ABSTRACTS **R. A. REINERS, Editor. ABSTRACTORS:** J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, H. S. Liles, C. C. Litchfield, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

Deacidification of olive oils by ion exchange resins. M. deFelice and V. Bolcato (Univ. of Bari, Italy). *Rivista Ital. Sost. Grasse* 3, 125–129 (1962). The regeneration of ion exchange resins used to deacidify olive oils is done using alcoholic NaOH solutions and its efficiency increases with the concentration of both NaOH and alcohol in water as well as with suspension and agitation of the resin in the regenerating solution. The deacidifying properties of some of the resins studied were still unchanged after 55 regenerating cycles.

On the behavior of the stationary phase in vapor phase chromatography of the methyl esters of fatty acids. F. Poy (C. Erba, Milan). *Rivista Ital. Sost. Grasse* 3, 137–139 (1962). The reasons for the reported lack of reproducibility of the retention times of mono- and polyunsaturated C_{18} and C_{20} fatty acids were studied. While the type of column packing used and the liquid-packing ratio have little or no effect on the retention times of oleic, stearic, and linoleic acids, these two variables were shown to have an appreciable effect on the relative retention times of the linolenic and arachidic acids. For example, the Celite C22 packing at low liquid concentration tends to slow down the arachidic acid and to speed up the linolenic, to the point of reversing their order of separation. This behavior was practically non-existent in the case of the Chromosorb W packing. These differences are attributed to different polarity characteristics of the two supports and to the presence in various degrees of active adsorption centers.

Analysis of triglyceride mixtures by permanganate oxidation in acetone solution. A. J. Haighton, G. J. Van Beers, and J. Hannewijk (Unilever Res. Lab., Vlaardingen, Holland). *Rivista Ital. Sost. Grasse* 3, 130–132 (1962). In determining the content of saturated glycerides in fats by permanganate oxidation of the unsaturated glycerides, several difficulties are encountered concerning the separation of the S_3 (trisaturated), S_2A (disaturated-monoazelaic), SA_2 and A_3 components. The authors propose two methods that are claimed to give more satisfactory separation of these components. With the first method, by using countercurrent distribution in a 1:1 isooctane-methanol solvent, three fractions can be separated: S_3, S_2A, and a fraction containing SA_2, A_3, and lower monocarboxylic acids. The second method is by partition chromatography in a column with rubber packing and aqueous acetone solutions of increasing acetone concentration as the eluent. This method permits the identification of S_3, S_2A, SA_2 and A_3, the latter two with some uncertainties.

Stoichiometric transesterification of glycerides by methyl alcohol. F. deFrancesco and C. Maglitto (Agric. Experim. Station, San Michele, Trento, Italy). *Rivista Ital. Sost. Grasse* 5, 245–248 (1962). An analytical method for the preparation of methyl esters of fatty acids is needed for vapor phase chromatography. By conducting the interesterification in a sealed vial with methyl alcohol and sodium methylate, none of the low molecular weight components are lost and accurate chromatograms are obtained. However, with fats containing more than 0.5% acidity the method is not satisfactory because of excessive soap formation, causing the esterification reaction to stop. Pre-treating the fat with alkaline resins overcomes this difficulty but the subsequent analysis does not reflect the glyceride's true over-all composition. The authors found that by using methyl alcohol and a dehydrating agent such as concentrated sulfuric acid or $Zn + ZnCl_2$, even fats with high acidity levels can be completely esterified. The reaction is practically stoichiometric, without losses and without effect on double bonds. Chromatographic analysis of glycerides using methyl esters prepared by this method is therefore accurate and complete.

Identification of higher alcohols by paper chromatography. P. Capella, G. Zotti, and G. Jacini (Stazione Sperimentale Oli e Grassi, Milan). *Rivista Ital. Sost. Grasse* 1, 2–8 (1962). Two new chromatographic methods for identifying higher alcohols are described. These are applicable to mixtures of straight-chain, saturated, even C-number alcohols from C_{10} to C_{26} and are based on previously transforming the alcohols into either malonic half esters (revealed as copper salts) or into acetic esters (revealed as iron salts).

A modified 2-thiobarbituric acid (TBA) method for the determination of malonaldehyde in cured meats. Marelynn W. Zipser and Betty M. Watts (Dept. of Food and Nutrition, Florida State Univ., Tallahassee, Fla.). *Food Technol.* 16(7), 102–04 (1962). A modification of the distillation method of the TBA determination suitable for cured meats is described. Small amounts of nitrite ion are capable of reducing TBA numbers of rancid meat significantly, and the reduction increases linearly with nitrite concentration. This interference takes place during the distillation step in the TBA procedure and is believed to be due to nitrosation of malonaldehyde. Diazonium salt formation with sulfanilamide is utilized to bind the nitrite before beginning the TBA test.

Correlation of smoke point to free fatty acid content in measuring fat deterioration from consecutive heatings. Mary E. Zabik (Foods and Nutrition Dept., College of Home Econ., Michigan State University, East Lansing). *Food Technol* 16, 111 (1962). A common laboratory test for measuring deterioration resulting from the use and reuse of fat as a cooking medium is based on subjective determination of the temperature at which the heated fat begins to give off visible fumes. The validity of these smoke-point determinations is, therefore, entirely dependent on the visual acuity of the technician. The subjectivity involved and its consequences on the validity of the measurement of fat deterioration prompted a search for a simple objective test to check on or substitute for smoke-point determinations. Fat samples for smoke-point determinations and free fatty acid analysis were obtained from the deep fat used as one cooking medium in an extensive project concerned with cooking beef in different media. The relation found between smoke-point and free fatty acid content agreed with earlier findings that smoke-point decreased as free fatty acid content increased. The smoke-point range was 232.5–163.5C, and free fatty acid content range was 0.026–0.164%. The significant correlation between smoke-point and free fatty acid content suggests the validity of both tests for determining progressive deterioration of fat subjected to repeated heating. Further investigations are necessary to establish the relation of smoke-point to free fatty acid content in various types of cooking fat, to determine the effect of cooking different kinds of food in each type of fat, and to determine the effect of varying the cooking temperature.

Effect of substituents on relative retention times in gas chromatography of steroids. B. A. Knights and G. H. Thomas (Dept. of Anatomy, Med. School, Univ. of Birmingham, Birmingham 15, England). *Anal. Chem.* 34, 1046–48 (1962). A number of steroids have been chromatographed on columns coated with QF-1-0065 (a fluorinated silicone). The results have been expressed as the logarithm of the retention times relative to cholestane (log r). Evidence is presented to show that the log r values can be estimated from the additive contributions of the individual substituents together with that of the steroid nucleus to which they are attached. The log r contribution for a substituent depends not only upon its chemical nature, but also on its position in the molecule and its stereochemical configuration.

Determination of unsaturation and average molecular weight of natural fats by nuclear magnetic resonance. L. F. Johnson and J. N. Shoolery (Instruments Div., Varian Associates, Palo Alto, Calif.). *Anal. Chem.* 34, 1136–39 (1962). The proton NMR spectra of triglycerides dissolved in CCl_4 are characterized by four sets of signals including, respectively, the olefinic protons, the four glyceride methylene protons, methylene groups attached to two doubly-bonded carbon atoms, and the remaining protons on saturated carbon atoms. The area of the signals produced by the C_1 and C_3 glyceride protons is measured using an electronic integrator and a D.C. digital voltmeter. With this measurement as an internal standard, one can measure accurately the number of olefinic protons and the total number of hydrogen atoms in like manner. From these determinations the average molecular weight can be calculated. Finally, an iodine number is calculated using the number of olefinic protons and the average molecular weight. The agreement between the NMR and Wijs iodine numbers is remarkably good in all fats studied except tung oil where conjugated bonds cause inaccuracy in the Wijs method.

The film tensionmeter, an instrument for continuous measurement of surface tension of liquids and solutions. E. C. Peterson (Whirlpool Corp., Res. Lab., St. Joseph, Mich.). *Kolloid-Z.* 183, 141–45 (1962). The film tensionmeter is described. It is an instrument capable of continuous measurement of the surface tension of a solution undergoing constant changes of its surface properties. The instrument uses continuous sampling of the test solution and measures the surface tension as a function of the pull exerted on a pair of vertical rods by a thin moving liquid film supported by these rods. A variation of surface tension causes a change of the force applied to the rods, resulting in movement of one of the rods which is spring loaded. This movement is converted by a transducer to a continuously recorded electrical signal. The force produced by the film on the rods is directly proportional to the product of the surface tension times twice the film length and is nearly independent of film width and thickness. The instrument can be calibrated to an accuracy of 0.5 dynes/cm and will detect a change of surface tension less than 0.3 dynes/cm. Instrument contamination has not proved to be a problem. The instrument can be easily applied to direct measurement and process control.

