ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: N. E. Bednarcyk, J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, E. G. Perkins, T. H. Smouse, J. A. Thompson and R. W. Walker

• Fats and Oils

Prevention of hydrogenation flavor during trace hydrogenation of butteroil. A. K. Vasishtha, J. G. Leeder and S. S. Chang (Dept. of Food Sci., Rutgers Univ., New Brunswick, N.J. 08903). *Food Technol.* 23, 244–47 (1969). A previous paper from this laboratory reported that the flavor stability of butteroil may be significantly improved by slight, selective, catalytic hydrogenation. However, an off-flavor, "hydrogenation flavor," developed during the hydrogenation process which had to be removed by vacuum steam distillation. The latter also eliminated the desirable flavor components of the butteroil. In a statistically designed investigation a low temperature process for hydrogenating butteroil without the formation of hydrogenation flavor was discovered. The butteroil thus hydrogenated requires no vacuum steam distillation and has improved flavor stability.

Type and level of fat and amount of protein and their effect on the quality of chicken frankfurters. R. C. Baker, J. Darfler and D. V. Vadehra (Cornell Univ., Ithaca, N.Y. 14850). *Food Technol.* 23, 808–811 (1969). Chicken frankfurters were made using (1) chicken, beef and pork fats and cottonseed oil at 25% of the formula; (2) four levels (20, 25, 30 and 35%) of each of the four fats; and (3) four levels (9, 12, 15 and 18%) of protein. Beef fat and cottonseed oil produced a significantly firmer frankfurter than chicken fat when unheated, but not when heated. Chicken and pork fats had higher flavor scores when unheated, but when heated there was little difference. As the level of each fat was raised, the frankfurters became less tender and less juicy when tested unheated. Flavor was not affected. Increasing the level of protein increased firmness.

Determining the emulsifying and emulsion stabilizing capacity of protein meat additives. P. A. Inklaar and J. Fortuin (Vaessen Schoemaker Res. and Dev. Lab., Deventer, Netherlands). *Food Technol.* 23, 103–107 (1969). The four additives studied were: two brands of isolated soy protein, sodium caseinate and a soy concentrate. The influence of several variables in the described method, such as dispersion time of the protein, quantities of water, oil and protein, temperature, variation in the manufacture of the emulsion, were studied. The results obtained with the proposed method are generally in agreement with those obtained in sausage manufacture, as far as fat separation is concerned.

Lipid oxidation and pigment changes in raw beef. Barbara E. Greene (Dept. of Food and Nutr., Florida State Univ., Tallahassee). *J. Food Sci.* 34, 110–113 (1969). Lipid oxidation in refrigerated, raw ground beef is accompanied by rancid odors which are easily detectable before and after cooking. Antioxidants, including butylated hydroxyanisole and propyl gallate, prevent lipid oxidation and flavor changes. They also protect color by retarding the formation of metmyoglobin. Air tight vs. oxygen permeable packaging was investigated.

Semiautomated thiocyanate method for determining peroxide values of lipids. J. A. Starkovich and W. T. Roubal (Food Sci. Pioneer Res. Lab., U.S. Bur. of Com. Fisheries, Seattle, Wash. 98102). *J. Food Sci.* 34, 194–195 (1969). A semiautomated liquid-flow arrangement, designed for use in monitoring peroxide values of extracted oils is presented. Twenty samples per hour can be measured by means of a system using conventional manifold tubing and AutoAnalyzer components.

Lipids of defatted soybean flakes: extraction and characterization. D. H. Honig, D. J. Sessa, R. L. Hoffmann and J. J. Rackis (Northern Util. Res. & Dev. Div., ARS, USDA, Peoria, Ill. 61604). *Food Technol.* 23, 803–808 (1969). Defatted soybean flakes contain about 3% crude lipid extractable with an azeotropic mixture of hexane: ethanol (79:21). Crude lipids contain 60% phospholipids together with sterols, triglycerides, sugars, amino acids and isoflavones. Palmitic acid content of phospholipids is nearly three times higher than that in typical soybean oil. Increase in palmitic acid is balanced by decreases in oleic and linoleic acids. The more intense flavors of soybean flakes are extracted with the azeotrope or hot 95% ethyl alcohol and the resulting flakes are much reduced in flavor.

Oxidation effects in a freeze-dried gelatin-methyl linoleate system. A. Zirlin and M. Karel (Dept. of Nutr. and Food Sci., Mass. Inst. Tech., Cambridge, Mass. 02139). *J. Food Sci.* 34, 160–164 (1969). Freeze-dried model systems containing gelatin and methyl linoleate were incubated at 50 C. Incubation for 5–10 days in absence of water caused a drop in viscosity of gelatin solution, an increase in solubility in ethanol-rich solvents, and other changes indicative of oxidative degradation of the protein. There were no such changes when the linoleate was extracted prior to incubation. High relative humidities during incubation minimized the above changes but in some cases led to partial insolubilization of gelatin.

Autoxidation of fatty acid lipids and carotene of freeze-dried avocado salad. J. Lime (Southern Util. Res. Lab. ARS, USDA, Weslaco, Texas). *Food Technol.* 23, 569–72 (1969). Samples of freeze-dried avocado salad were stored at 100 F and 68 F in both an air atmosphere and in vacuum. Analysis of the lipids and carotenes of the stored material showed no significant decrease in the concentration of the unsaturated fatty acid portion of the lipids for periods up to 48 weeks; however, the carotene content decreased rapidly in air packs. Exposure of methyl linoleate, methyl linolenate and carotene, and mixtures of these, to atmospheric oxidation indicated that peroxide values of the esters were low until the carotene had been essentially oxidized. In the presence of the methyl esters, the rate of carotene oxidation was significantly higher than in their absence.

Action of microorganisms on the peroxides and carbonyls of fresh lard. J. L. Smith and J. A. Alford (ERRL, ARS, USDA, Beltsville, Md. 20705). *J. Food Sci.* 34, 75–78 (1969). *Pseudomonas ovalis, Micrococcus freudenreichii* and two strains of *Streptomyces* increased the concentration of peroxides; *M. freudenreichii* also produced an increase in 2-enals, 2,4-dienals, and alkanals. *Pseudomonas fragi, Geotrichum candidum,* and *Candida lipolytica* produced an increase in alkanals and methyl ketones. All other cultures either removed the small amount of peroxides and monocarbonyls in fresh fat and prevented any build-up or had no effect. The ability of microorganisms to oxidatively attack fats was not related to their oxidase reactions or their ability to produce lipase. Differences in oxidative activity on fresh and rancid lard are discussed.

Lipid hydrolysis in frozen Baltic herring. I. Bosund and B. Ganrot (Nordreco AB, Bjuv, Sweden). *J. Food Sci.* 34, 13–18 (1969). The concentrations of the various lipid classes were initially 2–5 times as high in dark muscle as in white. Storage for up to 12 weeks at −15C resulted in an increase of the free fatty acid content from 50 to 1000 mg/100 g in dark muscle, and from 17 to 280 mg/100 g in white muscle. The increase was due to hydrolysis of lecithin, cephalin and to a varying extent also of triglycerides. The hydrolysis of lecithin was faster than that of cephalin in both types of muscle. The enzymatic attack showed no preference for any one of the different fatty acids in the phospholipids.

Changes in hydrogen sulfide and sulfhydryl content of heated beef adipose tissue. F. H. Pepper and A. M. Pearson (Dept. Food Sci., Michigan State Univ., East Lansing, Mich. 48823). *J. Food Sci.* 34, 10–12 (1969). Beef adipose tissue was separated into the water soluble, salt soluble and insoluble (water-salt-ether) fractions, and the amount of H_2S evolved upon heating each of the fractions was determined. The yield of H_2S per 100 g of adipose tissue was 17.6, 1.7 and 5.5 μM for the water soluble, salt soluble and insoluble fractions, respectively. Thus the water

(Continued on page 612A)

(Continued from page 610A)

soluble fraction contributed about 71% of the H_2S, while the corresponding contributions from the salt soluble and the insoluble fractions amounted to approximately 7 and 22%, respectively.

