anhydrogossypol: C, 74.66; H, 5.46; mol. wt., 482. Mixture melting-point with anhydrogossypol prepared according to the method of Miller and Adams (4), 225–226.5°. Mixture melting-point with anhydrogossypol prepared in accordance with the method of Clark (2), 225.5–226.5°.

An ethyl acetate solution of gossypol (0.5g./100 ml.) was refluxed under N_2 for 3 days. The solvent was removed under reduced pressure, and the residue was taken up in diethyl ether. The unreacted gossypol was removed from the ethereal solution by scrubbing it with 4% aqueous Na_2CO_3 containing a small quantity of dithionite. The ethereal solution was then dried with anhydrous Na_2SO_4 and concentrated on a water bath. Orange crystals separated when the solution was cooled. They were recrystallized from toluene. *Anal.*: C, 74.23; H, 5.56; m.p., 227–228°. Mixture melting-point with anhydrogossypol prepared according to the method of Miller and Adams (4), 226–227°.

Anhydrogossypol from each of the preparations was converted to dianilinogossypol by the method of Clark (2). Each crystalline preparation was dried *in vacuo* at 50°. Melting points of anils prepared from anhydrogossypol derived from ethyl acetate solutions were 275–276° and 274.5–276°, respectively, and of an anil prepared from anhydrogossypol prepared in accordance with the method of Miller and Adams, 267–268°. Mixture melting-point with gossypol anil prepared in accordance with the method of Miller and Adams, 268–269°.

The infrared spectra of all of the anhydrogossypol preparations, as determined in KBr discs and also in cyclohexane solution with a Beckman IR-2T spectrophotometer, were identical.

Discussion

Anhydrogossypol and several other alkali-fast products are formed spontaneously at room temperature when gossypol is dissolved in ethyl acetate whereas gossypol can be recovered quantitatively from benzene, toluene, cyclohexane, diethyl ether, and chloroform solutions of gossypol even when these are boiled under reflux for 3 days. Only 10–25% of the gossypol dissolved in ethyl acetate can be recovered if the solution is boiled under reflux for 3 days.

The fate of the water removed from gosypol on its conversion to anhydrogossypol was not determined. Apparently it was not involved in the hydrolysis of ethyl acetate since very carefully-conducted potentiometric titrations failed to reveal the presence of acetic acid in any of the solutions containing anhydrogossypol.

It is noteworthy that anhydrogossypol is not removed by alkali washing when it is added to refined and bleached cottonseed oil unless the alkaline solution is stronger than 2.5 *N*. Anhydrogossypol has not been separated from or identified in off-colored cottonseed oil.

Kinetic studies of the fixation of gossypol in cottonseed oil indicate that the reactions involved may be relatively simple (5). Comparable studies of the spontaneous conversion of gossypol in ethyl acetate solution to other products, including anhydrogossypol, do not lend themselves to any simple interpretation. Apparently the spontaneous conversion of gossypol to other products is much more extensive in ethyl acetate than in cottonseed oil.

Acknowledgment

The authors express their appreciation to L. E. Brown for the elemental analyses and to R. T. O'Connor for the infrared measurements.

REFERENCES

1. Berardi, L. C., and Frampton, V. L., J. Am. Oil Chemists' Soc., *34*, 399–401 (1957).
2. Clark, E. P., J. Biol. Chem., *75*, 725–739 (1927).
3. Frampton, V. L., Pons, W. A. Jr., and Kerr, I., Econ. Botany, in press.
4. Miller, R. F., and Adams, R., J. Am. Chem. Soc., *59*, 1736–1738 (1937).
5. Pons, W. A. Jr., Berardi, L. C., and Frampton, V. L., J. Am. Oil Chemists' Soc., *36*, 337–339 (1959).
6. Pons, W. A. Jr., Hoffpauir, C. L., and Hopper, T. H., J. Agr. Food Chem., *1*, 1115–1118 (1953).

[Received July 29, 1960]

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

ABSTRACTORS: S. S. Chang, Sini'tiro Kawamura, F. A. Kummerow,
H. S. Liles, Louise R. Morrow, and E. G. Perkins

• Fats and Oils

OPTIMUM CONDITIONS FOR SEPARATION IN GAS CHROMATOGRAPHY. J. C. Giddings (Dept. of Chem., Univ. of Utah, Salt Lake City 12, Utah). *Anal. Chem.* 32, 1707–1711 (1960). A procedure is outlined in which the separation function (a quantitative measure of the extent of separation) can be mathematically optimized with respect to the variables that influence the chromatogram. By using a simplified plate height expression for packed columns, optimum column length, flow velocity, temperature, particle diameter, and pressure are either derived or discussed. The optimum values of flow velocity, pressure, tube diameter, temperature, and thickness of the liquid layer are derived for capillary columns. The method may be extended to other variables and techniques. The problem of minimizing the analysis time is discussed, and a method of obtaining the variables for this is presented.

