• *Fats and Oils . . . .*

ANTISPATTERING MILK MARGARINE AND ITS PREPARATION. H. Pardun (Lever Bros. Co.). *U.S. 3,245,802.* The reduced tendency of this milk margarine to spatter in the frying pan is due to the presence of 0.1 to 1.5% (on weight of margarine fat) of a hydrothermally debittered soya bean flour in which the protein is not substantially denatured.

LOW SPATTERING MARGARINE. G. M. M. Houben and E. W. Jonker (N. V. Koninklijke Stearine Kaarsenfabrieken Gouda-Apollo, Netherlands). *U.S. 3,248,230.* Low spattering margarine compositions consist of margarine containing up to 0.3% of an aliphatic mono-ester of malic acid with a hydroxy compound selected from the group consisting of saturated fatty alcohols having 8 to 16 carbon atoms, oleyl alcohol and ethers derived from equimolar amounts of the alcohols and glycerol and 0.01 to 0.08% of a phosphatide. The amount of the mono-ester should be greater than the amount of the phosphatide.

MARGARINE MANUFACTURE. M. D. Wilding (Swift & Co.). *U.S. 3,250,628.* The steps for preparing a noncurdling margarine product comprise: forming a mixture of the oil and milk phases of the margarine; reacting the mixture with a proteolytic enzyme for a time sufficient to produce clotting of the proteins of the milk phase; and subsequently homogenizing the mixture.

EFFECT OF COOKING PROCEDURE ON FLAVOR COMPONENTS OF BEEF. CARBONYL COMPOUNDS. Anne Sanderson, A. M. Pearson and B. S. Schweigert (Dept. of Food Science, Michigan State Univ., E. Lansing, Mich.) *J. Agr. Food Chem.* 14, 245-7 (1966). Gas-liquid chromatography was employed to determine the carbonyl compounds resulting from beef cooked by two procedures. Aldehydes and ketones were collected as their 2,4-dinitrophenylhydrazine derivatives and regenerated as carbonyls with levulinic acid for injection into the chromatograph. Tentative identifications were made by comparing the retention times with known carbonyl compounds using two different column packings. Beef cooked with water gave the same number of aldehydes and ketones as beef cooked in fat, although in varying amounts. Results suggest that the characteristic differences in flavor and aroma of roasted and boiled beef may arise from the volatile carbonyl compounds.

SEPARATION OF MILK FAT FRACTIONS BY CENTRIFUGATION. J. R. Rolland and R. R. Riel (Dept. des Vivres, Universite Laval, Quebec, Canada). *J. Dairy Sci.* 49, 608–11 (1966). Fractionation of milk fat by crystallization from acetone and from ethanol was compared to a method based on melting and centrifugation. Crystallization was done with solutions containing 4% fat. Six fractions were obtained at 18, 10, 2, −6, and −15C filtrate. The method based on melting and centrifugation consisted in centrifuging a partially crystallized fat solution in acetone. The lipid concentration in the solution was 83.5%. The centrifuge was a chemical centrifuge such that liquid fractions were collected as they separated from the crystallized fat. Six fractions were obtained at 0, 8, 16, 24, 32, and 40C. When compared to the crystallization method, the melting and centrifugation procedure was time-saving, permitted the fractionation of relatively large quantities of milk fat, and provided fractions showing wide differences in cloud point, iodine number, and fatty acid content.

FATTY ACID CHANGES IN BEEF, PORK AND FISH AFTER DEEP-FAT FRYING IN DIFFERENT OILS. R. A. Chung, J. A. McKay and C. L. Ramey (Tuskegee Inst., Institute, Alabama 36088). *Food Technol.* 20, 123–5 (1966). Beef rib steak, pork chop and fish cuts were broiled or deep-fat-fried in corn oil, peanut oil or lard. Beef rib steak lost more weight when deep-fat fried than when broiled. At the same time, moisture content was greater and fat content less with broiling. The weight loss in pork chop was the same after broiling and deep-fat frying, but the moisture content was greater and the fat content less after broiling. The results of the fish cuts were variable, apparently because of large variations among cuts of the same fish. The 18:2 content of beef rib steak, pork chop, and fish cuts was higher with deep-fat frying in corn oil, peanut oil or lard than with broiling. The 20:4 content in fish cuts decreased. In general, fatty acid changes were greatest in the fish cuts after deep-fat frying.

EFFECT OF IONIZING RADIATIONS ON ANTIOXIDANTS IN FATS. J. R. Chipault and G. R. Mizuno (The Hormel Institute, Univ. of Minnesota, Austin, Minn.). *J. Agr. Food Chem.* 14, 221–24 (1966). The effect of high energy radiations on several antioxidants dissolved in methyl myristate or methyl linoleate has been studied. When used at a concentration of 0.01% in methyl myristate and irradiated under vacuum, 27% of butylated hydroxyanisole, 50% of propyl gallate and all of the tocopherol were destroyed with a dose of 5 megarads. In oxygen the same dose almost completely destroyed all antioxidants. Citric acid did not protect propyl gallate from destruction. No further changes occurred during storage of vacuum-irradiated samples. Destruction was greater in methyl myristate than in methyl linoleate.

EFFECT OF IONIZING RADIATIONS ON STABILITY OF FATS. *Ibid.*, 225–9. Ambient temperature irradiation of unsaturated fats in oxygen initiates autoxidation, which continues at a rapid rate during subsequent storage in presence of oxygen. Even when autoxidants are present, irradiation almost completely eliminates the induction period of the fat. Storage under vacuum of fats irradiated in oxygen, however, results in some recovery of stability. Irradiation in vacuum decreases the stability of fats, so that when exposed to oxygen after irradiation they undergo autoxidative deterioration more easily. When fats, proteins and other food components are in intimate contact, the effect of irradiation on the stability of fats is more complex. With piecrusts, ground pork and ground beef, irradiation results in an immediate decrease in stability, partly regained during postirradiation storage. Irradiation of ground beef treated with antioxidants produced an immediate improvement in fat stability, which continued to increase during post-irradiation storage. The effect did not occur with ground pork and appears to be associated with the free glyceride fat of beef.

COMPOSITION OF MILK FAT FRACTIONS OBTAINED BY FRACTIONAL CRYSTALLIZATION FROM ACETONE. P. C. Chen and J. M. deMan (Dept. of Dairy Food and Science, Univ. of Alberta, Edmonton, Alberta, Canada). *J. Dairy Sci.* 49, 612–16 (1966). Milk fat was separated into seven fractions and a residue by fractional crystallization from acetone. A special device is described for the separation of fat crystals at controlled temperatures in a thermostat bath. The fatty acid composition of the fractions was determined by gas-liquid chromatography. The higher melting fractions were characterized by low content of short chain fatty acids and high contents of saturated ones. The intermediate fractions were similar in composition to the original fat. The low melting fractions contained high levels of short chain and unsaturated fatty acids. The trisaturated glyceride content of the milk fat was 38.4% and ranged from 67.2 to 27.2% in the fractions. The fatty acid composition of all of the trisaturated glycerides was determined. Free cholesterol accumulated in the lower melting fractions; ester cholesterol was enriched in the intermediate fractions. Partial glycerides were low in the high melting and high in the low melting fractions.

SPRAY-DRIED BUTTER AND LOSS OF VOLATILE FATTY ACIDS DURING SPRAY DRYING. A. Boudreau, T. Richardson and C. H. Amundson (Dept. of Dairy and Food Industries, Univ. of Wisconsin, Madison, Wisc. 53706). *Food Technol.* 20, 100–3 (1966). Spray-dried butter of approximately 80% fat was prepared from butter and milk solids-not-fat. Conventional spray drying resulted in loss of added flavorful volatile fatty acids from the dried buttter. Spray-drying butter containing known amounts of volatile fatty acids showed that more than two-thirds of butyric and caproic acids, approximately one-half of caprylic and capric acids, and about one-fourth of lauric acid were lost during drying. Retention of flavorful volatile fatty acids was improved by spray drying at a lower atomization pressure. Recycling of the butterfat emulsion, as done in conventional spray-drying, did not affect the loss of volatile fatty acids. Spray-drying the butterfat emulsion at pH 9 resulted in retention of the fatty acids as their sodium salts.

MONTAN WAX. G. Fenton. *Am. Ink Maker* 43 (5), 78 (4 pp.) (1965). Extracted from lignite, the composition of montan wax varies with regional deposits. It is the hardest of non-vegetable waxes and resistant to oxidation. Wax/polymer blending to achieve correct flow, oil retention and other properties is a trend in the carbon paper industry. (Rev. Current Lit. Paint Allied Ind., No. 287).

TRACE ELEMENTS IN EDIBLE FATS. IX. INFLUENCE OF DEMETALIZATION ON THE OXIDATIVE AND FLAVOR STABILITIES OF SOYBEAN OIL. A. Vioque, R. Gutierrez, M. A. Albi and N. Nosti (Inst. of Fats, Seville, Spain). *Oils Oilseeds J. (Bombay)* 18, 10–12 (1966). Crude and degummed soybean oils were demetalized by passing through columns packed with Amberlite CG-120-I cation exchange resin. These oils, after being refined, bleached and deodorized, were compared with untreated oils for oxidative and flavor stability. Treatment of oils with resin lowered metal content and increased stability as measured by oxidative and sensory tests.

NEW ANALYTICAL DATA CONCERNING OLIVE OILS. M. Colakoglu (Dept. Agriculture, Ankara, Turkey). *Rev. Franc. Corps Gras.* 13, 261–269 (1966). Gas-liquid and thin-film chromatography of the components of the unsaponifiable matter and the fatty acids of several virgin oil samples gave the following results: (1) Sterols: content varying between 0.3 and 0.5%. Beta-sitosterol (over 95%) is the major component. There is no stigmasterol. (2) Triterpenic alcohols: content about 0.10%. Cycloartenol has been identified (25%); the other components might be beta-amyrin and 24-methyl cycloartenol. (3) Tocopherols: content about 0.01–0.02%. Alpha-tocopherol is the major component, but the other tocopherols might be present also. (4) Fatty acids: Results obtained corroborate literature. A C24 fatty acid has been identified. In addition, the author has developed techniques with which one can detect sunflower and cottonseed oils in olive oil.

NEW COLUMN FOR STEAM REFINING AND DEODORIZATION OF FATS AND FOR SINGLE OR FRACTIONAL DISTILLATION OF FATTY ACIDS. F. Blomen (Univ. of Delft, Delft Holland). *Rev. Franc. Corps Gras* 13, 247–259 (1966). The author describes a new column for the continuous steam refining and deodorization of oils. The column is in effect a thin film evaporator.

COMPONENTS OF BUTTER FAT OCCURRING IN TRACES. I. ISOLATION AND IDENTIFICATION OF SATURATED ALIPHATIC LACTONES. J. Boldingh, P. Haverkamp Begeman, A. P. deJonge and R. J. Taylor (Unilever Res. Lab., Vlaardingen, Netherlands). *Rev. Franc. Corps Gras* 13, 235–246 (1966). A description is given of investigations aimed at the identification of the compounds contributing to butter flavor. Various methods of isolation, concentration and identification of the flavor components are given. Saturated delta lactones with chain lengths of 6, 8, 9, 10, 11, 12, 14, and 16 carbon atoms have been identified as components of butter fat. The C8, C10, and C12 compounds appear to be the principal contributors to butter flavor.

FRACTIONATION OF TECHNICAL MONOGLYCERIDES BY UREA. T. N. Mehta and U. K. Shrivastava (Laxminarayan Inst. of Tech., Univ. of Nagpur, India). *Indian Oil Soap J.* 31, 79–84 (1965). Esterification of lauric, myhistic, palmitic and oleic acid with glycerol was carried out in the conventional manner. The glycerol esters were then fractionated by the method of liquid-solid countercurrent distribution of urea adducts. Diglycerides formed adducts with urea in preference to monoglycerides.

ELAIDIC ACID IN ALIMENTARY OILS. G. B. Martinenghi (Italian Assoc. of Fats and Oils (AITOGA), Milan, Italy). *Oleagineux* 21, 225–229 (1966). Laboratory evidence confirms earlier reports that the elaidic acid content increases during the refiining of hexane extracted olive pomace oil. Analysis of the oil from raw to refined state indicates that (1) elaidic acid is already present in the olives and probably in their skin which is a possible demonstration of its endogenous origin, (2) elaidic acid does not seem to be formed by fermentation or antoxidation of the olive press cakes, (3) elaidic acid concentration is increased during processing especially during drying and during oil recovery from insufficiently clear miscella, (4) the presence of iron does not seem to be an important factor.

EVOLUTION IN THE PRODUCTION OF FATS OF TROPICAL ORIGIN SINCE THE INDEPENDENCE OF FRENCH SPEAKING PRODUCER STATES. X. Torre. *Oleagineux* 21, 199–202 (1966). Before 1939 the French consumer market of fats was considered a nationally self-sufficient customs unity. The war saw the birth of the Senegalese oil industry and instigated the development of metropolitan fats. Until their independence, the French territories profited from a protected tariff rate and a sure market. The author shows that the protected tariff was necessary for peanut oil alone. By virtue of the Treaty of Rome, the protection has ceased. But the war in the Congo (the world's foremost palm-oil producer) and the eventual defection of Nigeria (whom Great Britain would like to become part of the Common Market) present serious problems, that is, the free entry of fats from the Sterling zone into the European market. This paper studies in particular the case of peanuts, palm oil and copra in comparison to the world market which the newly independent states will inevitably have to face.

INVESTIGATION OF THE BEHAVIOR OF SOME EDIBLE FATS DURING REGULATED FRYING AND OVER-HEATING OPERATIONS. A. M. Leclerc, P. Ramel, J. Dumain and D. Faucquembergue (Res. of the Central Lab. of Nutr., Paris, Fr.). *Rev. Franc. Corps Gras.* 13, 175–183 (1966). The following fats (coconut, palmkernel, palm, lard and butter) were evaluated in a controlled frying test where 10 and 20 fryings of 1 kg portions of potatoes were made. The fats were also subjected to continuous heating at 200C for 24, 48 and 72 hours. The frying fats and heated fats were given a complete chemical analysis. The data corroborate and complete a previous study which show that all fats are subject to degradation. The more unsaturated the fatty acid composition of a fat, the more vulnerable the fat is to breakdown. All things being equal, degradation seems to relate more to duration of heating than it does to fat composition.

CALCIUM AND MAGNESIUM IN VEGETABLE OILS AND ANIMAL FATS. INCIDENCE DURING REFINING. R. Guillaumin and N. Drouin (Lab. of the Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 13 (3), 185–193 (1966). Atomic absorption spectroscopy was used to determine the levels of calcium and magnesium in vegetable oils and animal fats. Oils have around 500 ppm

while animal fats have around 2 ppm. During processing the levels of calcium and magnesium vary in the same way as phosphorus. Calcium and magnesium phosphatides are not hydratable. However, treatment of the oil with a mineral acid solubilizes the metals and the phosphatides will then swell with water and precipitate. Low levels of calcium and magnesium are obtained even with hard to degum oils such as linseed and soybean.

THE OIL INDUSTRY IN EGYPT. G. El Sabban. *Oleagineux* 21 (2), 109–111 (1966). A statistical review of the fat industry in Egypt.

THE EFFECT OF A LABORATORY SCALE EARTH BLEACHING PROCESS ON THE COMPOSITION OF SOAPMAKING TALLOWS. A. Allen, G. H. Padley and G. R. Whalley. *Soap, Perfumery Cosmetics* 39 (3), 207–212 (1966). The fatty acid composition of bleached tallow remains substantially the same as the unbleached stock. However, the oleic acid content is about 1–2% lower in the bleached product. A significant reduction in the free fatty acid content and peroxide value is demonstrated in the bleached tallow.

STEROLS ANALYSIS AND ITS APPLICATION TO THE STUDY OF THE COMPOSITION OF FAT MIXTURES. A. Karlskund, F. Audiau and J. P. Wolff (Lab. Wolff, Paris, Fr.). *Rev. Franc. Corps Gras* 13 (3), 165–173 (1966). Sterols, separated from unsaponifiables by almuina thin layer chromatography may be easily analyzed by gas-liquid chromatography. The GLC columns must be conditioned for several hundred hours. The sterol composition of the various fats is different and constant enough to establish characteristic ratios. These ratios may be used to study fat mixtures when gas-liquid chromatograms of the fatty acids are inconclusive. Contamination or comingling of seed oils with olive oil, lard in palmkernel oil (or vice versa) and marine oil in linseed oil (even bodied or oxidized) can be determined.

ON THE UNSAPONIFIABLE MATTER OF PEANUT OIL. V. STEROLS AND TRITERPENOID ALCOHOLS. M. Walbecq (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 13 (2), 101–108 (1966). The author has investigated the qualitative and quantitative composition of sterols and triterpenoid alcohols found in peanut oil. The author has confirmed or found the occurrence of sitosterol, campesterol, stigmasterol and cholesterol, and cycloartenol, beta-amyrin and two other triterpenoid compounds.

APPLICATIONS OF DIFFERENTIAL THERMAL ANALYSIS TO THE STUDY OF FATS. V. INVESTIGATION ON DIFFERENT OLIVE OILS. R. Perron, A. Mahieu and C. Paquot (Lab. of Lipochem. of C. N. R. S., Thrais, Fr.). *Rev. Franc. Corps Gras* 13 (2), 81–89 (1966). Differential thermal analysis, as has been previously and successfully employed on other fats, is used to distinguish between different olive oils, virgin, refined, esterified and husk. It is possible to distinguish easily between virgin oil and esterified and olive husk oil. It is more difficult to distinguish between olive husk and esterified oils.

APPARATUS FOR APPLYING SAMPLES TO THIN-LAYER CHROMATOGRAMS. T. W. Scott and J. W. U. Beeston (C.S.I.R.O., Div. of Animal Physiol., Ian Clunies Ross Animal Res. Lab., Prospect, New South Wales, Australia). *J. Lipid Res.* 7, 456–57 (1966). A simple device is described for the rapid application of samples to thin-layer plates. It permits quantitative application of relatively large lipid samples in an extremely short time. Neutral lipids of sheep thyroid were separated.

INEXPENSIVE CARTRIDGE FOR THE COLLECTION OF RADIOACTIVE METHYL ESTERS FROM GAS-LIQUID CHROMATOGRAPHS. Mildred Bennett and E. Coon (Bruce Lyon Memorial Res. Lab., Children's Hospital Med. Center of Northern California, Oakland, Calif.). *J. Lipid Res.* 7, 448–49 (1966). Glass wool was substituted for anthracene in glass cartridges designed for the collection of methylated fatty acids in the effluent stream from a gas-liquid chromatograph. Inexpensive cartridges that gave the same results as those filled with anthracene were obtained.

GAS-LIQUID CHROMATOGRAPHY OF SILYLATED MIXTURES FROM LIPOLYSIS OF TRIGLYCERIDES CONTAINING UNUSUAL FATTY ACYL GROUPS. W. H. Tallent, R. Kleiman, Diana G. Cope (Northern Reg. Res. Lab., Peoria, Illinois). *J. Lipid Res.* 7, 531–35 (1966). A convenient and rapid procedure involving methylation, silylation and temperature-programmed gas-liquid chromatography (GLC) is described for analyzing unfractionated products from the hydrolysis of triglycerides with pancreatic lipase. The conditions employed for GLC were selected to provide maximum and rapid separation of silylated monoglycerides in which the acyl moieties differ in chain length or degree of substitution with oxygen-containing functional groups. Derivatives differing only in the number of double bonds present were not separated. In the GLC curves obtained, peaks representing methyl esters are generally readily distinguishable from those of other components. Therefore, the extent of lipolysis and the composition (with respect to chain length and substitution of acyl groups) of monoglycerides formed are determined simultaneously. The accuracy of the new method was demonstrated with standard mixtures and by comparison of results for several lipolysis products with data obtained by conventional procedures.

IMPROVED CONDITIONS FOR GAS-LIQUID CHROMATOGRAPHY OF TRIGLYCERIDES. A. Kuksis and W. C. Breckenridge (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Canada). *J. Lipid Res.* 7, 576–79 (1966). Improved conditions for gas-liquid chromatography of triglycerides are reported. Triglycerides of bovine colostrum and rapeseed oil have been analyzed under these conditions.

SIMPLE CHARRING METHOD FOR DETERMINATION OF LIPIDS. J. B. Marsh and D. B. Weinstein (Depts. of Biochem., School of Dental Med., Univ. of Pennsylvania, Philadelphia, Penna.). *J Lipid Res.* 7, 574–76 (1966). A rapid method is described for charring 5 to 300 μg of lipids (with concentrated sulfuric acid in a test tube) and estimating them with a reproducibility of $\pm$ 1%.

DETERMINATION OF FATTY ACID CONTENT AND COMPOSITION IN ULTRAMICRO LIPID SAMPLES BY GAS-LIQUID CHROMATOGRAPHY. F. M. Archibald and V. P. Skipski (Div. of Exper. Chemotherapy, Sloan-Kettering Inst. for Cancer Res., Rye, New York). *J. Lipid Res.* 7, 442–45 (1966). Simplified quantitative manipulations of very small amounts (30μg) of lipids for determination of fatty acid content and composition by gas-liquid chromatography after (a) methanolysis (b) reduction and acetylation are described.

ISOLATION OF GERANYL GERANIOL FROM THE UNSAPONIFIABLE FRACTION OF LINSEED OIL. E. Fedeli, P. Capella, M. Cirimele, and G. Jacini (Stazione Sperimentale per gli Oli e Grassi, Milan, and Centro Nazionale per la Biochimica del C.N.R., Milan, Italy). *J. Lipid Res.*, 7, 437–41 (1966). From the unsaponifiable fraction (63 g) of linseed oil (25 kg), two terpenic alcohols were isolated by alumina column, thin-layer and gas-liquid chroma-

tography. They were identified as phytol and geranyl geraniol (a precursor of bi- and tricyclic diterpenes) by infrared and nuclear magnetic resonance spectroscopy, ozonlysis and mass spectrometry.

DIOL LIPIDS. L. D. Bergelson, V. A. Vaver, N. V. Prokazova, A. N. Ushakov and G. A. Popkova (Inst. for Chem. of Natural Products, Acad, of Sciences of the U.S.S.R., Moscow, U.S.S.R.). *Biochim. Biophys. Acta* **116**, 511–20 (1966). Neutral fats of animal, plant and microbial origin contain minor amounts of two new types of lipids: long-chain diesters of dihydric alcohols and 1-alkenyl ethers of their monoesters. These lipids are not usually separated from triglycerides by column or thin-layer chromatography, but may be detected by high-temperature gas-liquid chromatography. Among the dihydric alcohols entering into the composition of neutral lipids from corn seeds, soil yeasts (Lipomyces sp.) and rat liver, ethylene glycol, propane-1,2-diol, propane-1,3-diol, butane-1,3-diol and butane-1,4-diol were identified. The new class of lipids, for which the general term diol lipids is suggested, is apparently widespread in nature.

SHORTENING COMPOSITION. T. J. Weiss (Swift & Co.). *U. S. 3,230,090.* A substantially water-free shortening agent comprises: a major amount of a triglyceride material having shortening properties and a small amount, sufficient to improve the creaming properties of the shortening, of surface-active higher fatty acid esters of polyglycerols and a coupling agent to disperse the surface-active agent in the shortening. The coupling agent is selected from the group consisting of monohydric aliphatic alcohols of 2-4 carbons, alkylene glycols of 2-6 carbons, and polyoxyalkylene compositions characterized by the structure: $R—OCH_2CH_2O-(CH_2CH_2O)_xH$ in which R is hydrogen or a lower alkyl radical of 1–4 carbons and x is 1–7.

METHOD OF REPURIFYING COOKING OILS USED IN DEEP-FAT FRYING OPERATIONS. E. F. Hoover (Wise Potato Chip Co.). *U.S. 3,231,390.* Described is a process for the purification of used vegetable cooking oils which have a free fatty acid content in excess of 0.20% and a smoke point from 340–370F. The oils are mixed with an adsorbent material at atmospheric pressures in an amount of 2–7% by weight at temperatures of 68–356F for a period of 3–15 minutes. The adsorbent is selected from the group consisting of an alkaline earth metal carbonate or oxide. The adsorbent is removed from the oils by mechanical agents at the completion of the reaction to give oils with a free fatty acid content below 0.10% and smoke point in excess of 410F.

PROCESS FOR HYDROLYSIS OF FATS AND OILS. K. E. Lunde (Carad Corp.). *U.S. 3,253,007.* The process comprises forming the fat into a substantially liquid phase having a linear velocity ranging from 10^1 to 10^5 feet per hour, contacting the liquid phase with a gas phase containing water and having a linear velocity ranging from 10^3 to 10^6 feet per hour to perturb the liquid phase and to thereby induce extreme turbulence in the liquid phase and to cause flow of the gas and liquid phases in the slug and annular regions, and heating the liquid phase while it is being contacted by the gas phase to cause relatively rapid hydrolysis of the fat in the liquid phase.

PLASTIC SHORTENING. L. H. Going and R. D. Dobson (Procter & Gamble Co.). *U.S. 3,253,927.* A shortening comprises by weight (a) from 50–95% glyceride base stock having an iodine value of 50–130 and (b) from 5–50% substantially completely hydrogenated triglyceride hardstock having an iodine value not exceeding 12. The hardstock consists of *beta*-phase-tending hardstock and *non-beta*-phase-tending hardstock in a weight ratio of from 9:1 to 1:1. The shortening is rapidly chilled from a melted mixture of components (a) and (b) to a temperature of from 55–90F and converted to a rigidly interlocking structure of predominantly *beta*-phase crystals. The shortening maintains its plastic consistency and spreadability for extended storage periods.

STORAGE-STABLE NON-FIRMING ICING AND SHORTENING UTILIZED THEREIN. W. T. Bedenk and R. D. Dobson (Procter & Gamble Co.). *U.S. 3,253,928.* A plastic shortening adapted to serve as a shortening component of a non-firming and non-hardening storage-stable icing comprising sugar, water, and shortening, consists of 55–75% by weight of partially hydrogenated glyceride base stock having an iodine value of from 50–110 and 25–45% of hydrogenated triglyceride hardstock having an iodine value not exceeding 12. At least 70% of the shortening is in a *beta*-phase.