Equipment selection for vegetable oil refineries. G. A. Frampton. *Chem. Process Eng.* 50(2), 91–6 (1969). The chief step in the refining of crude vegetable oils is treatment with caustic soda solution, after which the semi-refined oil is separated from the soapstock by centrifugation. Of the two types of centrifuge commonly used, tubular bowl machines are favoured for smaller plants and where maximum separation is required. Disc-bowl centrifuges tend to be used mainly in larger plants—over 150 tons/day—as they possess disadvantages with respect to down-time and control of surface of separation. (World Surface Coat. Abs. No. 325)

Extraction of oil from fresh coconut. P. Solé Castellanos and C. Rolz Asturias (ICAITI, Univ. of San Carlos, Guatemala, C.A.). *Oléagineux* 24, 419–421 (1969). In order to find a more satisfactory method for obtaining coconut oil from copra, experiments on the wet milling of fresh coconut meat were carried out. Percentages of oil recovered by the ICAITI process were lower than those found by pressing the copra. However, the acidity of the oil was low, and the color was very light, so that subsequent refining losses were reduced. The new process is somewhat simpler than other processes.

Controlling oxidized flavors in high-fat sterilized creams. H. K. Wilson and E. O. Herreid (Food Science Dept., Univ. of Ill., Urbana, Ill.). *J. Dairy Sci.* 52, 1229–32 (1969). Creams containing approximately 50% fat have been sterilized at 155C with no holding time, canned aseptically, and stored for more than six months with excellent results. Flavor scores were 38 or more immediately after processing for most creams to which concentrated milk, ascorbic acid, and α-tocopherol had been added. Flavor scores were as high as 37 after eight months' storage at 4C. These creams were homogenized after sterilization at not more than 35 kg/cm^2 in the second stage of a two-stage homogenizer or 35 kg/cm^2 in the first and 21 kg/cm^2 in the second stage. Most large globules retained their original size. Peroxide values decreased to near zero in three to five weeks of storage in creams containing added ascorbic acid. Reduced ascorbic acid concentration decreased at a faster rate in cream without added solids-not-fat than in creams with the added solids. The presence or absence of added α-tocopherol made no difference. The rate of decrease of ascorbic acid was greater than had been reported in enriched commercial evaporated milk. Ice creams made with sterilized cream containing added ascorbic acid and tocopherol retained good flavor for more than a year after they were frozen.

Donor-acceptor complexes and the semiconductivity of lipids. B. Rosenberg and B. B. Bhownik (Biophys. Dept., Michigan State Univ., East Lansing, Mich. 48823). *Chem. Phys. Lipids* 3, 109–24 (1969). The 1:1 electron donor-acceptor complexes of 2,4-dinitrophenol with lipids such as egg lecithin, synthetic lecithin and oxidized cholesterol have been studied spectrophotometrically in carbon tetrachloride solution. The charge-transfer absorption band has been found in the near ultraviolet for each complex. The equilibrium constants of these complexes have been estimated from their charge transfer bands and are in the order egg lecithin $>$ synthetic lecithin $>$ oxidized cholesterol. The electrical conductivity of bimolecular lipid membranes increases in the presence of iodine, picric acid, 2,4-dinitrophenol and trinitrobenzene. With increasing temperature, the electrical conductivity of bimolecular lipid membranes of oxidized cholesterol has been found to increase exponentially and the activation energies have been measured for membranes in solutions of iodine, picric acid, 2,4-dinitrophenol, trinitrobenzene and water. The increase of electrical conductivity with decreasing activation energy of oxidized cholesterol bimolecular lipid membranes in the presence of different acceptors supports the suggestion of donor-acceptor complex formation. The strength of the acceptors are in the order iodine $>$ picric acid $>$ 2,4-dinitrophenol $>$ trinitrobenzene. In the solid state, the activation energies of fully hydrated, oxidized cholesterol crystals have been measured alone and in the presence of iodine and 2,4-dinitrophenol. The values are in good agreement with those obtained for the bimolecular lipid membranes and suggest that the same mechanism of semiconduction appears in both cases.

Microbial sulfolipids. III. The disulfate of (+)-1,14-docosanediol in Ochromonas danica. G. L. Mayers, M. Pousada and T. H. Haines (Dept. of Chem., The City College of The City Univ. of New York, New York, N.Y.). *Biochemistry* 8, 2981–2986 (1969). A new sulfolipid, the disulfate of (+)-1,14-docosanediol, was isolated from the phytoflagellate, *Ochromonas danica.* It was characterized by synthesis of (DL)-1,14-docosanediol and its disulfate and by comparison of the synthetic materials with the natural materials. In order to determine the orientation of the natural secondary sulfate, it was necessary to explore the mechanism of solvolysis of sulfate esters in dioxane. It was found that solvolysis of secondary sulfates to alcohols in dioxane occurs with retention of configuration around the C–O bond of the alcohol. Comparison of the natural (+)-1,14-docosanediol rotation with the rotations of hydroxy acids of known absolute configuration suggest thee natural sulfolipid is 1-(S)-14-docosanediol 1,14-disulfate. With one exception all other natural hydroxy fatty acids (where the hydroxyl is isolated and beyond the β position) have the R configuration. Chlorodocosanediols are obtained from the solvolyzed sulfatides.

Lipids of Streptomyces sioyaensis VI. On the β-hydroxy fatty acids in siolipin. J. Kawanami and H. Otsuka (Shionogi Res. Lab., Shionogi and Co., Ltd., Fukushima-ku, Osaka, Japan). *Chem. Phys. Lipids* 3, 135–139 (1969). The structure of the hydroxy fatty acids in siolipin was proposed, mainly on the basis of mass spectroscopy to be 3-hydroxy fatty acids, that is, 3-hydroxy-14-methylpentadecanoic and 3-hydroxy-15-methylhexadecanoic acid.

Separation efficiency versus column length. An experimental study with capillary columns. K. Grob and G. Grob (Dept. of Organic Chem., Univ. of Zurich, Switzerland). *J. Chrom. Sci.* 7, 515–516 (1969). The columns of different length used for studying the relation between HETP and column length are supposed to exhibit identical characteristics per meter. In the laboratory this condition cannot be rigorously fulfilled. The best approximation probably consists in starting the work with a relatively long capillary column followed by running shorter parts obtained by progressive cutting of the original column. Based on this procedure a marked increase of HETP with increasing column length is observed.

Chromatography of conjugated bile acids on silica gel-impregnated, glass fiber paper. H. E. Gallo-Torres and J. G. Hamilton (Nutr. and Metabol. Res. Lab., Depts. Med. and Biochem., Tulane Univ. School of Med., New Orleans, La.). *J. Chrom. Sci.* 7, 513–514 (1969). Three new solvent systems are described for the separation of free and conjugated bile acids by glass fiber paper chromatography. An acidic solvent system consisting of isooctane-isopropyl ether-glacial acetic acid-isopropyl alcohol, 1:1:1:1: (v/v) was found suitable for the separation of glycine-conjugated bile acids. A more polar modification of this acidic solvent system with chloroform substituting for isooctane, was found adequate for the separation of taurine conjugates. A basic solvent system consisting of chloroform-isopropyl alcohol-ammonium hydroxide, 20:25:1, was found satisfactory for the separation of glycine and taurine-conjugated bile acids, and lecithin.

Gas chromatography of epoxyglycerides. J. A. Fioriti, M. J. Kanuk and R. J. Sims (General Foods Corp., Technical Center, White Plains, N.Y.). *J. Chromat. Sci.* 7, 448–452 (1969). Epoxyglycerides react with ketones in the presence of boron trifluoride to give 1,3-dioxolane derivatives. These derivatives are useful in the separation and identification of epoxyglycerides by gas liquid chromatography. Cyclopentanone is the most suitable reagent since it gives a derivative which has a large separation factor from the long-chain common triglycerides. The analysis of epoxyglyceride mixtures by GLC as their 1,3-dioxolane derivatives is described.

(Continued on page 616A)

(Continued from page 612A)

Crambe abyssinica, —A new commercial oilseed. J. A. Cornelius and E. A. Simmons (Tropical Products Inst., London). *Tropical Science* 11, 17–22 (1969). The development from original investigations in Russia of *Crambe abyssinica* as a new commercial source of oil is described. The conditions for cultivation and harvesting of the plant are outlined, and the characteristics and composition of the seed oil are compared with those of rape oil, which it closely resembles. The uses of the seed oil, particularly in the industrial field, are surveyed, and problems connected with the use of the meal as an animal feed and methods used to render it more suitable for feeding purposes are described.