SIMPLE AUTOMATIC VALVE FOR CONSTANT VOLUME COLLECTION IN COLUMN CHROMATOGRAPHY. G. J. Nelson (Donner Lab. of Biophys. and Med. Phys., Univ. of Calif., Berkeley). *Anal. Chem.* 32, 1724 (1960). The valve stem is constructed entirely of Teflon and encloses a soft iron core which opens the valve when the coil is activated by the photocell. The spring is stainless steel and prevents the valve from lifting too high and obstructing the flow through the outlet. The eluent collecting tube is made of a constant bore glass tubing 1 cm. in outside diameter. Thus, the volume collected in each fraction may be continuously varied, simply by raising or lowering the position of the photocell along the tube.

IONIZATION DETECTORS FOR GAS CHROMATOGRAPHY. P. H. Stirling and H. Ho (Canadian Ind., Ltd.). *Ind. Eng. Chem.* **52**(11), 61A–64A (1960). Gas chromatography separates complex mixtures into a series of dilute binary mixtures with the carrier gas. The usual differential detectors, such as the thermal conductivity cell or the gas density balance, sense the small changes in a bulk property of the carrier gas due to the sample components. Their sensitivity is limited by the over-all stability of this property.

STRUCTURE AND SYNTHESIS OF MILK FAT. I. GAS CHROMATOGRAPHIC ANALYSIS. S. Patton, R. D. McCarthy, Laura Evans, and T. R. Lynn (Dept. of Dairy Sci., Penn. Agr. Exper. Station, Univ. Park). *J. Dairy Sci.* **43**, 1187–1195 (1960). Investigation was made of the composition of milk fatty acid methyl esters (C_4–C_{18}) by means of gas chromatography employing an ionization detection system. The positions of the various methyl esters on the chromatograms were established by using reference compounds on a nonpolar (Apiezon-L) capillary column and a relatively polar (diethylene glycol succinate polyester) packed column. By this means, the presence of C_4, C_6 and C_8 through *n*-alkaloic acids, the C_{16} and *cis* and *trans* C_{18} *n*-alkenoic acids, and C_{18} *n*-alkadienoic and trienoic acids was confirmed. Analyses of milk fats collected at various seasons showed high summer levels of *trans*-octadecenoic acid, which progressively declined through fall and early winter. A comparison of summer and winter fat showed the entire C_{18} fraction to be increased, mainly at the expense of palmitate, in the summer sample.

EFFECT OF CHANGING THE FAT AND NONFAT SOLIDS OF MILK. S. S. Wahid-Ul-Hamid and L. J. Manus (Dept. of Dairy Sci., Wash. State Univ., Pullman). *J. Dairy Sci.* **43**, 1430–34 (1960). Milk containing 2 and 3% fat was more acceptable in flavor than milk containing 4% fat, when each was standardized to 12, 13, 14, and 15% total solids. No statistically significant differences in flavor were observed for milk containing 2 or 3% fat together with 11 or 12% nonfat solids, but these were more acceptable in flavor than regular unfortified University plant milk containing 3.7% fat and 9.2% nonfat milk solids. By comparison, the regular plant milk tasted watery and flat.

FLAVOR STUDIES ON BEEF AND PORK. I. Hornstein and P. F. Crowe (U. S. Dept. of Agr., Beltsville, Md.). *J. Agr. and Food Chem.* **8**, 494–98 (1960). The odor responses and the chemical compounds isolated from the volatile pyrolysis products of lyophilized cold water extracts of lean beef and lean pork were found to be similar. The flavor precursors in lean meat are low molecular weight compounds present in the dialyzable portion of the cold water extracts of the raw lean meats. Beef and pork fat, when heated, produced dissimilar aromas. Free fatty acids and carbonyls were determined in these fats before and after heating. The results suggest that, on heating, the lean portions of pork and beef contribute an identical meaty flavor to these meats, while the characteristic flavor differences in pork and beef reside in the fat.

UNIQUE FATTY ACIDS FROM LIMNANTHES DOUGLASII SEED OIL: THE C_{20}- AND C_{22}-MONOENES. C. R. Smith Jr., M. O. Bagby, T. K. Miwa, R. L. Lohmar, and I. A. Wolff (Northern Regional Research Laboratory, Peoria, Ill.). *J. Org. Chem.* **25**, 1770–4 (1960). The principal fatty acids of *Limnanthes douglasii* seed oil are shown to include two previously unknown components: *cis*-5-eicosenoic (65%) and *cis*-docosenoic acid (7%). The oil also contains *cis*-13-docosenoic (erucic) acid (13%) and 10% of an unknown C_{22}-acid.

CRUDE FAT OR ETHER EXTRACT IN MEAT AND MEAT PRODUCTS. R. H. Philbeck (Agr. Research Ser., U.S.D.A., Washington, D.C.). *J. Assoc. Off. Agr. Chem.* **43**(3), 536–7 (1960). The official method for crude fat or ether extract, 23.5, is modified.

FRACTIONATION OF RICE BRAN OIL FATTY ACIDS BY EXTRACTIVE CRYSTALLIZATION WITH UREA. T. N. Mehta and P. M. Meshramkar (Laxminarayan Inst. of Technology, Nagpur Univ., Nagpur, India). *Indian Oil and Soap J.* **26**, 18–21 (1960). Rice bran oil was extracted with hexane and analyzed (IV = 93.6; Sap. Value = 188). Its fatty acids were fractionated by liquid-solid, countercurrent distribution with urea. The fatty acids were found to be 0.5% myristic, 11.53% palmitic, 2.44% stearic, 7.42% arachidic, 39% oleic, and 34.72% linoleic.