Composition of the unsaponifiable material in tung oil. G. Shone (Tropical Products Institute, London). *J. Sci. Food Agr.* **13**, 315–20 (1962). The unsaponifiable matter of an *Aleurites montana* tung oil (Nyasaland) has been examined and found to contain 46% of Δ^5-stigmasten-3β-ol, 9% of alphatocopherol, 36% of gamma-tocopherol, 3% of tocopherol artifact, and 0.16% of carotenoid pigment. No evidence for the previously reported presence of α-glyceryl ether or squalene to the extent suggested by former workers was found.

Some new aspects of fatty acid chemistry. D. Swern, E. S. Rothman, L. S. Silbert, and J. S. Showell (Eastern Regional Res. Lab.). *Chem. & Ind. (London)* **1962**, 1304–9. The authors describe three areas of research that are being conducted in their laboratory: (1) reactions of enol acetates with fatty acids; (2) preparation of peroxy acids; and (3) selective epoxidation.

New antioxidant glycerides. H. G. C. King (Research Assoc. of British Flour Millers). *Chem. & Ind. (London)* **1962**, 1468. 1 Caffeoyl glycerol, 1-palmitoyl 2,3-dicaffeoyl glycerol, and 1,2,3-tricaffeoyl glycerol were synthesized by condensing 1,2-*O*-isopropylidene glycerol, monopalmitin, and glycerol, respectively, with the calculated quantities of dicarbomethoxycaffeoyl chloride, the reactions being carried out in chloroform solution in the presence of quinoline. The protecting carbomethoxy groups were subsequently removed in pyridine solution with aqueous ammonia. The isopropylidene group is first removed by acid hydrolysis. The antioxidant activity of the new glycerides with an oat oil substrate is of the same order as that of propyl gallate or butylated hydroxytoluene.

Treatment of mustard seed. K. J. Goering (Oil Seed Products, Inc.). *U. S. 3,044,876.* Mustard seed is crushed and mustard oil is separated from the crushed seed. The resulting seed is extracted with water at a temperature between 80 and 85C for about ½ hour. The liquid and solid phases are separated, and the separated solids are dried to produce an animal feed. Sinigrin or decomposition products of sinigrin are recovered from the separated liquid.

Shape-retaining peanut spread. E. A. Ferguson, Jr. (Fine Brands Corp.). *U. S. 3,044,883.* A shape-retaining peanut spread consists of between 48–80% by weight of peanut butter and from 20–60% of an edible oil composition. The oil composition includes between 0.5–10% of cotton stearine and between 2.5–20% of higher fatty acid monoglycerides and has a melting point in the range of 90–120F.

Process for recovering fats, meat and bone scrap from inedible slaughterhouse materials. P. Speer, C. Griggs, and D. J. McAvoy (Armour & Co.). *U. S. 3,046,286.* The described continuous process comprises (1) substantially reducing all solid portions including bones of the materials, (2) introducing vascular portions of the materials to the reduced portions, (3) heating the mixture thus formed at a temperature of 100 to 212F to denaturize the vascular portions and to lower the moisture content of the mixture, (4) reducing further the solid portions to a predetermined particle size, (5) heating the materials at 220 to 270F to rupture the fat cells, to further reduce the moisture content, and to render the material substantially free from deleterious agents, and (6) centrifugally separating and recovering the solid and liquid phases of the materials.

All-purpose culinary oils. F. J. Baur (Procter & Gamble Co.). *U. S. 3,047,401.* An all-purpose clear culinary oil consists of a liquid glycerile vehicle in which is dissolved from 1 to 4.5%, by weight of oil, of erucic acid, The oil has a smoke point of at least 300F and is capable of being maintained at a temperature as low as 40F for at least 10 hours without clouding.

Fluid shortening. W. H. Schmidt (Lever Bros. Co.). *U. S. 3,047,402.* The described shortening consists of an edible oil base having in stable suspension from 3 to 4% of finely divided saturated glycerides of fatty acids having from 12 to 20 carbon atoms. The saturated glycerides include diglycerides, from 1 to 2% by weight of monoglycerides, and from 0 to 0.5% of triglycerides. The di- and monoglycerides are present in a weight ratio of at least 1:1 and no greater than 3:1. The fatty acid complement of the saturated glycerides comprises from 35 to 42% of palmitic acid.

Winterization process. C. M. Gooding (Corn Products Co.). *U. S. 3,048,491.* At least two oils (cottonseed, soya, corn, peanut, or milo) are mixed in a ratio of 30:70 to 70:30. The mixture is then subjected to winterization and the blend of winterized oils is recovered.

Epoxidized animal fat diacetoglycerides as plasticizers. D Swern and H. B. Knight (U.S.A., Sec'y of Agr.). *U. S. 3,049,504.* A plasticizer-stabilizer for polymerized vinyl chloride is an epoxidized diacetoglyceride of lard or tallow fatty acids.

The glyceride structure of Erythrina indica seed fat. A. R. S. Kartha and R. Narayanan (Indian Agr. Res. Institute, New Delhi). *J. Sci. Food Agr.* **13**, 411–14 (1962). The glyceride structure of a specimen of *Erythrina indica* seed fat was studied by azelao-glyceride analysis techniques. The saturated acids amounted to 34 mol % and no trisaturated glycerides could be detected. The triglycerides were composed of disaturated 27.1, monosaturated 48.3 and triunsaturated glycerides 24.6 mol. % as against 28.8, 44.4 and 26.8%, respectively, required according to the Glyceride Type Distribution rule.

Rapid colorimetric determination of DDT in milk and butter. F. A. Gunther, R. C. Blinn, D. E. Ott (Dept. of Entomology, Univ. of Calif., Citrus Res. Ctr. and Agr. Exp. Sta., Riverside, Calif.). *J. Assoc. Offic. Agr. Chem.* **45**(2), 359–363 (1962). This rapid colorimetric method requires about 1.5 hours for completion, and responds to 0.2 ppm of DDT in 100–150 grams of milk and to less than 3 ppm in 6 grams of butter. Sensitivity of the method may be increased by increasing sample size and solvent volumes. It involves complete separation of the DDT by inert solvent partitioning operation followed by reaction-solvent partitioning operations. The DDT residue is nitrated and then determined colorimetrically by reaction with isopropylamine.

Chromatography of fat-soluble vitamins on thin layers of alumina. J. Davidek and J. Blattna (Dept. of Chem. & Control of Food, Inst. of Chem. Technol., Prague, Czechoslovakia). *J. Chromatog.* **1**, 204–210 (1962). A chromatographic separation and detection of fat-soluble vitamins on plates coated with alumina is described. The procedure for preparing the plates is given as well as the optimal thickness of the layer, the mesh size of the alumina, and the most suitable solvents for development. This procedure is also applicable for detection of other fat-soluble substances, particularly those which react with but are not soluble in the detection reagent: perchloric and sulphuric acids.

The use of antioxidants in frozen whole milk. A. J. Gelpi, L. L. Rusoff, and E. Pineiro (Dairy Dept., La. Agr. Exp. Sta., Baton Rouge, La.). *J. Agr. Food Chem.* **10**(2), 89–91 (1962). Various antioxidants—ethyl hydrocaffeate, gentisic acid, sodium gentisate, and lonol—were tested with whole milk at −10F for a six-month storage period with and without the addition of copper. All compounds, except lonol, showed good antioxidant properties, the sodium gentisate being superior to the others. Lonol imparted an off-flavor and precipitated the milk proteins. Using proper antioxidants and storage conditions, frozen whole milk could be kept in good condition for at least six months.