Sperm whale head oil. Part I. The ester fraction. C. J. Challinor, R. J. Hamilton and K. Simpson (Dept. of Chem. and Biology, Regional College of Technology, Liverpool). *Chem. Phys. Lipids* 3, 145–151 (1969). The wax esters of sperm whale head oil have been isolated and shown to range from C_{25}–C_{38} in chain length. The total wax esters were then fractionated according to the degree of unsaturation and the observed compositions have been compared to the values calculated assuming synthesis in a random fashion.

The identification of cis-11,12-Methylene-2-hydroxyoctadecanoic acid from Thiobacillus thiooxidans. H. W. Knoche and J. M. Shively (Dept. Biochem. and Nutr. and the Dept. of Microbiol., Univ. Nebraska, Lincoln, Neb.). *J. Biol. Chem.* 244, 4773–78 (1969). A polar fatty acid has been observed as a component of an ornithine-containing lipid of *Thiobacillus thiooxidans* The polar acid is proposed to be *cis*-11,12-methylene-2-hydroxyoctadecanoic acid.

Effect of vacuum of lipid binding during high energy dough development. N. W. R. Daniels, P. S. Wood, P. W. R. Eggitt and J. B. M. Coppock (Spillers Ltd., Cambridge, England). *Chem. Ind. (London)* 1969(6), 167–8. It is known that the quality of bread produced by high energy dough development may be improved by pressure reduction in the dough mixing chamber. It is now reported that lipid binding increases as the pressure in the dough mixing bowl is reduced. The extrapolated value for bound lipids at zero absolute pressure matches the experimental result obtained under nitrogen at atmospheric pressure. It is likely, therefore, that vacuum acts on lipid binding through the resultant reduction in oxygen content of the dough atmosphere rather than through the physical effect of reduced pressure alone.

Seed fats of some New Zealand Liliaceae. I. M. Morice (Dept. of Scientific and Industrial Res., Wellington, New Zealand). *J. Sci. Food Agr.* 20, 262–4 (1969). The seed fats of ***Herpolirion novae-zelandiae, Xeronema callistemon, Dianella intermedia,*** two species of ***Arthropodium*** and six of ***Bulbinella,*** members of the family ***Liliaceae,*** have been examined and found to contain as their predominant fatty acids linoleic (65–87%), oleic (7–24%) and palmitic (5–16%). They are similar to Group I of *Astelia* (Liliaceae). ***Iphigenia novae zelandiae*** (Liliaceae) shows a different pattern, containing 17% hexadecenoic, 20% palmitic, 26% linoleic and 34% oleic acid, as well as trace amounts of C_{12}, C_{14}, C_{15} and C_{17} alkanoic and C_{15} and C_{17} alkenoic acids.

Polyisoprenoid constituents of lipids. R. A. Morton. *Chem. Ind. (London),* 1710–8, 1968(49). A review.

Process for improving fats. P. J. Seip (Lever Bros. Co.). *U.S. 3,454,608.* A continuous process for alkali refining of glyceride oils is described, in which the oil flows smoothly through a series of stages in the form of an upper layer on an aqueous alkali solution, the composite stream being transferred between successive stages in such a way that the soap layer formed by reaction between the alkali and the fatty acids is dispersed into the body of the aqueous phase, thus exposing a fresh aqueous surface at the interface and enabling the neutralization reaction to proceed. Apparatus needed for carrying out the process is also described.

Liquid shortening process. R. J. Bell, R. L. Campbell, A. E. Brust and L. R. Custer (Anderson, Clayton & Co.). *U.S. 3,455,699.* A process for the manufacture of a liquid shortening includes forming a molten blend of an oil, fat having a melting point above 100F and an emulsifier containing mono- or diglycerides; rapidly cooling the blend to a temperature near the cloud point of the emulsifier; agitating for at least 30 minutes; rapidly cooling the blend to a temperature near the cloud point of the fat and finally agitating for at least 30 minutes.

Process for plasticizing fatty materials. C. E. McMichael and W. A. Singleton (Chemetron Corp.). *U.S. 3,455,700.* A process is described for preparing a plasticized fatty material which involves a substantial reduction in tempering times. A molten fat is cooled and partially crystallized at a first temperature in a first zone, then worked by agitation and partially crystallized at a second temperature higher than the first temperature in a second zone. The material is subsequently cooled and worked in a third zone at about the same or lower temperature than in the first zone to form small and well distributed crystal nuclei in the beta prime form.

Refining process comprising deacidification and deodorization of glyceride oils and fats and equipment for said process. G. B. Martinenghi. *U.S. 3,455,975.* Glyceride oils and fats are deacidified and deodorized by a process which involves passing low temperature steam through them under conditions of high temperature and low pressure so as to entrain volatile materials. The steam is then removed from contact with the oil and precipitated by refrigeration.

Low-fat table spread compositions. E. L. Josefowicz, I. Cooper and D. Melnick (Corn Products Co.). *U.S. 3,457,086.* A novel low-fat table spread which may be manufactured in either print form or soft tub form is substantially free of protein, contains less than 50% fat and is a stable water-in-oil emulsion. Observance of specified conditions of temperature, agitation and pressure is essential to prevent the emulsion from changing to an oil-in-water type. The spread composition does not contain any ingredients other than those now commonly used in margarine and it possesses all desirable organoleptic characteristics of margarine while providing much less calories.

Treatment of fats. L. Faur and P. Westdorp (Lever Bros. Co.). *U.S. 3,458,545.* Components of fat blends of different melting points are separated by incorporation of a dispersion of water and a wetting agent in the fatty material at a temperature at which a high-melting fraction is crystallized while maintaining the liquid fat as a continuous phase and subsequently separating from the system a liquid phase composed substantially of the liquid components of the fat blend.

Catalytic hydrogenation of oils for edible products. P. Seiden (Procter & Gamble Co.). *U.S. 3,459,777.* In a process for catalytically hydrogenating vegetable or marine oils to an I.V. greater than 60, catalyst is added at the beginning of the reaction in an amount sufficient only to start the hydrogenation, and subsequently incrementally added at a minimum prescribed frequency designed to cause the reaction to follow a predetermined, substantially straight Refractive Index vs. time curve.

• Fatty Acid Derivatives

Synthesis of 2-alk-1′-enyloxy-ethanols. J. K. G. Kramer and H. K. Mangold (Univ. Minn., Hormel Inst., Austin, Minn. 55912). *Chem. Phys. Lipids* 3, 176–184 (1969). Naturally occurring alk-1-enyl ethers of ethanediol, *i.e.,* 2-octadec-1′-enyloxy-ethanol, 2-hexadec-1′-enyloxy-ethanol and 2-tetradec-1′-enyloxy-ethanol, were prepared *via* alk-1-en-1-yl acetates, 2-bromo-1,1-dimethoxy-alkanes and 2-(1′-bromoalkyl)-1,3-dioxolanes. The *cis* and *trans* alk-1-enyl ethers formed in the debromination of the 2-(1′-bromoalkyl)-1,3-dioxolanes were each isolated by argentation chromatography.

The synthesis of diacyl-DL-(and-L-) α-glycerol phosphate. Y. Lapidot, I. Barzilay and J. Hajdu (Dept. of Biological Chem., The Hebrew Univ. of Jerusalem, Jerusalem, Israel). *Chem. Phys. Lipids* 3, 125–134 (1969). The synthesis of α-DL (and -L)-diacylglycerol phosphate is described. The method involves a direct acylation of glycerol-phosphate by fatty acid anhydride in the presence of the appropriate tetraethylammonium salt. Under the experimental conditions described in this paper, the phosphatidic acid was the sole reaction product and no cyclic phosphate could be detected. The procedure described is a general one and can be used for saturated as well as unsaturated fatty acids.

SYNTHETIC GLYCOSYLGLYCERIDES IN BREADMAKING. Y. Pomeranz and H. P. Wehrli (Dept. of Grain Science and Industry, Kansas State Univ., Manhattan, Ka. 66502). *Food Technol.* 23, 1213–15 (1969). Effects in breadmaking of synthetic glycosylglycerides were compared with those of phospholipids, sucroesters, wheat flour lipids and soybean polar lipids. The capacity to restore breadmaking potentialities of defatted wheat flour, and to increase loaf volume of soy-enriched bread, varied with the lipid classes. The improvement depended on carbohydrate and lipid (chain length and degree of fatty acid unsaturation) composition.