APPLICATION OF RADIOACTIVE ISOTOPES IN THE FIELD OF ANALYSIS OF VEGETABLE OILS. M. Jaky and K. Kaffka (Fat Res. Inst. Budapest). *Fette Seifen Anstrichmittel* **62**, 682–687 (1960). The authors have determined the iodine value of fats radiometrically with the aid of iodine-131. Radiometric analysis of fatty acids by means of paper chromatography and measurement of the radioactivity of the silver-110 and mercury-202 salts of the acids was carried out.

A NEW SEMIMICRO COMPLEXOMETRIC DETERMINATION OF NORDIHYDROGUAIARETIC ACID IN LARD. B. A. J. Sedlacek (Inst. Food Research, Prague). *Fette Seifen Anstrichmittel* **62**, 669–672 (1960). In order to determine NDGA in lard the sample is dissolved in petroleum ether and the solution extracted with 50% methanol. A solution of silver nitrate and buffer is added to the extract. The silver is reduced and precipitates out of solution. The separated silver can be determined complexometrically. The amount of NDGA in the sample can then be calculated from the amount of reduced silver.

THE ULTRAVIOLET ABSORPTION OF FATTY ACIDS WITH ISOLATED DOUBLE BONDS. E. Schauenstein and G. Benedikt (Inst. Phy. Chem., Univ. Graz., Austria). *Fette Seifen Anstrichmittel* **62**, 687–691 (1960). The ultraviolet spectra of fatty acids having one or more isolated double bonds and their esters in the Schumann ultraviolet are discussed and compared with that of conjugated compounds. A mixture of conjugated and fatty acids with isolated double bonds showed a strong superposition curve. The authors demonstrate with test mixtures that it is possible to determine the quantity of fatty acids with isolated double bonds from a single ultraviolet spectrogram where either the acid or its ester is present.

LOW PRICE UPS ANIMAL FATS SHARE OF FATS AND OILS MARKETS. *Chem. Eng.* **67**(24), 90–94 (1960). Data are presented for the U. S. production and consumption of fats and oils for the years 1955–1959. Baking and frying fats were the largest single domestic outlets for fats and oils, with production amounting to 2.2 billion lb., compared with 1.8 billion lb. in 1955. Soybean oil accounted for 51% of this amount, lard 22%, cottonseed oil 14%, and edible tallow 11% (more than twice the amount in 1955). Mixed animal feeds and pet food continued to be a steadily increasing outlet for inedible tallow and greases (552 million lb. in 1959, more than 300% above 1955 use). Declining soap sales have resulted in reduced use of fats and oils in this field. Use in production of fatty acids was 573 million lb.; a sharp increase over the 410 million lb. in 1958. Consumption of fats and oils in paints and varnishes decreased from 842 million lb. in 1955 to 779 million lb. last year. In chemical uses, mainly the production of plasticizers, use has more than doubled during the last 10 years.

CARNAUBA WAX MOLECULES. L. M. Prince (Reichhold Chemicals, Inc.). *Soap Chem. Specialties* **36**(9), 103–4, 107–9 (1960). The emulsifiability and solvent retention of carnauba wax are explained by a molecular interpretation rather than a thermodynamic one. The unusual performance properties of carnauba are associated with the presence of hydroxylated, long-chain esters which comprise a majority of its molecules.

COATED CITRIC ACID PARTICLES. M. Greif (American Cyanamid Co.). *U. S. 2,956,926.* Powdered citric acid having a particle size at least as fine as 30 mesh is coated with many thin coats of a glyceride wax, the number of coats being sufficient to give a total wax coating in excess of 5%.

• Fatty Acid Derivatives

BROMINATION OF METHYL OLEATE AT THE ALLYL POSITION. M. Naudet and E. Ucciani (Lab. Chim. Corp. Gras, Fac. Sciences, Marseille). *Fette Seifen Anstrichmittel* **62**, 691–694 (1960). Methyl oleate was brominated in the allyl position with N-bromosuccinimide, so that the existing unsaturation of the molecule remained undisturbed. The authors have examined the halogenation reaction under various conditions. The influence of reaction kinetics, concentration of methyl oleate, and molar ratio of N-bromosuccinimide to ester on the yields of brominated products was studied in detail.

FATTY ACID ESTERS OF DIGLYCEROL. H. P. Kaufmann and N. Forster (Deut. Inst. Fett. Forsch., Munster). *Fette Seifen Anstrichmittel* **62**, 796–802 (1960). Diglycerol was synthesized from diallylether by means of permanganate oxidation or by action of $NaHCO_3$ on di(2-hydroxy-3-chloro-propyl)ether. Distearyl-glycerol-1-allylether was synthesized from glycerol-1-allylether and stearic acid in the presence of p-toluenesulfonic acid as catalyst, the product was obtained in an 87% yield and melted at 41°. The corresponding dipalmityl derivative was obtained in an 80% yield and melted at 27–28°. Tetra esters were prepared in a similar manner. The dilauryl, distearyl ester had mp. 36–36.5°, dimyristyl, distearyl mp. 47–48, dipalmityl distearyl mp. 53–54.

