarium and Clarkia elegans seed oils. C. R. Smith, Jr., M. O. Bagby, R. L. Lohmar, C. A. Glass, and I. A. Wolff. *J. Organic Chem.* 25, 218–22 (1960). Coronaric acid, the constituent epoxy acid of *Chrysanthemum coronarium* seed oil, is characterized as *cis*-9,10-epoxy-*cis*-12-octadecenoic acid. The epoxy acid of *Clarkia elegans* seed oil is identified as vernolic acid.

Theoretical plates in gas chromatography. Effects of distribution ratio, viscosity, and amount of liquid phase. J. J. Duffield and L. B. Rogers (Dept. of Chemistry, Massachusetts Institute of Technology, Cambridge 39, Mass.). *Anal. Chem.* 32, 340–3 (1960). The value of the mass-transfer term in the van Deemter, Zuiderweg, and Klinkenberg equation increases with the viscosity and volume of the liquid phase. For distribution ratios greater than unity, the term is larger for the smaller ratios. With an increase in the mass-transfer term, lower efficiencies are observed and adjustment of the flow rate for optimum conditions is critical. The optimum flow rate for inefficient columns is generally low; hence long times are necessary for analysis. Very small samples of vapor rather than liquid were used successfully and required no extrapolation to zero size.

Response of thermal-conductivity cells in gas chromatography. L. J. Schmauch and R. A. Dinerstein (Research and Development Dept., Standard Oil Co., Whiting, Ind.). *Anal. Chem.* 32, 343–52 (1960). To understand better the performance of thermal-conductivity cells as detectors in gas chromatography, theoretical and experimental studies were made of the response of cells to changes in gas composition and operating temperatures. An equation for response was derived for cells in which most of the heat is conducted through the gas. Response was considered as the product of two factors: one, a cell factor, depends on operating conditions including electrical parameters of the cell and bridge; and the other, a thermal-conductivity factor, depends on the difference in conductivity of the carrier gas and the gas mixture passing through the cell when a component is eluted.

Coconut-like flavor defect of milk fat. IV. Demonstration of δ-dodecalactone in the steam distillate from milk fat. B. W. Tharp and S. Patton (Dept. Dairy Science, Pennsylvania Agricultural Experiment Station, University Park).

J. Dairy Sci. **43**, 475–9 (1960). Liquid-partition chromatography, using various solvent systems on paper and in packed columns together, with gas-liquid chromatography, enabled the identification of δ-dodecalactone in the steam distillate from fresh milk fat. It appears that this lactone occurs in the distillate at a lower level than does δ-decalactone. Because of its characteristic fruity flavor and odor properties, δ-dodecalactone is considered to be of possible significance in flavor changes of processed and stored dairy products. A useful column partition system for chromatographic separation of certain aliphatic lactones was revealed in the course of the investigation.

IDENTIFICATION OF THE STRUCTURE OF NON-VOLATILE ORGANIC SUBSTANCES BY GAS CHROMATOGRAPHY OF PYROLYTIC PRODUCTS. J. Janak (Lab. for Gas Analysis, Czechoslovak Academy of Sci., Brno). *Nature* **185**, 684–686 (1960). Pyrolytic spectra are presented of the C_1 to C_6 hydrocarbon products which are formed by the pyrolysis of olive, hydrogenated olive, and coconut oils. A qualitative and quantitative shifting of the components in the chromatograms with a change of the chemical nature of the oil is apparent.

ANTIOXIDANTS IN DRY FAT SYSTEMS: INFLUENCE OF THE FATTY ACID COMPOSITION OF THE SUBSTRATE. C. H. Lea (Low Temperature Res. Station, Downing St., Cambridge). *J. Sci. Food Agr.* **11**, 143–150 (1960). The activities of a number of antioxidants have been compared at 37° and 50° in purified distilled methyl esters of cottonseed, linseed and cod liver oil fatty acids, to which a small quantity of the pre-oxidized ester had been added as "starter." Relative activities were found to vary considerably with the fatty acid composition of the substrate and with the temperature and level of oxidation at which the measurements were made. The author stresses the desirability of keeping as close as practicable in antioxidant testing to conditions under which protection against autoxidation is required.

PROCESS FOR PRODUCING CONFECTIONERS' HARD BUTTER. A. Roylance (Lever Bros. Co.). *U. S. 2,928,745.* Palm kernel oil is hardened to an iodine value of less than 10 and randomly interesterified. Solvent fractionation of the resulting product gives a fraction having a dilatation at 30° of not less than 1000 and a dilatation at 37° of not more than 300.

TREATING SOAPSTOCK. N. H. Wittee and E. Sipos (Central Soya Co., Inc.). *U. S. 2,929,714.* A process is described for the production of a dry pigmentation agent. Soybean oil is treated with alkali to obtain a soapstock, the soapstock is heated, and the pH is adjusted to above 8.5. The soapstock in the form of a film is passed over a drying surface, chilled, and ground to a free-flowing product.

INSTANT COFFEE. W. E. Barch and I. M. Reich (Standard Brands, Inc.). *U. S. 2,929,716.* The incorporation of small but effective amounts of fatty acids, having at least 12 carbon atoms or their salts, into an instant coffee formulation substantially reduces foaming when the coffee is dissolved in water.

PROCESS FOR PREPARING SOLID FAT COMPOSITIONS. C. J. Schram (Lever Bros. Co.). *U. S. 2,931,730.* An edible fat is emulsified in an aqueous medium at a pH of 8.0 to 10.0 in the presence of at least 3% milk protein. The emulsion is dried, while the pH is within that range, to form a solid.