Gas chromatography of unsaponifiable matter. I. Butter and margarine sterols. J. Eisner, N. P. Wong, D. Firestone, and J. Bond (Division of Food, Food & Drug Administration, Washington 25, D.C.). *J. Assoc. Offic. Agr. Chem.* **45**(2), 337–343 (1962). The sterols of butter and margarine were isolated by saponification and chromatographic separation of the unsaponifiable matter on a Florisil column. Gas chromatography of the sterol fraction from six samples of butter indicated only one component, cholesterol. The sterols from six samples of margarine apparently consisted of three major components: β-sitosterol, γ-sitosterol, and stigmasterol. On the basis of

(Continued on page 27)

these results, it is believed that the presence of 1% margarine in butter could be detected easily.

One-step chromatographic cleanup of chlorinated hydrocarbon pesticide residues in butterfat. I. Chromatography on silicic acid. W. A. Moats (Market Quality Res. Div., Agric. Marketing Service, U.S. Dept. of Agric., Beltsville, Md.). *J. Assoc. Offic. Agr. Chem.* **45**(2), 355–359 (1962). Silicic acid does not appear to have been used previously in cleanup procedures although it has been used for separations of insecticides, either by direct adsorption or by partition chromatography using silicic acid as a support. Therefore, the present investigation covered the use of silicic acid and silicic-sulfuric acid mixtures. Both were easily handled and found to give excellent separations of DDT and a few other chlorinated hydrocarbon insecticides from large amounts of fat.

Antioxidants in oils, fats, and waxes. Peggy L. Heidrick and H. W. Conroy (Food & Drug Admin., Kansas City 6, Mo.). *J. Assoc. Offic. Agr. Chem.* **45**(2), 244–245 (1962). Because of the need for a rapid qualitative screening method for antioxidants, the available qualitative methods were reviewed and the following methods selected for indicating the antioxidants present in a sample. The study was limited to propyl gallate (PG), nordihydroguaiaretic acid (NDGA), butylated hydroxyanisole (BHA), and butylated hydroxytoluene (BHT). The methods of Anglin, Mahon, and Chapman (*J. Agr. Food Chem.* **4**, 1018 [1962]) were used for detecting PG and NDGA. A method reported by Laszlo and Dugan (*J. Am. Oil Chem. Soc.* **38**, 178 [1961]) was used for BHA and the method developed by Szalkowski and Garber (presented at the North Jersey A.C.S. Meeting-in-Miniature, Jan. 30, 1961) was used for BHT.

Total solids and ether extract in fish and other marine products. H. M. Risley (Food and Drug Admin., Seattle 4, Wash.). *J. Assoc. Offic. Agr. Chem.* **45**(2), 259–262 (1962). The rapid modified Babcock method for crude fat in canned fish *18.013* is recommended for further study and for application to raw fish. The method was performed on frozen boneless salmon, swordfish, and tuna fish by two different analysts and the results differed by 0.2–0.4% from those by the official method with the latter tending to give the higher values.

Industrial applications of cottonseed and soybean soapstocks. M. Blasi (Bailen 36, Barcelona 10, Spain). *Lipidos* **21**, 108–109 (1961). A review.

The influence of light on alterations in olive oil. II. Oils stored in closed glass containers. J. M. R. de la Borbolla and Miss R. Vazquez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **13**, 75–80 (1962). Olive oil was stored with and without antioxidants for 10 months at room temperature in closed glass containers of various light-transmission characteristics. All samples showed flavor reversion, and antioxidants had no effect on the rate of reversion. Glass containers absorbing light wavelengths below 450 mμ gave the best protection against reversion.

Physical chemistry studies on ground olive pastes. XIII. Effects of surfactants on the residual olive cake. J. M. Martinez, C. Gomez, C. Janer, and R. Caravaca (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **13**, 61–68 (1962). A total of 66 different surfactants were evaluated for their ability to increase the yield of oil extracted from ground olive paste. Oil yields were unchanged in most cases, but a slight yield increase was noted when pastes from unripe olives were treated with N-(coconut fatty acid)-aminobutyric acid.

Studies on olive oil rancidity. XI. Experiments with antioxidants in oils stored in open glass containers at room temperature. R. Gutierrez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **13**, 69–74 (1962). Refined, bleached, and deodorized olive oil was stored with and without Tenox II or BHA antioxidant for one year in the dark. Similar tests were run on samples containing 15% crude olive oil. Flavor stability was followed by peroxide number, Kreiss test, A.O.M. stability, and organoleptic testing. Samples containing antioxidant showed better flavor stability than samples without antioxidant.

The market for soyabeans, safflower seed, sunflower seed, sesame seed and their oils. P. J. R. Breslin (The Tropical Products Inst., London). *Tropical Science* **4**, 87–102 (1962). The market for soyabeans, safflower seed, sunflower seed, sesame seed and their oils is reviewed, particularly with reference to the United Kingdom. Markets are considerably influenced by the fact that, for edible purposes, the vegetable oils produced from the seeds are to some extent interchangeable—and therefore competitive—with other vegetable oils, marine oils and animal fats. Some of the more important statistics of production of, and trade in, the seeds and their oils are given, and changes in the pattern of consumption of oils and fats used in margarine manufacture in recent years, are examined. Prospects for new producers are indicated and the preference in the United Kingdom and other countries of Western Europe, which have their own seed-crushing industries, for seeds as opposed to oils is noted.

Insecticide residues, analytical method for determining 1,1-dichloro-2,2-bis (p-ethylphenyl) ethane in rat fat and cow's milk. C. F. Gordon, L. D. Haines, and I. Rosenthal (Rohm & Haas, Philadelphia, Pa.). *J. Agr. Food Chem.* **10**, 380–384 (1962). Perthane, 1,1-dichloro-2,2-bis(p-ethylphenyl) ethane, was administered to rats under a 2-year feeding study for toxicological evaluation. A method was completed for analyzing the fatty tissue from rats and the analytical results have evinced well-defined patterns of absorption and storage. A procedure has also been developed for residual Perthane. The complexities of handling milk and rat fat necessitated a modification of the methods to minimize background interference from extractive.

Insecticide residues in butterfat, residues of heptachlor epoxide in butterfat of dairy cows grazing pastures treated with granular heptachlor. L. L. Rusoff, W. H. Waters, J. H. Gholson, J. B. Frye, Jr., L. D. Newsom, and E. C. Burns (Louisiana Agric. Expt. Sta., Baton Rouge, La.) W. F. Barthel and R. T. Murphy. *J. Agr. Food Chem.* **10**, 377–380 (1962). Six groups of two dairy cows each (a high and low producer) were placed on pasture at various intervals after application of approximately 0.25 pound of granular heptachlor per acre. The butterfat from these animals showed continuous low level residues (maximum 3 p.p.m.) of heptachlor epoxide when animals were allowed to graze the treated pasture continuously after 1, 8, 15, 29, and 43 days following application. Residue was present in trace (indeterminate) amounts in the butterfat of the animals placed on the pasture 57 days after treatment. Animals continued to excrete residue in their butterfat after removal from the treated pasture (89 days after application) and placed in a dry lot for 40 days.

Preparation of polyunsaturated fatty acids. R. E. Beal (U.S.A., Sec'y of Agr.). *U. S. 3,052,699.* Safflower or linseed oil is deaerated and hydrolyzed in the absence of oxygen to free the mixed constituent acids. The mixed fatty acids are isolated and combined (one part by weight) with at least 10 parts by weight of furfural containing 1–3% water and about 3 parts by weight of hexane or isooctane. Each component of the mixture is preheated to 100F before combining. The heated component streams are fed to a centrifugal extractor; the extractor is externally cooled to hold the stream issuing from it to a temperature of about 100F. Substantially pure linoleic or linolenic acid is recovered.

Separation of fatty acid compound mixtures. H. Waldmann and W. Stein (Henkel & Cie. G.m.b.H.). *U. S. 3,052,700.* A method is described for the separation of mixtures of fatty acids, fatty alcohols, fatty acid esters, and fatty alcohol esters into components of different melting points. A dispersion of such a mixture is formed in an aqueous solution of a surface-active material at a temperature at which the mixture contains both solid and liquid constituents. The aqueous dispersion is then separated into a lighter phase of substantially liquid components of the mixture and a heavier phase with the solid components suspended in it. The improvement involves cooling the mixture in successive steps from a temperature higher than the separation temperature down to the separation temperature and interrupting the cooling steps at least once with an intermediate stage in which substantially no cooling takes place. The ratio of the time of stay of the mixture in the cooling steps to the time of stay in the intermediate stage lies within the range of 200:1 to 1:200.