ISOMERIZATION OF MONO- AND DIGLYCERIDE TRIMETHYLSILYL ETHERS. R. Watts and R. Dils (Dept. of Biochem., Univ. of Birmingham, England). *Chem. Phys. Lipids* 3, 168–175 (1969). Gas-liquid chromatography and nuclear magnetic resonance data have been correlated to show that on silylation with hexamethyldisilizine plus trimethylchlorosilane, 1-monoglycerides partially isomerise to the trimethylsilyl ethers of 2-monoglycerides. This isomerisation does not occur when bis(trimethylsilyl)acetamide is used as silylating reagent. Though GLC data alone could not be used to determine whether diglycerides isomerise on silylation with hexamethyldisilazine plus trimethylchlorosilane, this was excluded by nuclear magnetic resonance data.

EMULSIFIER SYSTEM. E. H. Freund (Nat. Dairy Prod. Corp.). *U.S. 3,453,116.* An emulsifier system is described, comprising a propylene glycol monoester having a saturated fatty acid moiety derived from oils and/or fats and a stabilizer for the monoester. The monoester is predominantly in the alpha crystalline form and the stabilizer, which is an ionic surface active salt, functions by maintaining the alpha crystalline form of the monoester. The emulsifier system is substantially free of solvent for the monoester and is particularly useful in food products.

STABILIZATION OF OXIRANE-CONTAINING FATTY DERIVATIVES. R. J. Sims (Swift & Co.). *U.S. 3,453,252.* Fatty, oxirane-containing compositions are stabilized against loss of oxirane oxygen by the addition of an antioxidant comprising a phenol having nuclear substituted alkyl radicals, such as butylated hydroxy toluene, butylated hydroxy anisole and propyl gallate.

HYDROCARBON LUBRICATING COMPOSITIONS CONTAINING MIXTURES OF AN ALKYL PHOSPHITE AND FATTY ACID ESTERS FOR IMPARTING LIMITED-SLIP PROPERTIES. A. G. Papayannopoulos (Mobile Oil Corp.). *U.S. 3,446,739.* Hydrocarbon lubricating compositions are provided which contain small amounts of mixtures of an alkyl phosphite and an ester of a fatty acid and a fatty alcohol, with the alkyl groups of the phosphite, fatty acid and fatty alcohol each containing from 12 to 30C atoms.

REACTION PRODUCTS OF SULFURIZED POLYBUTENES AND TRIGLYCERIDES. M. J. Den Herder and A. C. Borg (Standard Oil Co.). *U.S. 3,455,896.* Sulfur-containing oil-soluble extreme pressure additives for lubricants are produced by reacting one part by volume of sulfurized low molecular weight polybutenes and 0.5 to 1.5 parts by volume of liquid triglycerides susceptible to sulfurization at a temperature of about 250–400F for a period of at least five minutes.

BLEACHING DETERGENTS AND WASH ADJUVANTS. J. Schiefer and M. Dohr (Henkel & Cie., G.m.b.H.). *U.S. 3,459,665.* Peroxygen compounds are coated with an ester of glycerin and at least one member of the group consisting of C_8–C_{26} monocarboxylic acids, C_8–C_{26} hydroxy monocarboxylic acids, C_2–C_{10} aliphatic polycarboxylic acids, phthalic acid and mixtures thereof.

PROCESS FOR THE PRODUCTION OF METAL SOAPS OF EPOXIDIZED FATTY ACIDS. A. Szczepanek and M. Szczepanek (Hoesch-Chemie G.m.b.H.). *U.S. 3,459,776.* A process for the production of polyvalent metal soaps of epoxidized fatty acids comprises: (a) contacting epoxidized fatty acid in an aqueous, alcoholic, alkaline medium with a monovalent metal cation, the medium being a solvent for both the epoxidized fatty acid and its salt, and containing 10–70% alcohol, and (b) contacting the salt with an aqueous solution of a water soluble salt of the said polyvalent metal to form a polyvalent metal soap.

(Continued on page 622A)

(Continued from page 617A)

• Biochemistry and Nutrition

Studies on fatty acid composition of adipose tissue and blood lipids of Polynesians. F. B. Shorland, Z. Czochanska and I. A. M. Prior (Dept. of Scientific and Indt. Res., Food Chem. Div., Box 8021, Wellington, New Zealand). *Am. J. Clin. Nutr.* 22, 594–603 (1969). Dietary fat was fed at the level of approximately 40% of the total calories and its effect on the fatty acid composition of the depot and serum lipids of two groups of Polynesians has been studied. In the first group (Pukapukans) the dietary fat was mainly coconut oil, rich in lauric and myristic acids, whereas in the second group (Maoris) the dietary fat consisted largely of ruminant fat. The adipose tissue of Pukapukans contained elevated contents of lauric (ca. 11%) and of myristic (ca. 15%) acids characteristic of coconut oil. The adipose tissue of the New Zealanders, including Maoris and Europeans, was similar in fatty acid composition and comparable with that recorded by other workers for Americans. The intake of ruminant fat was reflected in these groups by the presence of branched-chain fatty acids characteristic of the dietary fat.

Conversions of non-biological polyunsaturated fatty acids in rat liver. H. Schlenk, T. Gerson and D. M. Sand (Hormel Inst., Univ. of Minn., Austin, Minn. 55912). *Biochim. Biophys. Acta* 176, 740–7 (1969). 7,10,13,16-Nonadecatetraenoic, 6,9,12,15,18-heneicosapentaenoic, 6,9,12,15-eicosatetraenoic, and 6,9,12,15-heneicosatetraenoic acids were prepared labeled with ^{14}C. They were administered to rats deficient in essential fatty acids and their metabolism was compared with that of 5,8,11,14-eicosatetraenoic (arachidonic) and 4,7,10,13,16,19-docosahexaenoic acids. All these acids and their conversion products were incorporated mainly into phospholipids. In phosphatidyl cholines they were in position 2. Incorporation of polyunsaturated acids was close to 8% with all non-biological acids and with arachidonic acid. Incorporation of 4,7,10,13,16,19-docosahexaenoic acid was 16%. The extent of conversion depended on the structure of the acids. Docosahexaenoic and arachidonic acid formed the least amounts of conversion products. Highest conversion products of all non-biological acids had the proximal structure 5,8, . . . and among them 5,8,11,14,17-docosapentaenoic acid, which derived from 6,9,12,15-eicosatetraenoic acid, was prominent in amount.

The cholesterol solubilizing capacity of lecithins in aqueous solutions of bile salt. D. R. Saunders and M. A. Wells (Dept. of Med. and Biochem., Univ. Washington, Seattle, Wash.). *Biochim. Biophys. Acta* 176, 828–35 (1969). These experiments tested the hypothesis that lecithins which had dissimilar fatty acid compositions would have differing abilities to solubilize cholesterol in an aqueous solution of bile salts. The ability of ten synthetic lecithins to solubilize cholesterol was determined in an assay system in which aqueous mixtures of 10 mM lecithin, 20 mM glycocholate and cholesterol were irradiated with ultrasound, and then were equilibrated at 37C. The cholesterol solubilizing capacities of dilinoleoyl lecithin and of dioleoyl lecithin were higher than those of dipalmitoyl lecithin or of distearoyl lecithin. There were no differences, however, among lecithins which contained both saturated and unsaturated fatty acids except that 1-palmitoyl,2-oleoyl lecithin had a greater cholesterol solubilizing capacity than did 1-oleoyl,2-palmitoyl lecithin. 10 mM of 1-palmitoyl lysolecithin could solubilize cholesterol, whereas mixtures of L-oleoyl lysolecithin above 0.70 mM were turbid in buffered glycocholate. Because bile contains predominantly 1-saturated, 2-unsaturated acyl lecithins, these data are probably not relevant to the pathogenesis of human cholesterol gall stones.

Effect of ethionine on the metabolism of phospholipids in rat liver. R. Sato and H. Hasegawa (Dept. of Biochem., Sapporo Med. College, Sapporo, Japan). *Biochim. Biophys. Acta* 176, 748–55 (1969). The effect of ethionine on the incorporation of $^{32}P_i$ into liver phosphatidyl choline and phosphatidyl ethanolamine in female rats was studied *in vivo* and *in vitro*. A marked decrease of ^{32}P uptake into phosphatidyl ethanolamine and a striking increase of that into phosphatidyl choline were produced by the intraperitoneal administration of ethionine. Methionine counteracted the effect of ethionine, but ATP did not. Liver slices from ethionine-treated rats, incubated in Krebs-Ringer bicarbonate or phosphate buffer solution, incorporated more ^{32}P into phosphatidyl choline and less into phosphatidyl ethanolamine than slices from saline-treated rats. The slices from ethionine-methionine-treated rats exhibited no decrease in ^{32}P uptake into phosphatidyl ethanolamine. The concentrations of phosphatidyl choline, phosphatidyl ethanolamine, CDP-choline, CDP-ethanolamine, phosphoryl choline and phosphorylethanolamine in livers of female rats were determined.