METHOD OF PREPARING HIGH SHORTENING-CONTAINING PASTRY MIX. E. E. Colby (Procter & Gamble Co.). *U.S. 3,257,213.* The method of making a non-sticky, free-flowing, granular pastry

mix comprises the following steps: forming by mechanical agitation a mixture consisting of flour and shortening in a weight ratio ranging from 1:1 to 4:1 and water in an amount ranging from 1/2 to 5 times the weight of the flour and sufficient to form a homogeneous slurry without the development of gluten at a temperature above the melting point of the shortening but below the gelatinization point of the flour; then atomizing the slurry through a high pressure nozzle directly into a spray drying chamber of circulating hot gases having an inlet-gas temperature of 300–500F and an outlet-gas temperature less than 180F to form discrete, substantially dry granules having a moisture content ranging from 4–10% and a matrix consisting of flour with shortening dispersed throughout the matrix.

EMULSIFIABLE DERIVATIVES OF NATURAL WAXES. K. Motiuk and L. I. Conrad (American Cholesterol Products, Inc.). *U.S. 3,257,329.* A new composition of matter especially suitable as an additive in oils and oil-wax mixtures consists of an ester wax of natural origin, a wax-like substance in which acyl groups of the ester wax have been replaced by acyl groups of an aliphatic acid (the acyl groups of the aliphatic acid having lower molecular weight than the acyl groups of the ester wax), and soaps of free acids formed from acyl groups of the ester wax which have been displaced from the ester wax. One example of such a composition contains beeswax as the ester wax of natural origin and acetic acid as the aliphatic acid.

SOLVENT EXTRACTION OF EPOXIDIZED OILS. D. S. Darrow (Swift & Co.). *U.S. 3,254,097.* A process for treating oxirane substituted higher fatty materials containing highly epoxidized triglycerides and less higly epoxidized triglycerides comprises: contactng the materials with a liquid lower aliphatic hydrocarbon solvent in which the less highly epoxidized materials are soluble, the solvent being selected from the group consisting of propane, butane, pentane, hexane, heptane, and octane, and mixtures thereof, and separating the solution of the less highly epoxidized triglycerides from the insoluble more highly epoxidized triglycerides.

PROCESS FOR REMOVING STILBENE FROM TALL OIL FATTY ACIDS. A. F. Wicke, Jr., H. E. McLaughlin, and J. H. Stump, Jr. (Tenneco Chemicals, Inc.). *U.S. 3,257,438.* The described process comprises contacting the tall oil fatty acids and boron trifluoride catalyst, separating the catalyst from the tall oil fatty acids, and then heating and distilling the tall oil fatty acids at a temperature below 310C and separating a tall oil fatty acid product fraction of distillate from a higher boiling fraction containing a substantial amount of the stilbene compound originally present.

• Fatty Acid Derivatives

APPLICATION OF LIQUID-LIQUID EXTRACTION FOR THE PRODUCTION OF MONOGLYCERIDES OF FATTY ACIDS. J. P. Martin (Univ. of Paris, Paris, Fr.). *Oleagineaux* 21 (2), 95–99 (1966). Commercial 40–42% monoglycerides were extracted with methanol to obtain an extract which was as high as 75% monoglyceride. The author used the diagrams of Janecke to represent his results and to predict optimum conditions.

ON OBTAINING THE HYDROXY ALLYLIC DERIVATIVES OF MONOUNSATURATED FATTY CHAINS. II. OXIDATION BY SELENIUM DIOXIDE. A. Tubul-Peretz, M. Noudet and E. Ucciani (Lab. of Fat and Oils Chem., Marseille, Fr.). *Rev. Franc. Corps Gras* 13 (3), 153–163 (1966). Hydroxy allylic unsaturated acids were obtained by oxidation of oleic acid with selenium dioxide. The influence of time, temperature, concentration, amount of selenium dioxide, solvent type (acetic acid-acetic anhydride, benzene, toluene, chloroform) were studied to determine the characteristics of the reaction products. Optimum conditions appear to be: acetic acid-acetic anhydride (2/3), 70C and 4 hours. The yield of hydroxy allylic material was 54.8%. The unfractionated reaction product is a mixture of unreacted oleic acid mono and dehydroxyelaidic acid, mono and dihydroxystearic acid, cetoelaidic, conjugated isolinelaidic and palmitic acid.

SYNTHESIS AND CHARACTERIZATION OF 3-KETOHEXADECANOIC ACID-1-C^{14}, DL-3-HYDROXYHEXADECANOIC ACID-1-C^{14}, AND TRANS-2-HEXADECANOIC ACID-1-C^{14}. J. A. Jones and M. Belcher (Dept. of Biochem., Schools of Med. and Dentistry, Georgetown Univ., Washington, D.C.). *J. Lipid Res.* 7, 422–6 (1966). The chemical synthesis and characterization of three intermediates in the β oxidation of palmitic acid-1-C^{14} by rat liver mitochondria,

namely, 3-ketohexadecanoic acid-1-C^{14}, DL-3-hydroxyhexadecanoic acid-1-C^{14}, and *trans*-2-hexadecenoic acid-1-C^{14}, are described.

ALKOXYLIPIDS. I. PREPARATION AND CHARACTERIZATION OF ALKOXY-DIGLYCERIDES AND DIALKOXY-GLYCERIDES. W. J. Baumann and H. K. Mangold (Univ. of Minnesota, The Hormel Institute, Austin, Minn.). *Biochim. Biophys. Acta* **116**, 570–76 (1966). Aloxy-diglycerides (3-alkoxy-1,2-di-O-acyl-propanediols) and dialkoxy-glycerides (2,3-dialkoxy-1-O-acyl-propanols) were prepared from the corresponding glyceryl ethers by reaction with acid chlorides in benzene-pyridine solution. The physical properties of these alkoxylipids are described, and their occurrence in nature is demonstrated.

SYNTHESIS OF LONG-CHAIN ALKYL AND ALKENYL BROMIDES. W. J. Baumann and H. K. Mangold (Univ. of Minnesota, The Hormel Institute, Austin, Minn.). *J. Lipid Res.* **7**, 568–69 (1966). Long-chain alkyl and alkenyl bromides are obtained in quantitative yields by the reaction of methane-sulfonates with anhydrous magnesium bromide in absolute ether; *cis-trans* isomerization of double bonds does not occur.

PREPARATION AND CHEMISTRY OF EPOXY ALCOHOLS. K. Allison, P. Johnson, G. Foster and M. B. Sparke (BP Res. Centre, The British Petroleum Co., Ltd., Chertsy Rd., Sunbury-on-Thames, Middlesex, England). *I & EC Product Res. & Dev.* **5**, 166–73 (1966). A new reaction has been discovered in which allylic hydroperoxides formed by olefin autoxidation are catalytically rearranged to epoxy alcohols. Epoxy alcohol-forming catalysts are transition elements of Groups 4, 5 and 6 of the Periodic Table and their compounds, excluding chromium. Vanadium, molybdenum and tungsten compounds are especially active. The epoxy alcohols can be produced either by a two-step process in which the hydroperoxides are formed and rearranged in separate steps, or in a single step by olefin autoxidation in the presence of an epoxy alcohol-forming catalyst. A range of olefins has been investigated. High yields (90 to 100 weight %) of a mixture of two epoxy alcohols—2-methyl-3,4-epoxypentan-2-ol (I) and 4-methyl-3,4-epoxypentan-2-ol (II)—have been realized with 4-methyl-2-pentene, and a wide range of derivatives of potential commercial utility has been prepared from I and II by reaction at both the epoxide and hydroxyl groups.

PRESSURIZED DESSERT TOPPINGS. S. W. Thompson (Lever Bros. Co.). *U.S. 3,230,091.* An edible composition confined under pressure in an aerosol dispensing container comprises a base fat, a protein, a sweetening agent, and an emulsifier which consists of fatty acid glycerides and lactylated glycerol esters. The composition is capable of being dispensed from the pressurized container to provide an aerosol whipped topping.

PRODUCTION OF DETONATABLE EXPLOSIVE EMULSION PREPARAT.ONS. A. Berthmann, C. Franze, and P. Lingens (Dynamit Nobel Aktiengesellschaft, Cologne). *U.S. 3,231,437.* The described emulsion preparation consists of a water-in-oil emulsion of 21–72% by weight water, 0.05–5% emulsifier, nitroglycerine, and collodion cotton or polyvinyl acetate stabilizer. The emulsifier is selected from the group consisting of glycerine-stearates, alkyl esters of abietic acid, metal salts of abietic acid, polyglycol ethers of ethylene oxide, adducts of higher fatty amines and ethylene oxide, polyvinyl alcohols, esters of long chain fatty acids and higher alcohols, mixtures of the above, and metal salts of long chain fatty acids.

INSTANT PUDDING COMPOSITION CONTAINING AN ACETYLATED MONOGLYCERIDE OF A HIGHER FATTY ACID. O. N. Breivik, W. Slupatchuk, R. J. Carbonell and G. Weiss (Standard Brands, Inc.). *U.S. 3,231,391.* A composition for use in preparing an instant pudding comprises a phosphate milk protein coagulating agent, a pudding stiffening agent, and a small amount of an acetylated monoglyceride of a higher fatty acid sufficient to substantially reduce the amount of foaming when the composition is whipped with cold milk.

TOPPING MIXES AND THEIR METHOD OF PREPARATION. J. J. Miles, Jr., M. Pader and S. W. Thompson (Lever Bros. Co.). *U.S. 3,251,696.* A whippable topping composition for preparing a whipped topping which is similar to whipped cream and which has a high per cent overrun, comprises a base fat, a sweetening agent, a water dispersible protein and an emulsifying agent, the emulsifying agent comprising a mixture of lactylated glycerol esters of a fatty acid selected from the group consisting of palmitic and stearic acids, and a lactylated glyceryl oleate.

COSMETIC PAINTS, PARTICULARLY FOR EYELASHES AND EYEBROWS. Helen Kambersky (Vienna). *U.S. 3,251,740.* The described mascara contains (% by weight): wax, 20–40; turpentine, 10–24; an emulsifier selected from the group consisting of the higher fatty alcohols, the sulfonates thereof, and mixtures of

the alcohols and sulfonates, 5–15; linseed oil, 5–15; non-drying fatty oil, 1–10; water, 20–50; and non-toxic pigmentation. The mascara is an aqueous emulsion having a pasty consistency and is acceptable to the eyelash portions of the eyelids without causing irritation of the mucous membranes of the eyelids or irritation of the eye.

POLYMERIC FATTY ACID COMPOSITION AND METHOD OF MAKING SAME. S. T. Putnam, R. M. Speck and C. A. Weisgerber (Hercules Powder Co.). *U.S. 3,251,869.* A polymeric fatty acid composition is obtained by heating unsaturated fatty acids with 0.1–2.0% by weight (on weight of fatty acids) of iodine and from 1–25% of a crystalline clay catalyst at temperatures from 180–300C and at pressures from atmospheric to 5000 p.s.i. for a period of 1–6 hours.

METHOD OF FORMING MONOGLYCERIDES OF CARBOXYLIC ACIDS. G. Dalby. *U.S. 3,251,870.* A process of forming a monoglyceride of a carboxylic acid comprises mixing glycidol with a carboxylic acid of not less than 3 carbon atoms and of not more than 18 carbon atoms and not more than 3 carboxyl groups in the ratio of one mol of glycidol for each carboxyl of one mol of the acid and maintaining the temperature of the mixture sufficiently high to melt the acid during the reaction between the glycidol and the acid.

PREPARATION OF AMIDES OF HIGHER FATTY ACIDS. J. E. Davis (Procter & Gamble Co.). *U.S. 3,253,006.* The process of preparing a normal amide of a fatty acid having from 8 to 18 carbon atoms comprises reacting, with agitation, a material selected from the group consisting of (1) fatty acids having 8–18 carbons, (2) the anhydrides of such fatty acids and (3) the ester of such fatty acids, with alcohols selected from the group consisting of methyl, ethyl, propyl and butyl alcohols with ammonia in the presence of water in an amount from about 50–200% of the amount of water needed to saturate the equilibrium reaction mixture, at a temperature of 320–550F and a pressure of more than 1000 pounds per square inch gauge. The temperature and pressure are adjusted to provide a maximum concentration of ammonia in the liquid fatty phase of the reaction mixture.

POLYMERIZABLE FATTY COMPOUNDS BEARING VICINAL HALOGEN-ACRYLOXY-GROUPS. C. S. Nevin (A. E. Staley Mfg. Co.). *U.S. 3,255,133.* Described is a polymerizable long chain fatty acid ester having an esterified fatty acid chain of from 10 to 24 carbon atoms in which the aliphatic fatty acid chain contains vicinal acryloxy and halo substituents, the acryloxy substituent having the structure OOC—CA=CHY in which Y is selected from the group consisting of hydrogen and -$COOR_1$. When Y is hydrogen, A is selected from the group consisting of hydrogen, halogen, alkyl of from 1 to 4 carbon atoms, phenyl, benzyl and -CH_2COOR_1. When Y is -$COOR_1$, A is selected from the group consisting of hydrogen, halogen and alkyl of from 1 to 4 carbon atoms. R_1 is an organic radical of 1 to 18 carbon atoms.

AMIDOALKYLAMINE GLYCERIDE WAX. H. H. Young and K. H. Spitzmueller (Swift and Co.). *U.S. 3,255,219.* A waxlike glyceride is prepared by reacting a monoamide of a C_{10}-C_{28} fatty acid and an alkylene polyamine consisting of 2–18 carbons and 2–10 nitrogens with a fatty composition selected from the groups consisting of epoxidized glycerides and halohydroxylated glycerides. The reaction is conducted at a temperature between 100 and 200C for about 1–5 hours.

SILVER SALT COMPLEXES OF FATTY ACIDS AND METHOD OF MAKING SAME. C. Horowitz (Yardney International Corp.). *U.S. 3,255,222.* A method of producing an antimicrobial composition comprises the following steps: directly reacting solid silver oxide with an undiluted liquid fatty acid such as caproic, caprylic, hexanoic, undecylenic, stearic or capric in a solvent-free environment. The acid is present in a molar quantity exceeding one mole of the acid per mole of silver in the silver oxide. The silver/acid product thus produced is then dissolved in an aqueous medium.

METHOD OF PREPARING STABLE SILVER-CONTAINING COMPOSITIONS. H. Groh (Yardney International Corp.). *U.S. 3,255,223.* A method of preparing a stable antimicrobial composition comprises the steps of reacting a metal oxide (silver, gold, mercury, or zinc oxide) directly with a fatty acid having a carbon chain of 5 to 30 carbons to produce the corresponding metal salt of the fatty acid; dissolving the metal salt in an approximately 5–29.5% aqueous ammonia solution; and separating solids from the solution.

POLYMERIC FAT ACIDS AND PROCESS FOR MAKING THEM. E. M. Fischer and F. M. Linn (General Mills, Inc.). *U.S. 3,256,304.* Described is a clay polymerized and hydrogenated monocarboxylic aliphatic acid having a hydrocarbon chain of 8 to 24 carbon atoms and having a photometric color not less than 90%.

LECITHIN COMPOSITION. R. A. Jameston and R. A. Eversole (Cargill, Inc.). *U.S. 3,257,331.* A water-dispersible lecithin composition comprises from 2–20% by weight of a polyethoxylated interesterified triglyceride oil containing at least 10 moles of ethylene oxide per mol of triglyceride oil, the triglyceride oil being interesterified with 3–30% of polyhydric alcohol. The remainder of the composition is lecithin.

FILM-FORMING ORGANOMETALLIC DERIVATIVES OF FATTY ACIDS. R. N. Faulkner and L. A. O'Neill (Secretary of Agr., U.S.A.). *U.S. 3,258,475.* Linseed acetoacetates are formed by fractionally distilling under nitrogen a toluene solution containing linseed alcohols and excess ethylacetoacetate until pure toluene begins to distill therefrom. The mixed linseed acetoacetates are purified and are then reacted, in toluene solution, with a toluene solution of a metal isopropoxide (aluminum tri-isopropoxide or titanium tetra-isopropoxide) to form an isopropoxy mixed linseed acetoacetate complex of the metal. The byproduct, isopropanol, is distilled off under nitrogen.

• Biochemistry and Nutrition

LIPID MONOLAYERS: ACTION OF PHOSPHOLIPASE A OF CROTALUS ATROX AND NAJA NAJA VENOMS ON PHOSPHATIDYL CHOLINE AND PHOSPHATIDAL CHOLINE. G. Colacicco and M. M. Rapport (Dept. of Biochem., Albert Einstein College of Med., Yeshiva Univ., Bronx, N. Y.). *J. Lipid Res.* **7**, 258–63 (1966). The activity of phospholipase A on phosphatidyl choline and phosphatidal choline spread as monolayers on phosphate buffers containing snake venom (*Crotalis atrox* or *Naja naja*) was studied by measuring the fall of surface potential as a function of time, pH, film pressure, temperature and concentrations of phosphate and venom. At 25C, pH 7.0, and 0.2 μg of venom per ml, optimal activity was observed with both venoms on both substrates at 12 dynes/cm film pressure on 0.04 M phosphate. Under these conditions, the pH optimum for *C. atrox* was broad (6.6–7.4) and that for *N. naja* was sharp (8.0) for the action on phosphatidyl choline, whereas both venoms had a sharp optimum at pH 8.0 in their action on phosphatidal choline. The optimal temperature with phosphatidyl choline was 27.5C for *N. naja* and 40C for *C. atrox*. In line with studies of phospholipase A activity in bulk phase in ether, phosphatidal choline was attacked much more slowly than phosphatidyl choline by *C. atrox*. Under conditions where both venoms had equal activity on phosphatidyl choline, *C. atrox* was only half as active as *N. naja* on phosphatidal choline. The studies suggest that the linkage of the hydrophobic chains in glycerophosphatides may affect their interaction with proteins.

METABOLISM OF HEPATIC AND PLASMA TRIGLYCERIDES IN RABBITS GIVEN ETHANOL OR ETHIONINE. A. Bezman-Tarcher, P. J. Nestel, J. M. Felts and R. J. Havel (Cardiovas. Res. Inst. and Dept. of Med., Univ. of Cal. School of Med., San Francisco, Cal.). *J. Lipid Res.* **7**, 248–57 (1966). The formation and transport of hepatic triglyceride fatty acids (TGFA) were studied after intravenous administration of palmitate-1-C^{14} or palmitate-9,10 H^3 in rabbits pretreated with ethanol or ethionine. Administration of ethanol produced significant hypertriglyceridemia without consistent accumulation of hepatic fat. The isotopic studies suggest that plasma free fatty acids were the major precursors of TGFA in $d < 1.006$ lipoproteins and that fatty acids synthesized in the liver were not the source of the hypertriglyceridemia in the ethanol-treated animals. Administration of ethionine resulted in an increased concentration of TGFA in the liver, a decreased level of TGFA in $d < 1.006$ lipoproteins and a very low specific activity in this plasma fraction. These findings suggest that the development of fatty liver after administration of ethionine is in part accompanied by impaired release of TGFA from the liver.

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PHOSPHOLIPIDS OF RAT TISSUES AFTER FEEDING PURE PHOSPHATIDYL ETHANOLAMINE AND LECITHIN. N. F. Maclagan, J. D. Billimoria and Carolyn Howell (Dept. of Chem. Pathol., Westminster Med. School, London, Eng.). *J. Lipid Res.* **7**, 242–7 (1966). Pure phosphatidyl ethanolamine and lecithin from egg yolks were fed to rats in saline or in olive oil and the changes in individual phospholipids in the intestinal wall, liver and plasma of the animals were studied. Ingestion of olive oil alone produced increased levels of all phospholipid fractions in each of the three tissues. Feeding phosphatidyl ethanolamine in saline resulted in slightly increased plasma phospholipids, but levels of liver total phospholipids were greatly reduced; when phosphatidyl ethanolamine was fed with olive oil, liver phospholipids were again reduced but this reduction was confined to the phosphatidyl ethanolamine and phosphatidic acid fractions. Feeding lecithin alone did not produce significant changes in levels of plasma or tissue phospholipids. The results suggest that liver phospholipid synthesis is depressed by feeding phosphatidyl ethanolamine; in the presence of olive oil, hepatic synthesis of phosphatidyl ethanolamine seems to be more selectively inhibited.

PARTIAL PURIFICATION OF MONOGLYCERIDE LIPASE FROM ADIPOSE TISSUE. F. P. Kupiecki (Res. Div., The Upjohn Co. Kalamazoo, Mich.). *J. Lipid Res.* **7**, 230–5 (1966). A monoglyceride lipase was partly purified from extracts of rat adipose tissue by ammonium sulfate fractionation, alcohol precipitation and lyophilization, or by ammonium sulfate fractionation, sodium deoxycholate treatment, and a second ammonium sulfate fractionation. Partial purification and heat denaturation showed the lipase to be different from tributyrinase and from an enzyme(s) which hydrolyzes diglycerides and triglycerides. Although the best preparation hydrolyzed monobutyrin this activity decreased with purification, indicating that the enzyme acts on insoluble substrates and is therefore a lipase and not an esterase. Furthermore, classification of the enzyme as a lipase is consistent also with its behavior with inhibitors, since low concentrations of esterase inhibitors, e.g., fluoride, sodium deoxycholate and physostigmine did not inhibit lipolytic activity. Inhibition studies with EDTA, sodium pyrophosphate, protamine and fluoride showed that the enzyme differs from clearing factor lipase. The enzyme catalyzed hydrolysis of monostearin in the pH range 6.3–9.0, with a maximum at 7.4–7.6.

ABSORPTION, TRANSPORT AND STORAGE OF RETINYL-15-C^{14} PALMITATE-9,10-H^3 IN THE RAT. C. W. Lawrence, F. D. Crain, F. J. Lotspeich and R. F. Krause (Dept. of Biochem., W. Va. Univ. Med. Center, Morgantown, W. Va.). *J. Lipid Res.* **7**, 226–9 (1966). Retinyl-15-C^{14}-palmitate-9,10-H^3 was fed to rats in order to study hydrolysis and reesterification of this ester during digestion, absorption, transportation and storage. After administration there was a progressive increase in the C^{14}/H^3 ratio of the retinyl esters as they moved from intestinal contents to intestinal mucosa, lymph and liver, which indicates that repeated hydrolysis and reesterification occur during the digestion and assimilation of this ester.

DESATURATION OF FATTY ACIDS IN SEEDS OF HIGHER PLANTS. H. J. Dutton and T. L. Mounts (Northern Reg. Res. Lab., Peoria, Ill.). *J. Lipid Res.* **7**, 221–25 (1966). Photosynthesizing flax, soybean, and safflower plants were exposed to $C^{14}O_2$ at seed-setting stage for a 1 hr period. Seed was sampled periodically thereafter and the lipids were extracted. A triglyceride-rich fraction was methanolyzed; the resultant methyl esters were analyzed by gas-liquid chromatography and assayed for radioactivity. Of the C_{18} unsaturated acids, oleic was the first to acquire radioactivity, which subsequently and successively appeared in linoleic and linolenic acids. The shapes of the radioactivity-time curves provide evidence that consecutive desaturation reactions occur in the seeds of these higher plants.

LIPID TRANSFER BETWEEN HUMAN SERUM HIGH DENSITY LIPOPROTEINS AND EGG YOLK LIPOPROTEINS IN INCUBATION MIXTURES. A. V. Nichols and Elaine Coggiola (Donner Lab., Lawrence Radiation Lab, Univ of Calif., Berkeley, Calif.). *J. Lipid Res.* **7**, 215–20 (1966). Ultracentrifugally isolated human serum high density lipoproteins of d 1.063–1.21 (HDL) were incubated with egg yolk lipoproteins of d 1.006 for up to 24 hr at various concentrations. Transfer of HDL cholesterol esters to egg yolk lipoproteins occurred simultaneously with transfer of glycerides from egg yolk lipoproteins to HDL. These observations show that exchange of lipids can take place between lipoproteins in the absence of other serum proteins and enzymes. The mole ratios of HDL cholesterol esters to glycerides approached an integral value of 1:1 during the course of the incubation. These results suggest that lipid components form complexes within the HDL structure.

ABNORMALITIES OF LIPID METABOLISM IN THE VITAMIN E-DEFICIENT MONKEY. M. D. Morris, C. D. Fitch and Evelyn Cross (Dept. of Biochem., Univ. of Arkansas School of Med., Little Rock, Ark.). *J. Lipid Res.* **7**, 210–14 (1966). A soybean protein diet was used to induce vitamin E deficiency in rhesus monkeys. The deficient monkeys had reduced triglyceride concentrations in liver and skeletal muscle, but the cholesterol concentration in their skeletal muscle was increased. A constant amount of radioactivity labeled H^3-cholesterol-7-α-H^3 was fed daily for 48–114 days to control and vitamin E-deficient monkeys to study the relationship between plasma, liver and skeletal muscle cholesterol. Plasma cholesterol reached constant, maximum specific activity by the 42nd day both in control and in vitamin E-deficient monkeys. In control and previously deficient vitamin E-treated monkeys the specific activity of cholesterol in liver and skeletal muscle was approximately equal to that of plasma. In vitamin E-deficient monkeys the liver cholesterol specific activity was equal to that of plasma cholesterol, but the ratio of skeletal muscle cholesterol specific activity to plasma cholesterol specific activity was reduced. It is concluded from these studies that there is a specific defect(s) in cholesterol metabolism in the skeletal muscle of vitamin E-deficient monkeys.

INCORPORATION OF ACETATE-1-C^{14} INTO LIPID BY THE PERFUSED LIVER OF NORMAL, X-IRRADIATED, OR PARTIALLY HEPATECTOMIZED RATS. G. G. Bartsch and G. B. Gerber (Physiologisch-Chemisches Institut der Universitat, Cologne, Germany). *J. Lipid Res.* **7**, 204–09 (1966). In order to study lipid metabolism in the liver without interference due to transport from and to the liver, the isolated livers of normal, X-irradiated and partially hepatectomized rats were perfused with acetate-1-C^{14} and the distribution of radioactivity in total lipids, total fatty acids, individual lipids and fatty acids of individual lipids was determined. In X-irradiated animals an increased incorporation of acetate into many lipids, particularly into cholesterol, was observed. Lipids in the liver of the partially hepatectomized rats exhibited a marked increase in triglyceride content together with a decreased rate of incorporation into all but the phospholipid fractions. It is concluded that the increase usually observed in lipid content of the regenerating liver is due to the changes in transport rather than to changes in synthesis. The changes observed in irradiated liver could be the result of alterations in the metabolism of precursors common to most lipids.