DEFOAMING COMPOSITIONS AND PROCESS. C. S. Steiner, E. Fritz, J. M. Becktel, and W. H. Kloster (Swift & Co.). *U. S. 2,931,780.* A substantially sterol-free mixture of fatty acids, rosin acids, and unsaponifiables is prepared by extraction of tall oil pitch with a liquid normally gaseous hydrocarbon and removal of the sterols. Incorporation of a small amount of this mixture in media having the tendency to foam excessively, significantly suppresses the foam.

PROCESS AND APPARATUS FOR TREATING OILS WITH HYDROGEN. J. E. Thompson. *U. S. 2,932,658.* The process consists of the following steps: moving oil through a catalyst-containing filter into a reaction chamber while dislodging the catalyst from the filter; introducing hydrogen under pressure into the reaction chamber through the filter; and finally releasing the pressure of the reacting gas to move the finished product back through the filter. A diagram of the apparatus is given.

MONOGLYCERIDE AQUEOUS EMULSION AND PROCESS OF PREPARING SAME. R. C. Bour. *U. S. 2,932,574.* A smooth aqueous dispersion is disclosed which contains from about 25 to 60% of a monoglyceride of fat-forming fatty acids and from about 7 to 35% of at least one water-soluble salt selected from the group consisting of alkali metal and calcium salts of acetic, propionic, citric, tartaric, gluconic, and sorbic acids.

• Fatty Acid Derivatives

THE LATTICE ENERGIES, INFRA-RED SPECTRA, AND POSSIBLE CYCLIZATION OF SOME DICARBOXYLIC ACIDS. M. Davies and G. H. Thomas (Univ. Col. of Wales, Aberystwyth). *Trans. Faraday Soc.* **56**, 185–192 (1960). From sublimation pressures measured by the effusion method, the heats and entropies of sublimation of the straight-chain dicarboxylic acids C_4, C_6, C_8, C_{10}, are (for C_n): $\Delta H = 24.3 + 1.71\ (n-2)$ and $\Delta S = 43.6 + 3.5\ (n-2)$. For C_{12}, C_{16}, and C_{20} the observed values are markedly lower than these relations predict. No evidence for different crystal structures could be found even when infra-red spectra of each acid were determined from 25° to the m.p. Thus there is reasonable support for the suggestion that the higher diacids are partially cyclized by intramolecular interaction in the vapor phase. Heats of solvation are also calculated.

SOLID FLAVORING COMPOSITIONS CONTAINING SUCROSE ESTERS AND PROCESS OF MAKING THE SAME. T. H. Schultz and W. F. Talburt (U.S.A., Secretary of Agriculture). *U. S. 2,929,722.* A volatile, liquid flavoring agent and a partial ester of sucrose with a higher fatty acid are incorporated in a hot, molten sugar base. The resulting hot mix is cooled to form a solid flavoring composition. A similar formulation in which the sucrose ester is replaced with lecithin is described in *U. S. 2,929,723.*

PRODUCTION OF ORALLY ADMINISTERABLE CONTROLLED RELEASE MEDICAMENTS. W. E. Gaunt (Strong, Cobb & Co.). *U. S. 2,928,771.* A therapeutic material and at least 5% (on weight of therapeutic material) of a metal soap of an 8 to 18 carbon atom fatty acid are subjected to compression sufficient to form a gel in which the therapeutic material is embedded. The gel thus formed is then subdivided into granules.

LITHIUM-CALCIUM GREASES. Rosemary O'Halloran (Esso Res. & Eng. Co.). *U. S. 2,929,780.* A fibrous grease having improved resistance to boiling water is prepared by blending a lithium soap of a fatty acid having a chain length of 12 to 30 carbon atoms and a calcium soap of a similar fatty acid in a lubricating oil menstruum at a temperature below that at which the lithium grease undergoes a phase change. The ratio of lithium soap to calcium soap should be in the range of 2:1 and 8:1, and the soaps should account for 5 to 40 weight percent of the final grease composition.

ESTERIFICATION AND CATALYSTS THEREFOR. G. R. Bond, Jr. (Houdry Process Corp). *U. S. 2,928,853.* Organic carboxylic acids having at least 6 carbon atoms in the hydrocarbon chain are esterified with aliphatic alcohols of at least 4 carbons by heating at reflux temperature in the presence of catalytic amounts (0.02% by weight of ester theoretically obtainable) of titanium sulfate incorporated in a porous absorptive mineral.

PROCESS FOR MAKING A LITHIUM-CALCIUM BASE GREASE. A. Beerbower, Rosemary O'Halloran, and H. G. Vesterdal (Esso Res. & Eng. Co.). *U. S. 2,929,781.* A mixture of C_{12} to C_{30} fatty acid, dry calcium hydroxide, dry lithium hydroxide monohydrate, and about 10 to 60% (on weight of soap concentrate) of a mineral lubricating oil is heated at a temperature of about 345°F. and under a pressure of about 120 p.s.i. for about 10 minutes to effect saponification. The pressure is released and vacuum is applied to dehydrate the concentrate.

PHYSICAL COMBINATION OF CALCIUM AND LITHIUM HYDROXY STEARATES FOR FORMING GREASES. L. W. Sproule and W. C. Pattenden (Esso Res. & Eng. Co.). *U. S. 2,929,782.* A lubricating grease consists of a major amount of mineral lubricating oil and a grease thickening amount of a mixed-metal thickener prepared by co-saponifying in the lubricating oil 12-hydroxy stearic acid with lithium base and calcium base. The thickener should consist of 18 to 22% of the lithium soap and

82 to 78% of the calcium soap.

ESTER-BASE LUBRICANT CONTAINING ANTI-OXIDANT MIXTURES. R. B. Tierney, R. H. Krug, and R. P. Chesluk (Texaco Inc.). *U. S. 2,930,758.* A lubricating oil composition having improved antioxidant properties at high lubricating temperatures consists of an alkyl C_1 to C_{10} diester of the dimer of linoleic acid as the base fluid, from 0.5 to 2% by weight of an anti-oxidant combination (a mixture of phenothiazine, N-phenyl-beta-naphthylamine, N,N'-diphenyl-p-phenylene diamine, and p-isopropoxy diphenylamine), and from 1 to 5% of di(o-chlorophenyl) phenyl phosphate.