OIL-SOLUBLE EMULSIFYING AGENT. S. B. Radlove, H. T. Iveson, and P. L. Julian (Glidden Co.). *U. S. 2,957,932.* The method of preparing emulsifiers consists of the following steps: (I) simultaneously reacting together under esterifying conditions (a) 1 molar equivalent of glycerol, (b) 1 molar equivalent of fatty acid comprising at least 50% by weight of palmitic acid with the remainder being composed of saturated fatty acid having 12-20 carbons, and (c) 1.75 to 3.0 molar equivalents of monohydroxy monocarboxylic acid of 2-4 carbons, at reflux temperatures between 160 and 200°; (II) washing the mixture to remove the water-solubles; and (III) drying the washed material which remains. The emulsifiers thus prepared are characterized by their ability to be wholly dissolved at 25° at a 4% level in liquid, edible, triglyceride oils having shortening properties.

SEPARATION OF VINYL ESTERS OF FATTY ACIDS FROM THE CORRESPONDING FATTY ACIDS. H. H. Kuhn and E. K. Wilip (W. R. Grace & Co.). *U. S. 2,957,015.* A mixture of a vinyl ester of a saturated fatty acid and the fatty acid is cooled to a temperature between about 2° and 10° above the melting point of the vinyl ester in order to precipitate the fatty acid. The mixture is filtered, and the filtrate is distilled in a molecular still to recover a vinyl ester of a high degree of purity.

DRAWING LUBRICANT. L. J. Brown (Pennsalt Chemicals Corp.). *U. S. 2,958,659.* A drawing lubricant for application to metal stock from admixture with water consists of from 15 to 45% by weight of fatty acid soap, a metal borate, and from 0.75 to 2.0% by weight of the solid materials of a polyethylene glycol having a molecular weight of at least 1,000.

PRODUCING HALOGENATED RUBBERY COPOLYMERS UTILIZING THE ALKALINE EARTH METAL SALT OF A FATTY ACID AS A STABILIZER. L. T. Eby, D. L. Cottle, and T. Lemiszka (Esso Res. and Eng. Co.). *U. S. 2,958,667.* A halogenated rubbery copolymer consisting of 85 to 99.5% of a C_4 to C_8 iso-olefin and about 15 to 0.5% of a C_4 to C_{14} multiolefin is slurried in water containing from 0.01 to 10% of an alkaline earth metal salt of a C_5 to C_{30} monocarboxylic fatty acid. Not only is the aqueous slurry stabilized against agglomeration of halogenated copolymer particles, but the halogenated copolymer is further stabilized against scorching and prevulcanization during drying.

• Biology and Nutrition

EFFECT OF FEEDING BUTYLATED HYDROXYANISOLE TO DOGS. O. H. M. Wilder, P. C. Ostby, and Barbara R. Gregory (Div. of Animal Feeds, Am. Meat Inst. Found., Univ. of Chicago, Chicago, Ill.). *J. Agr. and Food Chem.* **8**, 504–6 (1960). Groups of weanling Cocker Spaniel pups were fed BHA at levels of 0.0, 5.0, 50.0, and 250.0 mg. per kg. of body weight per day for a 15-month period to see what effect, if any, these subacute levels of BHA might have on a dog. General health and weight gains were good throughout the period. Hemoglobin and blood cell counts were not appreciably affected by feeding BHA at the levels used here. Urine from dogs fed BHA contained higher levels of glucuronates and a higher ratio of total to inorganic sulfates, indicating that BHA excretion was by this route. Microscopic examination of tissue sections at the time of autopsy showed no changes beyond normal variation, except in three animals which had received the highest dosage, in which liver injury had occurred. The results indicate that dogs can ingest BHA for a long period without harm, at a level at least 220 times the maximum allowable level for this antioxidant in lard.

NUTRITIONAL EVALUATION OF THE REPLACEMENT OF THE FAT IN WHOLE COW'S MILK BY COCONUT OIL. F. E. Rice (Food Res. Assoc., Chicago, Ill.). *J. Agr. and Food Chem.* **8**, 488–91 (1960). The fat of cow's milk in the light of modern nutritional knowledge is significantly preferable to coconut oil. The latter is low in unsaturated fatty acids, including linoleic acid, high in saturated fatty acids and especially high in lauric acid, compounds of which have a toxic effect when fed under certain conditions. Milk fat carries with it important milk nutrients, not present in skim milk or coconut oil. Cow's milk fat more closely approaches human milk fat in composition. Feeding experiments with animals and man have demonstrated two special conditions under which milk fat rates higher nutritionally than coconut oil—during the growth period and when the diet otherwise is marginal. Full-cream cow's milk is significantly preferable to a substitute, the fat content of which is coconut oil, for consumption by the young in areas where dietaries are not all they should be.