MOVEMENT OF LIPIDS INTO AND OUT OF THE BLOOD DURING HYPERLIPIDEMIA INDUCED IN RABBITS BY PITUITARY EXTRACT AND FRACTION H. R. L. Hirsch, D. Rudman and Rosemary Travers (Dept. of Pathology and Med., College of Physicians & Surgeons, Columbia Univ., New York, N.Y.). *J. Lipid Res.* **7**, 182–7 (1966). Rabbits were rendered hyperlipidemic by the subcutaneous injection of an alkaline aqueous extract of mammalian pituitary gland or a partially purified, concentrated fraction derived therefrom, designated Fraction H. Eight hours after the injection of Fraction H, arteriovenous (A-V) differences in plasma triglyceride (TG) were measured across five body areas. A consistent negative A-V difference in plasma free fatty acid concentration (net increase) was found across kidney 7–12 hr after injection, suggesting that the kidney hydrolyzes its accumulated TG and mobilizes it in the form of free fatty acids.

THE SYNTHESIS OF 15-HEXADECENOIC ACID-1-C^{14} AND ITS METABOLISM IN THE RAT. W. G. Knipprath and J. F. Mead (Dept. of Biophys. and Nuclear Med., School of Med., Univ. of Calif., Los Angeles, Calif.). *Biochim. Biophys. Acta* **116**, 198–204 (1966). 15-Hexadecenoic acid has been synthesized from commercially available 15-bromo-9-hexadecenoic acid by pyrolysis of methyl-15-acetoxypalmitate. Labeling of the acid in the carboxyl group with C^{14} was achieved by decarboxylation and reaction with C^{14}-labeled potassium cyanide. The 15-hexadecenoic acid-1-C^{14} was fed to adult rats. Isolation and characterization of the fatty acids from the organs revealed oxidative degradation to be the predominant metabolic fate of the fed material. There was no evidence for further desaturation or chain extension of the acid, but biohydrogenation of the terminal double bond could not be ruled out.

METABOLISM OF CYCLOPROPANE FATTY ACIDS. OXIDATION OF *cis*-9,10-METHYLENE HEXADECANOIC AND *cis*-9,10-METHYLENE OCTADECANOIC ACIDS BY RAT LIVER MITOCHONDRIA. A. E. Chung (Univ. of Col., School of Med., Dept. of Biochem., Denver,

Colo.). *Biochim. Biophys. Acta* 116, 205–13 (1966). Rat liver mitochondria were incubated with *cis*-9,10-methylene hexadecanoic or *cis*-9,10-methylene octadecanoic acids. The mitochondria converted these long chain cyclopropane fatty acids to short-chain cyclopropane fatty acids. The methylene carbon of the cyclopropane ring of *cis*-9,10-methylene hexadecanoic acid was not converted to CO_2.

STIMULATION OF FATTY ACID BIOSYNTHESIS BY PREINCUBATION WITH MITOCHONDRIA. D. B. Martin and J. G. Pittman (Dept. of Med., Harvard Med. School, Mass. Gen. Hosp., Boston, Mass.). *Biochim. Biophys. Acta* 116, 214–9 (1966). Preincubation of rat-liver mitochondria with isolated fatty acid-synthesizing systems from rat liver or adipose tissue stimulates long-chain fatty acid synthesis in a manner other than the provision of cofactors necessary for the enzymatic steps. This effect is similar to stimulation by citrate in (a) occurring at the same enzymatic site, (b) having similar requirements, and (c) having similar products. The identity of the stimulatory factor is under investigation.

INSULIN AND ESTROGEN REGULATION OF LIPID SYNTHESIS IN ADIPOSE TISSUE. Kay E. Gilmour and K. W. McKerns (Dept. of Obstetrics and Gynecology, College of Med., Univ. of Florida, Gainesville, Fla.). *Biochim. Biophys. Acta* 116, 220–8 (1966). The addition of estrone, estradiol and estriol at extremely low levels (10–9 μmoles/ml) stimulates the synthesis of tritium-labeled lipids from glucose-1-H^3 by sections of adipose tissue of the female rat *in vitro*. There is a marked synergistic action of estradiol with insulin on the stimulation of lipid synthesis from glucose by the adipose tissue of the female rat. The adipose tissue of the male rat fails to respond to estrogen *in vitro* but is stimulated by insulin. Other steroid hormones such as cortisol, progesterone, dehydroepiandrosterone and testosterone were without significant effect on the synthesis of lipid from glucose -1-H^3 in adipose tissue from the female rat.

UPTAKE OF FATTY ACIDS BY ACANTHAMOEBA. R. A. Weisman and E. D. Korn (Lab of Biochem., Sec. on Cellular Physiology, Nat. Heart Inst., Nat. Insti. of Health, Bethesda, Md.). *Biochim. Biophys. Acta* 116, 229–42 (1966). In the process of uptake of palmitate-1-C^{14} by *Acanthamoeba,* two classes of fatty acids are bound to the cells. These are distinguishable by the fact that one class of fatty acids was removed by washing the cells in 1% albumin. Neither class of fatty acids was removed by washing the amoebae in inorganic buffer. The uptake of both classes of fatty acids was proportional to the concentration of substrate, the concentration of cells, and the length of incubation. The class of fatty acids that was not removed by washing the cells with albumin was converted upon longer incubation into neutral esters and phospholipids. The other class of fatty acids appeared to be metabolically inert.

NEUTRAL AND ALKALINE LIPOLYTIC ACTIVITIES IN HUMAN ADIPOSE TISSUE. J. D. Schnatz (Dept. of Med., State Univ. of New York at Buffalo and the Buffalo Gen. Hosp., Buffalo, N.Y.). *Biochim. Biophys. Acta* 116, 243–55 (1966). Previous work from this laboratory suggested that human adipose tissue contains at least 2 lipolytic activities. Assay systems have been developed for the optimal demonstration of these activities in cell-free preparations of human adipose tissue, and additional differences have been demonstrated. Neutral lipolytic activity was assayed at pH 7.0 and 37C with olive oil as substrate, and alkaline lipolytic activity at pH 8.0 and 47C with tributyrin as substrate. Studies which related triglyceride concentration to both lipolysis and absorbence of the assay system suggested that neutral lipolytic activity represents hydrolysis of an emulsified ester and alkaline lipolytic hydrolysis of a soluble ester. In general, neutral lipolytic activity was augmented considerably by albumin, 50 mg/ml, but alkaline activity was not. In addition to the differences in assay conditions the 2 activities differed in their thermal stability, pH dependence, and inhibition characteristics.

STUDIES ON PLASMA CLEARING FACTOR. II. SUBSTRATES. H. B. Eiber, A. N. Payza and B. Goldberg (Gilman Lab., Depts. of Med. and Biochem., New York Med. College, N.Y., N.Y.). *Biochim. Biophys. Acta* 116, 256–63 (1966). Clearing factor activity of human post-heparin plasma showed a high dependence on the particle size or degree of emulsification of the substrate. Thus, higher lipolytic activity was observed when fat emulsions were sonicated for a longer period. The effect of sonication of substrates was insignificant on pancreatic lipase activity. This dependence on particle size clearly differentiates clearing factor from pancreatic lipase. As compared with pancreatic lipase, clearing factor hydrolyzed unsaturated fats at a slower rate and saturated fats were hydrolyzed at an equal or higher rate.

THIN-LAYER CHROMATOGRAPHIC STUDIES OF HUMAN BRAIN GANGLIOSIDES. R. J. Penick, M. H. Meisler and R. H. McCluer (Depts. of Physiolog. Chem. and Psychiatry, The Ohio State Univ., Columbus, Ohio). *Biochim. Biophys. Acta* 116, 279–87 (1966). The thin-layer chromatographic mobilities of 9 human brain ganglioside preparations were studied in 4 commonly used solvent systems. These solvent systems were: chloroform-methanol-water (60:35:8,v/v/v); chloroform-methanol-2.5 *N* NH_4OH (60:35:8,v/v/v); *n*-propanol-water (7:3,v/v) and *n*-propanol-conc. NH_4OH-water (6:2:1,v/v/v). The analytical data and thin-layer chromatographic properties of these ganglioside preparations were correlated with data reported in the literature for similar preparations. A summary of these correlations is presented in tabular form. Analytical data for one preparation (HG-5) are presented which indicate that it is a mixture even though the preparation appeared as a single spot with all 4 thin-layer chromatographic solvent systems. These thin-layer chromatographic studies indicated the presence of at least 3 minor gangliosides which are previously unreported.

QUANTITATIVE DETERMINATION OF GLUCOSE AND GALACTOSE IN GANGLIOSIDES BY GAS-LIQUID CHROMATOGRAPHY. R. J. Penick and R. H. McCluer *Ibid.*, 288–95. The samples are prepared for analysis by adding a known amount of mannitol to the ganglioside sample, and converting the hexoses to the glycosides by a simple methanolysis procedure. Interfering materials are removed from the reaction mixture by ion exchange and extraction techniques. The mannitol and glycosides are then converted to the trimethylsilyl ether derivatives for gas-liquid chromatography analysis. The absolute quantities of glucose and galactose can be calculated from peak areas of the individual components. The method allows the determination of glucose and galactose in gangliosides with an accuracy of 5–6%.

NEUTRAL GLYCOLIPIDS OF HUMAN KIDNEY ISOLATION, IDENTIFICATION AND FATTY ACID COMPOSITION. E. Martensson (Inst. of Med. Biochem., Univ. of Goteborg, Sweden). *Biochim. Biophys. Acta* 116, 296–308 (1966). The neutral glycolipids of human kidney have been isolated (almost quantitatively) from 3 different age groups; seniles, middle-aged people and juveniles. The preparative method is described in detail. The glycolipids isolated from senile material have been analysed for their fatty acid composition, and the sphingosines present have been identified. The dominating glycolipids are the aminoglycolipids, and then, in decreasing order of concentration, come the ceramide-trihexosides, the ceramide-dihexosides and the ceramide-monohexosides. The total concentration of these glycolipids was 4.85 mg/g of dry weight for the juvenile group, 3.67 mg/g for the middle-aged group and 3.55 mg/g for the senile group. It has been confirmed that the ceramide-dihexosides are a mixture of ceramide-lactosides and ceramide-digalactosides, and the ceramide-monohexosides a mixture of gluco- and galactocerebrosides. All the glycolipid fractions contained C_{16}-, C_{17}-, C_{18}-, and C_{20}-sphingosines. C_{18}-sphingosines constituted the predominant fraction which was composed of ordinary C_{18}-sphingosine, C_{18}-phytosphingosine and small amounts of C_{18}-dihydrosphingosine and dienic C_{18}-sphingosines. The fatty acid composition of the glycolipids shows a characteristic common pattern with C-22:0, C-24:0 and C-24:1 as the predominant acids, but there are also important differences between the fractions, especially in the concentrations of hydroxy acids. Possible metabolic implications of the fatty acid data are discussed.

FAT DIGESTION AND ABSORPTION IN THE ADRENALECTOMIZED RAT. W. C. Watson and E. Murray (Univ. Dept. of Med., Royal Infirmary, Glasgow, Scotland). *J. Lipid Res.* 7, 236–41 (1966). Malabsorption of fat in the adrenalectomized rat has been confirmed. The criteria for adrenal hypofunction were more rigorous than in previous studies. The malabsorption is not due to impaired intestinal lipolysis or inadequate intestinal intracellular glyceride synthesis. Delayed gastric emptying is probably secondary to the malabsorption rather than a cause. It is postulated that impaired intestinal fatty acid activation may be the key defect and that in some way this inhibits fatty acid transport across the mucosal membrane.

II. SYNTHESIS OF BIS(METHYL 9,10-DIHYDROXYSTEARATE)OSMATE FROM METHYL OLEATE AND OSMIUM TETROXIDE UNDER CONDITIONS USED FOR FIXATION OF BIOLOGICAL MATERIAL. E. D. Korn. *Ibid.*, 317–24. Methyl oleate was reacted with osmium tetroxide in water at 0C, conditions very similar to those used for fixation of biological material with osmium tetroxide. The major reaction product (the only one containing the fatty acid) was identified as bis(methyl 9,10-dihydroxystearate)osmate. Methods are described for the isolation of this compound and for its characterization by thin-layer and gas-liquid chromatography.

III. MODIFICATION OF OLEIC ACID DURING FIXATION OF AMOEBAE BY OSMIUM TETROXIDE. *Ibid.*, 325–35. Amoebae (*Acanthamoeba* sp.) were fixed with 1% osmium tetroxide exactly as for electron microscopy. The fixed cells were extracted with ethanol and the lipids in the extract and residue were separately transesterified in 0.5 N sodium methoxide. The fatty acid methyl esters were then separated and identified by gas-liquid and thin-layer chromatography. All of the unsaturated fatty acids, that normally account for about 85% of the total fatty acids, were destroyed by osmium tetroxide. At least 40% of the oleic acid (the major fatty acid of Acanthamoeba) was recovered as bis(methyl 9,10-dihydroxystearate)osmate. No methyl 9,10-dihydroxystearate was found. Thus, it seems most likely that during fixation of biological material with osmium tetroxide unsaturated fatty acids are converted to stable glycol osmates.

LIPID COMPONENTS OF DIATOMS. M. Kates and B. E. Volcani (Scripps Inst. of Oceanography, Univ. of Calif., (San Diego), La Jolla, Calif.). *Biochim. Biophys. Acta* 116, 264–78 (1966). The total lipids of five species of marine diatoms and one fresh-water diatom were studied chromatographically and the major components identified. All species contained glycerides, sulfoquinovosyl diglyceride, digalactosyl diglyceride, monogalactosyl diglyceride, phosphatidyl glycerol, lecithin and phosphatidyl inositol as major lipid components. Small to trace amounts of several unidentified sulfur-containing lipids, an unidentified glycolipid (sphingolipid?), phosphatidyl ethanolamine, phosphatidyl-*N*-methylethanolamine, phosphatidic acid and diphosphatidyl glycerol were also present. In general, the lipid compositon of the diatoms resembled that of green algae. Data on P^{32}-, C^{14}-, and S^{35}-incorporation into the diatom lipids are also included in this study. The major fatty acid constituents in the total lipids of the diatoms examined were palmitoleic, palmitic, eicosapentaenoic, and eicosatetraenoic acids; small amounts of hexadecadienoic hexadecatrienoic, octadecenoic, octadecadienoic, and octadecatrienoic acids were also present. The latter acid (linolenic acid), which is the major acid in algae and higher plants, was only a minor constituent of the diatom lipids.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. XV. PREPARATION AND GENERAL PROPERTIES OF β-KETOACYL ACYL CARRIER PROTEIN REDUCTASE FROM *Escherichia coli*. R. E. Toomey and S. J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, N. C.). *Biochim. Biophys. Acta* 116, 189–97 (1966). β-Ketoacyl acyl carrier protein (ACP) reductase, isolated from extracts of *Escherichia coli* and purified about 250-fold, shows optimal activity between pH 6.0 and 7.0, within which range the reaction equilibrium almost completely favors formation of the β-hydroxyacyl ACP derivatives. The equilibrium constant for the reaction at pH 7.0 is 3.93×10^7 M. The enzyme is specific for TPNH but appears to be nonspecific for the stant for the reaction at pH 7.0 is 3.93×10^7 M. The enzyme carbon chain length of the β-ketoacyl group. It exhibits marked preference for β-ketoacyl ACP derivatives over CoA derivatives as substrates. The product of the reaction is the D(−) isomer of the β-hydroxyacyl ACP derivative.

THE METABOLISM OF CHOLEST-5-EN-3-β, 7α-DIOL BY RAT-LIVER CELL FRACTIONS. H. R. B. Hutton and G. S. Boyd (Dept. of Biochem., Univ. of Edinburgh Med. School, Edinburgh, Great Britain). *Biochim. Biophys. Acta* 116, 336–61 (1966). The metabolism of cholest-5-en-3β, 7α-diol (7α-hydroxycholesterol) was studied by incubating this substrate labelled with tritium, with the different cell fractions of rat liver. After incubation, a lipid extract was made and the constituents crudely separated on small alumina columns. The metabolites were further separated, identified and estimated, both chemically and by radioactive means, by using thin-layer chromatography on fluorescent thin-layer plates. It was found that in microsomes in the presence of NAD^+, 7α-hydroxycholesterol was converted to cholest-4-en-3-one-7α-ol. The reaction was found to be dependent on substrate concentration and NAD^+ concentration. Increasing amounts of cyanide gave increasing amounts of product. The pH optimum was found to be between 7.0 and 7.4 and an acetone powder of microsomes retained the enzymic activity. In the supernatant fraction, 7α-hydroxycholesterol was converted into a substance with properties and mobility similar to those of an ester of 7α-hydroxy-cholesterol. It is thought that the cholest-4-en-3-one-7α, 26-diol must be formed from the "triol" by oxidation in mitochondria with NAD^+ as co-factor.

THE METABOLISM OF CHOLEST-4-EN-3-ONE-7α-OL BY RAT-LIVER CELL FRACTIONS. *Ibid.*, 362–78. The metabolism of cholest-4-en-3-one-7α-ol was studied by incubating the tritium-labelled substance with the different cell fractions of rat liver. In mitochondria, a more polar, ultraviolet absorbing product, suggested to be cholest-4-en-3-one-7α,26-diol, was formed. Disruption of the mitochondria either sonically or osmotically did not destroy the enzymic activity, which was found to lie in the debris sedimented after disruption. An acetone powder was found to be inactive. The supernatant fraction was partially purified by ammonium sulphate precipitation. Cholest-4-en-3-one-7α-ol was reduced to cholest-4-en-3α,7α-diol and 3α,7α-dihydroxycoprostane. The production of both substances was found to depend on substrate concentration and NADPH concentration. Cholest-4-en-3-one inhibited the production of 3α,7α-dihydroxycoprostane only. Cholest-4-en-3α,7α-diol was found to be not readily converted to 3α,7α-dihydroxycoprostane. The enzyme system was not specific and readily reduced many α,β-unsaturated ketones.

METABOLISM AND BIOLOGICAL POTENCY OF 5,6-MONOEPOXY-β-CAROTENE AND 5,6:5′,6′-DIEPOXY-β-CAROTENE. C. Subbarayan, M. R. Lakshmanan and H. R. Cama (Indian Institute of Science). *Biochem. J.* 99, 308–11 (1966). The subject compounds were partially converted to the furanoid forms during passage through the rat stomach. The monoepoxide was converted into vitamin A in the small intestine and showed a biological potency 21% of that of β-carotene. Neither β-carotene nor 5,6-monoepoxyvitamin A was formed. Intraperitoneal administration of the monoepoxide led to the accumulation of the unchanged compound in the liver and other tissues. The diepoxide gave no β-carotene or vitamin A or 5,6-monoepoxyvitamin A when given orally and showed no biological potency. The significance of these results with special reference to the mechanism of formation of vitamin A from β-carotene is discussed.

ABSORPTION, STORAGE AND DISTRIBUTION OF 3-DEHYDROVITAMIN A IN THE RAT. K. V. John, M. R. Lakshmanan and H. R. Cama. *Ibid.*, 312–16. The metabolism of 3-dehydroretinal was found to be similar to that of retinal. It alleviated all the symptoms of vitamin A deficiency and promoted the growth of vitamin A-deficient rats. When administered orally, 3-dehydroretinal was reduced in the intestine of the rat and subsequently esterified and transported to the liver, where it was stored mainly as the higher fatty acid ester. Intraperitoneal administration of the compound led to the accumulation of 3-dehydrovitamin A in liver and other tissues. Subcutaneous administration of the compound showed a good growth response in the rat. The ratio of 3-dehydroretinyl higher fatty acid ester to 3-dehydroretinol in liver in the postabsorptive state was nearly 93:7. There was a linear relationship between the 3-dehydroretinol concentrations of blood and liver of rats. Administration of 3-dehydroretinal at a dosage of 7.5 mg/day for 3 days brought about hypervitaminosis A in the rat. The maximal retention of 3-dehydrovitamin A by the kidneys was at an optimum dosage of 4.5 mg/day for 3 days.

THE RESTORATION OF DPNH OXIDASE ACTIVITY BY COENZYME Q (UBIQUINONE). Ludmila Szarkoswka (Univ. Wisconsin). *Arch. Biochem. Biophys.* 113, 519–25 (1966). Coenzyme Q can be efficiently removed from lyophilized mitochondria by extraction with pentane. The extracted mitochondria oxidize neither DPNH nor succinate. Both oxidative activities can be specifically restored, however, by addition of coenzyme Q_{10} in the presence of added mitochondrial phospholipids and cytochrome *c*. The restored DPNH-oxidase activity is fully sensitive to the classical respiratory chain inhibitors, rotenone, antimycin A, and KCN.

(Continued on page 414A)

CHANGES IN LAMB LUNG LIPIDS DURING GESTATION. N. Chida, F. H. Adams, M. Nozaki and Anne Norman (Dept. of Pediatrics, School of Med., Univ. of California, Los Angeles). *Proc. Soc. Exptl. Biol. and Med.* 122, 60–4 (1966). Fourteen fetal lambs at various gestational ages were delivered by cesarean section with intact placental circulations. The saline extracts of lung sections obtained by surgical biopsy were studied for surface tension on a Wilhelmy balance, and lyophilized extracts were analyzed for lipid composition after separation on silicic acid columns and thin layer chromatography. Individual phospholipids were identified. The fatty acid composition of lecithin and neutral lipids was determined by gas chromatography. All lipid fractions increased toward the end of gestation. The greatest increase was in the lecithin fraction. The palmitic acid content in the lecithin fraction also increased toward the end of gestation. No consistent changes were observed in the fatty acids of the neutral lipids between mature and immature fetuses. The stability index also increased toward term. These qualitative and quantitative changes observed during gestation in fetal lung extracts suggest the differentiation of the lung, possibly due to maturity of alveolar cells.

ABSORPTION OF C^{14}-TRIOLEIN IN THE BILE FISTULA RAT. L. Cesano and A. M. Dawson (Dept. of Med., Royal Free Hospital, London, England). *Proc. Soc. Expt. Biol. and Med.* 122, 96–9 (1966). Glyceride triolein-C^{14} was fed to bile fistula and sham operated rats which were killed after 4 hours. In the bile fistula animals there was a diminished absorption and decreased lipolysis of the triolein. Analysis of small gut mucosal lipid showed a greater proportion of radioactivity in the FFA and lower glycerides of the bile fistula animals than of the controls. This supports the concept that bile facilitates mucosal esterification of absorbed long chain fat.

BOVINE SERUM LIPID ANALYSIS. W. H. Brown and J. W. Stull (Dept. of Dairy Science, Univ. of Arizona, Tucson). *J. Dairy Sci.* 49, 636–41 (1966). An improved technique was devised for complete analysis of bovine blood serum. Three milliliters of blood serum were lyophilized and then extracted in a Soxhlet apparatus with chloroform:methanol 2:1. The extract was evaporated to dryness, and taken up in petroleum ether. A portion of the extract was removed for total lipid analysis. The lipid fractions were separated by using 1 g of silica gel G packed in a micro-column. The fractions were forced through the column with nitrogen. The elution solvents and fractions were as follows: I. 20 ml of 1% ethyl ether in petroleum ether (cholesterol esters). II. 27 ml of 10% ethyl acetate in petroleum ether (triglycerides and free cholesterol). III. 25 ml of ethyl ether (free fatty acids, mono-, and diglycerides). IV. 30 ml glacial acetic acid:methanol:ethyl ether 4:9:27 (phospholipids). In preparation for gas chromatography, total lipids and Fractions I and II were first saponified before methylation. Fractions III and IV were methylated without further preparation. All were extracted with petroleum ether from an aqueous solution, evaporated to dryness, and made up in 27 μl of hexane. Three microliters of this solution were then analyzed by gas-liquid chromatography for individual fatty acids.

FASTING AND POSTPRANDIAL SERUM TRIGLYCERIDE LEVELS IN HEALTH AND IN ISCHEMIC HEART DISEASE. D. F. Brown, S. H. Kinch and J. T. Doyle (Cardiovascular Health Center, Albany Med. College, Albany, N. Y.). *J. Atheroscler. Res.* 6, 232–39 (1966). Fasting and 9 hour serum cholesterol and triglyceride measurements were made in 470 middle-aged men following the ingestion of a 70 g fat meal containing I^{131}-labelled triolein. The amount of lipid-bound radioactivity in the 9-hour sample also was measured. Forty-two men who had clinical manifestations of IHD at the time of the test had significantly higher fasting and 9-hour serum cholesterol and triglyceride levels than those without disease but did not retain significantly more radioactive lipid at 9 hours. The correlation between fasting and 9-hour triglyceride levels was extremely high and indicated that a modified fat tolerance test, as utilized in this study, will yield no more information than a fasting triglyceride level as a means of differentiating between subjects with and without IHD. Although analysis of the data revealed that IHD was more prevalent in hyperglyceridemic than normoglyceridemic subjects, cholesterol levels also were higher in the former group than in the latter. It was thus not possible on this basis to implicate one lipid more than the other. The lipid combination associated with the highest prevalence of IHD was a cholesterol level exceeding 275 mg/100 ml associated with a normal triglyceride level. Although IHD occurs in the presence of normal triglyceride levels, the possibility that various types of hyperglyceridemia may be related to the pathogenesis of IHD can not be discounted. It is hoped that the more accurate classification of abnormal hyperglyceridemic states possible with newer methods will help to define this relationship.

GESTATIONAL AND DIETARY INFLUENCES ON THE LIPID CONTENT OF THE INFANT BUCCAL FAT PAD. J. D. Bagdade and and J. Hirsch (The Rockefeller Inst., New York City). *Proc. Soc. Exp. Biol. Med.* 122, 616–9 (1966). Comparison of the lipid content of the buccal and abdominal subcutaneous fat depots by gas liquid and thin-layer chromatography during gestation and infancy reveals no qualitative difference in major lipid classes, and small unexplained differences in triglyceride fatty acid composition. Similar alterations in composition occur in both tissues during the third trimester of pregnancy. The metabolic response of adipose tissue in these two sites to *in utero* and dietary influences of infancy is probably identical. Compositional differences do not appear to explain the preservation of the buccal pad in starvation states.

DISTRIBUTION AND DYNAMIC STATE OF STEROLS AND STEROIDS IN THE TISSUES OF AN INSECT; THE ROACH EURYCOTIS FLORIDANA. N. L. Lasser, A. M. Edwards and R. B. Clayton (The Conant Chem. Labs., Harvard Univ., Cambridge, Mass., and Dept. of Psychiatry, Stanford Univ. School of Med., Palo Alto, Cal.). *J. Lipid Res.* 7, 403–12 (1966). The total concentrations of sterols in the tissues of the roach, *Eurycotis floridana,* reared under aseptic conditions and on semisynthetic diets, are similar to, but somewhat lower than, those of tissues of vertebrates. Total concentrations of tissue sterols are relatively independent of dietary concentration of sterols whether the diet contains 0.1% cholesterol as the sole sterol, or a 'minimal cholesterol" mixture (0.1% cholestanol together with 0.005% cholesterol). Under the latter conditions the cholesterol is incorporated preferentially into most tissues and remains almost exclusively unesterified, while the cholesterol-sparing sterol is esterified to varying degree, depending upon the tissue. The fat body of the growing insect stores sterols (apparently as their esters) that have been displaced from other tissues. The fat body of the adult does not show evidence of sterol storage. Polar derivatives of sterols are present in minor amount in all tissues of the insect, most abundantly in the mid-intestine and gastric caeca. These compounds seem likely to be C_{27} steroids.