FRESH MEAT PACKAGE AND METHOD. W. A. Hoffman, J. P. Janosik, and J. S. TenBroeck, Jr. (E. I. du Pont de Nemours & Co.). *U. S. 2,931,732.* A transparent, flexible wrapper for fresh meat consists of a regenerated cellulose film having on one surface from 2 to 4 grams per square meter of a heat-sealable, continuous coating. The coating is composed essentially of a film-former, a blending agent, and a moisture-proofing agent consisting of at least one ester of pentaerythritol and a saturated aliphatic monocarboxylic acid having from 12 to 35 carbon atoms. The coated film should have an oxygen permeability value of at least 20.

MIXED METHYL GLUCOSIDE-GLYCEROL FATTY ACID ESTER EMULSIFIERS. J. P. Gibbons and Louise R. Morrow (Corn Products Co.). *U. S. 2,931,797.* Mixed methyl glycoside-glycerol partial fatty acid esters are prepared by reacting triglycerides (tallow, soya oil, corn oil, coconut oil, or tristearin) with methyl glucoside in the presence of an alkaline catalyst at a temperature between 235° and 300°. The molar ratio of triglyceride to methyl glucoside should be within the range of 1:1–2.5.

◆

• Biology and Nutrition

ESTERIFICATION OF VITAMIN A BY AN ACETONE POWDER FROM PANCREAS. C. J. Pollard and J. G. Bieri (National Inst. of Health, U. S. Dept. of Health, Education, & Welfare, Bethesda, Md.). *Arch. Biochem. Biophys.* **87**, 9–12 (1960). A pancreatic enzyme from the rat and chick has been shown to utilize free fatty acids or donors of fatty acids (monoglycerides, corn oil, or stripped lard) to esterify vitamin A alcohol. Optimum conditions for the reaction are given.

FATTY ACIDS OF HUMAN BLOOD. V. S. Patil and N. G. Magar (Dept. of Biochem., Inst. of Science, Bombay 1, India). *Biochem. J.* **74**, 427–429 (1960). The composition of lipids from plasma, blood cells, and whole blood has been studied. Saturated fatty acids and tetraenoic acids of blood cells were higher than those of plasma, while the levels of oleic acid and dienoic acid of plasma were high compared with those of blood cells. Oleic acid and polyunsaturated fatty acids of whole blood each comprised about one-third of the total fatty acids. The dienoic acid was the highest in the polyunsaturated fatty acids group.

EFFECT OF DIETARY FAT AND CHOLESTEROL ON THE POLYUNSATURATED FATTY ACIDS OF CHOLESTEROL ESTERS, PHOSPHOLIPIDS AND TRIGLYCERIDES IN THE LIVER OF THE RAT. V. S. Patil and N. G. Magar (Dept. of Biochem., Inst. of Science, Bombay 1, India). *Biochem. J.* **74**, 441–444 (1960). Liver phospholipids were reduced and cholesterol esters and triglycerides were increased as a result of feeding cholesterol to rats. The levels of polyunsaturated fatty acids of liver lipids decreased greatly on feeding the more saturated fats with and without cholesterol as compared with those obtained when less saturated fats, with and without cholesterol, were fed. Trienoic acids were increased on cholesterol feeding much more in the liver triglycerides than in the cholesterol esters and phospholipids.

SUBSTANCE SC (UBICHROMENOL): A NATURALLY-OCCURRING CYCLIC ISOMERIDE OF UBIQUINONE-50. D. L. Laidman, R. A. Morton, J. Y. F. Paterson, and J. F. Pennock (Dept. of Biochem., Univ. of Liverpool). *Biochem. J.* **74**, 541–549 (1960). A normal, minor unsaponifiable lipid present in kidney and other tissues of many species has been isolated from normal human kidney at a concentration of about 10 mg/kg. Substance SC is a yellow crystalline compound with a m.p. of 18° and the empirical formula of $C_{59}H_{90}O_4$. The material contains a chromene ring system and a large polyisoprenoid side chain. The name ubichromenol has been suggested for the compound.

LIPID SYNTHESIS IN FOWL BLOOD. Joan P. W. Webb, A. C. Allison, and A. T. James (National Inst. for Medical Res., Mill Hill, London, N.W. 7). *Biochem. J.* **74**, 30P (1960). Fowl blood was incubated *in vitro* with labelled acetate and the resulting radioactivity of a number of lipid fractions was investigated. Acetate was incorporated with the long-chain saturated and unsaturated fatty acids of the phospholipids and neutral fat fractions of both cells and plasma. The most active of the fractions was the triglycerides, followed by the phospholipids, and then the cholesterol esters. Additional experiments were carried out using fowl blood enriched in mature erythrocytes, young erythrocytes, and leucocytes.

FATTY ACIDS OF PHOSPHOLIPIDS FROM MITOCHONDRIA AND MICROSOMES OF RAT LIVER. M. G. MacFarlane, G. M. Gray, and L. W. Wheeldon (Lister Inst. of Preventive Medicine, London, S.W. 1). *Biochem. J.* **74**, 43P–44P (1960). The fatty acids of the cephalin and lecithin fractions were analyzed by gas chromatography of the methyl esters on Reoplex 400. Quantitative analyses are given. Linolenic acid was not present in either the cephalin or the lecithin. About 45% of the fatty acids are "essential" fatty acids, calculated as the sum of linoleic and C_{20} and C_{22} polyenoic acids.

