ABSTRACTS

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

• Fats and Oils

EFFECT OF PROCESSING METHOD IN OXIDATIVE OFF-FLAVORS OF SOYBEAN MILK. W. F. Wilkens, L. R. Mattick and D. B. Hand (N. Y. Agr. Exp. Sta., Dept. of Food Sci. and Technol., Cornell Univ., Geneva, N. Y. 14456). *Food Technol.* 21, 1630–33 (1967). A high temperature, rapid hydration grinding process for dehulled soybeans inactivated the lipoxidase system, the primary off-flavor potentiator and produced a nearly bland soymilk. Gas chromatography determined the effect of processing method on flavor development. An acceptable bland milk was produced by grinding unsoaked, dehulled soybeans with water at temperatures between 80 and 100C and maintaining the temperature for 10 minutes to completely inactivate the lipoxidase enzyme.

EFFECT OF BATTER INGREDIENTS ON CHANGES IN FATTY ACID COMPOSITION OF FATS USED FOR FRYING. M. Bennion (Dept. of Food and Nut., Brigham Young Univ., Provo, Utah). *Food Technol.* 21, 1638–42 (1967). Iodine values showed a significant decrease with time in both frying fat and absorbed fat. The presence of egg in the batter influenced the iodine values of the two frying fats differently. There was also a significant interaction among type of frying fat, presence of baking powder and presence of egg. Mean iodine values of the absorbed fats were increased when baking powder was present. The effect of egg on the absorbed fat was masked by the dilution of absorbed fat with egg fat, especially when baking powder was not present.

LAB-SIZED CRYSTALLIZER SEPARATES FAT IN MINUTES. J. Pominski, A. S. Gallo and J. J. Spadaro (Southern Regional Res. Lab., USDA, New Orleans, La.). *Food Eng.* 38(10), 122–23 (1966). A small, vertical, batch-type rotary scraped-surface crystallizer was developed for bench-scale work to reduce the time for separation and purification of desirable fat fractions in developing an economical and continuous process for making cocoa butter-like fats from hydrogenated cottonseed oil. Crystallizations are achieved in a few minutes instead of 1–3 hours.

THE USE OF A COMPUTER IN THE DETERMINATION BY GAS-LIQUID CHROMATOGRAPHY OF THE CONCENTRATION AND IDENTIFICATION OF INDIVIDUAL FATTY ACIDS PRESENT AS FREE FATTY ACIDS, TRIGLYCERIDES AND CHOLESTERYL ESTERS. C. E. West and T. R. Rowbotham (Unilever Res. Lab., Colworth House, Sharnbrook, Bedford (Great Britain)). *J. Chromatog.* 30, 62–76 (1967). A computer program written in Fortran IV suitable for remote access to an IBM 360 digital computer is presented enabling the calculation, from the results of the gas-liquid chromatography of methyl esters of fatty acids, of the proportion and concentration of fatty acids using an internal standard technique. Identification of the fatty acid methyl esters is assisted by the calculation of the relative apparent retention times and carbon numbers. Thin-layer chromatography is used to separate the fatty acid containing lipids studied in plasma—the free fatty acids, triglycerides and cholesteryl esters. Some results obtained with the free fatty acids and triglycerides of arterial and mammary venous plasma from fed goats are presented and discussed.

THIN-LAYER CHROMATOGRAPHIC STUDY ON THE LIPID COMPONENTS OF COCOA BEANS AND COCOA BUTTER. Y. Levanon, S. M. O. Rossetini, M. Raskin and M. T. P. Mesquita (Inst. Adolfo Lutz, Sao Paulo, S. P. Brazil). *J. Food Sci.* 32, 609–10 (1967). After thin-layer chromatography cocoa bean cotyledon section presented only one chromatographic spot whereas cocoa butter showed five spots. Apparently the lipids naturally occurring in cocoa beans are not modified during farm fermentation.

A STUDY OF THE EMULSIFYING CAPACITY OF SALT-SOLUBLE PROTEINS OF POULTRY MEAT. I. LIGHT AND DARK MEAT TISSUES OF TURKEYS, HENS AND BROILERS AND DARK MEAT TISSUES OF DUCKS. J. P. Hudspeth and K. N. May (Univ. of Ga., Athens, Ga.). *Food Technol.* 21, 1141–42 (1967). Values obtained for moisture (70.6–78.2%), ether extractables (1.85–9.85%) and total protein (17.5–24.2%) were within previously reported ranges. Total protein and salt-soluble protein was found in significantly greater amounts in light than in dark tissues of the same type poultry. This indicates that light meat would have a greater total amount of emulsifying potential than dark meat. However, in most cases, the emulsifying capacity of soluble protein, expressed as ml of oil emulsified by 100 mg of soluble protein, was significantly greater for dark than for light tissues.