THE EFFECT OF ANIMAL PROTEIN AND VEGETABLE PROTEIN DIETS HAVING THE SAME FAT CONTENT ON THE SERUM LIPID LEVELS OF YOUNG WOMEN. Georgianna Walker, Ellen Morse, and Virginia Overlay (Univ. of Conn., Storrs). *J. Nutrition* **72**, 317–21 (1960). Serum cholesterol, serum lipid phosphorus and serum fatty esters were determined for 12 young women, 6 of whom consumed a diet containing 50 gm. of protein from vegetable sources, while the diet of the other 6 subjects contained 50 gm. of protein from animal sources. The mixed fat content of the two diets was the same in quantity (95 gm.) and of vegetable origin. At the end of 2 weeks and 5 weeks on the dietary regimen, the serum cholesterol levels of the subjects receiving the vegetable protein diet were significantly lower than those eating the animal protein diet.

ANTISTERILITY ACTIVITY OF ALPHA-TOCOHYDROQUINONE IN THE FEMALE RAT. Julia Mackenzie and C. G. Mackenzie (Dept. of Biochem., Univ. of Colo. School of Med., Denver, Colo.). *J. Nutrition* **72**, 322–24 (1960). The antisterility activity of α-tocohydroquinone in vitamin E-deficient female rats has been reexamined. For this purpose, the hydroquinone was prepared daily by the catalytic hydrogenation of α-tocoquinone which was free of α-tocopherol. When injected at a level of 5 mg. daily, the α-tocohydroquinone exhibited antisterility activity. Smaller doses cured the muscle lesions in the mother but did not prevent fetal resorption.

INVESTIGATION OF PRECURSORS OF RUMINAL FATTY ACIDS OF SHEEP FED PURIFIED DIETS. D. R. Van Campen and G. Matrone (Animal Nutrition Sec., Dept. of Animal Ind., N. Carolina State College, Raleigh). *J. Nutrition* **72**, 277–82 (1960). The *in vivo* and *in vitro* incorporation of C^{14}-labeled bicarbonate and acetate-2-C^{14} into the ruminal volatile fatty acids of sheep receiving purified diets was studied. In the bicarbonate-CO_2 studies most of the incorporated label was found in propionate and the specific activity of valerate exceeded that of either acetate or butyrate in all cases.

ADRENAL CHOLESTEROL ESTER FATTY ACID COMPOSITION OF DIFFERENT SPECIES. R. E. Dailey, L. Swell, H. Field, Jr., and C. R. Treadwell (Vet. Admin. Center, Martinsburg, W. Va.). *Proc. Soc. Exp. Biol. and Med.* **105**, 4–6 (1960). The fatty acid composition of adrenal cholesterol ester fraction has been determined by gas-liquid chromatography in 7 species. Characteristic CEFA patterns for each type of animal were apparent. Rat and dog had the highest content of polyunsaturated fatty acids in the adrenal cholesterol ester fraction. The remaining species had considerably less of those acids and the major CEFA of dog, man, goose, chicken, and rabbit was oleic acid. In the dog, rat, and human, an acid tentatively identified as a C_{22} tetraenoic acid was found in the adrenal CEFA. The significance of these results in relation to hormone synthesis and polyunsaturated fatty acid metabolism is discussed.

FATTY ACID COMPOSITION OF FECES AND FECALITHS. J. A. Williams, A. Sharma, L. J. Morris, and R. T. Holman (Dept. of Surgery, Med. School and Hormel Inst., Univ. of Minn., Austin). *Proc. Soc. Exp. Biol. and Med.* **105**, 192–195 (1960). The relative proportions of palmitic, stearic, oleic, and linoleic acids in lipids extracted from fecaliths and feces are compared by means of gas-liquid chromatography. Fecaliths, in contrast to feces, contain little oleic acid and no apparent linoleic acid. Thin-layer chromatography was used to determine the types of lipids found in fecaliths and feces. The former contain less triglyceride and more free fatty acids than the latter. Fatty acid soaps were not found in fecaliths.

GLYCERIDE CONTENT OF HUMAN AND CANINE RED BLOOD CELLS. J. C. Vacca, P. P. Waring, and R. M. Nims (U. S. Army Med. Res. and Nutrition Lab., Fitzsimmons Gen. Hosp., Denver, Col.). *Proc. Soc. Exp. Biol. and Med.* **105**, 100–02 (1960). Human males fasted for 12 hours had twice as much total glyceride in blood serum as in red cells. Since the cell and serum contents of mono- and diglycerides are similar, it appears that almost 4 times as much triglyceride occurs in a given volume of fasting blood serum as in the red cells of humans. In humans 4 hours after meals containing 50 and 100 g. of corn oil or cocoanut oil and also in dogs 8 to 30 minutes after being given intravenous fat emulsion, the washed red blood cell glycerides and nonesterified fatty acids were not significantly different from those in the fasting state.

RELATION OF AGE AND RACE TO SERUM CHOLESTEROL ESTER FATTY ACID COMPOSITION. L. Swell, H. Field, Jr., and C. R. Treadwell (Vet. Admin. Center, Martinsburg, W. Va.). *Proc. Soc. Exp. Biol. and Med.* **105**, 129–31 (1960). The serum CEFA and cholesterol level of children (6–10 years old) and older subjects (60–87 years old) of both negro and white races have been compared. Children of both races had significantly less oleic acid and significantly more linoleic acid in their serum CEFA fraction than older subjects. Arachidonic acid did not show significant changes with increasing age. Negro and white subjects of the same age group did not show significant differences in CEFA spectrum. Also, children had a significantly lower total blood cholesterol level than older individuals. The significance of these findings as related to atherosclerosis is discussed.