Refining fatty acids. B. L. Hampton (Glidden Co.). *U. S. 3,052,701.* A process for upgrading a tall oil fatty acid distillate fraction without changing the composition of the fraction consists of suspending in the fraction 0.5–4% of finely divided, acid-activated montmorillonite clay solids. The resulting suspension is agitated for 0.5–3 hours at 50–110C and filtered. The filtrate is distilled giving a redistillate of improved heat-stable color.

(Continued on page 29)

• Biology and Nutrition

EFFECT OF FEEDING DIFFERENT FAT MIXTURES PROVIDING THE SAME AMOUNT OF LINOLEIC ACID, ON SERUM CHOLESTEROL LEVELS IN MONKEYS AND LIVER CHOLESTEROL CONCENTRATION IN CHOLESTEROL-FED RATS. S. N. Jagannathan (Nutrition Research Lab., Indian Council of Med. Research, Hyderabad 7, India). *J. Nutrition* 77, 323–31 (1962). The effect of feeding butterfat, coconut oil, and hydrogenated groundnut fat admixed with cottonseed oil providing equal amounts of linoleic acid (7.5%) on serum cholesterol levels of monkeys and liver cholesterol concentration of cholesterol-fed rats was studied. The butterfat blend elevated serum cholesterol of monkeys considerably, coconut oil blend elevated to a lesser extent, whereas the blend with hydrogenated groundnut fat did not cause appreciable change from the basal value obtained with a low-fat diet period. The total lipid content of the liver of cholesterol-fed rats was greater on butterfat and coconut oil diets than on the hydrogenated fat diet. There was a significantly greater concentration of cholesterol in liver of rats receiving the butterfat diet than on the hydrogenated fat diet despite identical linoleic acid contents in the fat blends.

VITAMIN E DEFICIENCY IN CATS. S. N. Gershoff and S. A. Norkin (Dept. of Nutrition, Harvard School of Public Health, Boston, Mass.). *J. Nutrition* 77, 303–8 (1962). Purified diets containing varying levels of vitamin E, and with and without tuna oil as a source of highly unsaturated fatty acids, were fed to cats for periods up to 13.5 months. Steatitis was observed in cats receiving diets deficient in vitamin E and containing tuna oil. The linoleic acid content of adipose tissue from cats with steatitis was significantly lower than that found in control cats. Vitamin E provided complete protection against steatitis in these experiments. Cats deficient in vitamin E, but not receiving tuna oil, showed relatively mild symptoms of deficiency, particularly muscle changes, after receiving the experimental diets for a year.

THE CONFIGURATION OF SPHINGOSINE SYNTHESIZED IN RAT BRAIN HOMOGENATES. Y. Fujino and I. Zabin (Dept. of Physiological Chem., School of Med., Univ. of Calif., Los Angeles 24). *J. Biol. Chem.* 237, 2069–71 (1962). The sterochemistry of sphingosine formed in rat brain homogenates to which palmityl coenzyme A and labeled serine were added was studied. Chromatography by the thin layer silicic acid procedure and preparation of the crystalline *erythro*-tribenzoyldihydrosphingosine derivative have yielded data which show that, under these conditions, *erythro*-dihydrosphingosine and, in lesser quantity, *erythro*-sphingosine were formed. The *threo* derivatives were not produced.

EFFECT OF BILE ACIDS ON EGG PRODUCTION, SERUM CHOLESTEROL AND EGG CHOLESTEROL IN HENS. H. M. Edwards, Jr., Vivian Jones, and J. E. Marion (Poultry Dept., Univ. of Georgia, Athens). *J. Nutrition* 77, 253-8 (1962). It was found that lithocholic acid alone or in combination with cholic acid in the diet when fed to hens caused an increase in serum cholesterol and an abrupt decrease in egg production. Cholic acid supplementation had no effect on serum cholesterol but caused a temporary decrease in egg production which returned to the control level after 25 days. A second experiment was conducted to determine the effect of level of lithocholic acid in the diet on laying hens. Diets containing none, 0.025, 0.05, and 0.10% of lithocholic acid were fed to laying hens. The results show that the feeding of 0.10% of lithocholic acid significantly decreased egg production, while increasing serum cholesterol level, total egg lipids, and egg cholesterol. None of the supplements had any significant effects on egg size.

CORONARY ATHEROSCLEROSIS IN RENAL HYPERTENSIVE RATS. C. H. Eades, Jr., G. E. Phillips, and Victoria B. Solberg (Dept. of Biochem., Warner-Lambert Res. Inst., Morris Plains, N. J.). *Proc. Soc. Exp. Biol. Med.* 110, 65–67 (1962). Renal hypertensive rats on an all-meat diet developed hypercholesterolemia and coronary atherosclerosis within 16 weeks. Intact meat-fed, intact chow-fed, and renal hypertensive chow-fed rats developed neither condition by 50, 20, and 20 weeks, respectively. Aortas of all animals, chow- or meat-fed, were normal. Thus, it appears that hyperstension coupled with a high fat, high protein, but low cholesterol diet is related to the production of hypercholesterolemia and coronary atherosclerosis. It is suggested that such a system may serve as an *in vivo* tool for the study of prevention, development, and possible reversal of coronary atherosclerosis.

INFLUENCE OF DIETARY MEDIUM-CHAIN FATTY ACIDS ON RAT LIPID COMPOSITION. I. *Cis*-2-OCTENOIC ACID AS PRECURSOR OF LINOLEIC ACID. R. R. Brenner, O. Mercuri, and Maria de Tomas (Catedra de Quimica Biologica, Inst. de Fisiologia, Facultad de Ciencias Medicas, La Plata, Argentina). *J. Nutrition* 77, 203–09 (1962). The administration of methyl *cis*-2-octenoate and methyl *trans*-2-octenoate to essential fatty acid (EFA)-deficient rats did not affect the low levels of linoleic and arachidonic acids in heart and liver. Only the *cis* acid partially enhanced the growth rate. Both *cis*-2-octenoate and methyl linoleate restored to normal the plasma cholesterol levels depressed by the absence of EFA in the diet. When sodium acetate 1-C^{14} was injected into rats fed methyl *cis*-2-octenoate, no activity was noted in the pure linoleic acid isolated from a pool of organs. Accordingly, it can be affirmed that no *in vivo* synthesis of linoleic acid occurred from dietary *cis*-2-octenoate, under the present experimental conditions.

PHOSPHOLIPIDS OF *Azotobacter agilis, Agrobacterium tumefaciens,* AND *Escherichia coli.* Tsuneo Kaneshiro and A. G. Marr (Dept. of Bact., Univ. of Calif., Davis, Calif.). *J. Lipid Research* 3, 184–189 (1962). The principal lipid of *A. agilis, A. tumefaciens,* and *E. coli* extractable with ethanol and methanol-chloroform was a phosphatidyl ethanolamine. A phosphatidyl choline was detectable only in *A. tumefaciens.* The fatty acids of phospholipid from *A. agilis* were found to be myristic (7%), palmitic (35%), palmitoleic (41%), and octadecenoic (17%). The fatty acids from *A. tumefaciens* were myristic (1%), palmitic (15%), hexadecenoic (1%), methylenehexadecanoic (6%), octadecenoic (30%), and lactobacillic (47%). The neutral lipid was a minor fraction (5% to 10%) of the extractable lipids and was found to consist of esters and coenzyme Q.

THE FATTY ACIDS OF BEEF BRAIN AND SPINAL CORD SPHINGOLIPID PREPARATIONS. K. K. Carroll (Collip Med. Research Lab., Univ. Western Ontario, London, Canada). *J. Lipid Research* 3, 263–268 (1962). Sphingolipid preparations from beef spinal cord and from a mixture of beef brain and beef spinal cord were subjected to methanolysis, and the composition of the fatty acid esters was investigated by conventional fractional distillation, by column chromatography, and by gas-liquid chromatography. Approximately 20 fatty acids were separated and characterized. Some improvements in methodology are reported in connection with these analyses.

FURTHER STUDIES ON MILK FAT SYNTHESIS. J. R. Luick and J. M. Lucas (Dept. of Animal Husbandry, Univ. of Calif., Davis). *Proc. Soc. Exp. Biol. and Med.* 110, 275–77 (1962). There is little evidence to suggest that stearic acid is synthesized in the udder. On the contrary, this acid is thought to be transported to the mammary gland as a part of the absorbed plasma lipids. The incorporation of C^{14} stearate into milk fat following its infusion into mammary tissue suggests that the plasma lipids are hydrolyzed in the udder and thereby provide a "pool" of fatty acids for milk fat synthesis.