THE INTRACELLULAR DISTRIBUTION OF STEROLS IN EURYCOTIS FLORIDANA AND ITS POSSIBLE RELATION TO SUBCELLULAR MEMBRANE STRUCTURES. N. L. Lasser and R. B. Clayton, *Ibid.*, 413–21. The roach *Eurycotis floridana* was reared on a semisynthetic diet containing minimal cholesterol-4-C^{14} (0.005%) supplemented with cholestanol-7α-H^3 (0.1%), and various tissues of the insect were separated into "nuclear," "mitochondrial," and "microsomal" fractions by differential centrifugation. Muscle and salivary gland were satisfactorily fractionated and results from these are reported together with some, as yet, incomplete results for nerve. The major concentrations of unesterified sterol and lipid phosphorus were in the mitochondrial and microsomal fractions.

PHOSPHOLIPIDS OF YEAST. R. Letters and B. Brown (Arthur Guinness Son & Co., Dublin Ltd., Dublin, Eire). *Biochim. Biophys. Acta* 116, 482–88 (1966). A strip-transfer technique, which enables phospholipids to be eluted from one type of paper on to a second type of paper, has resulted in improved resolution of phospholipid mixtures from yeast by two-dimensional paper chromatography. The most satisfactory separations were obtained when lipid mixtures were chromatographed in the first direction on formaldehyde-treated, alumina-impregnated, or anion exchange paper, followed by elution on to silicic acid-impregnated paper and development in the second direction. Resolution of lipid mixtures was less satisfactory when chromatography was carried out in the first direction on alumina- or silicic acid-impregnated paper, followed by development on to formaldehyde paper in the second direction. The merits of the various systems are discussed and a simple apparatus is described which facilitates the strip-transfer procedure. The chromatographic methods described are particularly effective for detecting minor phospholipids (phosphatidylinositol, phosphatidylglycerol, diphosphatidylglycerol, phosphatidylserine, and N,N-dimethylphosphatidylethanolamine) in crude lipid extracts.

II. EXTRACTION, ISOLATION AND CHARACTERIZATION OF YEAST PHOSPHOLIPIDS. R. Letters. *Ibid.*, 489–99. The extraction of lipids from whole cells and cell preparations obtained by mechanical breakage has been investigated. The distribution patterns of phospholipids in the extracts have been determined and compared with the phospholipid pattern obtained by extracting the whole cell residue with acidified solvents. The

isolation of pure samples of the individual phospholipids has been effected by combining preliminary column fractionations on silicic acid, alumina and DEAE-cellulose with final purifications involving chromatography on layers of silicic acid. A novel degradation, which permits the elimination of α-linked glycerol residues from glycerylphosphoryl derivatives has been used in structural investigations on the minor phospholipids of yeast. The structures of the following compounds have been examined: N,N-dimethylphosphatidylethanolamine, N-monoethylphosphatidylethanolamine, phosphatidylserine, phosphatidyl-glycerol and cardiolipin (diphosphatidylglycerol). The degradation procedure, which has been adapted for work with semimicro quantities, yielded phosphate monoesters which were readily related to the structures of the parent phospholipids. The degradation products have been characterized by paper chromatographic and column chromatographic methods.

SYNTHESIS OF AN UNSATURATED DIETHER ANALOGUE OF PHOSPHATIDYL ETHANOLAMINE. P. J. Thomal and J. H. Law (Dept. of Chem., Harvard Univ., Cambridge, Mass.). *J. Lipid Res.* **7**, 453–55 (1966). A synthesis of racemic diether analogues of glyceryl phosphatides is reported which is applicable to unsaturated aliphatic substituents. The "oleyl" diether analogue of phosphatidyl ethanolamine has been synthesized.

SEPARATION OF GLUCO- AND GALACTOCEREBROSIDES BY MEANS OF BORATE THIN-LAYER CHROMATOGRAPHY. E. L. Kean (Div. of Med., Roswell Park Memorial Inst., New York State Dept. of Health, Buffalo, New York). *J. Lipid Res.* **7**, 449–52 (1966). Gluco- and galactocerebrosides can be separated by thin-layer chromatography on Silica Gel G prepared with sodium borate solution instead of water. The most successful developing system was chloroform-methanol-water-15 *M* NH_4OH 280:70:6:1.

PREPARATION OF PHOSPHATIDYL INOSITOL FROM BAKER'S YEAST. W. E. Trevelyan (Distillers Co. Ltd., Great Burgh, Epsom, Surrey, England). *J. Lipid Res.* **7**, 445–47 (1966). Phosphatidyl inositol and a cardiolipin-like phospholipid survive the autolysis which is induced in yeast by treating it with toluene, whereas other phospholpids are extensively degraded. Lipid from autolyzed yeast was suspended in isopropanol to extract lecithin and neutral lipid. The insoluble phosphatidyl inositol and cardiolipin were then separated by chromatography on silicic acid.

METABOLISM OF ADIPOSE TISSUE IN THE FAT TAIL OF THE SHEEP IN VIVO. A. K. Khachadurian, B. Adrouni and H. Yacoubian (Depts. of Biochem., Med., and Surgery, American Univ. of Beirut School of Med., Beirut, Lebanon). *J. Lipid Res.* **7**, 427–36 (1966). The metabolism of the large mass of adipose tissue constituting the fat tail of the Syrian sheep has been investigated by measuring arteriovenous concentration (A-V) differences. In fed animals, the adipose tissue took up glucose and ketone bodies and released lactate and free fatty acids (FFA), although in some animals uptake of FFA also occurred. After 48 to 144 hr of fasting, uptake of glucose and ketone bodies continued and the FFA release increased. Total lipid esters and phospholipids were not released even after food had been withheld for 6 days. Insulin increased the A-V difference, the uptake of glucose, and reduced the FFA release.

THE MECHANISM OF α-OXIDATION IN LEAVES. C. Hitchcock and A. T. James (Unilever Res. Lab., Sharnbrook, Bedford, Great Britain). *Biochim. Biophys. Acta* **116**, 413–24 (1966). The oxidation of palmitate-16-C^{14} and of DL-2-hydroxypalmitate-16-C^{14} by particulate fractions and by acetone-dried powders of young green leaves has been investigated. Palmitate-16-C^{14} was converted to 2-hydroxypalmitate-C^{14}, pentadecanoate-C^{14}, 2-hydroxypentadecanoate-C^{14}, myristate-C^{14} and 2-hydroxymyristate-C^{14}. If 2-hydroxypalmitate-C^{14} were present in the incubation mixture, the above metabolites were not radioactive. 2-Hyroxypalmitate-16-C^{14} was converted to pentadecanoate-C^{14}, 2-hydroxypentadecanoate-C^{14} and myristate-C^{14}. If palmitate-C^{12} were present in the incubation mixture, the above metabolites were still radioactive. The radioactive hydroxy acids were characterized by chemical oxidation to the next lower unsubstituted acid. The results establish both the identity of the 2-hydroxy acids and their role as intermediates in the α-oxidation of long-chain fatty acids by leaf systems. They suggest that the reaction sequence is in leaves as follows: $RCH_2CO_2H \rightarrow RCHOHCO_2H \rightarrow RCHO \rightarrow RCO_2H$.

THE MITOCHONDRIAL FATTY AND SYNTHESIZING SYSTEM: GENERAL PROPERTIES AND ACETATE INCORPORATION INTO MONOENOIC ACIDS. E. J. Barron (The Virginia Mason Res. Center, Seattle, Wash.). *Biochim. Biophys. Acta* **116**, 425–40 (1966). The incorporation of acetate into fatty acids by mitochondria was investigated. The cofactor requirements, the effect of anaerobiosis and of aging the mitochondria were determined. The labeling pattern obtained when acetate-1-C^{14} was used as substrate was also examined. More acetate was incorporated into fatty acids under anaerobic conditions and after aging the mitochondria at 4C. There appeared to be more synthesis *de novo* under anaerobic conditions and less when "aged" mitochondria were used. The labeling pattern of the monounsaturated fatty acids show that Δ^9 acids can be chain elongated to produce Δ^{11} and Δ^{13} acids. Furthermore, the Δ^9 acids themselves can become labeled. The present evidence suggests that they become labeled by an exchange mechanism whereby the terminal carboxyl C_2 unit of the Δ^9 acid is exchanged with the acetate pool or the carboxyl C_2 unit of another acid or both.

THE EFFECTS OF THYROXINE ON THE PATTERN OF FATTY ACID SYNTHESIS IN RAT LIVER. D. Gompertz and A. L. Greenbaum (Dept. of Biochem., Univ. College London, London, Great Britain.). *Biochim. Biophys. Acta* **116**, 441–59 (1966). The effects of thyroxine on the pattern of fatty acid synthesis from acetate-1-C^{14} by rat liver slices have been investigated. Treatment with this hormone, both at physiological and at pharmacological doses, stimulates the incorporation of acetate-1-C^{14} into stearic acid, into the polyunsaturated fatty acids. The increased incorporation of acetate into the octadecenoic acid fraction appears to be associated with an increased desaturaton of stearic acid both in liver slices and in microsomal systems, and also with an enhanced activity of stearoyl-CoA desaturase. Degradation studies on the stearic acid synthesized in slices from control and from thyroxine-treated animals suggest that the increased formation of stearic acid may be by synthesis *de novo*. It appears that there may be an alteration in the rate of stearic acid synthesis in combined supernatant and microsomal systems when microsomes from thyroxine-treated animals are substituted for microsomes from normal animals.

THE EFFECT OF INSULIN ON MONOUNSATURATED FATTY ACID SYNTHESIS IN DIABETIC RATS. THE STABILITY OF THE INFORMATIONAL RNA AND OF THE ENZYME SYSTEM CONCERNED WITH FATTY ACID DESATURATION. A. Gellhorn and W. Benjamin (College of Physicians and Surgeons, Columbia Univ., New York). *Biochim. Biophys. Acta* **116**, 460–66 (1966). The effect of single injections of insulin on insulin-induced monounsaturated fatty acid synthesis in the epididymal adipose tissue of diabetic rats, was determined. Olefin synthesis increased slowly to a maximum between 48 and 72 hr, remained high for 24 to 48 hr and then declined rapidly to the low levels characteristic of diabetes. The level of enzyme activity attained and the duration of the effect were dependent upon the dose of insulin administered. To determine whether the informational RNA-ribosome complex formed under the influence of insulin was more stable than the enzyme induced, young normal rats were given either actinomycin D or puromycin, inhibitors of RNA and protein synthesis, respectively, and the olefin synthesis measured *in vitro* at intervals of time during continuous depression of RNA or protein synthesis. In animals receiving actinomycin D, 15 μg per 100 g, at 12-hr intervals, desaturating enzyme activity was reduced to ½ the initial value in 19 hr; the comparable time for animals receiving puromycin was 3.5 hr.

THE ACTION OF ADRENALIN AND GLUCAGON ON THE METABOLISM OF PHOSPHOLIPIDS IN RAT LIVER. G. De Torrontegui and J. Berthet (Laboratoire de Chimie Physiologique, Universite de Louvain, Belgium). *Biochim. Biophys. Acta* **116**, 467–76 (1966). The incorporation of phosphate into the phospholipids of rat-liver slices incubated *in vitro* is stimulated by adrenalin; the 3 main types of phospholipids, phosphatidylcholine, phosphatidylethanolamine and inositolphosphatides, are all influenced in the same way. This action is not obtained with glucagon. The incorporation of amines (choline and serine) is either slightly decreased or not affected by the 2 hormones. The incorporation of inositol is considerably stimulated by adrenalin but not by glucagon or by Ado-3′,5′-*P*. These results show that not all of the metabolic actions of adrenalin on the liver are shared by glucagon nor, probably, mediated by Ado-3′,5′-*P*.

THE ACTION OF INSULIN ON THE INCORPORATION OF (P^{33}) PHOSPHATE IN THE PHOSPHOLIPIDS OF RAT ADIPOSE TISSUE. G. De Torrontegui and J. Berthet (Laboratoire de Chimie Physiologique, Universite de Louvain, Belgium). *Biochim. Biophys. Acta* **116**, 477–81 (1966). When the epididymal fat pad of the rat was incubated in a medium containing (P^{33}) phosphate, 4 phospholipids became labelled; they have been tentatively identified as phosphatidylcholine, phosphatidylinositol, phosphatidic acid and possibly phosphatidylglycerol. The incorporation of phos-

phate into these 4 compounds is stimulated by insulin added to the incubation medium; this effect is greater on phosphatidylinositol.

THE ISOLATION AND PARTIAL CHARACTERIZATION OF THE GLYCOLIPIDS FROM PIG LUNG. Jennifer J. Gallai-Hatchard and G. M. Gray (Lister Inst. of Preventive Med., London, Great Britain). *Biochim. Biophys. Acta* 116, 532-42 (1966). The total lipid extracts of normal pig lungs were analyzed for glycolipids. A method for their quantitative extraction from the total lipid and subsequent isolation of the different classes of glycolipid is described. Minced lung was extracted with chloroform-methanol and the extract treated with mild alkali. The alkali-stable lipids, which included the glycolipids, were fractionated on silicic acid, silica gel H and Florisil columns. Five classes of glycolipid were isolated and characterized by thin-layer chromatography, paper chromatography, and by chemical estimations and gas liquid chromatography on the products of acid hydrolysis. The glycolipids were identified as ceramide glucoside, ceramide galactosylglucoside, ceramide digalactosylglucoside, ceramide N-acetylgalactosaminyldigalactosylglucoside and a ganglioside.

PHOSPHOLIPASE ACTIVITY IN RAT-LIVER MICROSOMES STUDIED BY USE OF ENDOGENOUS SUBSTRATES, P. Bjornstad (Inst. of Clinical Biochem., Univ. of Oslo, Rikshospitalet, Oslo, Norway). *Biochim. Biophys. Acta* 116, 500–10 (1966). Degradation of endogenous phospholipids in liver microsomes *in vitro* has been studied using microsomes from rats injected with the phospholipid precursors ($1,2C^{14}$) methionine and (P^{32}) orthophosphate. Calcium and magnesium ions greatly stimulated the breakdown of endogenous phosphatidylethanolamine, but had little influence on the degradation of lecithin. The main reaction products in the degradation of phosphatidylethanolamine have been shown to be glycerylphosphorylethanolamine and free fatty acids, while the main reaction product in the breakdown of lecithin was free choline. The degradation of phosphatidylethanolamine is most probably due to two enzymes: a phospholipase A and a lysophospholipase. Some of the properties of the phosphatidylethanolamine-hydrolyzing enzymic system have been determined and the findings are discussed in relation to previous studies of phospholipid-hydrolyzing enzymes in rat liver.

SULFATIDES OF HUMAN KIDNEY: ISOLATION, IDENTIFICATION AND FATTY ACID COMPOSITION. E. Martensson (Inst. of Med. Biochem., Univ. of Goteborg, Sweden). *Biochim. Biophys. Acta* 116, 521–31 (1966). Kidney sulfatides have been isolated from 3 different human age groups, seniles, middle-aged people and juveniles. Two sulfatide fractions occur; monohexose-sulfatides with the same structure as brain sulfatides, and dihexose-sulfatides. On the basis of hydrolysis and periodate oxidation studies, the latter are proposed to be galactosyl-glucosyl-ceramides esterified with sulfuric acid in position 3 of the galactose moiety. From senile kidneys were isolated 0.39 mg monohexose-sulfatides/g dry tissue weight, and from middle-aged and juvenile kidneys 0.40 mg and 0.48 mg/g dry tissue weight, respectively. Corresponding figures for the dihexose-sulfatides were 0.14 mg, 0.18 mg and 0.20 mg/g dry tissue weight. The fatty acid patterns of the sulfatides showed great similarities to those of the neutral kidney glycolipids and are characterized by C-22:0, C-24:0 and C-24:1 fatty acid fractions. The fatty acid patterns of the monohexose-sulfatides and the ceramide-monohexosides of kidney were almost identical. The dihexose-sulfatides have, on the other hand, a fatty acid pattern closely related to that of the neutral ceramide-oligohexosides of this organ. The sulfatides contained the same sphingosine bases as the neutral kidney glycolipids.

ESTERIFICATION OF CHOLESTEROL BY RAT ADRENAL GLAND HOMOGENATES AND SUBCELLULAR COMPONENTS. G. Shyamala, W. J. Lossow and I. L. Chaikoff (Dept. of Physiol., Univ. of California, Berkeley, Calif.). *Biochim. Biophys. Acta* 116, 543–54 (1966). This study demonstrates that the rat adrenal contains two enzymes that esterify cholesterol: one present principally in the mitochondria-rich fraction, the other most active in the microsome-rich fraction. The enzyme in the microsome-rich fraction had an optimum activity at pH 6.6 and required the addition of ATP, CoA, Mg^{2+} and GSH for its activity. The enzyme in the mitochondria-rich fraction had an optimum activity at pH 5.0 and did not require the addition of these cofactors, but required cell sap or a lipid extract of cell sap for its activity. At least one of the ways in which cell sap exerted this stimulatory effect was by providing both free cholesterol and the fatty acid for the esterification. Both triolein and oleic acid served as the source of fatty acid for the esterification by the enzyme associated with the mitochondria-rich fraction, but the triolein was apparently hydrolyzed to free fatty acids before incorporation into the esters.

CALCIUM ACTION ON FATTY ACID AND PHOSPHOLIPID MONOLAYERS AND ITS RELATION TO THE CELL MEMBRANE. D. W. Deamer and D. G. Cornwell (Dept. of Physiological Chem., The Ohio State Univ., Columbus, Ohio). *Biochim. Biophys. Acta* 116, 555–562 (1966). Calcium ions interact with stearic and palmitic acid monolayers producing a solid-condensed film which is rigid, has no measurable surface viscosity, and has a high solid-to-liquid transition temperature measured by the talc test. This effect can be explained by charge destruction, formation of di-soap molecules, or formation of a copolymeric soap lattice. Surface viscosity experiments indicate that charge destruction has a measurable but minor effect on film properties. Di-soap analogs have increased surface viscosities. However, these analogs form plastic films with moderate transition temperatures. The data suggest that the unusual properties of calcium stearate and palmitate films are most readily explained by a copolymeric lattice structure. Calcium has no effect on the surface viscosity of *cis*- and *trans*-monoethenoic acid and phospholipid monolayers. Saturated fatty acid soaps thus have unique surface properties which depend on their packing mode and cross-sectional area and limit their value as model systems for calcium interactions with the cell membrane.

ACYL GROUP EXCHANGE IN THE INTESTINAL LUMEN DURING FAT DIGESTION. R. Reiser and H. C. Fu (Dept. of Biochem. and Nutr., Texas A and M Univ., College Station, Texas). *Biochim. Biophys. Acta* 116, 563–69 (1966). Rats, previously on a fat-free diet, were administered by gastric intubation (1-H^3) glycerol- and (1-C^{14}) oleic acid-labeled triolein with either unlabeled oleic acid or various unlabeled triglycerides. Equations were developed utilizing the radioactivity data of the lumen triglycerides for calculating the percentages of acyl groups exchanged under the different conditions. To determine the differences in degrees of exchange at the 1,3-, and 2-positions, rats were administered 250-340-mg mixtures of C^{14}-labeled oleic and palmitic acids with 890 mg of refined cotton-seed oil. The triglycerides of the lumen were isolated 2 and 3 hours later and treated with pancreatic lipase. It was found that less than 1% of the acyl groups of triglycerides are exchanged with the free fatty acid and that 95% of these are in the 1- and 3-positions. About 2.5% of saturated and 10% of unsaturated acyl groups of triglycerides are exchanged with oleic acid of triolein during digestion and absorption. Calculations are given demonstrating that the unhydrolyzed moiety of digested triglycerides are absorbed as monoglycerides, and that the triglycerides are reconstituted in the mucosa. The significance of the results upon an earlier postulated mechanism of luminal fat digestion and mucosa resynthesis is discussed.

ELECTRON MICROSCOPE STUDY OF THE ROLE OF LIPID MICELLES IN INTESTINAL FAT ABSORPTION. C. T. Ashworth and J. F. Lawrence (Dept. of Pathology, The Univ. of Texas Southwestern Medical School, Dallas, Texas). *J. Lipid Res.* 7, 465–72 (1966). *In vitro* micellar solutions of oleic acid, mono-olein, and sodium taurocholate were studied electron microscopically. They contained osmiophilic particles 30–200A in diameter. Osmium staining alone was sufficient to demonstrate the particles; lead staining had little effect on their appearance. The intestinal intraluminal contents from rats during the absorption of unsaturated fat also contained osmiophilic particles, 40–200A, and numerous similar particles were found between the microvilli and engaged in the fine filamentous coating of microvilli. In the lumen only, larger emulsion-type droplets were also seen. The small particles were demonstrable in osmium-fixed material. With or without lead stains, and staining with lead only increased contrast of the particles. Spherules measuring about 1000A in diameter with walls about 100A thick were observed in the terminal web during fat absorption, at which time they were slightly larger and more numerous than in fasting rats. It is proposed that during fat absorption micellar particles are engaged in the filamentous material covering the microvilli and then enter the absorptive cell either by molecular diffusion across the plasma membrane or by being incorporated into the walls of thick-coated spherules which then pass into the subapical cytoplasm.

LIPID METABOLISM IN FATTY LIVER OF LYSINE- AND THREONINE-DEFICIENT RATS. R. Viviani, A. M. Sechi and G. Lenaz (Instituto di Chimica Biologica, Facolta di Medicina e Chirurgia, e Instituto di Biochimica, Facolta di Medicina Veterinaria, Universita di Bologna, Bologna, Italy). *J. Lipid Res.* 7, 473–78 (1966). Rats were fed a low protein diet deficient in and supplemented with lysine and threonine. Liver lipids contained more lecithin, sphingomyelin, and free fatty acids, and less

amino phospholipids in the deficient rats. No variations in fatty acid composition of choline- and ethanolamine-containing phospholipids were found; only palmitic acid was increased in the serine-containing phospholipids of the deficient animals. The incorporation of acetate-C^{14} into phospholipids, but not into other liver lipids, was lower in deficient rats. In the plasma of deficient rats the concentration of esterified fatty acids and phospholipids was lower, of free fatty acids higher, than in the controls. The fatty acid composition of depot fat differed from that of liver neutral fat both in deficient and supplemented animals. The results presented establish that multiple metabolic defects resulting from lysine and threonine deficiency accompany the fatty liver. The design of the experiments does not permit conclusions to be drawn regarding the causal relationship between the various alterations in lipid metabolism and the fatty liver.

CONCENTRATION AND FATTY ACID COMPOSITION OF CEREBROSIDES AND SULFATIDES IN MATURE AND IMMATURE HUMAN BRAIN. J. H. Menkes, M. Philippart and Maria Concone (Dept. of Pediatrics and Division of Neurological Med., The Johns Hopkins Hospital, Baltimore, Maryland). *J. Lipid Res.* **7**, 479–86 (1966). The fatty acid composition of cerebrosides and sulfatides from frontal lobe gray and white matter was determined for five fresh and four formalinized adult brains and for eight infants. Fatty acid patterns were unaffected by formalinization, but varied considerably from one another in the proportion of saturated to unsaturated fatty acids. The percentages of 24:0 and 24:1 increased with age. Cerebrosides obtained from areas such as the brainstem and cerebellum, where myelination was more advanced, tended to have a larger proportion of long-chain fatty acids than samples extracted from frontal or parietal lobe white matter. Hydroxy fatty acids showed an adult pattern in all instances in which amounts sufficient for accurate quantification could be isolated. Lipid hexose, cerebroside + sulfatide hexose, and methanol-eluted hexose were measured in the brains of 12 infants ranging in age from a 4 month fetus to 2 yr. In the most immature, the majority of lipid hexose was in the form of glycolipids more polar than cerebrosides and sulfatides. These have tentatively been identified as hematosides and globosides. With maturation, cerebrosides and sulfatides increased progressively, but amounts of more polar glycolipids remained constant in relation to the total lipid content of tissue.

INFLUENCE OF DIET ON THE COMPOSITION OF PLASMA CHOLESTEROL ESTERS IN MAN. P. J. Nestel and E. A. Couzens (Univ. of Melbourne Dept. of Med., The Royal Melbourne Hospital Post Office, Victoria, Australia). *J. Lipid Res.* **7**, 487–91 (1966). The effect on the plasma cholesterol esters of diets rich in either carbohydrate, chocolate or safflower oil was studied sequentially in two men. The changes in the cholesterol esters of the major plasma lipoproteins were studied by measuring (a) the distribution of fatty acids in the esters and (b) the distribution of radioactivity among the esters after the administration of cholesterol-4-C^{14} labeled lipoproteins. Similar changes were found in the cholesterol esters of the two major lipoproteins; these changes became apparent within 24 hr after changing diets. Monounsaturated esters predominated with carbohydrate-rich diets. When the chocolate-rich diet was substituted, the proportion of saturated and monounsaturated esters fell and that of preexisting linoleate in preference to the more saturated fatty acids which abounded in the diet. The substitution of safflower oil led to further increments of cholesteryl linoleate. The possible reasons underlying the preferential incorporation of cholesteryl linoleate in man are discussed.

PURIFICATION AND CHARACTERIZATION OF PHTHALANILIDE-LIPID COMPLEXES FROM TISSUES. D. W. Yesair, W. I. Rogers, J. T. Funkhouser and C. J. Kensler (Life Sci. Division, Arthur D. Little, Inc., Cambridge, Mass). *J. Lipid Res.* **7**, 492–500 (1966). What appears to be a new class of phospholipids has been isolated from dog brain in the form of complexes with a substituted phthalanilide. The complexes were extracted by chloroform-methanol and purified by countercurrent distribution in solvent systems containing water, chloroform, methanol and Freon 113. The binding of the phthalanilide congener to lipids has some ionic character. Cations such as H^+ or Ca^{++} displaced the phthalanilide from its lipid complex. The pH for 50% displacement acid was about 3.8 and was independent of the purity of the complex. Thin-layer chromatography of the lipid yielded four subfractions of lipid, three of which were ninhydrin-positive and all of which yielded a group of unidentified ninhydrin-positive components on hydrolysis. Each lipid subfraction contained nitrogen, phosphorus, fatty acids and glycerol but in different ratios. Of the known phospholipids containing nitrogen, none matches the composition and behavior of the lipids isolated as phthalanilide complexes. We have therefore concluded that the phthalanilides bind to a new class of phospholipids characterized by a high content of unidentified ninhydrin-positive components.