Comparative metabolic studies of H^3 and C^{14} labeled stearic acid. J. A. Reid and R. H. Williams (Dept. of Med., Univ. of Wash. School of Med., Seattle). *Proc. Soc. Exp. Biol. and Med.* **105**, 151–153 (1960). The stability of orally administered stearic-9, 10-H^3 appears comparable to that of stearic-1-C^{14} in its incorporation into lipid in rat liver and epididymal fat pad. However, column fractionation of tissue lipids and stock labeled fatty acids suggests a difference in behavior of stearic acid labeled in these 2 ways.

Uptake of free fatty acids by skeletal muscle during stimulation. B. Issekutz, Jr. (Dept. of Physiol., Hahnemann Med. Col. and Hosp., Phila., Pa.). *Proc. Soc. Exp. Biol. and Med.* **105**, 21–23 (1960). Uptake of free fatty acids by skeletal muscle was determined by simultaneously measuring blood flow through profunda femoris veins, and arteriovenous fatty acid difference. Thigh muscles of the anesthetized dog showed only an occasional uptake of free fatty acids during rest. During direct electrical stmulation of muscles a consistent uptake of fatty acids was found on the stimulated side.

Inhibition of cholesterol biosynthesis in vitro by β-diethylaminoethyl diphenylpropylacetate hydrochloride (SKF 525-A). W. L. Holmes and Joan D. Bentz (Smith Kline and French Labs., Phila. 1, Pa.). *J. Biol. Chem.* **235**, 3118–22 (1960). β-Diethylaminoethyl diphenylpropylacetate hydrochloride (SKF 525-A) has been shown to inhibit the conversion, by rat liver homogenates, of mevalonate-2-C^{14} to cholesterol and other nonsaponifiable lipids. Studies of the kinetics of the inhibition have shown it to be uncompetitive. The drug does not interfere with the decarboxylation of mevalonate-1-C^{14}. Evidence has been presented which shows that the drug interferes with the conversion of the C$_5$-alcohol pyrophosphates to nonsaponifiable lipid.

Biosynthesis of fatty acids. R. O. Brady, R. M. Bradley, and E. G. Trams (Lab. of Neurochemistry, Natl. Inst. of Health, Bethesda, Md.). *J. Biol. Chem.* **235**, 3093–98 (1960). The biosynthesis of palmitic acid was investigated with an enzyme preparation from rat liver which has been purified 580-fold from the supernatant solution obtained by high speed centrifugation of cell-free suspensions of liver tissue. Acetyl coenzyme A, 1 molecule, and malonyl coenzyme A, 7 molecules, are required for the synthesis of 1 molecule of palmitic acid. Studies with tritium labeled reduced triphosphopyridine nucleotide indicate direct hydrogen transfer to alternate carbon atoms beginning with the β-carbon of palmitic acid. The most highly purified fraction obtained in these experiments exhibited marked malonyl coenzyme A decarboxylase activity which was noncompetitively inhibited by short chain acyl coenzyme A derivatives.

II. Studies with enzymes obtained from brain. R. O. Brady. *Ibid.*, 3099–3103 (1960). The biosynthesis of long chain fatty acids has been investigated with an enzyme preparation obtained from rat brain tissue. Acetyl coenzyme A, 1 equivalent, 7 equivalents of malonyl coenzyme A, and 14 equivalents of reduced triphosphopyridine nucleotide are required for the biosynthesis of palmitic acid. The reaction of acyl coenzyme A derivatives with malonyl conezyme A causes the displacement of the unesterified carboxyl carbon atom of malonyl coenzyme A.

Studies of cholesterol biosynthesis. I. The identification of desmosterol in serum and tissues of animals and man treated with MER-29. J. Avigan, D. Steinberg, H. E. Vroman, M. J. Thompson, and R. Mosettig (Natl. Inst. of Health, Bethesda, Md.). *J. Biol. Chem.* **235**, 3123–26 (1960). It has been demonstrated that treatment of rats with MER-29 (1-[ρ-(β-diethylaminoethoxy)-phenyl]-1-[ρ-tolyl]-2-[ρ-chlorophenyl]-ethanol) leads to an accumulation of desmosterol (24-dehydrocholesterol) in the serum and tissues to the extent of 27 to 79% of the total sterols present. The identity of desmosterol was proven by several independent methods. Desmosterol gives a lower color yield than cholesterol in the Liebermann-Burchard reaction, when measured at 635 μm, and a colorimetric method based on this observation has been developed for determination of desmosterol and cholesterol in mixtures of the two. MER-29 causes an appreciable reduction in the level of rat serum sterols. The effect on tissue sterol concentrations, however, is generally very small.