ACTION OF PLASMA AND OF PLASMA ALBUMIN ON PALMITATE-1-C^{14} OXIDATION BY BLOOD CELLS. J. P. Hrachovec (Dept. of Physiology and Biophysics, New York Univ., School of Med., New York City). *Proc. Soc. Exp. Biol. Med.* 110, 239–45 (1962). Washed blood cells from normal, fasting adult rats were incubated with palmitate-1-C^{14} in the presence of increasing dilutions of homologous blood plasma, or in the presence of various concentrations of bovine plasma albumin. It has been observed that (a) blood plasma, even when diluted several hundred times, has an inhibitory action on palmitate oxidation by washed blood cells; (b) plasma albumin is one of the substances contributing to this inhibitory action of blood plasma; (c) under certain experimental conditions involving very high dilutions of blood plasma, its action is stimulatory rather than inhibitory. The results are discussed in relation to the action of plasma albumin on cell metabolism and to interactions between fatty acids, plasma albumin, and red blood cells.

THE *in vitro* INCORPORATION OF ACETATE-1-C^{14} INTO NORMAL AND LEUKEMIC LEUKOCYTE LIPIDS. B. Malamos, C. Miras, G. Lewis, and J. Mantzos (Dept. of Clinical Therapeutics, Univ. Athens, Athens, Greece). *J. Lipid Research* 3, 222–227 (1962). White blood cells and plasma from normal and leukemic subjects were incubated in the presence of acetate-1-C^{14}. The distribution of radioactivity in six lipid fractions of cells and plasma was measured. Leukemic leukocytes incorporated the highest percentage of radioactivity into the phospholipid fractions whereas normal leukocytes incorporated the highest percentage into the glyceride fractions. There is no conclusive evidence that the differential white cell count had an influence on these observations. The difference may be related to a more active lipid metabolism in leukemic cells.

INCORPORATION OF PALMITATE-1-C^{14} INTO NEUTRAL LIPID OF RAT DIAPHRAGM. E. M. Neptune, Jr., H. C. Sudduth, M. Colodzin, and J. J. Reish, Jr. (Naval Medical Research Institute, National Naval Medical Center, Bethesda 14, Maryland). *J. Lipid Research* 3, 229–232 (1962). When excised rat diaphragms are incubated with palmitate-1-C^{14}, radio-activity is found in triglyceride, diglyceride, and monoglyceride. The specific activity of diglyceride exceeds that of triglyceride after the various time periods studied. With increasing incubation time, the specific activity of triglyceride gradually approaches that of diglyceride. When diaphragm is incubated with labeled palmitate and then transferred to a second medium containing unlabeled palmitate, there is a marked decrease in the specific activity of the diglyceride fraction. There is formation of labeled triglyceride when a cell-free, particulate preparation of diaphragm is incubated with a labeled dipalmitin and palmitoyl-CoA. The data are consonant with the hypothesis that diglyceride is a precursor of triglyceride and glycerol phosphatides.

PLASMALOGENS AND PHOSPHATIDES OF RAT DIAPHRAGM AFTER INCUBATION WITH PALMITATE-1-C^{14} *in vitro*. M. Colodzin, E. M. Neptune, Jr., and H. C. Sudduth (Naval Med. Research Inst., Nat. Naval Med. Center, Bethesda 14, Maryland). *J. Lipid Research* 3, 234–237 (1962). Ethanolamine-containing plasmalogen was found to be the major type of plasmalogen in rat diaphragm. The molar ratio of total plasmalogen to total phosphatide phosphorus was 0.09. After incubation of rat diaphragm with palmitate-1-C^{14}, it was found that the specific activity of diglyceride always exceeded that of both cephalin and lecithin, and the specific activity of the phosphatides approached that of the diglyceride with increasing time of incubation. Lecithin specific activity always exceeded that of cephalin. Estimated turn-over times were approximately 2 hours for lecithin, 3 hours for triglyceride, and 10 hours for cephalin.

METABOLISM OF METHYL ELAIDATE. G. A. Dhopeshwarkar and J. F. Mead (Dept. of Physiol. Chem., School of Med., Univ. of Calif., Los Angeles, Calif.). *J. Lipid Research* 3, 238–241 (1962). Methyl elaidate-1-C^{14} was fed to fat-deficient guinea pigs. Very little incorporation of the radioactivity was found in the glycerides or phospholipids under these conditions. Methyl ester seemed to have been absorbed without complete hydrolysis and deposited in body tissues as the methyl ester. Intestinal lipids from these animals showed the presence of unhydrolyzed free methyl esters even after a period of 4 hours. Percentage distribution of the radioactivity in the stearic acid isolated from these animals shows direct *in vivo* hydrogenation of elaidic acid to stearic acid.

THE LIPID COMPOSITION OF NORMAL MOUSE LIVER. G. J. Nelson (Donner Lab. of Biophysics and Med. Physics, Univ. of Calif., Berkeley 4, Calif.). *J. Lipid Research* 3, 256–261 (1962). The lipid composition of the liver of the normal Swiss laboratory mouse has been determined by chromatography and infrared spectrophotometry. The neutral lipids were mainly triglycerides (80%) with cholesterol, cholesterol ester, and an unidentified hydrocarbon also present. No free fatty acids were isolated. The phospholipids were largely lecithin (58%), with phosphatidyl ethanolamine, phosphatidyl serine, monophosphoinositol, sphingomyelin, and cardiolipin also present. A trace of lysolecithin was also detected, although it was impossible to determine whether or not it was an artifact of the isolation procedure. The fatty acid composition of the isolated lipid fractions was determined by gas-liquid chromatography. The neutral lipids contained mainly palmitic, oleic, and linoleic acid, while the phospholipids contained large quantities of C_{20} and C_{22} polyunsaturated acids and considerably more stearic acid than the neutral lipids. The cardiolipin fraction had a high content of linoleic acid.

DISTRIBUTION OF LABELED CHOLESTEROL IN ANIMAL TISSUES. J. Avigan, D. Steinberg, and M. Berman (Nat. Heart Inst. and Nat. Inst. Arthritis and Metabolic Diseases, N.I.H., Bethesda 14, Maryland). *J. Lipid Research* 3, 216–221 (1962). Rats were fed single doses of cholesterol-4-C^{14} and sacrificed at various time intervals. In another experiment, rabbits were injected intravenously with lipoproteins labeled with cholesterol-4-C^{14} obtained from a donor animal and sacrificed at various time intervals. The ratios between specific radioactivities of cholesterol in several tissues and that in the serum were determined and followed as a function of time. For some tissues, this ratio reached values considerably above 1 when a sufficiently long time had elapsed between the administration of label and the time of sacrifice. Time curves for specific radioactivities in various tissues, best fitting the experimental data, were calculated with the aid of a digital computer by assuming that each tissue studied represented a single homogeneous compartment of cholesterol and that there was a flow of radioactive cholesterol from plasma into the tissues. Similar time curves, based on the additional assumption that no significant synthesis of cholesterol took place in the tissues, were also constructed. The results indicate that the treatment of cholesterol in each tissue as a single homogeneous compartment in exchange with plasma cholesterol, with a provision of some cholesterol synthesis in the various organs, is adequate to explain the data in most cases examined.

DISPOSITION OF THE CHOLESTEROL MOIETY OF A CHYLOMICRON-CONTAINING LIPOPROTEIN FRACTION OF CHYLE IN THE RAT. W. J. Lossow, N. Brot, and I. L. Chaikoff (Dept. of Physiology, Univ. of Calif., Berkeley, Calif.). *J. Lipid Research* 3, 207–214 (1962). Cholesterol-27-C^{14} in the form of chylomicron-containing lipoprotein fraction of chyle was injected intravenously into rats. About 75% of the injected sterol-C^{14} was in the ester and 25% in the free form. Ten minutes after the injection about 25% of plasma lipid C^{14} was recovered in higher-density α- and β-lipoproteins. The transfer of labeled sterol to the higher-density plasma lipoproteins involved both esterified and free forms, but the proportion of free sterol transferred was greater than that in the injected preparation. In 10 minutes, C^{14} was recovered in the lipid fractions of the nine tissues studied. Liver, adipose tissue, and muscle accounted for about 70% of the injected C^{14}, and liver alone accounted for about 50%. Adipose tissue of glucose-fed rats incorporated about twice as much of the injected sterol-C^{14} as did the same tissue of fasted rats at this time. Among the conclusions drawn are (1) hydrolysis is the principal fate of the injected cholesterol esters within a few hours after injection, and (2) release of labeled free sterol into plasma by liver or exchange of free sterol between liver and plasma occurs at a more rapid rate, some time between 10 minutes and 2 hours after the injection, than at any other time.