A SIMPLE LOW COST GAS CHROMATOGRAPH FOR THE DETERMINATION OF FATTY ACIDS. B. H. Priscott (Birmingham Materials Sect., Test and Insp. Branch, Post Office Eng. Dept., Fordrough Lane, Birmingham 9). *The Analyst* 92, 57–60 (1967). The construction of a chromatograph, conductivity cell and recording conductivity meter, and their application to the determination of the lower fatty acids, formic to caproic acids, is described. The effect of operating variables on the detector and the relationship between acid concentration and detector response are discussed. Limits of detection of 0.001 μg of formic acid and 0.03 μg of caproic acid were found.

CORRELATION OF FATTY ACID STRUCTURE WITH PREFERENTIAL ORDER OF UREA COMPLEX FORMATION. J. L. Iverson and R. W. Weik (Div. of Food Stand. and Add., Washington, D. C. 20204). *J. Assoc. Off. Anal. Chem.* 50(5), 1111–18 (1967). The selective order in which methyl esters of fatty acids form urea complexes was correlated with the fatty acid structure. Detailed information about the preferential order in which inclusion compounds are formed was obtained by fractionating complete oils (e.g., butter, lanolin, cod liver). The preferential order was correlated with GLC retention times, and the detection of trace amounts of fatty acids (<0.1%) was possible. Urea adductability values (UAV) are proposed as a useful means of expressing preferential order of the formation of inclusion compounds.

SPECTROPHOTOMETRIC DETERMINATION OF BHA AND BHT IN VEGETABLE OILS. D. P. Johnson (Res. Dept., R. J. Reynolds Tobacco Co., Winston-Salem, N. C. 27101). *J. Assoc. Offic. Anal. Chem.* 50(6), 1298–1304 (1967). Improved spectrophotometric methods have been developed for separate determinations of BHA and BHT in vegetable oils. The methods are applicable in the presence of other synthetic antioxidants and are adaptable to BHA and BHT concentrations ranging from 5 to 200 ppm. BHA is nitrosated directly in the oil and the nitroso product is isolated by a combination of solvent extraction and liquid chromatographic techniques. An alkaline solution of the product is measured spectrophotometrically at 480 mμ, and the absorbance is referred to a calibration curve to determine the BHA concentration. Both 2- and 3-isomers yield approximately the same absorptivity, and Beer's Law is obeyed from 0 to 50 μg BHA/ml final solution. BHT is determined by its ultraviolet absorption at 283 mμ. The compound is separated from the oil by direct extraction into acetonitrile. BHT is isolated from BHA and other extraneous materials by chromatography on alumina.

GAS-LIQUID CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF FAT-SOLUBLE VITAMINS. V. APPLICATION OF PHARMACEUTICALS CONTAINING VITAMIN E. H. C. Pillsbury, A. J. Sheppard and D. A. Libby (Fed. Trade Comm., Washington, D. C. 20580). *J. Assoc. Offic. Anal. Chem.* 50(4), 809–14 (1967). Gas-liquid chromatography, using a 5% SE-30 column and a hydrogen flame detector, has been used to quantitate vitamin E in pharmaceuticals. The gas chromatographic measurements were compared with the Emmerie-Engel results obtained on the same samples. Because of total recovery, smaller standard deviation, and simplicity, the GLC method was more desirable than the Emmerie-Engel method which includes a saponification preparatory step. The GLC method is also specific for each of the tocopherol analogs measured.

PROBLEMS IN THE ANALYSIS OF LIPIDS BY GAS CHROMATOGRAPHY. Monique Heintz (Lab. of Lipo-chem. of C.N.R.S., Thiais, Fr.). *Oleagineau* 23, 251–258 (1968). A review paper which discusses the uses of gas chromatography in fat and oil chemistry. Among the topics discussed were stationary phases and types of columns.

N-METHYL GROUPS IN BACTERIAL LIPIDS. III. PHOSPHOLIPIDS OF HYPHOMICROBIA. H. Goldfine and P. Hagen (Dept. of Bacteriol. and Immunol., Harvard Med. Sch., Boston, Mass. 02115). *J. Bacteriol.* 95, 367–375 (1968). The principal phospholipids of *Hyphomicrobium vulgare* were identified as phosphatidyl ethanolamine (23%) phosphatidyl N,N'-dimethylethanolamine (36%), lecithin (29%) and phosphatidyl glycerol (10%). Growing cells incorporated the methyl group from methionine into lipid bound N,N'-dimethylethanolamine.