PREPARATION AND PROPERTIES OF A CELL-FREE SYSTEM FROM RAT SKIN THAT CATALYZES STEROL BIOSYNTHESIS. J. L. Gaylor, C. V. Delwiche, D. R. Brady and A. J. Green (Grad. School of Nutr. and the Div. of Bio. Sciences, Cornell Univ., Ithaca, N. Y.). *J. Lipid Res.* **7**, 501–10 (1966). Homogenates of epidermis from rat skin were centrifuged at 10,000 × g for 20 min. The supernatant fraction ("whole homogenate") catalyzed the demethylation of lanosterol (C_{30}) to yield C_{27}-sterols. The rate of reaction was measured by the rate of release of $C^{14}O_2$ from the 4-methyl group of lanosterol. Conditions for maximal rates of demethylation were established. Addition of increasing amounts of washed microsomes to a constant amount of substrate resulted in additional release of $C^{14}O_2$, but the release was not proportional to the amount of microsomes. Incubation with increasing amounts of microsomes treated with Triton WR-1339 yielded a proportional rate of release of $C^{14}O_2$. The Triton-treated microsomes were frozen and stored without loss of activity. The rate of formation of $C^{14}O_2$ was constant up to 1 hr of incubation with both Triton-treated microsomes and whole homogenate, for which the K_m for lanosterol was 5.0 and 2.0×10^{-5}M, respectively. Other 4-gem-dimethyl sterols were competitive inhibitors, K_i', 2.0 and 5.5×10^{-5}. The enzyme system was inhibited by arsenite.

IDENTIFICATION OF MONO- AND DIHYDROXY BILE ACIDS IN HUMAN FECES BY GAS-LIQUID CHROMATOGRAPHY AND MASS SPECTROMETRY. P. Eneroth, B. Gordon, R. Ryhage, and J. Sjovall (Dept. of Chem. and Lab for Mass Spectrometry, Karolnska Institutet, Stockholm, Sweden). *J. Lipid Res.* **7**, 511–23 (1966). The mono- and disubstituted cholanoic acids present in human feces have been investigated. Extracts of feces were fractionated on silicic acid column and individual bile acids were isolated by preparative thin-layer chromatography of the methyl esters, partial trimethylsilyl ethers, oxidation products, and trifluoroacetates. The probable structures deduced were confirmed by gas chromatography-mass spectometry and by comparisons with authentic compounds. The following derivatives of 5β-cholanoic acid not previously isolated from human feces were identified: 3,12-diketo, 3-keto-12α-hydroxy, 3α12β-dihydroxy, 3β12β-dihydroxy, 3-keto-7α-hydroxy, 3α-hydroxy-7-keto, 3β,7βdihydroxy and 3α,7α-hydroxy. The presence of 3-keto-, 3β-hydroxy-, 3α-hydroxy-, 3β-hydroxy-12-keto-, 3α-hydroxy-12-keto-, 3β,12α-dihydroxy-, and 3β,12α-dihydroxy-5β-cholanoic acids was confirmed. Evidence was obtained for the presence of two bile acids having at least one hydroxyl group at a carbon atom other than 3, 7 or 12.

CHARACTERIZATION OF TRISUBSTITUTED CHOLANOIC ACIDS IN HUMAN FECES. P. Eneroth, B. Gordon and J. Sjovall. *Ibid.*, 524–30. The following bile acids have been identified: 3β, 7α, 12α-trihydroxy-, 3β, 7β, 12α-trihydroxy-, 3α, 7α-dihydroxy-12-keto-5β-cholanoic acids and 3α, 7α, 12α-trihydroxy-5α-cholanoic acid. The presence in human feces of 3α, 7α, 12α-trihydroxy-, 3α, 7β, 12α-trihydroxy-, and 3α, 12α-dihydroxy-7-keto-5β-cholanoic acids has been confirmed. The composition of bile acids in human feces is summarized and possible metabolic interrelationships suggested.

CARBOXYLIC ESTER HYDROLASES OF RAT PANCREATIC JUICE. F. H. Mattson and R. A. Volpenhein (The Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio). *J. Lipid Res.* **7**, 536–43 (1966). An attempt was made to establish the number and characteristics of the enzymes in pancreatic juice that hydrolyze nitrogen- and phosphorus-free esters of fatty acids. For this purpose model compounds were hydrolyzed by lyophilized rat pancreatic juice under conditions that accelerated or inhibited the reactions. It is suggested that three enzymes are responsible for the hydrolysis of fatty acid esters. The first enzyme is glycerol-ester hydrolase (EC3.1.1.3) or lipase. This enzyme hydrolyzes water-insoluble esters of primary alcohols. The reaction occurs at an oil/water interface and is inhibited by bile salts at pH 8. It has a broad pH optimum between 7.5 and 9.5. The second enzyme hydrolyzes esters of secondary alcohols and of other alcohols as well. It has an absolute requirement for bile salts and has a pH optimum at about 8. The enzyme is unstable in pancreatic juice when maintained at pH 9, probably due to the action of trypsin. The third enzyme hydrolyzes water-soluble esters. It too has an absolute requirement for bile salts, although a smaller amount is necessary for maximum activity. This enzyme also

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The new plant covers an area of 5,000 square meters, exclusive of surrounding park and parking areas.

In the main building, a constant temperature basement supplies the storage area for olive oil in tanks of reinforced concrete lined with sandstone. The bottling hall, at the loading level, contains modern filling-inspecting-sealing-tinning machines. The new equipment has a filling capacity, in eight working hours, of 200,000 liters of olive oil as follows: 100,000 bottles of various sizes; 80,000 tins, from 1/16 to 1-gallon size for export; and more than 10,000 tins from 5 to 25 kilograms for domestic market.

The automated and semi-automated processes are continuously under the control of technicians; transmitted light inspections, before and after filling, eliminate the smallest impurities in the bottles, which are previously sterilized by steam.

All pipes and machinery in contact with the olive oil are made of stainless steel or pure aluminum, and the containers are of enamelled steel.

The new Bertolli plant represents a strong contribution to the development of a traditional Italian product.

Conseil Oléicole International Meets

From May 4 through 10, 1966, the 14th Meeting of the Conseil Oléicole International (COI) was held at Bari. The Conseil, whose administrative office is in Madrid (Spain), represents the United Nations and is preparing the international Codex Alimentarius for olive oil. The Italian correspondents of the Codex are Prof. A. Montefredine, President 1967-68 of the Italian Oil Chemists' Society, and Prof. G. Jacini, Director of Experimental Station for Oils and Fats of Milan.

Milan Meeting on Detergents, October 7–8

The Italian Oil Chemists' Society (Milano, 3 via del Lauro) will organize a meeting devoted to the methods for the evaluation of detergent performance, to be held in Milan, Oct. 7–8, 1966.

New Periodical Published

The periodical *La Rivista Italiana delle Sostanze Grasse* (Milano, 79 via Giuseppe Colombo) will publish a supplement devoted to the problems of lubrication. The first issue of the supplement was published in June of this year.

• *Industry Items*

THE UNIVERSITY OF TEXAS M. D. ANDERSON HOSPITAL and Tumor Institute will participate in the development of the new Infotronics CRS-70 Automated Data System. The new system, designed and manufactured by Infotronics Corporation of Houston, Texas, will be used in general hospitals and cancer institutions to speed laboratory test results to the physician, permitting faster diagnosis.

A new sales, warehouse and service facility at 9520 Midwest Avenue, Garfield Heights, Ohio, was announced recently by E. H. SARGENT & Co. Al Klees, Cleveland divisional manager for Sargent, stated that the new plant includes an inventory of the items listed in the 1300-page Sargent catalog of scientific instruments and chemicals.

CHEMETRON CORPORATION has broken ground for a chemical specialties plant in Livonia, Mich., a suburb of Detroit. The plant will be part of Northwest Chemical Company, a unit of the corporation's Chemetron Chemicals Division. Eugene McCauliff, division president, said that the facility will double the present production capacity of Northwest and that it is designed for further expansion in the future.

FINE ORGANICS, INC., culminated a recent series of expansions at their Lodi, N. J., facility with the installation of a new Wyssmont Turbo-Dryer. With these additions, Fine Organics will substantially increase its production capacity of TEMASEPT I AND TEMASEPT II.

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is unstable at pH 9, but can be differentiated from the preceding enzyme by its stability at pH 4 and its pH optimum of 9.0.

ROLE OF THE INTESTINAL BRUSH BORDER IN THE ABSORPTION OF CHOLESTEROL IN RATS. J. S. K. David, P. Malathi and J. Ganguly (Indian Inst. of Science, Bangalore). *Biochem. J.* 98, 662–8 (1966). Results of studies involving short-term incubation of everted intestinal sacs of rats in media containing cholesterol oleate or cholesterol plus oleic acid indicated that the sequence of events in the absorption of cholesterol appears to be: the dietary cholesterol esters are hydrolyzed by the cholesterol ester hydrolase of pancreas or of the mucosal brush border or both, after which the brush border rapidly absorbs the de-esterified sterol and transfers it into the mucosal cell, by a mechanism of displacement where it is slowly re-esterified for transport through the lymph.

STUDIES ON METABOLISM OF VITAMIN A. THE EFFECT OF THE STAGE OF VITAMIN A DEFICIENCY ON SULPHATE ACTIVATION IN RAT LIVER. K. Subba Rao and J. Ganguly (Indian Institute of Science, Bangalore). *Biochem. J.* 98, 693-5 (1966). The synthesis of "active sulphate" (PAS, adenosine 3'-phosphate 5'-sulphatophosphate) in rat liver was studied at various stages of vitamin A deficiency, with the corresponding pair-fed controls. The activity was significantly decreased even at the onset of the deficiency and at the acute stage there was further loss. Only at the earlier stages of the deficiency was the addition of retinol, *in vitro*, fully effective in restoring the lost activity; retinoic acid was partially active. No such restoration was possible at the acute deficiency stage.

EFFECT OF A CHOLESTEROL-BIOSYNTHESIS INHIBITOR ON THE FATTY ACID COMPOSITION OF PHOSPHOLIPIDS IN THE SERUM AND TISSUES OF RATS. P. Hill (Ayerst Res. Labs., Montreal). *Biochem. J.* 98, 696–701 (1966). Treatment with AY-9944 (*trans*-1,4-bis-(2-chlorobenzylaminomethyl)cyclohexane dihydrochloride) produced the following changes in the fatty acid composition: (a) a marked decrease in the percentage of linoleic acid and an increase in oleic acid in the total fatty acids in the liver; (b) in the serum, an overall decrease in the percentage of linoleic acid in neutral lipids and phospholipids; (c) an increased content of linoleic acid in the β-acyl chain of phosphatidyl cholines in the liver and in sphingomyelins in the brain and lungs; (d) an increased content of palmitic acid and oleic acid in the β-acyl chain of phosphatidylcholines in the liver, heart and lungs; (e) an increased content of phosphatidylcholines and sphingomyelins, together with an increased percentage of saturated fatty acids in these phosphatides in the lungs.

THE CONVERSION OF 7-DEHYDROCHOLESTEROL INTO CHOLESTEROL. D. C. Wilton, M. Akhtar and K. A. Munday (Univ. of Southampton). *Biochem. J.* 98, 29C–31C (1966). The origin and stereochemistry of the 2 hydrogen atoms at positions 7 and 8 during the conversion of 7-dehydrocholesterol into cholesterol with rat-liver homogenates by the enzyme 7-dehydrocholesterol reductase is described. The 7α- and 8β-hydrogen atoms are derived from NADPH and a suitable proton source, respectively. The overall addition is *trans*-diaxial. The crucial step is apparently the formation of the $C_{(8)}$-H bond, thus generating a highly stable allylic carbonium ion at C_7 that in accordance with chemical expectations is neutralized by the delivery of a hydrogen by NADPH from the α-side of the steroid molecule.

COLORING AGENT CONTAINING CAROTENOID PIGMENT, AND PREPARATION OF SUCH AGENT. H. Mima, M. Terasaki and M. Kato (Takeda Chemical Industries, Ltd.). *U.S. 3,227,561.* A method for preparing a stable and safely utilizable coloring agent containing carotenoid pigment comprises dissolving carotenoid pigment in a solvent such as abietic acid, hydrogenated abietic acid or a lower aliphatic alcohol ester thereof while heating to a temperature of 90 to 140C.

ANTI-HYPERCHOLESTEROLEMIC ACTION OF SCLEROGLUCAN AND PECTIN IN CHICKENS. P. Griminger and H. Fisher (Dept. of Animal Sci., Rutgers—The State Univ., New Brunswick, N. J.). *Proc. Soc. Exp. Biol. Med.* 122, 551–3 (1966). Pectin and the polysaccharide scleroglucan reduced dietary hypercholesterolemia in chicks; this reduction was accompanied by an increased excretion of chloroform-methanol extractable lipid, including cholesterol. The chemical dissimilarity of pectin and scleroglucan suggests that the anti-hypercholesterolemic activity of the two materials may be due to their physical rather than to their chemical properties.

PHOSPHATIDO-PEPTIDE FRACTION AS A CARRIER FOR CATIONIC SUBSTANCES. Ruth R. Levine (Secretary of Dept. of Health, Education and Welfare). *U.S. 3,248,293.* A pharmaceutical preparation having increased absorption across biological membranes comprises a mixture of a quaternary ammonium compound and the isolated phosphatido-peptide fraction of mammalian cells.

METHOD FOR RECOVERING CAROTENOIDS AND PHYTOL FROM PAPAYA PLANTS. E. M. Burdick. *U.S. 3,248,301.* A method of separating carotenes, xanthophylls and phytol from papaya plants comprises the steps of: (a) treating the plants to recover a liquid portion; (b) adjusting pH of the liquid to 4.0–4.5; (c) digesting the liquid portion to form a coagulate; (d) neutralizing the coagulate; (e) separating a carotenoid containing fraction from the coagulate; (f) saponifying the carotenoid containing fraction; (g) dissolving the carotenoid containing fraction in an organic solvent; (h) filtering the resulting mixture to obtain a filtrate; (i) extracting the filtrate with water to remove water solubles therefrom; (j) separating the water phase and organic solvent phase containing carotenoids; (k) separating the carotenoids from the organic solvent phase; (l) mixing the carotenoids with a low molecular weight water-soluble ketone; (m) separating the resulting filtrate from the residue; (n) separating the solvent from the filtrate to obtain a carotenoids and phytol fraction; and (o) extracting the carotenoids and phytol fraction with an aqueous alcoholic solution to separate the phytols and xanthophylls from the carotenes.

PHOSPHOLIPID CONTENT IN THE MUSCLES IN DYSTROPHY AND STARVATION. T. F. Kastrikina (Inst. Biochem., Acad. Sci. Ukr. S.S.R., Kiev). *Ukr. Biochem. Zhur.* 37 (6), 871–876 (1965). The total and individual phospholipid contents in the muscles were studied in dystrophy induced by E-avitaminosis and in starvation. Results showed that in dystrophy and starvation the total phospholipid content in the skeletal, heart, and smooth gastric muscle does not differ practically from the norm. The content of individual phospholipids, however, changes in all investigated muscles in dystrophy and starvation. Data supporting these conclusions are tabulated in four tables.

PHOSPHOLIPID COMPOSITION OF THE CELL MEMBRANES OF THE NERVOUS SYSTEM IN ITS EVOLUTIONARY ASPECT. E. M. Kreps (I. M. Sechenov Inst. Physiol Biochem. Evolution, Acad. Sci. U.S.S.R., Leningrad). *Ukr. Biochem. Zhur.* 37 (5), 734–741 (1965). A very large number of cell membranes of different origins were studied with the electron microscope. The membranes were made of a bimolecular layer of phospholipids, covered on both sides with a monomolecular layer of albumins. The stability of this structure is attained by an arrangement of its units so that the hydrocarbon chains of fatty acid radicals from the phospholipid molecules are directed within and are held by hydrophobic bonds, while the polar surfaces of the phospholipid molecules are turned toward the albumin layer.

ENZYMATIC DEHYDROGENATION OF SATURATED ACIDS. M. T. Arondel (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 13 (2), 109–115 (1966). After a brief review of the chemical methods for dehydrogenation the author describes the enzymatic dehydrogenation of saturated acids by various bacteria. *Corynebacterium diphtheriae* and *Micrococcus lysodeikticus* yield the C-15:9 monounsaturate homolog from stearic acid. *Bacillus megatherium* yields the C-15:5 isomer. It was noted that the biosyntheses were stereospecific. The enzymes were able to selectively remove certain hydrogen atoms from carbon.

PALM OIL SUCROGLYCERIDES. EFFECT ON RAT GROWTH. STUDIES OF ABSORPTION. T. Balea, J. Carriou and C. Snozzi (Lab. LARAC, Nevilly, Fr.). *Rev. Franc. Corps Gras* 13 (2), 91–99 (1966). The physiological and nutritional properties of a palm sucroglyceride were studied. Eight groups of rats fed a diet including 0, 3, 5 and 10% of sucroglyceride were studied. The results show that this product promotes fat assimilation, growth and skeletal development. The metabolism ratio rises to about 80%.

EFFECT OF HYDROCORTISONE FEEDING ON CONCENTRATION OF FREE FATTY ACIDS AND OTHER LIPIDS OF RABBIT SERA. J. C. Forbes, R. A. Rudolph and O. M. Petterson (Dept. of Biochem. and Pathol., Med. College of Virginia, Richmond). *Proc. Soc. Exp. Biol. Med.* 122, 299–300 (1966). Rabbits fed Purina rabbit chow supplemented with 30 mg of hydrocortisone/kg of diet showed a marked rise in FFA content of the serum as well as in serum cholesterol, phospholipids and triglycerides. The addition of coconut oil at a 5% level to the diet augmented the effect. It is postulated that the various changes in serum lipid may be secondary to an increased mobilization of FFA from the adipose tissue as a result of the hydrocortisone feeding.

ACTION OF ANIONIC AND CATIONIC NERVE-BLOCKING AGENTS: EXPERIMENT AND INTERPRETATION. M. P. Blaustein and D. E. Goldman (U.S. Naval Med. Res. Inst., Bethesda, Md.). *Science* 153, 429–32 (1966). Barbiturates and anesthetics similar to procaine bind to phospholipids *in vitro*. The former increase the binding of calcium to the phospholipids: the latter decrease it. The data can be correlated with the effects of these drugs on peripheral nerve. The nonpolar portion of the narcotic agents may lie between the lipid chains of the membrane, with the charged region in close approximation to the polar heads of the phospholipids.

EFFECT OF DEFICIENCIES OF α-TOCOPHEROL, RETINOL AND ZINC ON THE LIPID COMPOSITION OF RAT TESTES. J. G. Bieri and E. L. Prival (Lab. of Nutr. and Endocrin., National Inst. of Arthritis and Metabolic Diseases, National Insts. of Health, Bethesda, Maryland). *J. Nutr.* 89, 55–61 (1966). To determine whether lipid changes noted previously in α-tocopherol-deficient rat testes were specific for vitamin E, a comparison was made with testes in deficiencies of retinol or zinc. Testicular degeneration was produced in rats fed purified diets deficient in either α-tocopherol, retinol or zinc for 12 to 19 weeks. Total lipid was reduced in testes in all 3 deficiencies with decreased amounts of phospholipid accounting for most of the change. α-Tocopherol-deficient testes had the lowest phospholipid content. The proportion of 20:4 ω6 was twice normal in α-tocopherol-deficient testes, moderately increased in zinc deficiency and unchanged in retinol deficiency; 22:4 ω6 increased only in α-tocopherol deficiency. The proportion of 22:5 ω6 was about two-thirds of normal in retinol and zinc-deficient testes but only one-third normal in α-tocopherol-deficient tissue. Dietary selenium had no effect on testes composition either in the presence or absence of α-tocopherol.

ESSENTIAL FATTY ACID REQUIREMENT OF YOUNG SWINE. R. F. Sewell and L. J. McDowell (Dept. of Animal Science, Univ. of Georgia, Athens, Georgia). *J. Nutr.* 89, 64–68 (1966). Uncastrated male pigs, 3 weeks of age, were fed purified diets containing 6 levels of linoleic acid. One testicle and a sample of scrotal fat were removed by orchiectomy at 5 and 10 weeks to provide biopsy tissue for gas-liquid chromatographic analysis of fatty acid composition. Marked alteration in tissue fatty acids was evident after 5 weeks and these differences were accentuated at 10 weeks. A progressive depression of the dienoic and tetraenoic fatty acids occurred, with a corresponding elevation of the trienoic fatty acids, as the dietary level of linoleic acid was decreased. Extensive dermal lesions, typical of EFA deficiency, were observed on all pigs in the group receiving the basal diet. Dermal lesions were also observed in the groups receiving linoleic acid as 0.25 and 0.50% of the dietary calories. Feeding linoleic acid as 1.0% of the dietary calories either prevented or remitted the dermal symptoms, or both. Weight gain was not significantly affected by dietary linoleate level. A plot of the triene-to-tetraene ratio versus the dietary linoleate level indicates that the linoleic acid requirement of the young pig is not more than 2.0% of the dietary calories.

SKIN LIPIDS OF PUPPIES AS AFFECTED BY KIND AND AMOUNT OF DIETARY FAT. Hilda F. Wiese, W. Yamanaka, E. Coon and Shirley Barber (Bruce Lyon Memorial Res. Lab., Children's Hospital Medical Center, Oakland, California). *J. Nutr.* 89, 113–122 (1966). Clinical evidence of a dietary requirement for linoleic acid in maintenance of a healthy skin prompted a study of fatty acid distributions in skin of 84 young dogs fed diets with and without linoleic acid. When weanling puppies were fed diets deficient in linoleic acid for 2 months, monoene fatty acids in whole skin greatly exceeded levels for saturated fatty acids. Linoleic and arachidonic acid levels were lower than for newborn puppies. Levels of these fatty acids decreased further in skin and serum after 4 months when definite deficiency signs were evident, but levels remained approximately the same during longer feeding periods. Small amounts of linoleic acid were always present in skin and serum. Step-by-step increases in dietary linoleate were reflected in increased levels of this fatty acid in triglycerides, cholesterol esters, and phospholipids in skin and serum. During linoleic acid-deficient states, 5,8,11-eicosatrienoic acid was always pres-

ent in serum, but it was observed infrequently in skin and only in the phospholipid fraction. In deficient states arachidonic acid was present in most serum silicic acid fractions but appeared infrequently in small amounts only in skin phospholipids. When ethyl arachidonate was fed for 2 months after weaning, it was observed in skin and serum, but durnig recovery from the linoleic deficient state, it was not noted in skin after a 2-month feeding period. Phospholipids make up a small fraction of skin lipids, but changes in their fatty acid patterns appear to reflect alterations which occur in epidermal cells during a dietary deficiency of linoleic acid.

DEVELOPMENT OF HYDROLYTIC CHOLESTEROL ESTERASE ACTIVITY IN RAT BRAIN. R. Clarenburg, A. B. Steinberg, J. H. Asling and I. L. Chaikoff (Dept. of Physiol., Univ. of California, Berkeley, California). *Biochemistry* **5**, 2433–40 (1966). Hydrolytic cholesterol esterase activity was measured by incubating cholesterol-4-C^{14} linoleate with homogenates prepared from the brains of rats of various ages. A method we developed by which the contribution of endogenous cholesterol esters to the substrate pool for the hydrolytic enzyme could be derived from measured initial rates of hydrolysis of the labeled substrate. The net amounts of cholesterol esters hydrolyzed during the incubations could thus be established. Brains of newborn rats showed hydrolytic activity. Additional activity was acquired chiefly between 7 and 20 days of age, a period when brain myelination is known to be most active. The esterase activity remained maximal from about 3 weeks to at least 3 months of age. Hydrolytic cholesterol esterase activity was shared about equally by various particulate subcellular fractions; cell sap was practically devoid of activity.

BIOSYNTHESIS OF WAX IN BRASSICA OLERACEA. RELATION OF FATTY ACIDS TO WAX. P. E. Kolattukudy (Dept. of Biochem., The Connecticut Agr. Expt. Station, New Haven, Conn.). *Biochemistry* **5**, 2265–75 (1966). According to the literature nonacosane and its derivatives, the major components of the surface wax of the leaves of *Brassica oleracea*, are supposed to be synthesized by the condensation of two molecules of pentadecanoic acid which in turn may be produced from palmitic acid by α-oxidation. If this hypothesis is true the carboxyl carbon of palmitic acid would be lost during the incorporation of palmitic acid into the C_{29} compounds. However, equal amounts of radioactivity were incorporated into *n*-nonacosane of broccoli leaves from palmitic acid-1-C^{14}, palmitic acid-U-C^{14}, and palmitic acid-9,10-H^3. Palmitic acid-1-C^{14} was as efficient as palmitic acid-U-C^{14} in labeling the other C_{29} compounds of broccoli leaf, nonacosanone and nonacosanol.

LIPID HYDROLYSIS IN UNBLANCHED FROZEN PEAS (PISUM savitum. B. Bengtsson and I. Bosund (Nordreco AB. Bjuv, Sweden). *J. Food Sci.* **31**, 474–81 (1966). Data on hydrolytic changes in the lipids on unblanched (enzymatically active) peas in the range −5 to −20C are presented. The Q_{10} value for the formation of free fatty acids between these temperatures is about 2.5. The corresponding value for development of off-flavor is about 3.0. Both values are considerably lower than those typical for deteriorative non-enzymatic reactions in blanched vegetables. Gas chromatographic analysis of the free fatty acid fraction demonstrates further that there is an apparent preference for hydrolysis of polyunsaturated acids. This tendency is especially evident in the lower part of the temperature range studied. A corresponding increase of the proportion of saturated acids in the unhydrolyzed fat can be shown. No net change of any single acid in the combined lipid fractions is observed, except for linoleic and linolenic acids, which decrease somewhat after long storage at the higher temperatures. This indicates a substantial breakdown into smaller molecules.