THE INCORPORATION OF P^{32} INTO THE INOSITOL PHOSPHATIDES OF RAT BRAIN. H. Wagner, A. Lissau, J. Holzl, and L. Horhammer (Institut für Pharmazeutische Arzneimettellehre der Universitat München, München, Germany). *J. Lipid Research* 3, 177–180 (1962). The inositol phosphatide fraction of rat brain has been separated by chromatography on formaldehyde-treated paper into monophosphoinositide and two other inositol-containing phosphatides named phosphoinositide 1 and 2. Quantitative determination of the ether soluble phosphatides gave the following values for rat brains of 450 and 500 mg. dry weight: 14 and 21 mg. phosphatidylcholine and phosphatidylethanolamine, 3.5 to 4.5 mg. phosphatidylserine, 0.9 to 1.3 mg. monophosphoinositide, and 0.1 to 0.2 mg. each of phosphoinositide 1 and 2. All three inositol phosphatides incorporated P^{32} at a significantly higher rate than the other brain phosphatides. Of the three, monophosphoinositide always had the lowest specific activity—after 16 and 32 hours, phosphoinositide 2, which is probably identical with the triphosphoinositide of Ballou, had the highest specific activity.

STUDIES OF CANINE ADRENAL POLYENOIC ACIDS: LOCATING DOUBLE BONDS BY PERIODATE-PERMANGANATE OXIDATION AND GAS-LIQUID CHROMATOGRAPHY. Ta-Chuang Lo Chang and Charles C. Sweeley (Dept. Biochem. and Nutrition, Grad. School of Pub. Health, Univ. of Pittsburgh, Penna.). *J. Lipid Research* 3, 170–176 (1962). An improved micromethod has been developed for the location of double bonds in some naturally occurring polyenoic acids by oxidative cleavage of olefinic bonds with a mixture of periodate and permanganate (von Rudloff's oxidant) and analysis of the acidic fragments by gas-liquid chromatography. A method is described for determination of the position of double bonds in polyunsaturated fatty acids. The structures of three polyenoic acids, isolated from canine adrenal lipids by methanolysis and preparative gas-liquid chromatography of the methyl esters, were established as 8-,11-,14-eicosatrienoic acid, 5-,8-,11-,14-eicosatetraenoic acid, and 7-,10-,13-,16-docosatetraenoic acid.

BREAKDOWN OF LECITHIN ON ALUMINUM OXIDE COLUMNS. O. Renkonen (Dept. of Serology and Bacteriology, Univ. of Helsinki, Finland). *J. Lipid Research* 3, 181–183 (1962). A method is described for the detection of slow breakdown reactions that sometimes occur in chromatographic columns. Hydrolysis of lecithin on aluminum oxide columns has been demonstrated to occur under conditions normally used in the chromatography of phosphatides. About 1% of lecithin is estimated to be destroyed in alumina columns in 1 hour at 22C. A substantial part of the decomposed lecithin is found as lysolecithin. Lowering the working temperature to 2C markedly reduces the rate of the degradation of lecithin.

(Continued on page 34)

DIETARY ANTIOXIDANTS AS RELATED TO VITAMIN E FUNCTION. S. Krishnamurthy and J. G. Bieri (Lab. of Nutrition and Endocrinology, Nat'l Inst. of Arthritis and Metabolic Diseases, Nat'l Inst. of Health, Bethesda, Md.). *J. Nutrition* **77**, 245–52 (1962). Chicks were fed a basal diet deficient in vitamin E and biologically active selenium with supplements of synthetic antioxidants at varying levels. The efficiency of the antioxidants in preventing exudative diathesis correlated with their apparent concentration in the tissues as determined by an *in vitro* lipid peroxidation test (thiobarbituric acid). Ethoxyquin and DPPD were most active, butylated hydroxytoluene (BHT) and di-tertiary-butyl-4-methylphenol (DBPC) were intermediate, whereas nordihydroguaiaretic acid (NDGA) and 2,5-di-tertiary-amyl hydroquinone) (DAH) were inactive as tissue antioxidants. Results indicate that the variation among antioxidants in their ability to substitute for vitamin E is due primarily to differences in their availability to the body and subsequent deposition in the tissues.

LIVER KETOGENESIS. V. *In vitro* ACETOACETATE PRODUCTION AND UTILIZATION IN RATS FED HIGH FAT-HIGH CASEIN DIET. J. M. Khanade and M. C. Nath (Dept. of Biochem., Nagpur Univ., Nagpur, India). *Proc. Soc. Exp. Biol. Med.* **110**, 7–11 (1962). The results in general indicate that the antecedent diet leaves its imprint on the metabolism of isolated tissues, causing profound changes in the metabolic pattern, depending on the type of such diet. The gain in body weight of rats fed high casein and high fat-high casein alone or in combination with thyroid, is found to be less than that in normals. These rats were observed to have in varying degrees hyperglycemia, fatty liver and hypertrophy of liver, kidney and adrenal tissue. Feeding of high fat-high casein diet alone, or with thyroid, induces overproduction of acetoacetate, both endogenous and exogenous, by liver slices. Utilization of acetoacetate by the kidney slices obtained from such rats is not, however, increased. Consumption of oxygen by liver and kidney slices of rats fed high casein and high fat-high casein is less than that in normal tissues. The metabolic disturbances observed in the tissues of rats fed diets low in carbohydrate but rich in protein or fat plus protein, are aggravated by prolonged feeding of the same diet (10 weeks as compared to 4 weeks).

EFFECT OF FEEDING FAT BLENDS OF HYDROGENATED GROUNDNUT (PEANUT) FAT AND COTTONSEED OIL CONTAINING DIFFERENT LEVELS OF LINOLEIC ACID ON SERUM CHOLESTEROL LEVELS IN MONKEYS (MACACARADIATA) AND LIVER CHOLESTEROL CONCENTRATION IN CHOLESTEROL-FED RATS. S. N. Jagannathan (Nutrition Research Lab., Indian Council of Med. Research, Hyderabad 7, India). *J. Nutrition* **77**, 317–22 (1962). Unhydrogenated cottonseed oil blended with hydrogenated groundnut fat so as to provide linoleic acid levels of zero, 2,5, 5.0, 7.5, and 10.0% in the blend, was included in the diet of adult male monkeys at a 30% level, supplying 50% of total calories. Serum cholesterol levels were determined after the animals had received the diet for 4, 7, and 10 weeks. The fat blends were included at a 20% level in the diet of young growing male rats along with 1% of cholesterol. Liver cholesterol and total lipids were determined at the end of 8 weeks. The results showed that the hypercholesterolemia normally associated with a high consumption of hydrogenated groundnut fat in monkeys, could be prevented by incorporating into the fat cottonseed oil providing linoleic acid at a level of 7.5%. The concentration of liver cholesterol in cholesterol-fed rats maintained with the fat blend containing 7.5% of linoleic acid, was significantly lower than in those that were maintained with the blends having lower levels of linoleic acid.

EFFECT OF THYROID-ACTIVE SUBSTANCES ON PLASMA CHOLESTEROL IN THE MOUSE. E. E. Howe and D. K. Bosshardt (Merck Inst. for Therapeutic Res., Rahway, N. J.). *J. Nutrition* **77**, 161–64 (1962). Thyroid-active substances were effective agents in lowering the plasma cholesterol of weanling mice receiving hydrogenated coconut oil as the sole source of fat. Small amounts of dietary unsaturated fatty acids including oleic acid eliminated this hypocholesterolemic effect. Two-tenths per cent of thiouracil in the diet produced a maximal increase of plasma cholesterol in the weanling mouse. This effect was reduced by feeding a mixture of pentaenoic and hexaenoic acids but not by oleic or linoleic acids.