The effect of dietary melengestrol acetate (MGA) on body weight gain, percentage carcass fat and fatty acid composition of roasting chickens. N. G. Sauer, D. A. Cramer and J. V. Shutze (Dept. of Avian Sci., Colorado Expt. Station, Fort Collins, Colorado 80521). *Poultry Sci.* 48, 543–5 (1969). The feeding of 17.6 mg of MGA/kg of feed to male and female roasters from 9 to 14 wks of age significantly depressed growth, increased fat deposition and shifted the fatty acid composition toward increased saturation. The feeding of 17.6 mg of MGA/kg of feed to male roasters from 14 to 16 wks of age tended to increase growth and fat deposition with no significant change in fatty acid composition. The females, when fed 17.6 mg of MGA from 14 to 16 wks of age, showed no growth response, significantly decreased fat deposition and had significant alteration of fatty acid composition. The feeding of graded levels (0.0, 1.1, 2.2, 4.4 and 8.8 mg/kg) of MGA to male roasters from 8 to 12 wks of age produced no significant differences in growth, percentage of body fat, alterations of fatty acid composition, differences in calculated iodine number or TBA number. Females, when fed graded levels of MGA from 8 to 12 wks of age, showed a level response. At the 1.1 mg/kg level, the females showed a slight increase in body weight gain and decrease in fat deposition. At the 2.2 mg/kg level, body weight gain was decreased, and fat deposition was significantly ($P < 0.01$) decreased. At the 4.4 mg/kg level the body weight gain of females was significantly ($P < 0.01$) decreased, but fat deposition at the 4.4 mg of MGA/kg was not significantly ($P < 0.01$) lower than the control group. At the 8.8 mg/kg level, the females showed a trend toward decreased body weight gain. At all levels, the fatty acid composition of the females was not significantly altered, and no trend toward increased saturation was observed.

Dietary fat and the inhibition of hepatic lipogenesis in the mouse. J. R. Sabine, H. McGrath and S. Abraham (Depts. of Physiol., Anat. and Nutr. Sciences, Univ. of Calif., Berkeley, Calif.). *J. Nutr.* 98, 312–318 (1969). The effects of dietary fat upon lipogenesis from acetate-1-^{14}C by slices of mouse liver was examined under two sets of conditions: a) a high fat diet (15% corn oil) was fed for 1 to 5 days, following zero, 1 and 2 days of fasting; and b) corn oil, safflower oil, coconut oil, tricaprylin, tripalmitin, triolein, oleic acid and mineral oil (all at 10% of the diet) were fed for 3 days, with no prior fasting. Of the high fat diets only those high in linoleic acid suppressed fatty acid synthesis. Corn oil reduced fatty acid synthesis in nonfasted mice, and suppressed the usual "adaptive hyperlipogenesis" found after fasting and refeeding. From this work, and that of others, it is now clear that any alteration in hepatic lipogenesis induced by the inclusion of fat in the diet will depend not only on the fatty acid composition of the fat, but also on the level in the diet, the length of time it is fed, the animal species and age examined, and on whether the studies are conducted *in vivo* or *in vitro*.

Effect of restricted energy and protein intake on atherosclerosis and associated physiological factors in cockerels. R. J. Rose and S. L. Balloun (Dept. of Poultry Sci., Iowa State Univ., Ames, Iowa). *J. Nutr.* 98, 335–343 (1969). Practical or semipurified diets, with and without added cholesterol, were fed to growing cockerels to determine the effect of dietary energy or protein restriction on systolic blood pressure, total serum cholesterol, total serum lipids, liver lipids and incidence of atherosclerosis in thoracic and abdominal aortas. The effect of dietary protein or energy restriction on systolic blood pressure was inconsistent. Variations in blood pressure appeared to be associated more with body weight than with restriction of protein or energy as such. Serum cholesterol, serum lipids and liver lipids were markedly increased when cockerels were fed diets containing cholesterol. Each was increased by protein restriction and decreased by energy restriction. Without added dietary cholesterol, serum cholesterol was not significantly affected by protein of energy restriction. Serum lipids were significantly increased, and liver lipids were slightly increased, when birds were fed protein-restricted diets without added cholesterol. Atherosclerosis was more prevalent when the diets contained cholesterol, and more severe in the abdominal than in the thoracic aorta, regardless of dietary treatment. Protein or energy restriction affected atherosclerosis, especially in the thoracic aorta, most when the diets contained cholesterol.

Incidence of atherosclerosis in the thoracic aorta was reduced in energy restricted, and increased in protein-restricted birds.

Biosynthesis of lysophosphatidic acid from ATP and 1-monoolein by subcellular particles of intestinal mucosa. R. Paris and G. Clement (Lab. de Physiologie Animale et de la Nutr., Faculte des Sciences, Dijon, France). *Proc. Soc. Exptl. Biol. Med.* 131, 363–5 (1969). Evidence is presented that incubation of monoolein with ATP, fatty acids, and other appropriate additions in the presence of subcellular fractions from intestinal mucosal cells results in the formation of lysophosphatidic acid (LPA). These results indicated that LPA is an intermediate in the formation of phosphoglycerides in the intestinal mucosa during fat absorption.

The intestinal absorption of 1,2- and 1,3-dialkyl glycerol ethers and of diether phospholipids. F. Paltauf (Institut fur Physiologische Chemie, Univ. of Graz, Graz, Austria). *Biochim. Biophys. Acta* 176, 818–27 (1969). Labeled 1,2- and 1,3-dialkyl glycerol ethers and 1,2-dialkyl analogs of phosphatidyl choline, phosphatidyl ethanolamine and phosphatidic acid were used as model substances for the corresponding fatty acid ester derivatives to study their intestinal absorption and incorporation into lymph lipids. The substances were fed to intact and lymph cannulated rats. Lipids extracted from lymph and organs were analyzed for total activity and distribution of activity between different lipid classes. The amount of dialkyl glycerol ethers absorbed depends on the chain length (8–10% for the long chain vs. 52% for the dioctyl derivative), but not on the position or degree of saturation of the alkyl moieties. The rate of esterification with fatty acids during passage through the gut, however, is quite different for the 1,2 and 1,3 isomer, the 1,2 isomer being the favored substrate in this reaction. Only traces of intact diether phospholipids are incorporated into lymph lipids. The possibility of ω-oxidation as the pathway for the degradation of the 1,2-dialkyl glycerol ethers is discussed.

The lipid content of mitochondria from transplantable animal tumours. R. F. Mitchell (Australian Atomic Energy Comm., Res. Establishment, Sutherland, N. S. W. 2232). *Biochim. Biophys. Acta* 176, 764–73 (1969). Ehrlich ascites tumour mitochondria are shown to contain 34% lipid (by wt.), 91% of which is phospholipid. This is about twice the content of liver mitochondria and more than that of heart mitochondria. Measurements of the cytochromes and soluble compartments provide evidence against the observation being an artifact produced by loss of soluble protein from tumour mitochondria during their isolation from the cells. Thin-layer chromatography shows that the same lipids are common to tumour, heart and liver mitochondria and are present in about the same proportions. Several other transplantable tumours (solid and ascitic) were studied and all have a high content of phospholipid, suggesting this is a general characteristic of transplantable tumours. These observations are not explicable in terms of the inner membrane content of the mitochondria. Whether they relate to the size of tumour mitochondria or represent an abnormality in their membrane or matrix composition cannot be determined without measurements of the relevant outer membrane areas in relation to mitochondrial volume. Possible aetiological factors are briefly discussed.

Chemistry and metabolism of sphingolipids. Chemical synthesis of 2-amino-1-hydroxyoctadecan-3-one (3-ketosphinganine). P. B. Mendershausen and C. C. Sweeley (Dept. of Biochem., Grad. School of Public Health, Pittsburgh 15213). *Biochemistry* 8, 2633–2635 (1969). A method is reported for the chemical synthesis of 3-ketosphinganine from commercially available sphinganine. The amino group of sphinganine was protected with a carbobenzyloxy group, the secondary alcohol was selectively oxidized to the ketone with chromic anhydride, and the product was converted by hydrogenolysis into 3-ketosphinganine. Mass spectra of the carbobenzyloxy derivatives of sphinganine and 3-ketosphinganine are presented. The structure of free 3-ketosphinganine was confirmed by reduction with sodium borodeuteride, N acetylation and gas chromatography mass spectrometry of the trimethylsilyl derivative.