TEXTURE OF ICE CREAM. 4. THE INFLUENCE OF FAT CONTENT ON THE STRUCTURE OF MELTED ICE CREAM. J. Whitehead and P. Sherman (Unilever Res. Lab., Welwyn, Hertfordshire, Eng.). *Food Technol.* 21, 1521–24 (1967). Low shear stress measurements in a coaxial cylinder viscometer at 20C simulate the conditions operating during subjective assessment of ice cream on the palate. Increasing the fat content from 0–10% increases all measured rheological parameters. Between 6–8% fat a significant change occurs in the structure. The influence of churned fat has also been investigated. Preliminary examination of 'good' and 'poor' texture ice cream suggests that all rheological parameters are significantly higher in samples of low coagulated fat content.

THE LIPID COMPOSITION OF MYCOPLASMA LAIDLAWII STRAIN B. N. Shaw, P. F. Smith and W. L. Koostra (Univ. of Newcastle-upon-Tyne, England). *Biochem. J.* 107, 329–33 (1968). Total lipid was extracted from *Mycoplasma laidlawii* strain B with chloroform-methanol mixtures and fractionated into neutral lipid, glycolipid and phospholipid components by chromatography on silicic acid. Saponification of the glycolipid fraction, which represented nearly half of the total lipid, yielded two glycosides for which the structures O-α-D-glucopyranosyl-(1 → 1)-D-glycerol and O-α-D-glucopyranosyl-(1 → 2)-O-α-D-glucopyranosyl-(1 → 1)-D-glycerol were established. The ratio of monoglucosyl diglyceride to diglucosyl diglyceride increased with the age of the culture, though the total glycolipid concentration remained virtually constant. The glycolipid concentration was unaffected by the addition of cholesterol to the culture medium. The phospholipid fraction consisted of two components, phosphatidylglucose and phosphatidylglycerol. Organisms harvested at acidic pH also contained O-amino-acyl esters of phosphatidyl glycerol. No lipids containing inositol could be detected.

METHODS FOR IDENTIFYING THE PRESENCE OF NATURAL OR SYNTHETIC PIGMENTS IN VEGETABLE OILS. G. Petruccioli (Olive Experim. Inst., Spoleto, Italy). *Industrie Alimentari* 7(3), 65–74 (1968). The mixture of natural pigments occurring in genuine olive oil can be characterized by its absorption peaks in the 420–485 mμ and 610–710 mμ areas. Methods aimed at identifying the presence of artificially added pigments have been studied and are discussed.

MASS SPECTROMETRIC EVIDENCE FOR METHYL AND ETHYL ESTERS OF LONG-CHAIN FATTY ACIDS IN OX PANCREAS. J. Skorepa, P. Hrabak, P. Mares and A. Linnarson (LKB Produkter AB, Stockholm, Sweden). *Biochem. J.* 107, 318 (1968). The presence in ox pancreas of naturally occurring methyl esters of several long chain fatty acids has been demonstrated by mass spectrometry; in addition, the presence of ethyl esters has also been established. The origin and physiological role of these compounds are not clear.

SEED OILS OF THE GENUS OPUNTIA. G. Lotti and V. Averna (*Univ. of Palermo, Palermo, Italy*). *Riv. Ital. Sostanze Grasse* 45, 133–7 (1968). The seed oils of 29 plant species of the genus *Opuntia* have been analyzed and their physicochemical characteristics (fatty acid composition, unsaponifiable, I.V., I.R., U.V., etc.) are reported. The type of species from which the oil is derived has a strong influence on the amount of unsaponifiable, fatty acid composition and I.V.

INTERESTERIFICATION OF GLYCERIDES. N. R. Artman, R. M. Cartier and D. D. Whyte (The Procter & Gamble Co.). *U.S. 3,376,326.* A process is claimed for simultaneously interesterifying and selectively separating triglyceride oils high in combined linolenic acid by (1) contacting a triglyceride oil with a flowing stream of solvent selected from the group consisting of dimethylformamide, dimethylcyanamide, and 3,3-dimethylaminopropionitrile, with a countercurrent flowing stream of solvent selected from the group consisting of pentane, hexane, heptane and octane, while introducing into the contact zone an interesterification catalyst selected from the group consisting of sodium and potassium methyl sulfinyl carbanion, and sodium and potassium t-butoxide; and (2) separating the two solvent phases.