HYDROGENATION OF CHLOROPLAST LIPIDS BY RUMEN BACTERIA. D. E. Wright (Plant Chem. Div., Dept. of Scientific & Ind. Res., Palmerston North, New Zealand). *Nature* **185**, 546–547 (1960). Bacteria incubated in phosphate buffer caused only a slight hydrogenation of the unsaturated fatty acids in the chloroplasts. Bacteria suspended in rumen liquor, however, converted nearly all the triene acid to more saturated acids, particularly the diene acids.

CARNITINE IN LIPID METABOLISM. E. P. Adams, P. E. Ballance, and A. E. Bender (Res. Dept., Bovril Ltd., London). *Nature* **185**, 612 (1960): Carnitine (4-trimethyl amino-3-hydroxy butyric acid) could not be detected in the phospholipids of foxhound serum or beef muscle.

MODIFICATION OF CHOLESTEROSIS AND LIPIDOSIS OF RATS MAINTAINED ON AN ATHEROGENIC DIET. N. R. DiLuzio (Univ. of Tennessee, Memphis). *Nature* **185**, 616–618 (1960). Maintenance of rats on an atherogenic diet for 14 days significantly raised the level of free and ester cholesterol and neutral fat in the liver. The administration of the yeast enzyme, zymosan, reduced these accumulations. A significant reduction in plasma ester cholesterol was also noted. A possible mechanism for zymosan prevention of cholesterol accumulation and the possible etiology of hypercholesterolemia and lipidosis in untreated animals are also discussed.

FORMATION OF CAROTENE IN VITRO. H. Yokoyama, C. O. Chichester, and G. MacKinney (Univ. of California, Davis and Berkeley). *Nature* **185**, 687–688 (1960). Both β-hydroxy β-methylglutarate and mevalonate were found to be precursors of carotene formation in an *in vitro* extract obtained from mycelial mats of the mould *Phycomyces blakesleeanus.* Evidence also substantiated existence of a back reaction from mevalonate to the glutarate.

INCORPORATION OF ORTHOPHOSPHATE LABELLED WITH PHOSPHORUS-32 INTO CEREBRAL PHOSPHOLIPIDS IN VIVO. G. B. Ansell and S. Spanner (Medical School, Birmingham). *Nature* **185**, 826–828 (1960). The specific radioactivity of the acid-soluble fraction of rat brain tissue rapidly rose and then stayed relatively constant. Phosphorylethanolamine and phosphorylcholine acquired the same radioactivity as the acid-soluble fraction as a whole within 24 hours. Over a period of 7 days several of the phospholipids steadily acquired radioactivity. Phosphatidyl serine acquired it at the slowest rate and phosphatidyl choline at a faster rate than the ethanolamine-containing phospholipids. Loss of radioactivity from rat brain phospholipids as a whole is apparently very slow.

FRACTURE HEALING BY VITAMIN K. J. H. Bouckaert (State Univ., Ghent) and A. H. Said. *Nature* **185**, 849 (1960). Vitamin K was found to have a pronounced effect in speeding up the rate of bone healing.

SUPPLEMENTATION OF CHICK DIETS WITH VITAMIN E TO IMPROVE MEAT QUALITY. B. Laksesvela (Herring Oil & Meal Industry Res. Inst., Straumsgrend, Norway). *J. Sci. Food Agr.* 11, 128–133 (1960). The taste and odor of fresh chicken meat were significantly improved when the birds were fed diets containing 6 or 15% of an experimentally produced herring meal containing highly unsaturated fat (not favorable for production of good-quality meat) or of normal herring meal, provided a supplement of 36.7 mg. of *d*-*a*-tocopheryl acetate per kg. of diet was given. Such addition also tended to improve the flavor of birds reared on an all-vegetable diet. High levels of vitamin E acetate fed to chicks only in their first week of life or only on the last 5 days before slaughter, also improved the taste of the meat to some extent.

PROCESS OF TREATING LECITHIN FOR FREEING IT OF ITS DEPRESSOR FACTOR. E. B. McQuarrie and H. P. Andersen (Cutter Labs.). *U. S. 2,931,818.* Lecithin is dissolved in a lower alkanol containing no more than 10% water. The resulting alcoholic solution is treated with an anion-exchange resin in the free base form to remove the depressor content of the lecithin.

LIPOPROTEINS QUANTITATED BY PAPER ELECTROPHORESIS AS AN INDEX OF ATHEROSCLEROSIS. M. Wurm, R. Kositchek, and R. Straus (Dept. of Med. Res., St. Joseph Hosp., Burbank, Calif.). *Circulation* 21, 526–537 (1960). Data dealing with cholesterol, phospholipid, their ratios, and total lipids in a group of 40 ''normal'' and 40 individuals with manifest coronary artery disease have been evaluated and have been found to have a low order of significance in determining the atherosclerotic status for both individuals and for groups. Serum lipoproteins separated by paper electrophoresis and visualized with Fat Red 7B have been shown to occur in 5 fractions. Of these, lipalbumin and beta lipoproteins as well as beta/alpha and beta/lipalbumin ratios reveal a high level of significance for distinguishing normal from abnormal individuals and groups.

THE REDUCTION OF VITAMIN K_1 BY AN ENZYME FROM DOG LIVER. W. D. Wosilait (Dept. of Pharmacology, State Univ. of N. Y. College of Medicine, Brooklyn, N. Y.). *J. Biol. Chem.* 235, 1196–1201 (1960). The purification and properties of an enzyme from dog liver which catalyzed the reduction of vitamin K_1 (2-methyl-3-phytyl-1,4-naphthoquinone) by reduced di- or triphosphopyridine nucleotides is described. The vitamin K_1 used as an electron acceptor was solubilized with BRIJ-35 (polyoxyethylene lauryl alcohol). Menadione, coenzyme Q_{10}, and benzoquinone also served as electron acceptors. Flavin adenine dinucleotide and flavin mononucleotide increased the rate of reaction whereas Dicumarol and other anticoagulants decreased the rate. On the basis of spectrophotometric evidence, the reduction of vitamin K_1 appeared to take place in the naphthoquinone nucleus.