In vivo fatty acid and cholesterol synthesis in fasted and fasted-refed chicks. G. A. Leveille (Div. of Nutr. Biochem., Dept. of Animal Sci., Univ. of Ill., Urbana, Ill.). *J. Nutr.* 98, 367–372 (1969). The effects of fasting and refeeding following a fast on *in vivo* hepatic fatty acid and cholesterol synthesis were studied in growing chicks. Also investigated was the influence of these treatments on liver lipid and glycogen content and on the activities of hepatic glucose 6-phosphate and 6-phosphogluconate dehydrogenases and malic enzyme. Hepatic fatty acid and cholesterol synthesis were significantly depressed by a 24-hour fast and continued to decrease during the 3-day starvation period studied. Fatty acid synthesis increased to 275% and 364% of normal after 1 and 2 days of refeeding, respectively, following a 3-day fast. On day 3 of refeeding, fatty acid synthesis returned to normal and remained so throughout the remainder of the 5-day refeeding period. Cholesterol synthesis remained depressed until day 3 of refeeding, when a significant increase was observed, and reached near-normal values on day 4. Activity of the pentose pathway dehydrogenases was very low in chick liver and was not greatly influenced by fasting or refeeding. Malic enzyme activity was severely decreased by fasting and returned to control values after 2 days of refeeding. Liver weight and liver glycogen decreased markedly during the fasting period, increased to above normal values during the first 2 days of refeeding and returned to control levels after 3 days of refeeding. Liver total lipid was not significantly influenced by fasting but increased upon refeeding and began to decrease after 3 days of refeeding. Liver cholesterol content increased during fasting and decreased rapidly upon refeeding.

Differences in bile acid excretion: Primary hypercholesteremia compared to combined hypercholesteremia and hypertriglyceridemia. B. A. Kottke (Section of Med., Mayo Clinic, Rochester, Minn.). *Circulation* 40, 13–20 (1969). Total daily bile acid excretion was measured in 10 patients with primary hypercholesteremia and in 9 patients with combined hypercholesteremia and hypertriglyceridemia by using ^{14}C-labeled cholic acid and ^{3}H-labeled chenodeoxycholic acid. The average bile acid excretion by the patients with primary hypercholesteremia was 282 mg/day; that by the patients with combined hypercholesteremia and hypertriglyceridemia, 1092 mg/day. These findings suggest a fundamental difference in cholesterol metabolism in these two types of hyperlipidemia.

Biosynthesis of molecular species of phosphatidyl choline and phosphatidyl ethanolamine from radioactive precursors in rat liver slices. H. Kanoh (Dept. of Biochem., Sapporo Med. College, Sapporo, Japan). *Biochim. Biophys. Acta* 176, 756–63 (1969). The incorporation of radioactive precursors into the 4 main molecular species of phosphatidyl choline and phosphatidyl ethanolamine was studied in rat liver slices, and the following results were obtained. Bienoic phosphatidyl choline was found to be most active in incorporating ^{32}P, glycerol-1-^{14}C and choline-1,2-^{14}C$_2$. In the case of phosphatidyl ethanolamine, incorporation of ^{32}P, glycerol-1-^{14}C and ethanolamine-1,2-^{14}C$_2$ was found to occur at the highest rate in the hexaenoic subfraction. In contrast the tetraenoic subfractions of both phospholipid showed the lowest metabolic reactivity. Tetraenoic subfractions of both phosphatidyl choline and phosphatidyl ethanolamine were found to take up preferentially lyso-(1-acyl-)phosphatidyl choline labeled with choline-1,2-^{14}C$_2$ and lyso-(1-acyl-)phosphatidyl ethanolamine labeled with ethanolamine-1,2-^{14}C$_2$, respectively. From the results of incorporation of L-(Me-^{14}C)methionine into subfractions of phosphatidyl choline, hexaenoic phosphatidyl choline was confirmed to be a major product of methylation of phosphatidyl ethanolamine in rat liver.

Phospholipid composition of mitochondria and microsomes of liver and kidney in adrenalectomized, hypophysectomized and diabetic rats. J. D. Johnson and W. E. Cornatzer (Dept. of Biochem., Univ. of North Dakota, School of Med., Grand Forks, North Dakota 58201). *Proc. Soc. Exp. Biol. Med.* 131, 474–7 (1969). The individual phospholipid concentration of mitochondria and microsomes of liver and kidney in adrenalectomized, hypophysectomized, and diabetic rats was studied. Adrenalectomy and hypophysectomy resulted in a decreased concentration of total phospholipid of mitochondria and microsomes of liver and kidney. A decreased concentration of total phospholipids occurred in the microsomes of liver and kidney mitochondria and microsomes is apparently uniformly distributed in all of the phospholipid fractions except phosphatidylinositol. A decreased concentration of phosphatidyl-inositol of liver mitochondria occurred in the hypophysectomized rats.

Some properties and distribution of the ω-hydroxylation system of medium-chain fatty acids. K. Ichihara, E. Kusunose and M. Kusunose (Res. Lab. of Biochem., Toneyama Hosp., Osaka City Univ. Med. School, Toyonaka, Osaka, Japan). *Biochim. Biophys. Acta* 176, 704–12 (1969). 10-Hydroxydecanoate and sebacate were identified as the major products of decanoate oxidation by rat liver microsomes and 11,000 × g supernatant, respectively. The microsomal ω-hydroxylation system of medium-chain fatty acids in rat liver required NADPH and O_2. The Michaelis constant for decanoate was 2.6 μM. Various neutral salts strongly stimulated the reaction. CO produced considerable inhibition, suggesting the participation of cytochrome P-450 in the reaction. Neither SKF 525-A nor *tert*-butyl isocyanide had any significant effect. The ω-hydroxylation activity of medium-chain fatty acids was found in the microsomes from the livers, kidneys and lungs of various species of vertebrates (eight mammals, one bird, one amphibian and two fishes).

Biosynthesis of methylcyclopentane monoterpenoids. IV. Verbenalin. A. G. Horodysky, G. R. Waller and E. J. Eisenbraun (Depts. of Chem. and Biochem., Oklahoma State Univ. Stillwater, Oklahoma). *J. Biol. Chem.* 244, 3110–6 (1969). The biosynthesis of verbenalin (I) was studied by the administration of acetate-1-^{14}C, acetate-2-^{14}C, mevalonate-2-^{14}C, and geraniol-1-^{14}C to *Verbena officinalis* L. plants. When I which had been formed biosynthetically from mevalonate-2-^{14}C was degraded, randomization of the label between carbon atoms 6 and 9 was not observed; carbon atom 6 retained most of the radioactivity in young and old plants. Randomization between carbon atoms 3 and 8 varied with age of plant. There was complete randomization in young plants, limited randomization in older plants, and essentially nonrandomization in senile plants. The percentage of radioactivity in carbon atom 3 predominated over that in carbon atom 8 as the plant age increased. The ratio of radioactivity found in aglucone to that in glucose is considered to be metabolically significant.

Effect of kidney beans and taurocholate on serum tocopherol and nutritional muscular dystrophy in chicks. H. F. Hintz, D. E. Hogue and E. F. Walker, Jr. (Dept. of Animal Sci., Cornell Univ., Ithaca, New York 14850). *Proc. Soc. Exp. Biol. Med.* 131, 447–53 (1969). Proteins and LDH-isoenzymes were determined simultaneously in human serum and aqueous humor by an agar gel electrophoretic technique. The isoenzyme patterns of ocular tissues were obtained. Normal and uveitis cases were studied. The results showed that in uveitis, the protein concentration and isoenzyme activity in the aqueous humor increased; the protein pattern in the humor was similar to that of the serum indicating serum protein penetration into the aqueous humor, while the isoenzyme pattern of the aqueous humor showed an influence from both the serum and the ocular tissues. The combined determination of proteins and LDH-isoenzymes in serum and aqueous may be useful as a diagnostic aid, for permeability studies in the eye and for detection of metabolic changes of ocular tissues.