FATE OF BUTYLATED HYDROXYANISOLE IN MAN AND DOG. B. D. Astill, J. Mills, D. W. Fassett, R. L. Roudabush, and C. J. Terhaar (Lab. of Industrial Medicine, Eastman Kodak Co., Rochester 4, N.Y.). *J. Agr. Food Chem.* **10**(4), 315–319 (1962). To see if results in rats, rabbits, and dogs at high dose levels justified extrapolation, the fate of butylated hydroxyanisole in man was studied. Further possible pathways were sought in dogs. Dogs excreted 60% of a 350-mg/kg dose unchanged in the feces within 3 days, and the remainder in the urine largely as sulfate conjugates of BHA, tert-butylhydroquinone, and an unidentified phenol. Procedures used for low dose levels in rats were applied to man. Dosages of 0.5 to 0.7 mg/kg yielded in the urine less than 1% of the dose an unchanged BHA, and 27 to 77% as the glucuronide of BHA, mostly within 24 hours. Small doses in man and large doses in rats and rabbits have similar fates, and extrapolation from these species is justified. Comparative metabolism studies are important for safety evaluation of additives, particularly if extension to man is permissible.

EFFECT OF FREE FATTY ACID ON FLAVOR OF FAT. J. L. Hall, Dorothy L. Harrison, and D. L. Mackintosh (Dept. of Chem., Kansas State Univ., Manhattan). *J. Agr. Food Chem.* **10**(2), 96–98 (1962). Initial increases in free fatty acid in back fat attending *in vivo* modulation of metabolic processes in hogs were related to rise in desirability of flavor of the cooked fat. This relation was reversed with increased acidity brought about by post-mortem autolysis.

INCREASED LYSOSOMAL ENZYMES IN MUSCULAR DYSTROPHY OF VITAMIN D-DEFICIENT RABBITS. H. Zalkin, A. L. Tappel, K. A. Caldwell, S. Shibko, I. D. Desai, and T. A. Holliday (Dept. of Food Science and Tech., Univ. of California, Davis). *J. Biol. Chem.* **237**, 2678–82 (1962). Detergent-induced activation of particle-bound β-glucuronidase, β-galactosidase, cathepsin, aryl sulfatase, acid phosphatase, and acid ribonuclease from rabbit leg muscle suggests that they are bound in lysosomes. In leg muscle from vitamin E-deficient rabbits the free and total activities of four lysosomal indicator enzymes were increased. Increases of total activity were: ribonuclease, 11-fold; cathepsin, 15-fold; β-galactosidase, 61-fold; aryl sulfatase, ∞. The increased activities correlate with the increased urinary excretion, allantoin, and amino acids. Histopathological signs of muscle degeneration appeared shortly after these acid hydrolases began to increase. The results suggest that these lysosomal acid hydrolases cause the muscle degeneration in vitamin E-deficient dystrophic rabbits.

CHANGES IN SERUM LIPIDS IN RELATION TO EMOTIONAL STRESS DURING RIGID CONTROL OF DIET AND EXERCISE. S. Wolf, W. R. McCabe, J. Yamamoto, C. A. Adsett, and W. W. Schottstaedt (Univ. Oklahoma Med. Center, Oklahoma City). *Circulation* **26**, 379–387 (1962). Without change in diet or exercise it has been shown that striking alterations in the serum concentration of cholesterol and triglycerides correlate with the occurrence of emotionally stressful situations. Such changes may be brought about during stressful interviews within 60 minutes. No inferences are drawn with respect to the significance of emotional stress in the pathogenesis of coronary atherosclerosis or myocardial infarction, but it is clear that the mechanisms that govern the serum concentration of certain lipids are connected with and capable of responding to impulses from the higher centers of the brain.

PROPIONATE METABOLISM BY SLICES OF MAMMARY GLAND AND LIVER OF LACTATING RAT. J. Katz and J. Kornblatt (Inst. for Med. Research, Cedars of Lebanon Hosp., Los Angeles 29, Calif.). *J. Biol. Chem.* **237**, 2466–2473 (1962). In the presence of glucose, propionate-1-C^{14} was extensively incorporated into fatty acids by mammary gland slices of lactating rats. Of the activity in this fraction, 80 to 90% was in heptanoic, nonanoic, and undecanoic acids; smaller amounts were in tridecanoic and pentadecanoic, and traces were in pentanoic and heptadecanoic acids. The incorporation of propionate-2- and 3-C^{14} into fatty acids was somewhat larger than that of propionate-1-C^{14}. The composition of the fatty acids from all labels was similar, but those from the former also contained approximately 20% of even-carbon acids, mainly caproic and capric acids, and smaller amounts of even-carbon acids of longer chain length.

BIOSYNTHESIS OF C^{14}-LABELED GOSSYPOL. P. F. Heinstein, F. H. Smith, and S. B. Tove (Animal Nutrition Sec., Dept. of An. Industry, N. Carolina State College, Raleigh). *J. Biol. Chem.* **237**, 2643–46 (1962). The biosynthesis of gossypol has been investigated by the incubation of methyl- and carboxyl-labeled acetate with excised cotton roots. From the high incorporation of small amounts of C^{14}-labeled acetate in the presence of large amounts of glucose, and from the pattern of labeling, it is concluded that gossypol is metabolically formed via the isoprenoid pathway. It was also found that homogenates of cotton roots were capable of synthesizing gossypol from either labeled acetate or labeled mevalonate.

(Continued on page 37)

• Fatty Acid Derivatives

CLAY GREASE COMPOSITIONS. W. H. Peterson (Shell Oil Co.). *U. S. 3,050,463.* A water-resistant thickened lubricant composition consists of a hydrophobic lubricating oil as the major components, a bentonitic clay colloidally dispersed in the oil, and an oil-soluble, water-insoluble amino amide. The amino amide is formed from fatty acids having 16–20 carbon atoms per molecule, at least 50% of the fatty acids containing at least 1 double bond, and a mixture of polyethylene polyamines, 20–80% of the mixture being diethylene triamine and the remaining fraction being polyethylene polyamines having an average molecular weight within the range of 250–400. About 0.4–0.5 equivalents of fatty acid is heated with an equivalent of polyamine at a temperature between 200 and 225C for 1–4 hours.

GLYCERYL LACTO ESTERS IN COATINGS. V. K. Babayan and G. N. Comes (Drew Chemical Corp.). *U. S. 3,051,577.* A hard butter consists of a hard fat and a minor proportion of an ester of glycerine, lactic acid and a fatty acid having 10–24 carbon atoms. At least one hydroxyl group of the glycerine is esterified with lactic acid.

STABLE EMULSIONS. G. R. Ferrante (Shell Oil Co.). *U. S. 3,052,562.* A stable aqueous emulsion consists of a continuous aqueous phase having dispersed in it an oil phase consisting of a water-immiscible ester such as diisobutyl adipate or ethyl hexyl diphenyl phosphate, from 60–100% (by weight of ester) of 2,6-di-tert-butyl-4-methylphenol, and from 10–100% (by weight of phenol) of a fatty acid ester of polyoxyethylene sorbitan, the fatty acid having from 12 to 18 carbon atoms.

AQUEOUS SOLUTIONS OF HIGHER FATTY ALCOHOLS AND HIGHER FATTY ALCOHOL ESTERS AND A METHOD FOR PREPARING THE SAME. J. J. Hirsh. *U. S. 3,052,607.* A crystal clear aqueous solution consists of a mixture of water, (polyoxyethylene)$_{20}$ sorbitan monostearate, and at least one compound selected from the group consisting of alcohols having 12–20 carbon atoms in an alkyl chain and the 1 through 5 carbon atom alkyl chain esters of acids derived from such alcohols. The polyoxyethylene sorbitan monostearate is present in the mixture in a weight ratio of at least 3 to 1.

• Drying Oils and Paints

QUICK-DRYING PRINTING INK FOR COATING MATERIALS AND METHOD OF DRYING SAME. B. L. Sites and M. S. Agruss (Miehle-Goss-Dexter, Inc.). *U. S. 3,050,413.* A method for rapidly indurating a drying oil having a conjugated system of double bonds consists of forming a non-aqueous solution of the drying oil and an oil-soluble acyl chloride catalyst, forming a film of the solution, and irradiating the film with actinic energy.