PROPIONIC ACID METABOLISM. IV. SYNTHESIS OF MALONYL COENZYME A. P. Vagelos (National Heart Inst., Bethesda, Maryland). *J. Biol. Chem.* 235, 346–350 (1960). Malonyl semialdehyde coenzyme A dehydrogenase, an enzyme which catalyzes the triphosphopyridine nucleotide-specific dehydrogenation of malonyl semialdehyde coenzyme A to malonyl coenzyme A, was demonstrated in extracts of *Clostridium kluyveri.* The enzyme preparation also contained β-hydropropionyl coenzyme A dehydrogenase, so that the over-all reaction studied was a dismutation. The products of the reaction were identified by chromatographic comparison of the hydroxamic acid derivatives to authentic malonyl monohydroxamate and β-hydroxypropionyl hydroxamate, and by chromatographic comparison of the products of alkaline hydrolysis of the thiolesters to authentic malonate and β-hydropropionate.

BUTTER, CORN OIL, AND FIBRINOLYSIS IN RATS. R. L. Tillman, R. M. O'Neal, W. A. Thomas, and Barbara B. Hixson (Dept. of Pathology, Washington Univ. School of Medicine, St. Louis, Mo.). *Circulation Res.* 8, 423–30 (1960). A dietary method for the production of thrombosis and infarcts in rats has been described and it has been suggested that part of the mechanism of thrombosis in these animals was interference by the diet with some hematologic factor, possibly fibrinolysis. In the study reported herein, a method for studying fibrinolysis in rats *in vitro* is reported, utilizing an electronic device called the Thrombelastograph.

EFFECT OF COENZYME Q_{10} ON THE DETERMINATION OF TOCOPHEROL IN ANIMAL TISSUE. W. Pudelkiewicz and L. Matterson (Dept. of Poultry Sci., Univ. of Conn., Storrs, Conn.). *J. Biol. Chem.* 235, 496–498 (1960). Interference of coenzyme Q_{10} in the analysis of tocopherol is indicated if it is allowed to come in contact with a reducing substance without molecular distillation. The latter procedure effectively separated it from tocopherol, thereby eliminating it as a source of interference.

STUDIES OF THE BIOLOGICAL FUNCTION OF VITAMIN E. II. THE NATURE OF THE SPECIFIC ACTIVATING EFFECT OF TOCOPHEROL IN AGED PREPARATIONS OF CYTOCHROME REDUCTASES. C. J. Pollard and J. G. Bieri (Lab. of Nutrition and Endocrinology, National Insts. of Health, U. S. Public Health Service, Bethesda, Md.). *J. Biol. Chem.* 235, 1178–82 (1960). The activating effect of tocopherol on aged preparations of chick heart cytochrome *c* reductases has been examined. The stimulating effect of tocopherol on aged preparations is shown to be nonspecific. The activating effect of the antioxidant, Santoquin, on succinate-cytochrome *c* reductase of some aged preparations is described. The consistent activating effect of naphthotocopherol and 5-pentadecyl resorcinol, also an antioxidant, on succinate-cytochrome *c* reductase of aged preparations which responded to tocopherol is also described. The efficacy of naphthotocopherol and reduced vitamin K_1 in activating reduced diphosphopyridine nucleotide-cytochrome *c* reductase of aged preparations is demonstrated to be of the order of that of tocopherol.

SERUM LIPOPROTEINS IN PATIENTS WITH INTERMITTENT CLAUDICATION AND MYOCARDIAL INFARCTION. P. Nestel (Univ. of Melbourne, Victoria, Aust.). *Circulation* 21, 522–25 (1960). Serum beta/alpha lipid ratios were estimated by electrophoresis in 4 groups of people. These comprised 44 male patients with intermittent claudication; 61 men who were matched for age with the previous group and who were clinically free of cardiovascular disease; 3a mole patients who had recently had a myocardial infarction; and a further group of 30 male controls whose physical activity was limited by factors other than disease. The highest mean serum beta/alpha lipid ratio was found among the patients with intermittent claudication and was very significantly higher than the ratios found among the other 3 groups. The difference in the ratios between the patients with myocardial infarction and the 2 control groups was not significant. These differences and in particular the difference in the ratios between the patients with myocardial infarction and intermittent claudication are discussed.

THE PHOSPHOLIPID AND PHOSPHOLIPID FATTY ACID COMPOSITION OF HUMAN SERUM LIPOPROTEIN FRACTIONS. G. J. Nelson and N. K. Freeman (Donner Lab. of Biophysics and Medical Physics, Univ. of California, Berkeley). *J. Biol. Chem.* 235, 578–83 (1960). The phospholipid compositions of human serum lipoproteins have been determined on ultracentrifugally separated serum lipoprotein classes by silicic acid column chromatography and infrared spectrophotometry. The lipoproteins were separated into three classes: $S^{\circ/f}$ 20–400, $S^{\circ/f}$ 0–20, and the major high-density lipoproteins. The phospholipids were separated into a fraction containing phosphatidyl ethanolamine and phosphatidyl serine, a lecithin fraction, and a sphingomyelin fraction. All phospholipids are present in each lipoprotein class, but their distributions in each class are sufficiently different to be characteristic. Analyses were run on sera from five individuals and only small deviations from the average values were observed.