FIBRINOLYSIS IN RELATION TO BODY FATNESS, SERUM LIPIDS AND CORONARY HEART DISEASE IN AFRICAN AND ASIAN MEN IN UGANDA. A. G. Sheper, K. W. Jones, J. Kyobe and M. Jones (Dept. of Med., Makerere Univ. Coll. Medical School, Kampala, Uganda). *J. Atheroscler. Res.* **6**, 313–27 (1966). Fibrinolytic activity was significantly greater in African than in Asian subjects. No difference in lysis time was observed between healthy Asians and Asians with coronary heart disease, but Asian subjects with an abnormal glucose tolerance test had longer lysis times than non-diabetic subjects. The normal Asian subjects had a greater clot binding power than the African subjects. No differences were observed in platelet adhesiveness in the three groups studied, but a striking difference in the flow rate of venous blood was observed. In the Asian subjects there was a significant interrelationship of lysis time both with skinfold thickness and with serum cholesterol level, although not with serum triglyceride levels.

THE RELATIONSHIP BETWEEN BLOOD LIPIDS AND THE FIBRINOLYTIC ENZYME SYSTEM. B. Sweet, B. M. Rifkind and G. P. McNicol (Univ. Dept. of Med., Royal Infirmary, Glasgow, Great Britain). *J. Atheroscler. Res.* 6, 359–67 (1966). Levels of serum or plasma lipids (cholesterol, triglyceride, phospholipid and free fatty acid) were estimated and tests of the fibrinolytic enzyme system (plasminogen, fibrinogen, euglobulin lysis activity and urokinas sensitivity) were performed in 46 out-patents with peripheral vascular disease, and 46 age-matched, healthy subjects. A significant negative correlation was found between plasma triglyceride levels and plasma euglobulin lysis activity in both groups of subjects. Serum cholesterol levels tended to show a negative correlation, and plasma free fatty acid levels, a positive correlation with plasma euglobulin lysis activity. No correlations were found between the lipid levels and the other components of the fibrinolytic enzyme system. The subjects with peripheral vascular disease were similar to the control group with respect to their levels of lipids, plasminogen, fibrinogen and euglobulin lysis activity; they showed a significantly lower urokinase sensitivity.

INTERRELATED EFFECTS OF DIETARY FATS AND PROTEINS ON ATHEROSCLEROSIS IN THE PIGEON. H. B. Lofland, T. B. Clarkson, L. Rhyne and H. O. Goodman (Wake Forest College, The Bowman Gray School of Med., Dept. of Biochem., Winston-Salem, N. C.). *J. Atheroscler. Res.* 6, 395–403 (1966). White Carneau pigeons were maintained for 15 months on diets in which 30% of the calories came from either margarine, butter, corn oil or Crisco (30 mg of cholesterol was added to each 100 g of the latter two fats to equal the cholesterol content of butter). Dietary protein was supplied by either wheat gluten or a casein-lactalbumin mixture, each fed at two levels. At the end of the experiments the levels of serum triglycerides and cholesterol were measured, as were the prevalence and severity of aortic atherosclerosis. The aortas were analyzed for their cholesterol content as an additional measure of degree of atherosclerosis. The results indicate that almost all of the dietary variables studied (type of fat, presence of cholesterol, type and feeding level of protein) can influence one or more of the parameters thought to be related to atherosclerosis, e.g., serum cholesterol or triglyceride levels, or the extent of aortic atherosclerosis. Of more significance, however, was the detection of significant interactions, indicating that the effect of a single dietary ingredient is influenced by the other components of the diet, and that such influences may be in opposite directions.

SYNTHESIS OF PHOSPHOLIPID BY FOAM CELLS ISOLATED FROM RABBIT ATHEROSCLEROSIS LESIONS. A. J. Day, H. A. I. Newman and D. B. Zilversmit (Dept. of Physiol. and Biophysics, Univ. of Tennessee Med. Units, Memphis, Tenn.). *Circulation Res.* 19, 122–31 (1966). Foam cells from atherosclerotic lesions have been isolated by incubation of the intima with collagenase and elastase. The composition and metabolism of homogeneous preparations of foam cells obtained in this way have been compared with other parts of the atherosclerotic intima. About 1% of the cholesterol and phospholipid of the intima was present in the cells obtained. The phospholipids of the foam cells contained a lower percentage of lecithin and of sphingomyelin and a higher percentage of "phosphatidyl ethanolamine" than the other parts of the intima. The isolated foam cells incubated *in vitro* incorporated P^{32}-phosphate into phospholipid at a rate of about 0.5 mumoles/10^6 cells/hr. The P^{32} was incorporated mainly into lecithin and phosphatidyl inositol with smaller amounts incorporated into phosphatidyl ethanolamine, sphingomyelin and lysolecithin.

IN VITRO PHOSPHOLIPID SYNTHESIS IN NORMAL AND ATHEROMATOUS RABBIT AORTAS. H. A. I. Newman, A. J. Day, and D. B. Zilversmit. *Ibid.*, 132–8. The incorporation of P^{32}-phosphate and C^{14}-choline into normal and atherosclerotic rabbit aortas was studied extensively *in vitro*. The same results as observed *in vivo* were found, namely an enhanced synthesis of phospholipids by the atheromatous aorta, localized primarily in the intima. Aortic intimal phospholipids incorporated more choline than phosphate. Tests with cyanide and fluoride showed that the higher incorporation of choline could not be attributed to exchange with preformed aortic phospholipid but presumably was due to differences in intermediate metabolic pools. The difference in distribution of P^{32} between the two most active phospholipid classes, phosphatidyl choline and phosphatidyl inositol, of normal and atherosclerotic aortas was similar *in vivo* and *in vitro*. In the normal aorta, phosphatidyl inositol had a higher percentage of P^{32} than phosphatidyl choline; in the atheromatous aorta, these percentages were reversed.

SOME PHYSIOLOGICAL PROPERTIES OF HALPHEN-POSITIVE COTTONSEED OILS. V. L. Frampton, J. C. Kuck, A. B. Pepperman, Jr. and W. A. Pons, Jr. (Southern Regional Res. Lab., Agr. Res. Service, U.S. Dept. Agr., New Orleans, Louisiana), A. B. Watts and C. Johnson. *Poultry Sci.* 45, 527–35 (1966). Investigations of the properties of fresh and stored shell eggs produced by hens on rations containing cottonseed oils have established that the *in vivo* reaction in the stearic acid ← . . . . → oleic + linoleic acids hen is driven abnormally to the left. The degree of disturbance in the stearic, oleic, and linoleic acids in yolk fat was observed to be related to the concentration of malvalic acid in the ingested cottonseed oils. Halphen-negative cottonseed oils, produced by bleaching cottonseed oil with sulfurous acid-treated alumina, did not have the ability to disturb the distribution of these three fatty acids in egg yolk fat. Coefficients of variation for fatty acids in cottonseed oils were determined.

FATTY ACID INTERCONVERSION BY LAYING HENS. W. E. Donaldson (Dept. of Poultry Science, North Carolina State Univ., Raleigh, N. C.). *Poultry Sci.* 45, 473–8 (1966). Hens fed corn-soya diets from day-old to 8-months of age were then fed a "fat-free" or one of 2 fatty acid supplemented diets for 10 weeks. Hens fed each diet were then given intraperitoneal injections of carboxyl-labeled-C^{14} fatty acids. Fatty acid supplementation resulted in marked changes in fatty acid composition of liver, adipose tissue and eggs. The principal changes with supplementation were a decrease in 16:0 and increases in 18:1 and 18:2 acids. Interconversion of C^{14}-labeled fatty acids was determined from developing follicle fatty acids. Diet did not affect the interconversion pattern of 16:0 and 18:1 acids. The interconversion pattern of 18:0 and 18:2 acids in hens fed the "fat-free" diet differed from the pattern in hens fed the fatty acid supplemented diets. Total apparent interconversion of labeled acids by fat-fed hens was reduced in comparison to control hens.

ISOLATION AND TENTATIVE IDENTIFICATION OF THE CAROTENOIDS PRESENT IN CHICKEN SKIN AND EGG YOLKS. I. D. Smith and H. S. Perdue (Abbott Lab., North Chicago, Illinois). *Poultry Sci.* 45, 577–81 (1966). Six carotenoids were isolated from the skin of chickens and four carotenoids were isolated from the egg yolks of laying hens fed either a combination of yellow corn and alfalfa or algae (*Chlorella pyrenoidosa*) as their source of dietary carotenoids. The distribution of the carotenoids in the skin differed markedly from their distribution in the diet. The more non-polar compounds were in greatest amount in the skin; whereas, the more polar compounds were in greatest amount in the diet. The distribution of the carotenoids in the egg yolk was quite similar to their distribution in the diet. Four of the six carotenoids from the skin and the four from the yolk were tentatively identified on the basis of adsorption chromatography and absorption maxima as being α-carotene-like, cryptoxanthin-like, lutein-like and zeaxanthin-like. The carotenoids deposited from either dietary source appeared to be qualitatively the same.

SERUM NEFA FOLLOWING FAT, CARBOHYDRATE AND PROTEIN INGESTION, AND DURING FASTING AS RELATED TO INTRACELLULAR LIPID DEPOSITION. W. P. Castelli, R. J. Nickerson, J. M. Newell and D. D. Rutstein (Dept. of Preventive Med., Harvard Univ. Med. School, Boston, Mass.). *J. Atheroscler. Res.* 6, 328–41 (1966). Direct quantitative comparison of changes in the concentrations of non-esterified fatty acids (NEFA), triglycerides, total cholesterol and phospholipids following fat, carbohydrate and protein test meals and during the prolonged fasting state are made. Fat ingestion was followed in postprandial serum specimens (3–9 hours) by a marked increase in NEFA, a moderate increase in triglycerides, a slight increase in phospholipids and no change in total cholesterol concentration. Carbohydrate ingestion was followed by a sharp decrease and then an overshoot of serum NEFA concentration. Other lipid measurements were unchanged. Protein ingestion was followed by a moderate decrease and then a gradual rise to just above the initial fasting level of serum NEFA concentration. Other lipid measurements were unchanged. Protein ingestion was

followed by a moderate decrease and then a gradual rise to just above the initial fasting level of serum NEFA concentration. Other lipid measurements were unchanged.

THE BIOSYNTHESIS OF SQUALENE, LANOSTEROL AND CHOLESTEROL BY MINCED HUMAN PLACENTA. L. Zelewski and C. A. Villee (Dept. of Biological Chem., Harvard Med. School, Boston, Mass.). *Biochemistry* **5**, 1805–14 (1966). The data from the experiments with doubly labeled mevalonate are consistent with the hypothesis that lanosterol is synthesized from one pool of squalene and the cholesterol is synthesized from one pool of lanosterol. The isotope ratios of the three products were identical. In contrast, the isotope ratios in these three products differed markedly in the experiments with acetate-1-C^{14} plus mevalonate-5-H^3 as substrates. The H^3/C^{14} ratio for lanosterol was much greater and the ratio for cholesterol was much smaller than the ratio for squalene in any given flask. This suggests that in the placenta the metabolic pathway from acetate to cholesterol differs in some respects from that of mevalonate.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. I. P. Williamson and S. J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, North Carolina). *J. Biol. Chem.* **241**, 2326–32 (1966). Acetyl coenzyme A-acyl carrier protein transacylase (acetyl transacylase) and malonyl coenzyme A-acyl carrier protein transacylase (malonyl transacylase) have been purified 90- and 255-fold, respectively, from *Escherichia coli* extracts and exhibited the following properties. Acetyl transacylase is heat-labile whereas malonyl transacylase is comparatively heat-stable, 80% of its activity surviving for 20 min at 80C. Both enzymes have pH optima in the region of 6.5. The reactions are readily reversible, and equilibrium constants are 2.09 for acetyl transacylase and 2.33 for malonyl transacylase. Inhibition of the enzymes of N-ethylmaleimide and iodoacetamide demonstrates that both are sulfhydryl enzymes. Acetyl transacylase is relatively specific for acetyl-CoA but can transacylate coenzyme A esters of propionic, butyric, and hexanoic acids at a rate of 23.4, 9.8, and 4.5% that of acetyl-CoA, respectively. Evidence is presented in support of a mechanism of action of acetyl transacylase involving the intermediary formation of an acetyl-S-enzyme which can then transfer the acetyl group to acyl carrier protein or coenzyme A.

PATHS OF CARBON IN GLUCONEOGENESIS AND LIPOGENESIS. P. Walter, V. Paetkau and H. A. Lardy (Inst. for Enzyme Res., Univ. of Wisconsin, Madison, Wis. 53706). *J. Biol. Chem.* **241**, 2523–32 (1966). The data, together with previous information, indicate that phosphoenolpyruvate is synthesized from pyruvate by a pathway involving pyruvate carboxylation and formation of aspartate and malate inside the mitochondria, diffusion of these compounds into the cytosol, and their conversion of phosphoenolpyruvate via oxalacetate. The regulation of this pathway is discussed and a hypothesis as to how fatty acids could control gluconeogenesis is outlined.

PANCREATIC LIPASE ACTIVITY IN DEUTERIUM OXIDE. J. F. Thomson, K. J. Bush and Sharron L. Nance (Div. of Biological and Med. Res., Argonne Nat'l Lab., Argonne, Ill.). *Proc. Soc. Exp. Biol. Med.* **122**, 502–5 (1966). The activity of purified pancreatic lipase, with tributyrin emulsified in gum arabic as the substrate, has been studied in ordinary water and in varying concentrations of D_2O up to 100%. Estimates of maximum reaction velocities indicate that the degree of inhibition increases linearly with increasing D_2O. At low substrate concentrations, however, the inhibition produced by D_2O was much less, an indication that there is a stronger solvent effect on enzyme-substrate binding than on the rate of hydrolysis itself.

STUDIES ON ALDOSTERONE BIOSYNTHESIS IN VITRO. Prema B. Raman, D. C. Sharma and R. J. Dorfman (Inst. of Hormone Biology, Syntex Res. Center, Stanford Industrial Park, Palo Alto, California). *Biochemistry* **5**, 1795–1804 (1966). Biosynthesis of 18-hydroxycorticosterone and aldosterone from corticosterone by bovine, guinea pig, and particularly sheep adrenal tissue has been studied. Both "18-hydroxylase" and "18-ol-dehydrogenase" were located mainly in the mitochondrial fraction. Reduced triphosphopyridine nucleotide (TPNH) and not reduced diphosphorpyridine nucleotide (DPNH) was the cofactor for C-18 hydroxylation; presence of oxidized triphosphopyridine (TPN^+) or diphosphopyridine nucleotide (DPN^+) in the incubation media resulted in the conversion of 18-hydroxycorticosterone into 18-hydroxy-11-dehydrocorticosterone and not into aldosterone. Ca^{2+} stimulated the conversion of corticosterone into 18-hydroxycorticosterone. SU 4885 (1,2-bis(3-pyridyl)2-methyl-1-propanone) and SU 9055 (3-(1,2,3,4-tetrahydro-1-oxo-2-naphthyl)pyridine) had inhibitory effect on C-18 hydroxylation while SU 8000 (3-(6-chloro-3-methyl-2-indenyl)pyridine) inhibited "18-ol-dehydrogenase." N-Ethylmaleinide at lower concentrations inhibited the conversion of 18-hydroxycorticosterone into 18-hydroxy-11-dehydrocorticosterone without affecting the biosynthesis of 18-hydroxycorticosterone and aldosterone; other sulfhydryl inhibitors affected both "18-hydroxylase" and "18-ol-dehydrogenase" by varying degrees. Although aldosterone had no effect on the conversion of corticosterone into 18-hydroxycorticosterone or of the later into 18-hydroxy-11-dehydrocorticosterone, "18-hydroxylase" was inhibited by the intermediate 18-hydroxycorticosterone. The formation of 18-hydroxy-11-dehydrocorticosterone and the inhibiting effect of 18-hydrocorticosterone appears to be of significance in the control of aldosterone biosynthesis.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. E. L. Pugh, F. Sauer, M. Waite, R. E. Toomey and S. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, North Carolina 27705). *J. Biol. Chem.* **241**, 2636–43 (1966). The fatty acid-synthesizing system of *Escherichia coli* was fractionated by chromatography on diethylaminoethyl cellulose into three different enzyme fractions: E-II, E-III, and E-IV. Incubation of Fraction E-II with acetyl coenzyme A, malonyl coenzyme A, reduced triphosphopyridine nucleotide, and acyl carrier protein (ACP) yielded β-hydroxydecanoyl-ACP, β-hydroxylauryl-ACP, and β-hydroxymyristyl-ACP in variable amounts depending on the E-II preparations. Addition of Fraction E-III to reaction mixtures of E-II yielded mainly palmitic acid, whereas the addition of E-IV to the same E-II reaction mixture yielded mainly *cis*-vaccenic acid. Therefore, E-III and E-IV must have directed the synthesis of saturated and unsaturated fatty acids from β-hydroxyacyl-ACP, respectively. Isolated β-hydroxyacyl-ACPs could be converted to their saturated homologues by incubation with E-III and TPNH or could be elongated to palmitic caid by incubation with E-III, TPNH, malonyl-CoA, and E-II. Incubation of E-III or its subfractions with β-hydroxydecanoyl-CoA yielded the 2-decenoyl derivative. Incubation of E-IV or its subfractions with β-hydroxy-decanoyl-CoA yielded a mixture of *cis*-3-decenoyl and *trans*-2-decenoyl derivatives. The relationship between the two dehydrases and the various products formed are discussed as well as their role in the synthesis of saturated and unsaturated fatty acids.

A STUDY OF A MONOGLYCERIDE-HYDROLYZING ENZYME OF INTESTINAL MUCOSA. J. L. Pope, J. C. McPherson and H. C. Tidwell (Biochem. Dept., Southwestern Med. School, Univ. of Texas, Dallas, Texas). *J. Biol. Chem.* **241**, 2306–10 (1966). An enzyme present in the microsomes of small intestinal mucosa cells was partially purified by a combination of several conventional methods: solubilization with deoxycholate, $(NH_4)_2SO_4$ fractionation, diethylaminoethyl Sephadex column chromatography, carboxymethyl Sephadex treatment, and finally starch zone electrophoresis. The purified enzyme preparation had a specific activity 300 times that of the starting homogenate. The enzyme showed little if any hydrolytic activity on long chain di- and triglycerides, cholesterol esters, lecithin, and monoglycerides tested, except monostearin, and a variety of short chain esters including mono-, and di-, triglycerides as well as methyl and ethyl esters. The substrate specificity pattern indicates that this enzyme acts on soluble substrates and might be considered an esterase rather than a lipase. However, since this enzyme has been previously referred to as "monoglyceride lipase" together with the fact that the most probable physiological substrates are long chain monoglycerides, this designation might be preferable.

EFFECT OF PECTIN DOSE ON SERUM CHOLESTEROL LEVELS. G. H. Palmer and D. G. Dixon (Sunkist Growers Inc., Res. and Dev. Div., Corona, California). *Am. J. Clin. Nutr.* **18**, 437–42 (1966). Evaluation of the daily pectin intake, in 2 gm. increments, has been carried out in a double-blind clinical study of 16 volunteer subjects. The treatment time extended over 6–4 week test periods followed by a 10 week nontreatment period. Total serum cholesterol determinations were made on blood samples obtained prior to treatment and during the final week of each observation period. Four statistical procedures were used to analyze the data. Results of the Student's t test analysis of variance and Duncan's range test all indicated that a daily dose of 6 gm. to 10 gm. of Pectin N.F. XI significantly reduced the serum cholesterol level in this group of subjects. The correlation coefficient calculation for each subject was the fourth statistical procedure used to evaluate the data. The results of the paired Student's t test implied that possibly there was a carry-over effect at the 10 gm. intake level which appears to have been dissipated in two to three months. In

addition to evaluating the effect of treatment with various pectin doses, the analysis of variance indicated that all subjects on self-selected diets do not respond equally well to pectin therapy. From the correlation coefficient calculations it was noted that 12 of the 16 subjects had negative coefficients signifying a reduction of serum cholesterol with increased pectin doses. Two of these twelve subjects had negative correlation coefficients which were significant at $P = 0.05$.

LIPIDS OF THE LIVING COELACANTH, LATIMERIA CHALUMNAE. J. C. Nevenzel, W. Rodegker, J. F. Mead and M. S. Gordon (Dept. of Biophysics and Nuclear Med., Univ. of California, Los Angeles). *Science* 152, 1753–5 (1966). The muscle of *Latimeria chalumnae* contains 30 to 71% (dry weight) of lipid deposited extracellularly. Wax esters consituted 90% or more of the lipids from muscle and fat storage tissues. These esters, by gas-chromatographic analysis, consisted of C_{30} to C_{40} homologs with one or two double bonds.

SOME EFFECTS OF METHYL LINOLEATE HYDROPEROXIDE ON OXIDATIVE PHOSPHORYLATION IN RAT LIVER MITOCHONDRIA. H. Naito, Betty Johnson and B. C. Johnson (Div. of Nutritional Biochem., Dept. of Animal Science, Univ. of Illinois, Urbana). *Proc. Soc. Exp. Biol. Med.* 122, 545–48 (1966). Evidence indicates that methyl linoleate hydroperoxide has an inhibiting effect on the coupling of phosphorylation with oxidation in rat liver mitochondria.

THE EFFECT OF CHOLESTEROL FEEDING AND ESTROGEN ADMINISTRATION ON THYROID AND ADRENAL GLAND FUNCTION IN RABBITS. M. D. Morris, D. A. Fisher and A. A. Krum (Depts. of Pediatrics, Biochem. and Physiol., Univ. of Arkansas Med. School, Fayetteville, Ark.). *J. Atheroscler. Res.* 6, 283–91 (1966). Male New Zealand rabbits were fed control and 0.2% cholesterol supplemented diets with and without estrogen for 90 days. Increased plasma and aorta lipids were observed in cholesterol fed rabbits. The added estrogen had no influence on these parameters of lipid metabolism.

• Drying Oils and Paints

DEGRADATION OF PAINT FILMS. I—AN ACCELERATED TEST OF THE YELLOWING OF DRYING OILS. T. Takeshita et al. *J. Jap. Soc. Col. Mat.* 38 (4), 171–9 (1965) (in Japanese). A filter paper test for determining the yellowing of drying oils is described. The amount of yellowing was related to differences in optical density measurements on oil-treated paper and a clean filter paper as reference. The effects of temperature, humidity and drier were discussed. (Rev. Current Lit. Paint Allied Ind., No. 287).

FURAN CARBOXYLIC ACID-MODIFIED ALKYD RESIN AND PROCESS OF MAKING THE SAME. V. F. Jenkins, R. J. Wicker, N. G. Boast and E. W. Hoy. *U.S. 3,238,161.* A modified alkyd resin is described which is the resinous product of esterification of at least one polyhydric alcohol (pentaerythritol, polypentaerythritol, trimethylolpropane, trimethylolethane, ethyleneglycol, propyleneglycol, glycerol, tetramethylolcyclohexanol, mannitol, sorbitol) with an acid component comprising (1) at least 1 unsaturated fatty acid containing from 12–22 carbons in the molecule, (2) at least 1 member of the group consisting of dicarboxylic acids and anhydrides selected from the group consisting of phthalic, isophthalic, and mixtures with at least 1 compound of the group consisting of adipic, sebacic, succinic, fumaric, maleic, and (3) at least 1 furan carboxylic acid. The molar amount of furan carboxylic acid constitutes at least 5% of the total molar amount of fatty acid and furan carboxylic acid.

PARTIALLY EPOXIDIZED DRYING OILS AND DERIVATIVES THEREOF AND THEIR PREPARATION. A. E. Rheineck and D. de Clerck (E. I. duPont deNemours and Co.). *U.S. 3,242,196.* A drying oil containing at least 5% by weight of esterified linolenic acid is reacted with hydrogen peroxide in the presence of an acid cation exchange resin and acetic acid. Hydrogen peroxide is employed in an amount equivalent to 0.6 to 1.3 moles of H_2O_2 for each linolenyl group present in the reactant oil, the cation exchange resin is present in an amount corresponding to a weight ratio of resin/H_2O_2 of 0.29–0.80, and the acetic acid in an amount corresponding to a weight ratio of acetic acid/H_2O_2 of 0.5–4.0. Also claimed is a drying oil of the group consisting of (a) an epoxidized oil product prepared by the method described above having an oxirane oxygen content of 1.5–3.4% and (b) a crosslinked reaction product of the epoxidized oil product with a crosslinking agent which effects crosslinking by reaction with the oxirane groups of the epoxidized oil product.

METHOD OF PREPARING A PHENOLIC-DRYING OIL COATING ON A METAL SUBSTRATE. S. B. Radlove, A. Ravve and C. W. Fitko (Continental Can Co.). *U.S. 3,257,232.* A method of preparing a hard-flexible adherent coating on a metal substrate comprises applying to the substrate an effective amount of an unreacted phenolic resin-drying oil composition and subsequently baking the composition onto the metal at a temperature ranging from 400–700F for a period of at least 10 seconds. The unreacted phenolic resin-drying oil composition consists of a volatile organic solution of 45–65% by weight of a phenol-aldehyde resin, 35–55% of a raw drying oil such as tung, oiticca or isano, and an effective amount of a metallic drier. The phenol-aldehyde resin is prepared by condensing a mixture consisting of 0.5–2.0 parts by weight of phenol for each part of a monoalkyl phenol in which the alkyl group has 8–18 carbons and 1–3 parts of an aldehyde for each part by weight of a combination of phenols in the presence of an an alkaline polymerization catalyst to obtain a phenolic resin having a Strokes gel of about 8–100 seconds at 150C.

• Detergents

ALKYL ARYL SULFONATE DETERGENTS. C. A. Cohen (Esso Research and Engineering Co.). *U.S. 3,234,297.* A hydrocarbon mixture suitable for sulfonation to form detergents consists essentially of monoalkyl benzene hydrocarbon having the general formula R—CH_2—R_1, in which R is benzene, R_1 is a tetrapropylene radical and the degree of branching of R_1 is such that about 50–80% of the total carbon atoms in the alkyl group (including the methylene group) are in a straight chain of carbon atoms.

DETERGENT PROCESSES. M. E. Tuvell (Monsanto Co.). *U.S. 3,235,505.* A process for manufacturing a liquid detergent composition comprises (1) preparing an aqueous emulsion of (a) a water-soluble detergent active material containing a polyoxyalkylene chain in intimate contact with (b) an acidic copolymer of maleic anhydride and a lower molecular weight olefinically unsaturated compound containing from 2 to 4 carbons and having a molecular weight between 26 and 100; the aqueous phase of the emulsion being a concentrated salt solution in which the detergent active material is substantially insoluble and containing about 3 weight per cent of an inorganic alkali metal chain phosphate salt; the detergent being an alkoxylated detergent having from 5–50 alkylene oxide units in its polyoxyalkylated chain and being selected from the group consisting of reaction products of a lower alkylene oxide with an alkylphenol having an alkyl chain containing 6–20 carbons, a monohydric alcohol containing 10–18 carbons, a fatty acid containing 10–18 carbons and sulfates thereof, and the acidic copolymer having a molecular weight between 1000–100,000; (2) subsequently converting the acidic copolymer to the alkaline salt form while the detergent active material is in the emulsified state.