Absorption of vitamin A by infants receiving fat-free or fat-containing dried skim milk formulas. F. Figueira, S. Mendonca, J. Rocha, M. Azevedo, G. E. Bunce and J. W. Raynolds (Univ. of Recife, Brazil). *Am. J. Clin. Nutr.* 22, 588–593 (1969). There is a potential hazard in providing protein supplements to protein- and vitamin A-deficient children unless concomitant vitamin A supplements are given. Dried skim milk (DSM) is a high quality protein food that is widely used as a protein supplement. The fortification of DSM with vitamin A is a direct method not only of preventing the occurrence of keratomalacia secondary to rapid protein repletion of children deficient in both protein and vitamin A but also of providing a portion of the daily requirement of vitamin A to many children who might otherwise develop a deficient state. However, many children receiving vitamin A-fortified DSM will also have a low fat intake. The role of dietary fats in facilitating the absorption of dietary carotene and vitamin A has not been defined adequately.

Hyperlipemia in children with liver glycogen disease. J. Fernandes and N. A. Pikaar (Wilhelmina Children's Hosp., Univ. Utrecht, and Central Inst. for Nutr. and Food Res. TNO, Zeist, The Netherlands). *Am. J. Clin. Nutr. 22*, 617–627 (1969). Seven children with liver glycogen disease were studied during periods of controlled formula diets. The formula was changed equicalorically by altering either the carbohydrate-fat ratio or the type of fat. Fasting blood samples were taken once a week and analyzed for total fatty acids, cholesterol, phospholipids and composition of the fatty acids. The patients with deficiency of the debranching enzyme system and with deficiency of the phosphorylase system were less hyperlipemic, while on paper electrophoretograms only a dense β band was observed but no pre-β band. Substitution of fat for an equicaloric amount of carbohydrates lowered the lipid level and the palmitic acid percentage, especially in patients with severe hyperlipemia.

Depletion and repletion of body xanthophylls' reserves as related to broiler pigmentation. I. Bartov and S. Bornstein (Div. of Poultry Sci., Volcani Inst. of Agr. Res., Rehovot, Israel). *Poultry Sci.* 48, 495–504 (1969). The level of xanthophylls in the diets fed to broilers up to five weeks of age markedly influences the pigmentation scores obtained at eight to ten weeks of age. Chicks fed low-xanthophylls' diets during the first weeks of life and then transferred to relatively high-xanthophylls' diets, were not able to produce a desirable degree of pigmentation, even after four weeks on the latter diets. Shank pigmentation of depleted broilers, measured either as toe-web xanthophylls or as visual score, increased curvilineally after they had been fed a xanthophylls-containing diet, with the linear portion of the ascending dose-response curve being limited to the first two to three weeks. However, the decrease in shank pigmentation of broilers which changed from high to low-xanthophylls' diets, seemed to be a linear function during the five weeks of observation. Final pigmentation score, as well as efficiency of xanthophylls' conversion during the entire eight-week growth period appeared to be improved by the use of starter diets containing medium or high levels of xanthophylls. Nevertheless it seems that broilers raised on a low xanthophylls' starter diet utilized more efficiently the xanthophylls in the finisher diet. The increase and decrease in liver xanthophylls' levels seemed to be parallel to those observed in plasma. Both have serious drawbacks as criteria for broiler pigmentation, whereas visual scoring may be a better parameter than often presumed.

Impairment of gastrointestinal processing of fat and protein by ethanol in rats. J. J. Barboriak and R. C. Meade (Res. and Radioisotope Services, Wood Veterans Admin. Hosp. and Depts. of Pharmacol. and Med., Marquette School of Medicine, Milwaukee, Wisc.). *J. Nutr.* 98, 373–377 (1969). Ethanol, administered simultaneously with corn oil and trace amounts of ^{131}I triolein to fasting rats, temporarily delayed the removal of the radioactivity from the gastrointestinal tract. This interference with fat absorption was dose-dependent; no significant delaying effect was seen with 2 g ethanol/kg body weight, whereas a retardation of adsorption was observed with doses of 3 g or more of ethanol per kilogram body weight. The removal of ^{131}I triolein or

^{131}I oleic acid from the gastrointestinal tract was inhibited to about the same degree, indicating that blocking of intestinal lipase activity by ethanol was not an important factor in this interference. Administration of alcohol also led to retention of a protein meal in the stomach.

Enzymic ω-oxidation: stoichiometry of the ω-oxidation of fatty acids. J. A. Peterson, E. J. McKenna, R. W. Estabrook and M. J. Coon (Dept. of Biol. Chem., Univ. of Michigan, Ann Arbor). *Arch. Biochem. Biophys.* 131, 245–52 (1969). The stoichiometry of the ω-oxidation of fatty acids catalyzed by the inducible enzyme system of *Pseudomonas oleovorans* was determined. Assay methods are described for the polarographic measurement of oxygen uptake and the spectrophotometric measurement of DPNH oxidation. The development of these assay methods for the ω-hydroxylase has permitted the determination of the stoichiometry of the ω-hydroxylation of fatty acids. The reaction is a mixed function oxidation and the following equation is sufficient to describe the stoichiometry of the reaction catalyzed by the enzyme system: $DPNH + H^+ + \text{laurate} + O_2 \rightarrow DPN^+ + H_2O + \omega\text{-hydroxylaurate}$.

Phospholipid composition of Bacillus subtilis. J. A. F. Op den Kamp, I. Redai and L. L. M. van Deenen (Lab. of Biochem., Univ. of Utrecht, Vondellaan 25, Utrecht, The Netherlands). *J. Bacteriol.* 99, 298–303 (1969). At least five phospholipids have been identified in *Bacillus subtilis.* The four positively identified are cardiolipin, phosphatidylglycerol, phosphatidylethanolamine and lysophosphatidylglycerol. Cultural conditions affected the phospholipid composition. The addition of glucose which caused a lowering of pH during growth resulted in an increase in the amount of lysophosphatidylglycerol and a decrease in the phosphatidylglycerol content; other phospholipids and the total phospholipid content remained constant. Increased resistance to lysis of protoplasts from cells grown at low pH suggests a more rigid membrane structure occurs under these cultural conditions.

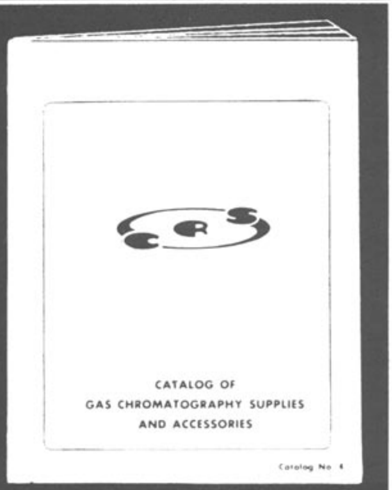
• Detergents

Preparation of a water-insoluble metal soap prill containing a mixture of two bivalent metal soaps. L. B. Weisfeld and S. E. Whitehead (Carlisle Chem. Works, Inc.). *U.S. 3,446,749.* A prilled soap mixture of at least two bivalent metals is precipitated by reacting the hydroxide of one such metal with an oil-in-water suspension of droplets which consist of a molten soap of another metal and the molten acid forming said soap; the metal of the hydroxide reactant must form a soap having a higher melting point than the added molten soap.

Method of embossing soap or detergent bars. M. E. Kamen (Revlon, Inc.). *U.S. 3,446,900.* A method for embossing dry, nonplastic soap or detergent compositions by pre-heating surface portions and contacting with a heated embossing die is described. The bars may be wrapped with a thermally deformable wrapper prior to embossing, and either wrapped or unwrapped compositions may be printed simultaneously with embossing by interposing hot-transfer roll leaf between the composition and heated die.

Liquid cleaner composition. F. Morgan and A. F. Walden (Procter & Gamble Co.). *U.S. 3,453,144.* A liquid cleaner composition for hard surfaces contains 3–47% of a water-soluble salt of ethane-1-hydroxy-1,1-diphosphonic acid and 1–37% of a water-soluble inorganic buffering ingredient capable of maintaining a pH of 9–11 in an aqueous solution, selected from the group consisting of sodium and potassium sesquicarbonate, tetraborate and orthophosphate salts, the combined materials being present in aqueous solution in an amount of at least 12% by wt.