PROTECTIVE FILM FORMING COMPOSITIONS AND RESULTANT FILMS. W. M. Budde (Archer-Daniels-Midland Co.). *U. S. 3,050,480.* The described composition is a mixture of epoxidized long-chain fatty acids or esters having an iodine value of at least 90 before epoxidation and containing not less than 4% oxirane groups, and a polycarboxylic acid having a molecular weight of at least 180, at least 2 reactive carboxylic acid groups and a pH value of not more than 4.7.

REACTION MIXTURE DERIVED FROM OLEIC ACID, SEBACIC ACID, AND TRIETHYLENE TETRAMINE. Elizabeth C. Dearborn and P. K. Isaacs (W. R. Grace & Co.). *U. S. 3,050,527.* Oleic acid (2 moles) is reacted in a deoxygenated system with 1 mole of sebacic acid and 2 moles of triethylene tetramine at a temperature of 50–240C and a pressure of about 10 to 760 mm. Hg while continuously removing the water of reaction. The reaction is continued until the flow of water of reaction substantially ceases. *U. S. 3,050,528* describes the reaction product formed from 2 moles of oleic acid, 5 moles of sebacic acid, and 6 moles of triethylene tetramine.

CARBOXYLIC ACID-POLYAMINE REACTION MIXTURE. Elizabeth C. Dearborn and P. K. Isaacs (W. R. Grace & Co.). *U. S. 3,050,529.* The described composition is prepared by reacting in a deoxygenated system 4 moles of oleic acid, 1 mole of a mixture of dimeric and trimeric fatty acids, 3 moles of sebacic acid and 8 moles of triethylene tetramine at a temperature of 50–240C and a pressure of 10–760 mm. Hg while continuously removing the water of reaction. The polymerized acids consist of about 75% dimeric and 25% trimeric acids derived from a mixture of unsaturated 18-carbon monocarboxylic acids.

(Continued on page 39)

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Quick drying vehicle and method. B. L. Sites and M. S. Agruss (Miehle-Goss-Dexter, Inc.). *U. S. 3,051,591.* A method of rapidly indurating a drying oil having a conjugated system of double bonds consists of (1) forming a non-aqueous, stable solution of the drying oil, an oil-soluble organic peroxide (2% by weight of total weight) and a tertiary amine, (2) forming a film of the solution, and (3) irradiating the film with actinic energy.

Polyvinyl halides plasticized with epoxidized esters of higher fatty acids containing pairs of acyloxy groups. S. P. Rowland and R. G. White (Rohm & Haas Co.). *U. S. 3,051,672.* The described composition is a vinyl halide polymer containing as a plasticizer a mixture of water-insoluble alkyl esters of aliphatic acids containing 11 to 22 carbon atoms and mono- or polyhydric alcohols containing from 2 to 18 carbons. Each ester in the mixture has as sole substituents on different pairs of carbon atoms at least 1 substituent from the group consisting of oxirane oxygen and pairs of vicinal acyloxy groups containing 2 or 4 carbon atoms. The total substituents in the esters of the mixture average about 2 to 8 weight % oxirane oxygen and about 1 to 35 weight % pairs of vicinal acyloxy groups.

Method of preparing epoxidized oils and the like. L. I. Hansen and G. O. Sedgwick (Archer-Daniels-Midland Co.). *U. S. 3,051,729.* The described process consists of introducing and mixing into a higher fatty acid ester at a temperature of about 90–150F, 0.7–10 moles of hydrogen peroxide and 0.3 to 0.7 moles of acetic acid for each mole of unsaturation of the ester, and about 3–8% of sulfuric acid (on weight of acetic acid) over a period of 2 hours or more. The reaction is continued until epoxidation of the ester is effected.

• Detergents

Use of soybean soapstock for making potassium soap. M. Bestraten. *Lipidos (Jabones, Detergentes, Tensoactivos Section)* 21, 23–24 (1961). A process for making potassium soaps from soybean soapstock is described.

Detergent-containing lubricating oil. T. F. Brown and P. Matthews (Universal Oil Products Co.). *U. S. 3,050,464.* A naphthene-containing petroleum lubricating oil from 300–500C is contacted with a hydrocarbon reforming catalyst containing a noble metal of group VIII of the periodic table at aromatizing conditions. The naphthene components in the oil are thus converted to aromatic hydrocarbons. The resulting reformed oil is then subjected to sulfonation at conditions sufficient to convert a substantial proportion of the aromatic components to their sulfonated derivatives. The sulfonated oil is then neutralized with an alkaline base.

Water-in-oil emulsion hydraulic fluids. C. E. Francis (Shell Oil Co.). *U. S. 3,050,465.* A hydraulic fluid for colliery equipment consists of a water-in-oil emulsion in which the water phase is from 20–45% of the emulsion and the oil phase from 55–80%. The oil phase is essentially an 80–100 V.I. mineral oil having a viscosity in the range of 75–250 SUS at 100F containing from 1–4% of a monoester of a fatty acid having from 8 to 18 carbon atoms and an alkitan such as sorbitan or mannitan, and from 0.5–3% of an oil-soluble C_{4-20} alkyl phenoxy$(ethoxy)_{4-6}$ethanol based on the oil.

Lanolin transparent emulsions. J. J. Hirsh. *U. S. 3,052,608.* A crystal clear aqueous solution consists of water, lanolin, and $(polyoxyethylene)_{20}$ sorbitan monostearate with the weight ratio of the polyoxyethylene sorbitan monostearate to lanolin being greater than 1:1.

Liquid laundering compositions. H. E. Wixon (Colgate-Palmolive Co.). *U. S. 3,052,635.* A liquid detergent composition consists of (1) 5–15 parts by weight of a water-soluble anionic organic sulfate detergent having an alkyl group of 8–18 carbon atoms; (2) 15–45 parts of potassium pyrophosphate or tripolyphosphate; (3) 2–15 parts of a higher fatty acid alkylolamide having 8–18 carbon atoms in the fatty acid radical and 2–3 carbons in the alkylol radical; (4) 4–12 parts of an alkali metal salt of a lower alkyl substituted benzene hydrotropic sulfonated salt having up to 2 carbon atoms in the alkyl substituent; and (5) an aqueous alcoholic medium having 0.5–20 parts of a saturated aliphatic monohydric alcohol having 2 to 3 carbon atoms. The ingredients are proportioned to form a pourable, substantially homogeneous product having less than 75% total solids by weight in the liquid detergent composition.

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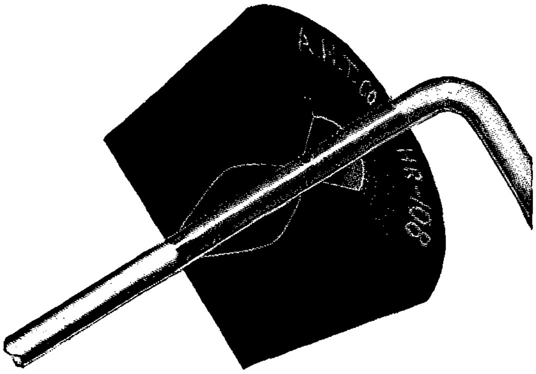
SAFETY STOPPERS



THOMAS HR-108 SAFETY STOPPERS are of bloomless, black, resilient, heat resisting composition, with low sulfur content and long life; specific gravity 1.08. Straight bore of the conventional stopper has been replaced by a fusiform bore with bevelled entrance. Internal diameter at center is approximately twice that of a 2 mm high sealing band at either end. These stoppers offer the following advantages:

Safety
Glass tubes can be easily inserted and removed, *particularly by students,* with greater safety than with straight bore. Insertion is facilitated by the bevelled entrance of the bore, and the tube slides through only the two sealing bands.

Larger Tubes
Fusiform bore permits insertion of larger tubes than is possible with straight bore. For example, tubes 6 to 11 mm can be inserted in sizes 5 to 9 incl.

Superior Composition
The stock contains *more than 70% of pure virgin gum,* possesses great elasticity, is free from surface sulfur and contains less than 0.75% free sulfur; no reclaimed rubber is used.

Heat Resistance
Temperatures *up to 110°C* do not affect shape, size or structure.

Long Life
Tests indicate useful life approximately *five times* that of common stoppers.

HR-108 Safety Stoppers are not sold by weight but, because of the specific gravity and design, include more stoppers per pound than many other brands. They are packed in cartons, each containing approximately 1 lb. of a size, for convenient shelf storage. Each size is priced individually, based on actual cost of manufacture.

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