DETERGENT COMPOSITIONS. F. I. Diehl and R. G. Laughlin (Procter & Gamble Co.). *U.S. 3,235,506.* A cleaning and detergent composition which has superior cool water washing ability consists of a detergent compound having the general formula $R_1PO(NR_2R_3)(NR_4R_5)$ in which R_1 is an alkyl radical containing 10–18 carbon atoms and R_2, R_3, R_4 and R_5 are each selected from the group consisting of hydrogen and methyl, ethyl, propyl, isopropyl, 2-hydroxyethyl, 2-hydroxypropyl, 3-hydroxypropyl, and 2,3-dihydroxypropyl radicals, and at least one builder material selected from the group consisting of sodium tripolyphosphate, -carbonate, -tetraborate, -pyrophosphate, bicarbonate, orthophosphate, -ethylenediaminetetraacetate, -sesquicarbonate, -hexametaphosphate, -N-(2-hydroxyethyl)ethylenediaminetriacetate, -nitrilodiacetate, -phytate and the corresponding potassium, ammonium and substituted ammonium salts. The ratio of the detergent compound to the builder material is in the range of 4:1 to 1:20.

DETERGENT COMPOSITIONS. G. P. Touey (Eastman Kodak Co.). *U.S. 3,236,779.* A composition soluble in water to form a washing solution which is effective not only to remove soil from textile materials but also to minimize re-deposition of removed soil comprises the mixture of a detergent selected from the group consisting of water-soluble soap, the water soluble synthetic nonionic organic detergents and the water-soluble synthetic organic anionic sulfated and sulfonated detergents with 1–10% by weight based on the dry weight of the detergent of a water-soluble salt selected from the group consisting of the alkali metal, ammonium and amine salts of the cellulose acetate sulfates having 1–2.2 acetyl groups and 0.4–1 sulfate radicals per anhydroglucose unit of cellulose.

HARD SURFACE CLEANING COMPOSITIONS. A. B. Herrick (Colgate-Palmolive Co.). *U.S. 3,239,468.* A hard surface cleaning composition consists of (by weight on total weight of the composition) 40–55% of at least one fatty acid-diethanolamine condensate containing 8 to 20 carbon atoms in the fatty acid portion, 15–25% of a water soluble salt of a higher alkyl aryl sulfonate having 10 to 18 carbons in the alkyl group, and 20–45% of a nonionic polyoxyalkylene alkylphenol condensate containing 5 to 30 alkylenoxy groups and 6 to 12 carbon atoms in the alkyl group. The composition is characterized by a low foam level at use concentrations containing about 0.03 to 0.50% of the composition.

PROCESS FOR MANUFACTURING A DETERGENT BRIQUETTE. A. L. Schulerud, A. E. Austin, Jr. and K. H. Speckhals (Colgate-Palmolive Co.). *U.S. 3,240,712.* A process for manufacturing a detergent briquette comprises mixing together 20–40% of a normally solid water soluble anionic organic detergent selected from the group consisting of sulfated and sulfonated synthetic detergents with 20–70% of a normally solid water soluble inorganic hydratable builder salt, producing therefrom a particulate detergent containing 2–21% moisture; applying 4–12% added water to the detergent particles to increase the moisture content to 6–25% and to improve the disintegrability of the briquette later formed, the application of the predetermined proportion of water being effected while the particles are tumbled thereby effecting a uniform distribution of the added water over the surfaces of the detergent particles; pressing the detergent particles into a lightly compacted solid briquette at a pressure of between 3 and 100 lbs/sq. inch to form a readily distintegrable briquette and applying to the briquette a proportion between 1 and 5% of a readily water soluble synthetic organic film-forming polymer selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone, sodium carboxymethylcellulose and hydroxypropyl methyl cellulose to form on the briquette surface a water soluble film which is of strength sufficient to help make the detergent briquette resistant to abrasion and accidental breakage, when dry, and of such ready solubility that the detergent briquette will be readily disintegrable in water.

SPRAY DRIED DETERGENT CONCENTRATE. J. A. Monick (Colgate-Palmolive Co.). *U.S. 3,242,091.* A detergent concentrate particularly suitable for commercial laundering operations consists of 55–80% by weight of an alkali metal higher alkyl benzene sulfonate detergent having 9–15 carbons in the alkyl group and selected from the group consisting of sodium and potassium sulfonates, and minor proportions of alkali metal higher fatty acid soap selected from the group consisting of sodium and potassium salts of fatty acids having a titer of 38–43C, the sulfonate to soap ratio being from 95:5 to 70:30; sodium silicate having a sodium oxide to silica ratio of 1:2 to 1:3.5 in an amount from 5–20% of the alkyl benzene sulfonate; and 0.2–5% of alkali metal carboxymethylcellulose selected from the group consisting of sodium and potassium salts. The concentrate is in particulate form and comprises spray-dried particles of at least the sulfonate and silicate.

WAX-CONTAINING LIQUID DETERGENT. C. L. Bechtold (Colgate-Palmolive Co.). *U.S. 3,242,092.* A process for preparing a detergent composition in the form of a substantially stable, homogeneous, pourable liquid comprises: forming a stable liquid dispersion of 1–18% castor wax and 1–25% alkali metal higher alkyl benzene sulfonate detergent salt having 8–18 carbons in the alkyl group in water by admixing the castor wax in particulate form with water in the presence of the detergent with agitation at a temperature above 160F sufficient to melt the wax and form a homogeneous liquid mixture; cooling the mixture with agitation at a rate not substantially in excess of 5F/minute through a transition temperature below 160F until a critical stage of emulsion formation has passed; admixing the dispersion with alkali metal polyphosphate and additional water soluble detergent selected from the group consisting of the water soluble anionic organic sulfonated and sulfated detergents in water at a temperature below 160F while maintaining the wax in fine suspension. The ingredients are proportioned to form a homogeneous, pourable product consisting of 5–30% water soluble sulfonated detergent, 5–30% polyphosphate and 0.1–1% castor wax, by weight of the product.

REMOVAL OF ALKYL BENZENE SULFONATES FROM WATER. J-Y. Shang (Sun Oil Co.). *U.S. 3,247,103.* A method of removing sodium alkyl benzene sulfonate detergent from water comprises mildly and intimately contacting water containing the detergent with a water-immiscible organic liquid, settling the resulting mixture in a separation zone to form an upper organic liquid layer and a lower water layer (whereby the detergent collects adjacent the interface between the layers), and removing from the separation zone water essentially free of the detergent.

METHOD AND APPARATUS FOR REMOVING SURFACE ACTIVE AGENTS FROM WATER. F. F. Sako and J. A. Abbott (FMC Corp.). *U.S. 3,247,104.* A method of reducing the concentration of surface active agents dissolved in water comprises the following steps: passing a column of water in one direction through a treatment tower as a continuous phase liquid; dispersing discrete droplets of a collecting liquid that is completely insoluble with water into the continuous phase column adjacent to the end of the treatment tower toward which the water is flowing; causing the droplets to flow countercurrently to the continuous phase column of water for a time sufficient to cause the agents to concentrate at the interfaces between the droplets and the water as a film of enriched water solution of the agents; removing the agents from the treatment tower with the droplets remaining discrete and introducing them into a separating zone outside of the tower; coalescing the droplets into a homogeneous body of collecting liquid in the separating zone; and withdrawing the coalesced collecting liquid and the enriched solution of agents separately from the separating zone.

METHOD FOR PREPARING DETERGENT COMPOSITIONS. R. G. Matthaei (Lever Brothers Co.). *U.S. 3,247,118.* A process for preparing a detergent composition containing a water-soluble, alkaline condensed phosphate, a water-soluble alkali metal silicate and chlorinated trisodium phosphate comprises: (a) mixing a hydrated, water soluble, alkaline condensed phosphate with chlorinated trisodium phosphate, (b) adding subsequently water and the total amount of an alkali metal silicate having $Na_2O:SiO_2$ ratios ranging from 1:1.65 to 1:3.75 to form agglomerates at a maximum temperature of 120F and (c) aging the agglomerates by treating with hot air while agitating the particles to remove about 5 to 13% of free moisture content to form a moisture level of 22–35% in the final product.

(Continued on page 440A)

(Continued from page 432A)

CLEANSING COMPOSITION AND THICKENER THEREFOR. A. B. Herrick, E. Jungermann, and J. Arriaga (Armour and Co.). *U.S. 3,247,119*. A germicidal cleansing composition consists of about 82.25 parts water; 5 parts of a germicidal quaternary compound consisting of equal parts of n-alkyl dimethyl benzyl ammonium chloride and n-alkyl dimethyl ethylbenzyl ammonium chloride, the alkyl groups having from 12–18 carbon atoms; and about 4.5 parts of nonylphenol polyethenoxyethanol; about 2 parts of polyethenoxy diethanolamide derived from coconut fatty acids; 1 part of a compound selected from the group consisting of the dodecylbenzyl quaternary of N,N-dimethyloctadecylamine, the dodecenyl chloride quaternary of N,N-dimethyloctadecylamine, the propargyl chloride quaternary of N-methyl-N,N-di-(hydrogenated tallow)amine, the dodecenyl chloride quaternary of N,N-dimethyldodecylamine, and the dodecylbenzyl chloride quaternary of N-tallow tris-(hydroxyethyl)trimethylenediamine; 3 parts of sodium carbonate; and 2 parts of sodium tripolyphosphate.

COMPOSITION AND PROCESS FOR CLEANING METAL SURFACES. J. A. VonPless (Cowles Chemical Co.). *U.S. 3,247,120*. A composition adapted to be added to water to produce a cleaning composition consists of the following ingredients in weight per cent based on the total weight of the composition before addition to the water: (a) hydrated sodium borate, calculated as the $Na_2B_4O_7 \cdot 10H_2O$ equivalent weight, 68–73; (b) alkali metal soap of highly unsaturated fatty oil having a titer value of 29–32C, 10–20; (c) water soluble sodium lignosulfonate, 1–4; (d) alkyl ether of polyethylene glycol containing 1 to 18 carbon atoms in the alkyl groups and 2–20 oxyethylene groups, 2–10; (e) polyalkylene glycol tertiarydodecylthioether selected from the group consisting of polyethylene glycol tertiarydodecylthioethers and polymethylene glycol tertiarydodecylthioethers containing 6–18 carbons in the polyalkylene group, 0.75–5; (f) alkyl phenoxy polyethoxyethanol containing 9–18 carbon atoms in the alkyl groups and 8–30 moles of ethylene oxide per mole of phenol, 0.75–5; (g) ethylene glycol monoalkylether containing 1–4 carbon atoms in the alkyl group, 1.5–5; (h) pine oil, 0–0.5.

WASHING COMPOSITION. M. H. Hendricks (Procter & Gamble Co.). *U.S. 3,247,121*. A personal use milled toilet bar is claimed which consists of: (1) 50–80% by weight of soap having from 8–20 carbon atoms, at least 15% by weight of the soap having 8–14 carbons and any remaining soap having from 14–20 carbons, the cation of the soap being either sodium or a mixture of sodium and potassium such that no more than 25% by weight of the soap is potassium soap; (2) 0.0–0.85 part per part by weight of the soluble soap of a compatible non-soap anionic synthetic detergent surfactant; (3) 0.5–30% of a compound which improves smear characteristics with the formula $RHCSO_3XCOOM$ in which R is an alkyl chain containing 6–20 carbons and X and M are cations selected from the group consisting of alkali metal, ammonium, monoethanolamine, diethanolamine, triethanolamine, hydrogen and magnesium cations; (4) 0.0–0.30 part per part by weight of the soluble soap but not more than 15% by weight of fatty acid having from 8–20 carbons; (5) 0–15% water; (6) 2–12% alkali metal inorganic salts selected from the group consisting of sodium sulfate, sodium chloride, potassium sulfate and potassium chloride.

DETERGENT TABLET AND PROCESS OF PREPARING SAME. B. R. Schaafsma and A. L. Schulerud (Colgate-Palmolive Co.). *U.S. 3,247,122*. A process is described for manufacturing a detergent tablet comprising 2-20% of a water-soluble synthetic organic detergent selected from the group consisting of sulfated and sulfonated anionic detergents and water-soluble nonionic detergents containing both hydrophilic and hydrophobic portions in the molecule in which at least the hydrophilic portion includes a plurality of joined lower alkylene oxide groups or mixtures thereof; 25–40% of a water-soluble alkali metal polyphosphate; 20–50% of a water-soluble alkali metal silicate; 4–12% of a water-soluble alkali metal sulfate; and up to 15% water. A mass of the particulate detergent is moved and circulated while 2–30% water is added to raise the moisture content to 17–30%, whereby the moisture is uniformly distributed throughout the mass of particles. The resulting particles are lightly compacted at a pressure of 3–100 p.s.i. into form retaining tablets which are readily disintegrable in wash water, soluble therein and resistant to breakage when subjected to shipping shocks.

MANUFACTURE OF DETERGENT TABLETS. J. S. Schrager and H. E. Wixon (Colgate-Palmolive Co.). *U.S. 3,247,123*. A process is described for manufacturing a detergent tablet which comprises 2-20% of a water-soluble synthetic organic deteregnt selected from the group consisting of sulfated and sulfonated anionic detergents and water-soluble nonionic detergents containing both hydrophilic and hydrophobic portions in the molecule of which at least the hydrophilic portion includes a plurality of joined lower alkylene oxide groups or mixtures thereof, 20–50% of a water-soluble alkali metal polyphosphate and 20–50% of a water-soluble alkali metal silicate having a metal oxide to silica ratio between 0.3 and 1. A mass of the particulate detergent is moved and circulated, 2–35% water added to raise the moisture content to 15–35% whereby the moisture is substantially uniformly distributed throughout the mass and the resulting particles lightly compacted at a pressure of 3–100 p.s.i. into form retaining tablets which are readily disintegrable in wash water, soluble therein and resistant to breakage when subjected to shipping shocks.

EMULSIFIER COMPOSITION. M. Pader and E. J. Reid (Lever Brothers Co.). *U.S. 3,248,229*. A multipurpose emulsifier composition capable of being employed subsequently with an appropriate fat to form a cake batter, whipped topping, icing, thickened milk drink and mayonnaise-type dressing comprises: (a) phosphoric acid esters of mono- and diglycerides; (b) a member selected from the group consisting of (1) lactylated esters of glycerol and higher fatty acids, (2) partial esters of glycols and higher fatty acids and (3) mixtures thereof; and (c) partial esters of glycerol and higher fatty acids.

PROCESS FOR PREPARING A STABLE, FREE-FLOWING DISHWASHING COMPOSITION. H. E. Feierstein and R. L. Liss (Monsanto Co.). *U.S. 3,248,330*. A process for preparing a stable, free-flowing dishwashing composition for machine dishwashers characterized in having a bulk density of at least 0.6 g/cc comprises the steps of homogeneously mixing together (A) solid particles formed by (1) intimately admixing granular alkali metal tripolyphosphate, an alkali metal silicate having a SiO_2 to alkali metal oxide mol ratio of from 4:1 to 0.5:1, from 0.1–5% by weight, based on the weight of the mixture, of a non-soap synthetic organic detergent selected from the group consisting of non-soap synthetic anionic or nonionic surface active agents, and sufficient water to form a homogeneous mass consisting

essentially of a mixture of (a) from 45–65% of hydrated alkali metal tripolyphosphate, (b) 55–30% of an alkali metal silicate having the aforementioned SiO_2 to alkali metal oxide mol ratio and selected from the group consisting of anhydrous alkali metal silicate, partially hydrated alkali metal silicate and mixtures thereof, (c) from 0.1–5% of a non-soap synthetic organic detergent selected from the group consisting of anionic and nonionic detergents, and (d) from 10–25% water in the form of water of hydration in the tripolyphosphate and silicate, and (2) forming the mass into solid particles, and (B) solid particles of from 0.5–3.0% by weight of the composition of an available chlorine-containing compound selected from the group consisting of chlorinated trisodium phosphates and organic available chlorine containing compounds and having a particle size such that at least 90% of the last mentioned solid particles are retained on a No. 100 mesh U.S. Standard Screen.

HEAT-TREATED DETERGENT COMPOSITION. J. T. Inamorato (Colgate-Palmolive Co.). *U.S. 3,248,331.* A heat-treated solidified detergent composition comprises about 5–50% by weight of a water-soluble higher alkyl mono-nuclear aryl sulfonate detergent having 8–15 carbons in the higher alkyl group and in minor proportion, sufficient as a soil-suspending agent of water-soluble polyvinyl alcohol having a viscosity of 1.8 to 3 centipoises and a polyvinyl acetate content of 10–30% by weight, and the balance being primarily water-soluble inorganic builder salts. Another detergent composition comprises 5–50% by weight of a water-soluble higher alkyl benzene sulfonate detergent having 8–15 carbons in the alkyl group, 0.05–5% each by weight of (a) an alkali metal salt of carboxy lower alkyl cellulose having up to 3 carbon atoms in the alkyl group, and (b) water-soluble polyvinyl alcohol having a viscosity of 1.8 to 3 centipoises and a polyvinyl acetate content of 10–30% by weight, the balance being primarily water-soluble inorganic builder salts with 10–80% by weight of alkaline inorganic alkali metal builder salts.

LOW PH DETERGENT BAR. J. R. O'Roark (Hewitt Soap Co., Inc.). *U.S. 3,248,333.* A milled non-soap synthetic detergent bar has a pH of about 6.4 and consists of (%): coconut oil fatty acid ester of sodium isethionate, 25; milled, bleached wheat flour, 52.5; glycerin, 3; cornstarch, 4; oil soluble liquid fraction of lanolin, 1; isopropyl myristate, 2; lactic acid, 2; and water, 9.

DETERGENT COMPOSITION FOR HARD SURFACES. A. S. Teot and D. G. Brown (Dow Chemical Co.). *U.S. 3,248,335.* A hard surface detergent composition consists of alkaline inorganic salt builders and from 0.1–12% by weight, based on the composition, of sodium 2-octadecylidiphenyl oxide disulfonate.

PROCESS FOR THE PREPARATION OF WATER-SOLUBLE AND WATER-INSOLUBLE SUCROSE ESTERS AND PRODUCTS OBTAINED THEREBY. L. Nobile and T. LaNoce (Ledoga S.p.A., Milan). *U.S. 3,248,381.* A process for the preparation of mixtures of sucrose esters of high molecular weight non-drying fatty acids which are easily separable into esters of low combined sucrose content and esters of high combined sucrose content comprises (1) reacting 1 mol of a non-drying, natural triglyceride with from 2 to 4.4 mols of sucrose in dimethylformamide in an inert atmosphere in the presence of a basic catalyst at a temperature of 90–95C, (2) continuing the reaction for 3–9 hours, (3) adding a quantity of a non-drying natural triglyceride to the reaction mass which is at least sufficient to combine with all the unreacted sucrose, (4) heating the mass to 90–95C for 3–9 hours in the presence of a basic catalyst, and (5) evaporating off the dimethylformamide.

PROCESS FOR THE PREPARATION OF PURIFIED SUCROSE ESTERS AND PRODUCTS OBTAINED THEREBY. L. Nobile and T. LaNoce (Ledoga S.p.A., Milan). *U.S. 3,249,600.* A process is described for the substantially quantitative isolation of high purity sucrose mono- and di-esters of high molecular weight aliphatic acids with the recovery of unreacted sucrose and unreacted lower alkyl or unreacted and only partially reacted glyceryl esters of the acids from the product of the interesterification reaction of an excess of sucrose in an organic reaction solvent with a member selected from the class consisting of lower alkyl esters and fatty acid glycerides. The reaction solvent is evaporated, the residue is dissolved in a lower alkyl acetate at 60–90C, the

solution is extracted with water at substantially the same temperature, the aqueous phase containing the unreacted sucrose is separated, the organic phase is cooled to 0–30C and extracted with water, and the aqueous phase is separated to effect substantially quantitative isolation of the sugar ester fraction from the remaining organic fraction of the reaction product.

PROCESS FOR PREPARING A LIQUID DETERGENT COMPOSITION. J. T. Foley, W. H. Kiesel and K. L. Johnson (Swift & Co.). *U.S. 3,250,718.* A process for preparing an improved liquid detergent comprises simultaneously reacting at an elevated temperature and under vacuum (1) a stoichimetric excess of an alkylolamine having about 2–8 carbon atoms per alkylol group, (2) a member selected from the group consisting of ternary polyprotic inorganic acids and the C_1–C_8 alkyl esters thereof, the inorganic acid consisting of hydrogen, oxygen and a member selected from the group consisting of sulfur, phosphorus and boron, and (3) an aliphatic fatty acylating substance containing 4–26 carbons in the acyl portion, the acylating substance containing C_8–C_{10} and C_{12}–C_{18} aliphatic fatty acylating substances in an amount of at least 10% by weight of the total weight of ingredients (1), (2) and (3).

FOAMING DETERGENT COMPOSITIONS. I. R. Schmolka and J. W. Compton (Wyandotte Chemicals Corp.). *U.S. 3,250,719.* A detergent composition consists essentially of (1) a water-soluble nonionic polyalkylene oxide detergent selected from the group consisting of (a) compounds of the formula: $[H(C_2H_4O)_y(C_3H_6O)_x]_2$–$NCH_2CH_2N$–$[(C_3H_6O)_x(C_2H_4O)_yH]_2$ in which x is sufficiently large to provide a molecular weight of the oxypropylene chains of at least 900 and y is sufficiently large to provide 30–90% of the total molecular weight of the compound, (b) compounds of the formula: $HO(C_2H_4O)_a(C_3H_6O)_b(C_2H_4O)_cH$ in which b is an integer sufficiently high to provide a molecular weight of at least 900 for the oxypropylene base and a + c is an integer sufficiently high to provide 30–90% of the total molecular weight of the compound, and (c) condensation products of a fatty alcohol having 8–22 carbon atoms with 6 to 30 moles of ethylene oxide, and (2) a foam improving agent having the formula $RHNCOCH_2OCH_2CH_2(OCH_2CH_2)_xOH$ in which R is a member selected from the group consisting of alkyl, alkenyl and alkynl radicals containing from 8–22 carbon atoms and x is an integer from 0 to 100 in which the ratio of the foaming agent to the water-soluble nonionic detergent is from 1 to 500 parts per 1000 parts by weight and sufficient to improve the foaming power of the detergent.

SULFOXIMINE-CONTAINING DETERGENT COMPOSITIONS. J. S. Berry (Procter & Gamble). *U.S. 3,255,116.* A detergent composition consists of an unsymmetrical sulfoximine detergent compound having the general formula $(R)(NH)(R')S \rightarrow O$, in which R is an aliphatic radical selected from the group consisting of straight or branched chain saturated alkyl radicals having from 10 to 18 carbon atoms and R′ is an alkyl radical selected from the group consisting of methyl and ethyl radicals, and a builder material selected from the group consisting of water-soluble inorganic alkaline builder salts, organic alkaline sequestrant builder salts and mixtures thereof in which the ratio of detergent to builder is in the range of 3:1 to 1:10 by weight. Also claimed is a detergent composition as described above and including from 3–15% by weight of a peroxygen type bleach such as sodium perborate, -perbenzoate, -perlaurate, -perazelate, -persebacate, -peroxyphosphate, -peroxycarbonate, or potassium hydrogen perfulfate.

LOW-FOAMING DISHWASHING COMPOSITION. K. W. Knapp and J. S. Thompson (FMC Corp.). *U.S. 3,255,117.* A composition which does not attack overglaze colors and decorations of fine china consists of the following ingredients in the indicated weight percentages: 20–50% of a sodium polyphosphate, 1–5% of an alkali metal salt of dichlorocyanuric acid, 10–30% of a sodium silicate having an $Na_2O:SiO_2$ ratio of 1:1 to 1:3, 0.5–5% of an amphoteric metal compound such as alkali aluminates or zincates, 1–5% of a nonionic surfactant having the formula $R(OC_2H_4)_xOR'$ in which R is an alkylphenyl group in which the alkyl group has 6 to 13 carbon atoms or an alkyl group having 8 to 18 carbon atoms, x is 10 to 18, and R′ is an alkyl, phenyl, alkylphenyl or phenylalkyl group, the R′ having 3 to 12 carbon atoms, and the balance an alkali metal salt from the group consisting of sulfates, orthophosphates, carbonates and chlorides.

SOLUBILIZATION OF ESSENTIAL OILS BY NONIONIC SURFACTANTS. Kazutoshi Kenjo (Takahashi Toyodo K.K., Tokyo). *Yukagaku* 15, 267–77 (1966). Solubilities of ternary system consisting of polyoxyethylene nonylphenyl ether of different ethylene oxide contents, essential oils having different polarity and water have been investigated. Heating of turbid heterogeneous phase gives transparent homogenous phase but further heating turns it cloudy. A diagram of the state of solubility is made by measurement of transparent point and cloud point. This gives the first heterogeneous phase system above the cloud point, the second homogenous (solubilized) phase system and the third heterogeneous system below the transparent point. From the diagram, the minimum concentration of each surfactant for the solubilization of each essential oil at any temperature is determined. It shows the smallest value in the system of the intermediate *n* (degree of polymerization of ethylene oxide) which is the optimum solubilizer. *n*, HLB and required concentration of optimum solubilizer between 0–40C can easily be found from the diagram. Optimum value of HLB is increased with increase in polarity of essential oil. Discussion is also made on the effect of ethanol in the ternary system.

SODIUM ALKYLBENZENESULFONATES. V. CONCENTRATION OF SULFONATING AGENT AND RELATIVE REACTION RATE OF DODECYLBENZENES. Yasushi Kimura, Shuhei Tanimori and Tetrunosuke Shimo (*Lion Fat & Oil Co., Tokyo*). *Yukagaku* 15, 262–7 (1966). The correlation between concentration of sulfonating agent and structure of dodecylbenzene has been investigated in the selectivity of sulfonation. When the nucleus moves from the second position to the center of the chain, the relative sulfonation by 95.5% sulfuric acid showed decrease of 10–25% in comparison with that using of sulfur dioxide. Distribution of *o*- and *p*-isomers was also determined by infrared spectrography. The distribution of *n*-alkylbenzenesulfonic acid sulfonated with 3.2 moles of 20% oleum at low temperature was about 25% *o*- and 75% *p*-compound. Sulfonation at 50C was about 21% *o*- and 79% *p*-compound.