COENZYME Q. XII. ETHOXY HOMOLOGS OF COENZYME Q_{10}. ARTIFACT OF ISOLATION. B. Linn, N. Trenner, B. Arison, R. Weston, C. Shunk, and K. Folkers (Merck and Co., Rahway, N. J.). *J. Am. Chem. Soc.* 82, 1647–1651 (1960). An artifact of coenzyme Q_{10} produced during the isolation of beef myocardial tissue has been discovered. Ethoxy and the diethoxy homologs of coenzyme Q_{10} have been characterized. Evidence for the probable mechanism of formation of these homologs indicates that Q_{10} had undergone alkali-catalyzed ethanolysis, a unique reaction of methoxy-1,4-benzoquinones. A method of isolation which avoids ethanolysis of Q_{10} is given. Comparison of our data on ethoxy homologs with those of early ubiquinone preparations shows close similarities and differentiates these compounds from coenzyme Q_{10}.

LIPID METABOLISM IN THE DIABETIC RAT. III. ACETATE METABOLISM AND ACETOACETATE SYNTHESIS IN VITRO. J. C. Elwood and J. T. Van Bruggen (Dept. of Biochemistry, Univ. of Oregon Medical School, Portland, Ore.). *J. Biol. Chem.* **235**, 568–72 (1960). The amounts of CO_2 produced and of O_2 utilized per hour per g. of liver slice were found to be decreased in the diabetic rat preparation. The incorporation of acetate-1-C^{14}, however, was increased by some 70%. The amount of fatty acid per g. of liver slice was the same for normal and diabetic rat preparations, but the incorporation of acetate-1-C^{14} into fatty acids was reduced 92% in the diabetic liver slice. The amount of nonsaponifiable (cholesterol) material per g. of liver slice was the same for the normal and diabetic rat preparations, but the amount of β-hydroxybutyrate formed by the diabetic was decreased. The incorporation of acetate-1-C^{14} into the C_4 fraction was decreased 38% in the diabetic rat preparation.

LIPID METABOLISM IN THE DIABETIC RAT. IV. METABOLISM OF ACETATE, ACETOACETATE, BUTYRATE, AND MEVALONATE IN VITRO. J. C. Elwood, Alicia Marco, and J. T. Van Bruggen, *Ibid.*, 573–77 (1960). The four tracer molecules, acetate-1-C^{14}, acetoacetate-3-C^{14}, butyrate-1-C^{14}, and mevalonate-2-C^{14} have been used in liver slice studies of CO_2, fatty acid, and cholesterol formation. The data suggest that butyrate is first converted to acetyl-CoA before labeling of the three fractions occurs. Acetoacetate is seen to equilibrate with acetoacetate precursors of fatty acid and cholesterol synthesis, seemingly without complete conversion to acetyl-CoA. Mevalonate is shown to label cholesterol selectively, the amount of C^{14} of mevalonate-2-C^{14} found in CO_2 being about 20% higher than expected.

GOSSYPOL EXTRACTANTS, ORAL TOXICITY TO POULTRY OF A COMMERCIAL OCTYLAMINE. S. P. Clark and R. T. DuBose (Texas Engineering Experiment Station, College Station, Texas). *J. Agr. and Food Chem.* **8**, 147–51 (1960). Two hundred broiler-type chickens, including both sexes, were for 9 weeks fed rations containing different levels of commercial primary *n*-octylamine. Levels of amine were 0.036, 0.072, 0.144, and 0.36% of the rations. A control ration containing no amine, but otherwise similar to the other four, was also fed. No definitely toxic effects were observed. Consistent lesions were produced by force feeding of amine at levels above those which the chickens would voluntarily accept in the ration. Many of these birds died. Prominent changes included hardening and peeling of the crop lining, inflammation of the intestine, edema and congestion of the lungs, and swelling of the anterior lobes of the kidneys.

THE FORMATION OF Δ^9-UNSATURATED FATTY ACIDS. D. Bloomfield and K. Bloch (Chem. Lab., Harvard Univ., Cambridge, Mass.). *J. Biol. Chem.* **235**, 337–345 (1960). Extracts prepared from anaerobically grown yeast with the aid of the Hughes' press catalyze the desaturation of palmitic to palmitoleic acid and of stearic to oleic acid. The cofactors required for the conversion are coenzyme A, adenosine triphosphate, reduced triphosphopyridine nucleotide, and Mg^{++}. Molecular oxygen is essential for the reaction and cannot be replaced by artificial electron acceptors. With palmityl coenzyme A as the substrate, desaturation takes place in a system containing only the particulate fraction of yeast homogenates, reduced triphosphopyridine nucleotide, and oxygen in the gas phase. The reaction product has been identified as palmitoleyl coenzyme A. Evidence is presented to show that in yeast monounsaturated fatty acids are formed primarily by desaturation of the corresponding saturated acid. The slow anaerobic rate of lipid synthesis from acetate by intact yeast can be markedly enhanced by raising the glucose concentration from 20 to 25%. In resting cells of a biotin-deficient strain of yeast the incorporation of C^{14}-acetate into fatty acids is greatly stimulated by addition of biotin to the medium.

PATTERN OF CHOLESTEROL ESTER FATTY ACIDS IN SERUM IN NORMAL SUBJECTS AND IN PATIENTS WITH ESSENTIAL HYPERCHOLESTEROLEMIA. P. Björntorp and B. Hood (Medical Service I, Sahlgrens Hospital, University of Gothenburg, Sweden). *Circulation Res.* **8**, 319–23 (1960). Sera from 10 patients with essential hypercholesterolemia on *ad libitum* diets have been analyzed for their content of polyunsaturated fatty acids in the cholesterol esters and the results compared with a matched group of normal subjects. The absolute increase in the amount of polyunsaturated fatty acids in the cholesterol esters in essential hypercholesterolemia, particularly after an extremely high intake of unsaturated fat, speaks against factors causing an inhibition in esterification with polyenes as being of central importance.