II. The role of desmosterol in the biosynthesis of cholesterol. D. Steinberg and J. Avigan. *Ibid.*, 3127–29 (1960). The role of demosterol as a precursor in cholesterol biosynthesis has been demonstrated in the rat and in man treated with the drug MER-29. The conclusion is based on: (a) higher specific radioactivity of desmosterol than that of cholesterol when the two are isolated, either from a liver of MER-29-fed rat given 1-C^{14}-acetate, or from a serum of a MER-29-treated man given 2-C^{14}-mevalonate; (b) conversion *in vivo* in the rat of labeled desmosterol into cholesterol; and (c) conversion *in vitro* by rat liver homogenate. MER-29 appears to inhibit the reduction of 24,25 double bond of cholesterol. The possibility is discussed that desmosterol may not be an intermediate in cholesterol biosynthesis in the absence of the inhibitor.

Biology of fats. XIII. Serum lipids in a case of lipisarcoma. H. P. Kaufmann and H. Garloff (Deut. Inst. Fettforsch., Münster). *Fette, Seifen, Anstrichmittel* **62**, 679–682 (1960). The authors have reported serum lipid values for one diseased and one normal patient, aged 45 and 24 years, respectively. The values determined and the results for each patient are, respectively: total lipid—706, 425 mg.%; free cholesterol—64, 51 mg.%; total phospholipid—0.94, 3.03 mg.%; total lipid nitrogen—0.79, 1.38 mg.%; lecithin—24, 79 mg.%; N-P ratio—1.86:1, 1:1; carotinoids—0.077, 0.077 mg.%; acid no.—7.2, 49.1; unsaponifiables—342, 186.5 mg.%; total cholesterol—214, 158.3 mg.%; cholesterol-free unsaponifiables—128, 27.9 mg.%. The authors discuss the fact that the amount of phosphatides is very low, and that the cholesterol-free unsaponifiable material is significantly high.

New investigations on the fatty acids in blood. W. Schrade, E. Bohle, and R. Biegler (Univ. Medical Clinic, Frankfort). *Fette, Seifen, Anstrichmittel* **62**, 673–679 (1960). The different components of the lipid complexes of human blood were separated by dialysis and adsorption chromatography and the fatty acid composition of all of the fractions determined. Characteristic changes in the ratio of essential to nonessential fatty acids in the case of infected persons were observed. Examination of the serum fatty acids of healthy subjects with the aid of gas chromatography showed the presence of lauric, myristic, palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, and arachidonic acids. The authors have demonstrated that the free fatty acids in blood are in a dynamic metabolic state.

The preparation of serum lipoproteins labeled with radioactive cholesterol. A. F. Whereat and E. Staple (Univ. of Pennsylvania, Philadelphia). *Arch. Biochem Biophys.* **90**, 224–228 (1960). Cholesterol-4-C^{14} in a Tween 20 dispersion was found to exchange readily with the cholesterol of the plasma lipoprotein of rats or humans. This proved to be a rapid and simple method for preparing lipoprotein containing radioactive cholesterol. On the basis of electrophoretic, ultracentrifugal, and immunochemical characteristics it was concluded that it was a true isotope exchange and that the physical properties of the lipoproteins studied were not altered.

The toxicity to rabbits and some other animals of the fluorofatty acid present in the seeds of dichapetalum toxicarium. R. A. Peters and R. J. Hall (Agr. Res. Council, Inst. of Animal Physiol., Babraham, Cambridge). *J. Sci. Food Agr.* **11**, 608–612 (1960). The long-chain fluorofatty acid (fluoro-oleic) ''ratsbane'' is toxic to rabbits in a dose of 1 mg./kg. Death is delayed and usually occurs quite suddenly, probably due to a heart attack. Wild as well as tame rabbits are poisoned by a bait of the ground seeds mixed with oats, and are more easily killed than sheep; in this respect the compound is a better rabbit poison than sodium fluoroacetate. Estimates of LD$_{50}$ values (mg./kg.) for fluoro-oleic for various animals are as follows: rat 6; guinea pig 1.5; pigeon 2.5; rabbit 0.5; and sheep 2.0. Deaths to sheep may be delayed up to 5 days.

Separation of phytosterol from unsaponifiables. T. S. Burns and O. K. McDaniel (Union Bag and Paper Corp.). *U. S. 2,957,891.* The unsaponifiable non-acid fraction of black liquor skimmings is recovered by hydrocarbon extraction of the skimmings, and the hydrocarbon solution is treated with 5 to 50% of mineral acid. Phytosterol is crystallized at a temperature of 75°F. to 125°F. and separated from the acidified solution. The crude sterol is then dissolved in a low moleculular weight monohydric aliphatic alcohol at elevated temperature and the hot solution neutralized with hydrated lime or caustic soda. Precipitated impurities are removed from the solution and substantially pure phytosterol is crystallized. The crystals are removed and washed with methanol or isopropanol.

◆

• Drying Oils and Paints

COMPARATIVE EVALUATION OF NYASALAND AND CHINESE TUNG OILS IN SURFACE COATINGS. H. W. Chatfield. *Paint, Oil and Colour J.* 32/33, 742–746 (1960). Nyasaland and Chinese tung oils give similar performance when used with either linseed or soybean oil in alkyd resins.

COATING COMPOSITION. Alma L. Rushton and M. Rushton. *U. S. 2,956,897.* A heat and weather resistant paint consists of linseed oil and finely divided molybdenite dispersed therein.