REACTION BETWEEN ALCOHOLS AND AMINES. V. REACTION BETWEEN OLEYL ALCOHOL AND TRIETHYLAMINE. Kikuo Takehara, Shigeki Okazima, Susumu Nagao, Toshio Agawa and Saburo Komori. *Yukagaku* 15, 252–7 (1966). Reaction of oleyl alcohol and triethylamine was carried out by using Cu-Cr-O catalyst modified with MnO_2 (15% catalyst to alcohol, and molar ratio of oleyl alcohol:triethylamine 1:5) with initial pressure of hydrogen at 20 kg./cm² (the maximum pressure at 45 kg./cm²) for 3 hours at 250C yielded 76% tert-amine to be used as surfactant.

THE RELEASE OF A METABOLICALLY ACTIVE LIPID FRACTION FROM THE ARTERIAL WALL IN VITRO. V. Maggi (Dept. of Pathol., Royal College of Surgeons, Lincoln's Inn Fields, London, Great Britain). *J. Atheroscler. Res.* **6**, 256–63 (1966). Human and dog arteries have been incubated in the presence of radioactive sodium acetate, and a labelled lipid fraction has been isolated from the incubation medium. This fraction has been analyzed and the influence of some cofactors upon its specific activity has been studied. It is suggested that the lipid fraction found is a complex phospholipid-mucopolysaccharide, the synthesis of which is influenced by some cofactors. This complex seems to be released actively and selectively into the buffer.

THE CHEMICAL CHARACTERIZATION AND ENZYMATIC SYNTHESIS OF MANNOLIPIDS IN MICROCOCCUS LYSODEIKTICUS. W. J. Lennarz and Barbara Talamo (Dept. of Physiol. Chem., The Johns Hopkins Univ. School of Med., Baltimore, Maryland 21205). *J. Biol. Chem.* **241**, 2707–19 (1966). The major glycolipid of *Micrococcus lysodeikticus* has been isolated in pure form and has been shown to have the structure of α-D-mannosyl-(1 → 3)-α-D-mannosyl-(1 → 3)-diglyceride. The presence of two enzymes involved in glycolipid biosynthesis in *M. lysodeikticus* has been established. One of the enzymes is associated with the particulate cell fraction and catalyzes the formation of α-D-mannosyl-(1 → 3)-diglyceride from guanosine diphosphate mannose and 1,2-diglyceride. The enzyme is specific for 1,2-diglyceride and manifests maximal activity on 1,2-diglycerides containing branched chain fatty acyl groups. The reaction is stimulated by Mg^{++} ion and shows an absolute requirement for an anionic surface active agent. Although long chain alkyl surface-active agents and straight chain fatty acid salts stimulate the reaction, the most effective surface-active agents are the branched chain fatty acids common to *M. lysodeikticus*. A second enzyme present in the soluble cell fraction catalyzes the conversion of enzymatically prepared α-D-mannosyl-(1→3)-diglyceride to α-D-mannosyl-(1→3)-α-D-mannosyl-(1→3)-diglyceride.

MEASURING TACKINESS OF DETERGENT POWDERS. J. A. Monick (Colgate-Palmolive Res. Center). *Soap Chem. Specialties* **42** (6), 49–53, 107 (1966). A portable unit has been developed to test the tackiness of powders, especially spray dried detergents, by measuring the shear resistance of a compressed briquette. The effects of moisture, particle size and temperature were studied and found to be significant. This test makes it possible to evaluate anti-tackiness agents and changes in particle size and shape as might occur during a manufacturing process. The tackiness that is measured is essentially the "cohesion" effect and differs from caking that can occur in powders over long term aging during which hydration phenomena exert significant effects.

REACTION OF ETHYLENE OXIDE WITH ACTIVE HYDROGEN. II. REACTION OF ETHYLENE OXIDE WITH WATER. Masayuki Miki, Teruhiko Ito, Hajime Ouchi, Fumio Moriya and Hiyoo Tsuchiya (Seitetsu Kagaku Kogyo K.K., Hyogo Pref.). *Yukagaku* **15**, 257–62 (1966). Reaction of ethylene oxide (1.75–16.1 moles/liter of water) has been investigated. It is accompanied with following reactions: $H_2O + C_2H_4O \xrightarrow{k_1} HOC_2H_4OH$; $HOC_2H_4OH + C_2H_4O \xrightarrow{k_2} HOC_2H_4OC_2H_4OH$; $HOC_2H_4OC_2H_4OH + C_2H_4O \xrightarrow{k_3} HOC_2H_4OC_2H_4OC_2H_4OH$. The reactions are first order to each reactant and the seenod order rate constant k_1 is $k_1 = \frac{1}{2}\ k_2 = 2.8 \times 10^3 a_0 \exp(-21{,}100/RT)$.

SYNERGISTIC COMBINATION OF SODIUM DODECANE SULFONATE AND TRIETHANOLAMINE LAURYL SULFATE. W. M. Bright (Lever Brothers Co.). *U.S. 3,230,174.* A synergistic foaming composition comprises: 2.5–13.5 parts sodium dodecane sulfonate and 15.5–4.5 parts triethanolamine lauryl sulfate. After 15 minutes aging the composition has an actual foam volume more than 35 ml. above the expected foam volume and has a maximum actual synergistic foam value of at least 110 ml.

(Continued on page 446A)

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CLEANSING COMPOSITION AND THICKENER THEREFOR. A. B. Herrick, E. Jungermann, and J. Arriaga (Armour and Co.). *U.S. 3,247,119*. A germicidal cleansing composition consists of about 82.25 parts water; 5 parts of a germicidal quaternary compound consisting of equal parts of n-alkyl dimethyl benzyl ammonium chloride and n-alkyl dimethyl ethylbenzyl ammonium chloride, the alkyl groups having from 12–18 carbon atoms; and about 4.5 parts of nonylphenol polyethenoxyethanol; about 2 parts of polyethenoxy diethanolamide derived from coconut fatty acids; 1 part of a compound selected from the group consisting of the dodecylbenzyl quaternary of N,N-dimethyloctadecylamine, the dodecenyl chloride quaternary of N,N-dimethyloctadecylamine, the propargyl chloride quaternary of N-methyl-N,N-di-(hydrogenated tallow)amine, the dodecenyl chloride quaternary of N,N-dimethyldodecylamine, and the dodecylbenzyl chloride quaternary of N-tallow tris-(hydroxyethyl)trimethylenediamine; 3 parts of sodium carbonate; and 2 parts of sodium tripolyphosphate.

COMPOSITION AND PROCESS FOR CLEANING METAL SURFACES. J. A. VonPless (Cowles Chemical Co.). *U.S. 3,247,120*. A composition adapted to be added to water to produce a cleaning composition consists of the following ingredients in weight per cent based on the total weight of the composition before addition to the water: (a) hydrated sodium borate, calculated as the $Na_2B_4O_7 \cdot 10H_2O$ equivalent weight, 68–73; (b) alkali metal soap of highly unsaturated fatty oil having a titer value of 29–32C, 10–20; (c) water soluble sodium lignosulfonate, 1–4; (d) alkyl ether of polyethylene glycol containing 1 to 18 carbon atoms in the alkyl groups and 2–20 oxyethylene groups, 2–10; (e) polyalkylene glycol tertiarydodecylthioether selected from the group consisting of polyethylene glycol tertiarydodecylthioethers and polymethylene glycol tertiarydodecylthioethers containing 6–18 carbons in the polyalkylene group, 0.75–5; (f) alkyl phenoxy polyethoxyethanol containing 9–18 carbon atoms in the alkyl groups and 8–30 moles of ethylene oxide per mole of phenol, 0.75–5; (g) ethylene glycol monoalkylether containing 1–4 carbon atoms in the alkyl group, 1.5–5; (h) pine oil, 0–0.5.

WASHING COMPOSITION. M. H. Hendricks (Procter & Gamble Co.). *U.S. 3,247,121*. A personal use milled toilet bar is claimed which consists of: (1) 50–80% by weight of soap having from 8–20 carbon atoms, at least 15% by weight of the soap having 8–14 carbons and any remaining soap having from 14–20 carbons, the cation of the soap being either sodium or a mixture of sodium and potassium such that no more than 25% by weight of the soap is potassium soap; (2) 0.0–0.85 part per part by weight of the soluble soap of a compatible non-soap anionic synthetic detergent surfactant; (3) 0.5–30% of a compound which improves smear characteristics with the formula $RHCSO_3XCOOM$ in which R is an alkyl chain containing 6–20 carbons and X and M are cations selected from the group consisting of alkali metal, ammonium, monoethanolamine, diethanolamine, triethanolamine, hydrogen and magnesium cations; (4) 0.0–0.30 part per part by weight of the soluble soap but not more than 15% by weight of fatty acid having from 8–20 carbons; (5) 0–15% water; (6) 2–12% alkali metal inorganic salts selected from the group consisting of sodium sulfate, sodium chloride, potassium sulfate and potassium chloride.

DETERGENT TABLET AND PROCESS OF PREPARING SAME. B. R. Schaafsma and A. L. Schulerud (Colgate-Palmolive Co.). *U.S. 3,247,122*. A process is described for manufacturing a detergent tablet comprising 2-20% of a water-soluble synthetic organic detergent selected from the group consisting of sulfated and sulfonated anionic detergents and water-soluble nonionic detergents containing both hydrophilic and hydrophobic portions in the molecule in which at least the hydrophilic portion includes a plurality of joined lower alkylene oxide groups or mixtures thereof; 25–40% of a water-soluble alkali metal polyphosphate; 20–50% of a water-soluble alkali metal silicate; 4–12% of a water-soluble alkali metal sulfate; and up to 15% water. A mass of the particulate detergent is moved and circulated while 2–30% water is added to raise the moisture content to 17–30%, whereby the moisture is uniformly distributed throughout the mass of particles. The resulting particles are lightly compacted at a pressure of 3–100 p.s.i. into form retaining tablets which are readily disintegrable in wash water, soluble therein and resistant to breakage when subjected to shipping shocks.

MANUFACTURE OF DETERGENT TABLETS. J. S. Schrager and H. E. Wixon (Colgate-Palmolive Co.). *U.S. 3,247,123*. A process is described for manufacturing a detergent tablet which comprises 2-20% of a water-soluble synthetic organic deteregnt selected from the group consisting of sulfated and sulfonated anionic detergents and water-soluble nonionic detergents containing both hydrophilic and hydrophobic portions in the molecule of which at least the hydrophilic portion includes a plurality of joined lower alkylene oxide groups or mixtures thereof, 20–50% of a water-soluble alkali metal polyphosphate and 20–50% of a water-soluble alkali metal silicate having a metal oxide to silica ratio between 0.3 and 1. A mass of the particulate detergent is moved and circulated, 2–35% water added to raise the moisture content to 15–35% whereby the moisture is substantially uniformly distributed throughout the mass and the resulting particles lightly compacted at a pressure of 3–100 p.s.i. into form retaining tablets which are readily disintegrable in wash water, soluble therein and resistant to breakage when subjected to shipping shocks.

EMULSIFIER COMPOSITION. M. Pader and E. J. Reid (Lever Brothers Co.). *U.S. 3,248,229*. A multipurpose emulsifier composition capable of being employed subsequently with an appropriate fat to form a cake batter, whipped topping, icing, thickened milk drink and mayonnaise-type dressing comprises: (a) phosphoric acid esters of mono- and diglycerides; (b) a member selected from the group consisting of (1) lactylated esters of glycerol and higher fatty acids, (2) partial esters of glycols and higher fatty acids and (3) mixtures thereof; and (c) partial esters of glycerol and higher fatty acids.

PROCESS FOR PREPARING A STABLE, FREE-FLOWING DISHWASHING COMPOSITION. H. E. Feierstein and R. L. Liss (Monsanto Co.). *U.S. 3,248,330*. A process for preparing a stable, free-flowing dishwashing composition for machine dishwashers characterized in having a bulk density of at least 0.6 g/cc comprises the steps of homogeneously mixing together (A) solid particles formed by (1) intimately admixing granular alkali metal tripolyphosphate, an alkali metal silicate having a SiO_2 to alkali metal oxide mol ratio of from 4:1 to 0.5:1, from 0.1–5% by weight, based on the weight of the mixture, of a non-soap synthetic organic detergent selected from the group consisting of non-soap synthetic anionic or nonionic surface active agents, and sufficient water to form a homogeneous mass consisting

essentially of a mixture of (a) from 45–65% of hydrated alkali metal tripolyphosphate, (b) 55–30% of an alkali metal silicate having the aforementioned SiO_2 to alkali metal oxide mol ratio and selected from the group consisting of anhydrous alkali metal silicate, partially hydrated alkali metal silicate and mixtures thereof, (c) from 0.1–5% of a non-soap synthetic organic detergent selected from the group consisting of anionic and nonionic detergents, and (d) from 10–25% water in the form of water of hydration in the tripolyphosphate and silicate, and (2) forming the mass into solid particles, and (B) solid particles of from 0.5–3.0% by weight of the composition of an available chlorine-containing compound selected from the group consisting of chlorinated trisodium phosphates and organic available chlorine containing compounds and having a particle size such that at least 90% of the last mentioned solid particles are retained on a No. 100 mesh U.S. Standard Screen.

HEAT-TREATED DETERGENT COMPOSITION. J. T. Inamorato (Colgate-Palmolive Co.). *U.S. 3,248,331.* A heat-treated solidified detergent composition comprises about 5–50% by weight of a water-soluble higher alkyl mono-nuclear aryl sulfonate detergent having 8–15 carbons in the higher alkyl group and in minor proportion, sufficient as a soil-suspending agent of water-soluble polyvinyl alcohol having a viscosity of 1.8 to 3 centipoises and a polyvinyl acetate content of 10–30% by weight, and the balance being primarily water-soluble inorganic builder salts. Another detergent composition comprises 5–50% by weight of a water-soluble higher alkyl benzene sulfonate detergent having 8–15 carbons in the alkyl group, 0.05–5% each by weight of (a) an alkali metal salt of carboxy lower alkyl cellulose having up to 3 carbon atoms in the alkyl group, and (b) water-soluble polyvinyl alcohol having a viscosity of 1.8 to 3 centipoises and a polyvinyl acetate content of 10–30% by weight, the balance being primarily water-soluble inorganic builder salts with 10–80% by weight of alkaline inorganic alkali metal builder salts.

LOW PH DETERGENT BAR. J. R. O'Roark (Hewitt Soap Co., Inc.). *U.S. 3,248,333.* A milled non-soap synthetic detergent bar has a pH of about 6.4 and consists of (%): coconut oil fatty acid ester of sodium isethionate, 25; milled, bleached wheat flour, 52.5; glycerin, 3; cornstarch, 4; oil soluble liquid fraction of lanolin, 1; isopropyl myristate, 2; lactic acid, 2; and water, 9.

DETERGENT COMPOSITION FOR HARD SURFACES. A. S. Teot and D. G. Brown (Dow Chemical Co.). *U.S. 3,248,335.* A hard surface detergent composition consists of alkaline inorganic salt builders and from 0.1–12% by weight, based on the composition, of sodium 2-octadecylidiphenyl oxide disulfonate.

PROCESS FOR THE PREPARATION OF WATER-SOLUBLE AND WATER-INSOLUBLE SUCROSE ESTERS AND PRODUCTS OBTAINED THEREBY. L. Nobile and T. LaNoce (Ledoga S.p.A., Milan). *U.S. 3,248,381.* A process for the preparation of mixtures of sucrose esters of high molecular weight non-drying fatty acids which are easily separable into esters of low combined sucrose content and esters of high combined sucrose content comprises (1) reacting 1 mol of a non-drying, natural triglyceride with from 2 to 4.4 mols of sucrose in dimethylformamide in an inert atmosphere in the presence of a basic catalyst at a temperature of 90–95C, (2) continuing the reaction for 3–9 hours, (3) adding a quantity of a non-drying natural triglyceride to the reaction mass which is at least sufficient to combine with all the unreacted sucrose, (4) heating the mass to 90–95C for 3–9 hours in the presence of a basic catalyst, and (5) evaporating off the dimethylformamide.

PROCESS FOR THE PREPARATION OF PURIFIED SUCROSE ESTERS AND PRODUCTS OBTAINED THEREBY. L. Nobile and T. LaNoce (Ledoga S.p.A., Milan). *U.S. 3,249,600.* A process is described for the substantially quantitative isolation of high purity sucrose mono- and di-esters of high molecular weight aliphatic acids with the recovery of unreacted sucrose and unreacted lower alkyl or unreacted and only partially reacted glyceryl esters of the acids from the product of the interesterification reaction of an excess of sucrose in an organic reaction solvent with a member selected from the class consisting of lower alkyl esters and fatty acid glycerides. The reaction solvent is evaporated, the residue is dissolved in a lower alkyl acetate at 60–90C, the

solution is extracted with water at substantially the same temperature, the aqueous phase containing the unreacted sucrose is separated, the organic phase is cooled to 0–30C and extracted with water, and the aqueous phase is separated to effect substantially quantitative isolation of the sugar ester fraction from the remaining organic fraction of the reaction product.

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REACTION BETWEEN ALCOHOLS AND AMINES. V. REACTION BETWEEN OLEYL ALCOHOL AND TRIETHYLAMINE. Kikuo Takehara, Shigeki Okazima, Susumu Nagao, Toshio Agawa and Saburo Komori. *Yukagaku* 15, 252–7 (1966). Reaction of oleyl alcohol and triethylamine was carried out by using Cu-Cr-O catalyst modified with MnO_2 (15% catalyst to alcohol, and molar ratio of oleyl alcohol:triethylamine 1:5) with initial pressure of hydrogen at 20 kg./cm² (the maximum pressure at 45 kg./cm²) for 3 hours at 250C yielded 76% tert-amine to be used as surfactant.

THE RELEASE OF A METABOLICALLY ACTIVE LIPID FRACTION FROM THE ARTERIAL WALL IN VITRO. V. Maggi (Dept. of Pathol., Royal College of Surgeons, Lincoln's Inn Fields, London, Great Britain). *J. Atheroscler. Res.* **6**, 256–63 (1966). Human and dog arteries have been incubated in the presence of radioactive sodium acetate, and a labelled lipid fraction has been isolated from the incubation medium. This fraction has been analyzed and the influence of some cofactors upon its specific activity has been studied. It is suggested that the lipid fraction found is a complex phospholipid-mucopolysaccharide, the synthesis of which is influenced by some cofactors. This complex seems to be released actively and selectively into the buffer.

THE CHEMICAL CHARACTERIZATION AND ENZYMATIC SYNTHESIS OF MANNOLIPIDS IN MICROCOCCUS LYSODEIKTICUS. W. J. Lennarz and Barbara Talamo (Dept. of Physiol. Chem., The Johns Hopkins Univ. School of Med., Baltimore, Maryland 21205). *J. Biol. Chem.* **241**, 2707–19 (1966). The major glycolipid of *Micrococcus lysodeikticus* has been isolated in pure form and has been shown to have the structure of α-D-mannosyl-(1 → 3)-α-D-mannosyl-(1 → 3)-diglyceride. The presence of two enzymes involved in glycolipid biosynthesis in *M. lysodeikticus* has been established. One of the enzymes is associated with the particulate cell fraction and catalyzes the formation of α-D-mannosyl-(1 → 3)-diglyceride from guanosine diphosphate mannose and 1,2-diglyceride. The enzyme is specific for 1,2-diglyceride and manifests maximal activity on 1,2-diglycerides containing branched chain fatty acyl groups. The reaction is stimulated by Mg^{++} ion and shows an absolute requirement for an anionic surface active agent. Although long chain alkyl surface-active agents and straight chain fatty acid salts stimulate the reaction, the most effective surface-active agents are the branched chain fatty acids common to *M. lysodeikticus*. A second enzyme present in the soluble cell fraction catalyzes the conversion of enzymatically prepared α-D-mannosyl-(1→3)-diglyceride to α-D-mannosyl-(1→3)-α-D-mannosyl-(1→3)-diglyceride.

MEASURING TACKINESS OF DETERGENT POWDERS. J. A. Monick (Colgate-Palmolive Res. Center). *Soap Chem. Specialties* **42** (6), 49–53, 107 (1966). A portable unit has been developed to test the tackiness of powders, especially spray dried detergents, by measuring the shear resistance of a compressed briquette. The effects of moisture, particle size and temperature were studied and found to be significant. This test makes it possible to evaluate anti-tackiness agents and changes in particle size and shape as might occur during a manufacturing process. The tackiness that is measured is essentially the "cohesion" effect and differs from caking that can occur in powders over long term aging during which hydration phenomena exert significant effects.

REACTION OF ETHYLENE OXIDE WITH ACTIVE HYDROGEN. II. REACTION OF ETHYLENE OXIDE WITH WATER. Masayuki Miki, Teruhiko Ito, Hajime Ouchi, Fumio Moriya and Hiyoo Tsuchiya (Seitetsu Kagaku Kogyo K.K., Hyogo Pref.). *Yukagaku* **15**, 257–62 (1966). Reaction of ethylene oxide (1.75–16.1 moles/liter of water) has been investigated. It is accompanied with following reactions: $H_2O + C_2H_4O \xrightarrow{k_1} HOC_2H_4OH$; $HOC_2H_4OH + C_2H_4O \xrightarrow{k_2} HOC_2H_4OC_2H_4OH$; $HOC_2H_4OC_2H_4OH + C_2H_4O \xrightarrow{k_3} HOC_2H_4OC_2H_4OC_2H_4OH$. The reactions are first order to each reactant and the seenod order rate constant k_1 is $k_1 = \frac{1}{2}\ k_2 = 2.8 \times 10^3 a_0 \exp(-21{,}100/RT)$.

SYNERGISTIC COMBINATION OF SODIUM DODECANE SULFONATE AND TRIETHANOLAMINE LAURYL SULFATE. W. M. Bright (Lever Brothers Co.). *U.S. 3,230,174.* A synergistic foaming composition comprises: 2.5–13.5 parts sodium dodecane sulfonate and 15.5–4.5 parts triethanolamine lauryl sulfate. After 15 minutes aging the composition has an actual foam volume more than 35 ml. above the expected foam volume and has a maximum actual synergistic foam value of at least 110 ml.

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LIQUID DETERGENT COMPOSITIONS. G. F. Marion, T. L. Treitler and P. A. Munger (Colgate-Palmolive Co.). *U.S. 3,231,504.* The described composition consists of 10–18% by weight of a mixture of an alkali metal higher alkyl benzene sulfonate detergent, the alkyl group having 8–15 carbon atoms, an alkali metal alkyl polyethoxamer sulfate salt having 10–18 carbons in the alkyl group and an average of 2–15 moles of ethylene oxide, the ration of alkyl benzene sulfonate to polyethoxamer sulfate being from 6.5:1 to 1:4 by weight; 10–20% of water-soluble potassium polyphosphate; 6-12% of a hydrotropic salt selected from the group consisting of sodium and potassium salts of xylene, toluene, ethylbenzene and isopropylbenzene sulfonate, n-amyl and n-hexysulfate, and mixtures thereof; 2–10% of a higher fatty acid alkylolamide having 8–18 carbons in the acyl radical and up to 3 carbons in each alkylol group; and the balance substantially water. The composition in aqueous medium forms a homogeneous, pourable, clear liquid at room temperature.

PROCESS FOR MANUFACTURING DETERGENT TABLET. R. E. Farrar and J. L. Sweeney (Colgate-Palmolive Co.). *U.S. 3,231,505.* A process for manufacturing a briquetted detergent tablet comprises mixing together 4–14% of a water soluble nonionic organic polyethoxy detergent selected from the group consisting of ethoxylated alkyl phenol, higher fatty alcohol, higher fatty acid and propylene oxide polymers with 30–75% of a normally solid water soluble inorganic alkali metal builder salt, producing a particulate detergent containing up to 21% moisture; applying an aqueous solution of soluble alkali metal silicate to the particulate detergent to coat the particles with 3–20% soluble alkali metal silicate to cause agglomeration into larger particles, substantially all within the size range of 6 to 60 mesh and to increase the moisture content to 16–25%; pressing the detergent particles into a solid form-retaining briquetted tablet at a pressure of 10–100 pounds per square inch to form a tablet which is readily disintegrable in water and applying to the tablet 0.25–5% of a readily water soluble synthetic organic film-forming polymer selected from the group consisting of polyvinyl alcohol, polyvinylpyrollidone, sodium carboxymethylcellulose and hydroxypropyl methyl cellulose, to form on the briquette surface a water soluble film which is of strength sufficient to help make the detergent tablet resistant to abrasion and accidental breakage, when dry, and of solubility such that the detergent tablet is readily disintegrable in water.

PROCESS FOR MAKING A DETERGENT TABLET. A. L. Schulerud (Colgate-Palmolive Co.). *U.S. 3,231,506.* Described is a process very similar to that claimed in *U.S. Patent 3,231,505.* However, following the step of coating the detergent particles with 3–20% soluble alkali metal silicate, the coated particles are then treated with 0.5–5% of finely divided water insoluble inorganic silicate to form a coating on the particles, held to them by the water soluble silicate, to arrest agglomeration of the detergent particles and produce agglomerates within the range of 6 to 60 mesh.

LOW FOAMING DETERGENT COMPOSITIONS. H. Y. Lew (Chevron Research Co.). *U.S. 3,231,508.* A detergent composition characterized by a low degree of foaming in agitated dilute aqueous solutions consists of a normally high foaming detergent component selected from the group consisting of water-soluble salts of organic sulfonic acids and water-soluble salts of sulfuric acid alkyl esters and, to suppress foaming, about 35% by weight of the detergent of a foam suppressing agent of the formula $RCONHR_1$ in which R is a saturated alkyl radical of 15 to 21 carbon atoms and R_1 is selected from the group consisting of a hydrocarbyl radical of 1–22 carbon atoms, and N-methyleneamide radicals, the alkyl group in the last mentioned amide radical having 15–21 carbon atoms.

FATTY ACID SUGAR ESTERS AND FATTY ACID SUGAR-BORON ESTERS. T. E. Brunelle, L. M. Rue and S. B. Crecelius (Economics Laboratory, Inc.). *U.S. 3,231,561.* A process for producing esters of fatty acids and saccharides comprises reacting in the presence of glacial acetic acid a saccharide with a reactable boron compound to form a reaction product soluble in glacial acetic acid; reacting a fatty acid halide with the reaction product to form a fatty acid ester of the saccharide-boron reaction product; heating the fatty ester of the saccharide-boron reaction product with a lower monohydric alcohol to form a borate ester with the alcohol; and removing the last-mentioned ester from the reaction mixture by distillation.