STUDIES ON RAT ADIPOSE TISSUE IN VITRO. V. EFFECTS OF GLUCOSE AND INSULIN ON THE METABOLISM OF PALMITATE-1-C^{14}. P. Bally, G. Cahill, Jr., B. Leboeuf, and A. Reynold. (Dept. of Med., Harvard Med. School, Cambridge, Mass.). *J. Biol. Chem.* **235**, 333–336 (1960). Albumin-bound palmitate-1-C^{14} is readily utilized by adipose tissue incubated *in vitro*. Its incorporation into tissue lipid and its oxidation to CO_2 is linearly proportional to its concentration in the medium. Small concentrations of glucose increase the incorporation and depress oxidation. Insulin in the presence of glucose in the medium, slightly but significantly increases the incorporation and markedly depresses oxidation. The major portion of fatty acid incorporated is recovered in the neutral or glyceride fraction.

• Paints and Drying Oils

POLYESTERS FROM EPOXIDES AND ANHYDRIDES. R. F. Fischer (Shell Development Co., Emeryville, Calif.). *Ind. Eng. Chem.* **52**, 321 (1960). In the presence of a tertiary amine, a terminal epoxide such as allyl glycidyl ether reacts cleanly at 70° to 100° with an acid anhydride (such as phthalic) giving a linear polyester. If equimolar quantities are used, residual activity at the end of the reaction is generally less than 1% of the starting value, proving that the reaction is at least 99% specific—i.e., that at least 99% of the epoxide molecules react with anhydride molecules rather than with each other.

GLYCIDYL ETHER REACTIVITIES IN VARNISHES FROM LIQUID EPOXY RESINS. J. Wynstra, R. P. Kurkjy, and N. H. Reinking (Union Carbide Plastics Co., Div. of Union Carbide Corp., Bound Brook, N. J.). *Ind. Eng. Chem.* **52**, 326 (1960). Liquid and solid bisphenol-epichlorohydrin condensates differ mainly in their molecular weights and therefore they have been represented by one idealized structural formula. Both are derived from bisphenol A and epichlorohydrin by reaction with caustic, and the solid resins are theoretically equivalent to liquid resin plus bisphenol A.

EPOXY RESINS FROM RESORCINOL-ACETATE CONDENSATION PRODUCTS. C. L. Segal and J. B. Rust (Materials Res. Dept., Res. Labs., Hughes Aircraft Co., Culver City, Calif.). *Ind. Eng. Chem.* **52**, 324 (1960). A series of resorcinol-acetone resins was prepared by heating resorcinol and acetone to 70°C. in a round-bottomed flask equipped with a stirrer, condenser, and addition funnel. Concentrated hydrochloric acid was added slowly and the reaction was maintained at between 70° and 100°C., depending on the amount of acetone added, for 4 to 8 hours.

COATINGS FROM CYCLOHEXANE OXIDE DERIVATIVES. C. W. McGary, Jr., C. T. Patrick, Jr., and R. Stickle, Jr. (Res. Dept. Union Carbide Chemicals Co., South Charleston, W. Va.). *Ind. Eng. Chem.* **52**, 318 (1960). A new technique was developed for preparing drying oil varnishes from diepoxides and unsaturated fatty acids—the diepoxide, 3,4-epoxy-6-methylcyclohexylmethyl 3,4-epoxy-6-methylcyclohexanecarboxylate (EP-201), was condensed with the fatty acid in such proportions that residual epoxide groups remained. The resulting adduct in the presence of a catalyst was then polymerized in solution. The polymerization reaction was carried out in enough solvent, usually xylene, to give a polymer concentration of about 50 to 55%. The varnishes also had a high tolerance for aliphatic solvents.

POLYMERIC PRODUCT PREPARED BY REACTING MODIFIED VEGETABLE DRYING OILS AND VINYL-CONTAINING MODIFIERS. J. S. Heckles (Armstrong Cork Co.). *U. S. 2,928,796.* A modified vegetable drying oil such as a heat-bodied oil having a viscosity in the range of B to L on the Gardner Bubble Viscosimeter scale or an alkyd-modified drying oil prepared by the reaction of tall oil fatty acids, pentaerythritol, and phthalic anhydride is heated to a temperature of at least 200°. Vinyl toluene and divinyl benzene in amounts of 15–60% and 1–15%, respectively are added and the reaction mixture is heated at 200° in the presence of an organic peroxide catalyst.

Inhibiting corrosion in metals. H. W. Chatfield (A. Boake, Robert & Co., Ltd., London, England). *U. S. 2,930,708.* A film-forming, corrosion-inhibiting varnish composition consists of an oleoresinous material (prepared from a long-chain fatty acid drying or semi-drying oil and a resin) and an epoxidized oil material. The epoxidized oil is derived from an unsaturated oil or fatty acids from such oil having an iodine value of not less than 80 before epoxidation and in which unsaturation has been at least partially removed by the formation of epoxy groups across double bonds in the fatty radical portion of the material.

Pigment concentrate. C. F. Clark and Nancy C. Paul (W. P. Fuller & Co.). *U. S. 2,932,580.* A pigment concentrate in paste form consists of about 40% to 75% by volume of a solvent compatible with paint bases of oil and latex type and having an evaporation rate of between 5 and 500 hours (diacetone alcohol or the alkyl ethers and acetates or propylene glycols); from 10% to 40% pigment; and about 10% to 25% of a wetting agent combination of one part soya lecithin to between one and fifteen parts of the mixture of (1) one part of the condensate of a dialkanolamine ethylene diamine tetraacetic acid and a fatty acid with at least 8 carbon atoms and (2) five to seven parts of an ester of polyethylene glycol and a fatty acid having 12 to 18 carbons.