OIL RESISTANT COATED GASKET MATERIAL. H. L. Brownback. *U. S. 2,956,908.* The described material has on its outer surface a coating of an adherent sealing composition prepared by combining a blown castor oil which forms a tacky gel and has a viscosity of at least 2,000 poises with a dimethyl silicone having a viscosity of at least 30,000 centistokes in the proportion of approximately 9 to 1.

POLYESTER RESIN COMPOSITIONS OF LONG-CHAIN DIETHYLENICALLY UNSATURATED ACIDS. C. W. Smith and C. A. May (Shell Dev. Co.). U. S. *2,957,837.* A resin composition having an acid number ranging from about 5 to 50 consists of the reaction product of phthalic anhydride, glycerol, soya fatty acids and 5 to 95% of a diethylenically unsaturated divalent acid having from 14 to 26 carbon atoms. The two unsaturated linkages are at least 4 carbon atoms removed from each other and at least 4 carbons from the carboxy groups. The polyester is prepared at temperatures ranging from 100 to 300°.

ALKYD RESIN FROM PHTHALIC ACID AND A TRIBASIC ACID. B. A. Bolton and R. E. Van Strien (Standard Oil Co.). *U. S. 2,960,485.* An oil modified alkyd resin of about 40% oil-length is prepared by (1) reacting glycerine and soybean oil, (2) condensing the resulting product mixture with trimellitic anhydride, and (3) condensing the condensation reaction product mixture of step 2 with phthalic anhydride, the trimellitic anhydride being about 10 mol per cent of the total anhydride charged. Condensation is carried out at a temperature between about 200 and 250° with continuous removal of water until a resin is obtained in step 3 which is soluble in inert organic solvents.

◆

• Detergents

THE ACTION OF HEAT TREATMENT ON THE PROPERTIES OF SOAP. D. G. Dervichian (Dept. of Biophysics, Institut Pasteur, Paris). *Soap, Perfumery & Cosmetics* 10, 1061–1068 (1960). The behavior of soap in the presence of water was investigated. Special transitions were found at 50°, 70°, and 90°. It was found that heat treatment affects the ability of the insoluble soap to swell, although heat does not affect the solubility of soap. Because of its ability to swell, insoluble soap, in the amorphous gel state, makes the liquid which forms visco-elastic bubbles, giving a thick, consistent lather. The changes noted seem to be independent of the duration of the heat treatment. Fatty acid salts of a commercial soap were used for this study.

THE LAURYL ETHER SULFATES. *Indian Oil and Soap J.* 10, 364–366 (1960). Preparation, formulation, and mildness testing of lauryl sulfates for dishwashing detergents and shampoos are discussed.

HOUSEHOLD DETERGENT TRENDS. F. D. Snell and Cornelia T. Snell (Foster D. Snell, Inc.). *Soap Chem. Specialties* 36(9), 55–58 (1960). Various types of detergents currently being used (heavy duty powders, heavy duty liquids, light duty products) are discussed as well as new developments such as monofatty acid esters of sucrose, optical bleaches, and syndet bars.

INDUSTRIAL DETERGENTS. H. C. Speel (Universal Oil Products Co.). *Soap Chem. Specialties* 36(9), 59–61, 115 (1960). Industrial use of surfactants is growing at a rate faster than for household detergents. Sewage and waste disposal problems created by replacement of soaps with synthetics are increasing; this problem must be solved by chemical methods or new detergent synthesis if the alternative of a return to soap for detergent and processing needs is to be avoided.

LABORATORY METHODS FOR EVALUATION OF DRYCLEANING DETERGENTS. L. E. Weeks and J. T. Lewis (Monsanto Chem. Co.). *Soap Chem. Specialties* 36(9), 65–68 (1960). Laboratory methods are presented for evaluating drycleaning detergents. Physical tests include detergent stability, solvent solubility, and flash point. Functional tests are carbon soil redeposition, soiled wool detergency, and water soluble soil removal. Functional tests appear to have reasonable correlation with practice, are of fairly short duration, require a minimum of equipment, and have good reproducibility. They are recommended for comparative evaluation of proprietary compositions as well as for screen testing surfactants and formulations in product development.

DEFOAMING COMPOSITOINS AND METHOD AND PRODUCTS CONTAINING THE SAME. Shek Ying Lam. *U. S. 2,956,971.* A nonaqueous composition consists of 45 to 95% of an oil in which is dispersed 0.5 to 10% of a water-insoluble metallic soap, 0.5 to 10% of secondary amines having alkyl groups derived from mixed fatty acids (from tallow, coconut, or soybean), and 1 to 10% of a completely esterified polyoxyalkylene polyhydric alcohol fatty acid ester. The composition induces a marked, immediate and sustained defoaming action when added to water emulsions and latices normally susceptible to foaming.

PROCESS OF SULFATION WITH NEW SULFATING AGENT. J. L. Smith and R. C. Harrington, Jr. (Eastman Kodak Co.). *U. S. 2,957,014.* An N-lower alkyl ethylene carbamate-sulfurtrioxide complex is mixed with a long-chain alcohol and the mixture is stirred at a temperature between room temperature and 90° for not more than 55 minutes. The sulfated alcohol thus formed is neutralized with an amine and the sulfated alcohol salt isolated.