Textile softener compositions. J. E. Clark and J. A. Bungener (Standard Chem. Products, Inc.). *U.S. 3,454,494.* A textile softener composition compatible with anionic detergents contains (1) 50–90 parts by wt. of an acid salt of a condensation product of a C_8–C_{22} fatty derivative selected from fatty acids, fatty halides and lower alkyl esters of fatty acids and an aliphatic polyfunctional amine selected from lower alkanol amines and polyalkylene polyamines, and (2) 10–50 parts of a particular type of polyoxyalkylene compound. The softener composition may be used in the wash cycle of a laundering operation along with conventional built detergents.



Process for preparing a crystalline uniformly sized granular detergent composition. L. E. Meyer and R. D. Walker (Procter & Gamble Co.). *U.S. 3,454,499.* A process for preparing a crystalline, uniformly sized granular detergent composition containing sodium tripolyphosphate comprises adding granular silicate compounds substantially contemporaneously with a strong base to an aqueous detergent slurry containing an alkali metal trimetaphosphate.

Soap compositions having improved curd dispersing properties. F. Lancashire (Procter & Gamble Co.). *U.S. 3,454,500.* Soap compositions having improved curd dispersing properties are described which consist essentially of a higher fatty acid soap and at least about 5% of a synergistic curd dispersing mixture of (A) at least one synthetic detergent selected from the group consisting of detergents containing a zwitterion or a semi-polar bond and amphoteric detergents; and (B) at least one water soluble salt of compounds selected from the group consisting of (1) linear polymeric phosphoric acid containing more than 2 P atoms per molecule; (2) linear polymeric carboxylic acid having a molecular weight of at least 350 and an equivalent weight of 50–80 and which is derived from a monomeric acid containing at least two carboxyl groups in the molecule; and (3) nitrilotriacetic acid; the ratio by wt. of A to B being from 1:4 to 4:1. These compositions provide excellent lime soap dispersing power and are particularly adapted to use in hard water.

Anionic detergents of sulfoalkyl-carbamate esters. F. S. Eiseman, Jr. and L. M. Schenck (GAF Corp.). *U.S. 3,454,624.* A new series of sulfoalkylcarbamate esters of alkoxylated higher primary and secondary aliphatic alcohols and of alkoxylated alkylated phenols, having detergent characteristics, has the general formula: $R\text{–}O\text{–}(CH_2C(R')H)_n\text{–}CO\text{–}N(R'')\text{–}(CH_2)_xCH_2SO_3M$ where n is an integer of from 3 to 150.

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Polyether amine oxide surface active agents. J. T. Patton, Jr. and L. C. Pizzini (Wyandotte Chemicals Corp.). *U.S. 3,454,646.* Polyether amine oxides are prepared by (1) reacting a polyoxyalkylene polyol with an epihalohydrin to form a polyoxyalkylene epihalohydrin adduct, (2) reacting the adduct with a secondary amine and a base to form a polyether-tertiary-amine compound, and (3) oxidizing the tertiary-amino with hydrogen peroxide. These amine oxides are useful as surface active agents.

Hydrogenation of detergent alkylate. H. E. Jacobs, J. C. Jubin, Jr. and G. P. Masologites (Atlantic Richfield Co.). *U.S. 3,454,666.* A process is described for the selective hydrogenation of a detergent alkylate material in order to improve its color and odor characteristics by selectively hydrogenating alkenylaryl compounds and poly-nuclear aromatic compounds contained as impurities, while the mono-nuclear alkylaryl compounds do not undergo hydrogenation and retain their aromatic character.

Detergent compositions containing magnesium di(dichloroisocyanurate). W. F. Symes (Monsanto Co.). *U.S. 3,454,699.* A sterilizing, disinfecting and bleaching composition comprises an inorganic compound (such as sodium tripolyphosphate) and a chlorocyanurate compound, such as magnesium di(dichlorocyanurate). This latter ingredient being present at least at the 0.01% by wt. level. The composition may additionally contain an organic surfactant. Both the inorganic compounds and the organic surfactant are incapable of undergoing oxidation-reduction reactions with the chlorocyanurate compound.

Process for production of detergent tablets. M. N. Kraus (Colgate-Palmolive Co.). *U.S. 3,455,834.* Improved detergent tablets containing sodium tripolyphosphate are prepared by treating the compressed tablets with superheated steam at a temperature above 450F for less than 10 seconds and then cooling to ambient temperature for at least 30 seconds, the moisture content of the tablet remaining unchanged.

Liquid detergent processes. J. M. Huggins (Monsanto Co.). *U.S. 3,457,176.* A process for manufacturing a liquid detergent composition comprises the steps of (a) partially hydrolyzing a copolymer of vinylmethyl ether and maleic anhydride at specific temperatures and for specific periods of time, (b) intermixing the partially hydrolyzed material with a synthetic detergent material containing at least one hydroxyl radical, (c) esterifying the polymer by maintaining certain temperatures and pH ranges for a specific period of time, and (d) thereafter raising the pH of the detergent material to at least about 9.

Monoamidotriphosphate detergent compositions. X. Kowalski and K. J. Shaver (Monsanto Co.). *U.S. 3,457,177.* Aqueous detergent and dispersant compositions containing at least 0.01 weight percent N-substituted monoamidotriphosphates are disclosed. The preferred N-substituent is an alkyl or monohydroxy alkyl containing from 1 to 11 C atoms.

Amine oxides. E. J. Miller, Jr. and A. Mais (Armour Industrial Chem. Co.). *U.S. 3,457,312.* Alkoxylated amine oxides of secondary-alkyl and cycloalkyl amines are synthesized and are used as detergents.

Abrasive cleaning compositions. J. L. Duvall and J. V. Otrhalek (Wyandotte Chemicals Corp.). *U.S. 3,458,300.* An abrasive cleaning composition for use in spray-cleaning systems is prepared from aluminum oxide, sodium metasilicate pentahydrate, a phosphate complex and a wetting agent.

Abrasive scouring cleaner. R. B. Diaz (Colgate-Palmolive Co.). *U.S. 3,458,446.* An abrasive scouring cleaner contains as essential ingredients a water-insoluble, inorganic, siliceous abrasive material, a water-soluble organic detergent compound, an alkali metal monopersulfate salt and a water-soluble alkali metal or alkaline earth metal bromide salt.

Organic sulfonates. A. Shultz (Allied Chemical Corp.). *U.S. 3,458,447.* Novel, low-foaming, highly biodegradable alkyl aryl sulfonates are provided by sulfonating that portion of an aryl alkylation product containing up to 50% monoalkylbenzenes, 10–50% by wt. dialkylindanes and dialkyltetrahydronaphthalenes and about 35–90% by wt. of a mixture of diphenylalkanes and dialkylbenzenes.

Liquid cleaning compositions. M. Weichbrodt and W. D. Willmund (Henkel & Cie., G.m.b.H.). *U.S. 3,459,666.* Liquid cleaning compositions comprise an aqueous solution containing 20–50% of an alkaline potassium phosphate and 15–40% by wt. of a water-soluble salt of amino alkane sulfonic acids.

Bleaching compositions for hard surfaces. B. Das and K. G. van Senden (Lever Bros. Co.). *U.S. 3,459,669.* Powdered bleaching compositions for hard surfaces, particularly scouring powder bleaching compositions, containing an inorganic per compound, such as an inorganic perborate, have their bleaching power improved by the addition of an activator mixture consisting of urea and an alkali metal phosphate.

Builders for synthetic detergents. R. P. Carter, Jr. (Monsanto Co.). *U.S. 3,459,670.* A composition useful as a detergent in an aqueous solution includes a surface active compound and as a builder a cycloalkane polycarboxylic acid or a water soluble salt thereof.

Novel quaternary phosphonium salts. A. W. Frank and I. Gordon (Hooker Chemical Corp.). *U.S. 3,459,795.* Quaternary phosphonium salts of the formula $[RR_1PR_2COOH]^+X^-$, where R is a lower alkyl, R_1 is a higher alkyl, R_2 is a lower alkylene and X is a halogen, are novel compounds, useful as detergents, surface active agents, sequestrants, emulsifiers, plasticizers and thickeners.

Process for the preparation of phosphonium salts and phosphine oxides starting with aluminum trialkyl. R. E. Hall, A. Kessler and A. R. McLain (Procter & Gamble Co.). *U.S. 3,459,808.* A novel process for preparing quaternary phosphonium salts, precursors for tertiary phosphine oxide detergents, comprises the steps of forming alkyldichlorophosphine from aluminum trialkyl and phosphorous trichloride, hydrogenating the alkyldichlorophosphine to form alkylphosphine, and methylating the alkylphosphine to obtain a quaternary alkyltrimethyl phosphonium salt.

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