Thixotropic coating vehicle containing a short oil alkyd resin and a copolymer polyamide resin. D. Glaser and H. Wittcoff (General Mills, Inc.). *U. S. 2,932,623.* The vehicle is composed of (1) an aromatic hydrocarbon solvent, (2) an alkyd resin formed by the reaction of phthalic anhydride, a polyhydric alcohol such as glycerol or pentaerythritol, and from 20 to 45% of naturally occurring glyceride oils or fatty acids containing from 8 to 22 carbon atoms, and (3) from 1 to 5% (by weight of alkyd) of a polyamide formed by the reaction of a mixture of (a) dimerized and trimerized polymeric fat acids, (b) aliphatic dicarboxylic acids containing less than 14 carbons (3–30% on total acids), and (c) an equivalent weight of a polyamine of the structure $H_2N(R'NH)_nH$ where R' is an alkylene radical and *n* is an integer less than 6.

• Detergents

Liquid detergent builders. R. Getty and W. Stericker (Philadelphia Quartz Co., Philadelphia, Penn.). *Soap Chem. Specialties* **36**(4), 45–8, 105–7 (1960). Compatibility and stability of the silicate-polyphosphate mixtures in solution were tested at various ratios and concentrations. Efforts were made to find areas of stability for solutions containing both soluble silicates and polyphosphates. Four sodium silicates and three potassium silicates were used. Results showed that the factors that affect the stability of silicate-phosphate mixtures are: solubility of phosphate used, SiO_2/alkali metal oxide ratio of the silicate, common ion effect, high phosphate-low silicate concentrations, high silicate concentrations, and low temperatures.

Useful combinations of anionic and cationic surfactants. Rachel C. Heald (Schimmel & Co., Inc., New York). *Am. Perfumer Aromat.* **75**(4), 45–7 (1960). A quaternary combined with a soap in an aqueous solution in roughly equal parts forms a wax-like product. The reaction product is a salt of high molecular weight, formed by the union of the hydrophobic anion of the soap with the hydrophobic cation of the quaternary ammonium compound. This produt may be used as a cosmetic ingredient and when combined with oils may be made into emulsions with the aid of an emulsifier. Difficulties which arise from the insolubility of the electro-neutral salts can be overcome by the use of a nonionic solubilizer. Although these soap-quaternary mixtures cause some cloudiness in hard water, the precipitate is very finely dispersed. At low concentrations the soap-quaternary mixtures foam better than pure soap in hard water.

A method for determining nonionic surface-active agents in oils and solvent extracts from wool. B. C. Hobson and R. S. Hartley (Wool Industries Research Assoc., Torridon, Headingley, Leeds, Engl.). *Analyst* **85**, 193–6 (1960). It is shown that polyethylene glycol ethers containing about ten ethylene oxide units can be determined in fatty oils, mineral oils, and solvent extracts from wool. The nonionic surface-active agents are separated from fatty and mineral oils by passing an aqueous ethanolic dispersion of the sample through an alumina column and eluting with water. The nonionic compound passes through the column, whereas fatty materials are retained. The nonionic compound is determined in the eluate by precipitation with molybdophosphoric acid solution.

Household cleaners. D. Justice (Lever Brothers Co., New York). *Soap Chem. Specialties* **36**(3), 47–50, 93; (4) 54–5 (1960). Cleansers which are effective in removing soil from the surface and in controlling the invisible contamination of microorganisms, and which are applicable to household chores, were evaluated. Controlled laboratory tests, practical evaluation under laboratory conditions, and finally consumer evaluation in the field, were carried out. Mildness in use, possible toxic effects, and results from accidental ingestion were considered.

Unique soap bacteriostat. W. J. Lennon, T. E. Furia, and H. W. Zussman (Geigy Chem. Corp., Ardsley, N. Y.). *Soap Chem. Specialties* **36**(3), 51–4, 93; (4) 56–8, 109 (1960). A bacteriostat agent commercial known as "Irgasan BS 200" and chemically as 3,5,3',4'-tetrachlorosalicylanilide is evaluated. TCSA is chemically stable under most conditions normally encountered in the formulation, storage, and use of detergent products. Unlike many other bacteriostats, TCSA exhibits relatively broad spectrum activity against fungi, gram-positive and gram-negative bacteria. The compound may be used in toilet soap at 0.5%, also in shampoos and in scrub soap. Addition of 0.1–0.2% to laundry detergents will impart a residual bacteriostatic effect. The special value of TCSA in laundering is its adsorption and retention on many textile materials which will then exhibit reduced susceptibility to bacterial contamination. For home use, TCSA is most conveniently combined with detergents; it may also be applied in the rinse cycle, along with the cationic softener or starch. Substantivity of TCSA is highest for nylon, followed by wool and then cotton, rayon, and resin-treated cotton. TCSA has limited light stability and should not be exposed for extended periods of time to strong direct sunlight. It is more effective than hexachlorophene in reducing skin bacteria count over a 12-day period of continuous use.

Protective coatings for cakes or tablets of soap. Kepec Chemische Fabrik G.m.b.H. *Brit. 823,118.* Soap tablets are prepared with a non-hygroscopic readily water-soluble coating of a film-forming substance using an aqueous solution of same containing an added agent improving the ability of the solution to wet the soap.

Surface-active substances. Henkel & Cie. *Brit. 826,171.* Products especially suitable as dispersing agents and additives to other emulsifying agents are obtained by reacting 2 molecules of a diisocyanate with 1 mole of a dialkylolamide and heating the product with a polyglycol ether.

Detergent germicidal compositions and process of making the same. S. Goldwasser (Lever Brothers Co.). *U. S. 2,927,899.* A germicidal soap contains as a germicidal agent, a thiuram sulfide having each thiuram nitrogen atom fully substituted with aliphatic groups, and a compound which acts as a stabilizer for the thiuram sulfide. The stabilizer may either be a stannous compound or a compound of a group IVa element below silicon and in a valence state of more than 2. The stabilizer also acts as an inhibitor against the decomposition of the thiuram sulfide as evidenced by development of odor and staining characteristics.