MODIFIED SPRAY FOR THE DETECTION OF PHOSPHOLIPIDS ON THIN-LAYER CHROMATOGRAMS. V. E. Vaskovsky and E. Y. Kostetsky (Inst. of Biologically Active Substances Siberian Dept. of the Acad. of Sci. of the USSR, Vladivostok 22, USSR). *J. Lipid Res.* 9, 396 (1968). A simplified method for the preparation of the Dittmer-Lester spray for the detection of phospholipids on thin-layer chromatograms is described.

MASS SPECTROMETRY OF DERIVATIVES OF CYCLOPROPENE FATTY ACIDS. N. K. Hooper and J. H. Law (Dept. of Biochem., Univ. of Chicago, Chicago, Ill. 60637). *J. Lipid Res.* 9, 270–5 (1968). Diketo fatty acids prepared by ozonization of cyclopropene fatty acids have been separated and purified by chromatographic techniques. Mass spectra of esters of these compounds and of methanethiol adducts of cyclopropene acid esters are reported and interpreted. Location of the ring from examination of mass spectra of these derivatives appears to be a straight-forward matter.

ANALYSIS OF FATTY ACIDS OF HUMAN RED CELLS WITHOUT LIPID EXTRACTION. G. B. Phillips, J. T. Dodge, Carole S. Rockmore (Dept. of Med., College of Physicians and Surgeons, Columbia Univ., and Roosevelt Hosp., New York 10019). *J. Lipid Res.* 9, 285–6 (1968). Exposure of human red cells to 2 *N* HCl for 18–20 hr at 110C appears to release the total fatty acid, which can then be esterified for GLC analysis. This technique is simpler and may be more reliable than the conventional methods that depend on lipid extraction of the red cells.

PHOSPHOLIPIDS OF THE THIOBACILLI. J. K. Barridge and J. M. Shively (Dept. Microbiol., Univ. of Nebraska, Lincoln, Neb. 68508). *J. Bacteriol.* 95, 2182–2185 (1968). All *Thiobacillus* species contained phosphatidyl glycerol, diphosphatidyl glycerol and phosphatidyl ethanolamine. *T. thioparus* contained only these lipids. *T. intedius, T. neapolitanus* and *T. thiooxidans* contained these 3 and phosphatidyl N-methylethanolamine (MMPE). *T. novellus* contained the common 3 lipids, MMPE, phosphatidyl-N,N-dimethyl-ethanolamine and phosphatidyl choline.

CHARACTERIZATION OF THE C_{15} BRANCHED-CHAIN FATTY ACIDS OF CORYNEBACTERIUM ACNES BY GAS CHROMATOGRAPHY. C. W. Moss and W. B. Cherry (Bacteriol. Sect., Nat. Communicable Disease Center, Atlanta, Georgia 30333). *J. Bacteriol.* 95, 241–242 (1968). Twenty-two strains of *Corynebacterium acnes* were analyzed for fatty acid content. In all strains studied 13-methyltetradecanoic acid (*iso*-C_{15}) was the most abundant fatty acid. The similarity of fatty acid profiles of these strains supplies further evidence of the homogeneity of these strains and serves to differentiate them from the closely related Propionibacteria.

LIPIDS OF SALMONELLA TYPHIMURIUM AND ESCHERICHIA COLI: STRUCTURE AND METABOLISM. G. F. Omes (Dept. Biochem., Univ. of Calif., Berkeley, Calif. 94720). *J. Bacteriol.* 95, 833–843 (1968). Phosphatidylethanolamine (PE), phosphatidylglycerol (PG) and cardiolipin (CL) were the major phospholipids of *Salmonella typhimurium* and *Escherichia coli*. Minor components were phosphatidyl serine, phosphatidic acid and 2 unidentified lipids. The lipid composition of each organism was essentially similar excepting that the level of all components was lower in *E. coli*. Phosphate turnover did not occur in PE, was slow in PG and CL.

FATTY ACIDS IN THE GENUS BACILLUS. II. SIMILARITY IN THE FATTY ACID COMPOSITIONS OF BACILLUS THURINGIENSIS, BACILLUS ANTHRACIS AND BACILLUS CEREUS. T. Kaneda (The Res. Coun. of Alberta, Edmonton, Alberta, Canada). *J. Bacteriol.* 94, 2210–2216 (1968). Two strains each of *Bacillus thuringiensis* and *B. cereus* produced 16 major fatty acids in common (9 branched chain, 3 normal and 4 monounsaturated). In all cases 12 branched chain acids (including saturated and monounsaturated) made up over 70% of the total fatty acids. The *iso* C_{15} acid was the most abundant. Minor but distinct differences between the fatty acid compositions of *B. thuringiensis*, and *B. anthracis* were observed and could serve as criteria for identification.

WHIPPABLE FAT COMPOSITIONS. B. A. Patterson. *U.S. 3,383,219.* A free-flowing particulate fat composition is claimed, including a dried emulsion of an emulsifier composition and a fat coated with a proteinaceous material such as sodium caseinate, the emulsifier composition containing both an emulsifier having at least 90% edible monoglycerides and another emulsifier having at least 40% edible diglycerides.

• Fatty Acid Derivatives

QUANTITATIVE REACTIONS FOR THE CHAIN ELONGATION OF ALIPHATIC COMPOUNDS. W. J. Baumann and H. K. Mangold (Univ. of Minnesota, The Hormel Inst., Austin, Minnesota 55912). *J. Lipid Res.* **9**, 287 (1968). Procedures are described for the reaction of methanesulfonates with potassium cyanide and for the conversion of the resulting nitriles to methyl esters. Both reactions in this method of chain elongation are quantitative and do not lead to alterations of elefinic double bonds.

NEW WAY OF SYNTHESISING OPTICALLY ACTIVE DIGLYCERIDES. Yu. G. Molotkovskii, L. F. Nikulina and L. D. Bergel'son. *Izv. Akad. Nauk, Ser. Khim.* **1967**, No. 4, 927–9. Optically active α,β-diglycerides are needed in the synthesis of biologically important phospholipids. Starting from *D*-mannitol and *L*- and *D*-α-*O*-tritylglycerol, methods were developed for synthesising intermediate substances for diglycerides. From the tritylglycerols, *D*- and *L*-α,β-distearin and *D*-α,β-dilinolenin were obtained. (Rev. Current Lit. Paint Allied Ind. No. 311.)

ENRICHMENT OF CASTOR OIL MONOGLYCERIDES. M. Niazullah, D. V. Chandran, Y. M. Chandhok and R. K. Bhatnagar. *Indian J. Tech.* **5**, 352–3 (1967). The possibility of fractionating mixed monoglycerides of castor oil by partitioning between aqueous ethanol and hexane has been investigated. The monoglycerides were concentrated in the aqueous ethanol phase and di- and tri-glycerides in the hexane phase. Maximum enrichment of monoglycerides was obtained in a multistage liquid/liquid extraction using 72% aqueous ethanol (vol./vol.) and hexane. Castor oil monoglycerides were enriched from 80 to 93–96% monoglycerides, calculated as monoricinolein, by stepwise and continuous extraction. (Rev. Current Lit. Paint Allied Ind. No. 311.)

NEW USES FOR VEGETABLE OILS. Anon. *New Scientist*, **35**, No. 562, 533 (1967). It is reported that acrylamides can be produced by the reaction of acrylonitrile with oleic, linoleic and ricinoleic fatty acids. They may be useful as surface tension modifiers or plasticisers.

• Biochemistry and Nutrition

GENERALIZED GANGLIOSIDOSIS: BETA-GALACTOSIDASE DEFICIENCY. S. Okada, J. S. O'Brien (Dept. of Pathology, Univ. of Southern Calif., School of Med., Los Angeles). *Science* **160**, 1002–4 (1968). A profound deficiency (10- to 30-fold) of β-galactosidase activity was found in tissues (liver, spleen, kidney, and brain) from two patients with generalized gangliosidosis; this deficiency is demonstrated as a failure to cleave both p-nitrophenyl-β-D-galactopyranoside and ganglioside GM_1 labeled with ^{14}C in the terminal galactose. This enzymic defect is responsible for the accumulation of ganglioside GM_1 and is the fundamental enzyme defect in generalized gangliosidosis.

CHOLESTEROL: TREADMILL ACTIVITY ACCELERATES OXIDATION IN RATS. M. R. Malinow, Phyllis McLaughlin and Anne Perley (Oregon Regional Primate Res. Center, Beaverton). *Science* **160**, 1239–40 (1968). Cholesterol-26-^{14}C was injected intravenously into male and female rats of two different strains. Recovery of radioactivity from the expired air was increased by treadmill activity.

LYSOSOMAL LIPASES OF RAT LIVER AND KIDNEY. S. Mahadevan and A. L. Tappel (Dept. of Food Sci. and Technol., Univ. of Calif., Davis, Calif.). *J. Biol. Chem.* **243**, 2849–54 (1968). The subcellular distribution in rat liver and rat kidney of the enzymes hydrolyzing triglycerides at acid pH has been studied. The lipase was shown to be lysosomal by the purification of lysosomes and by the isolation of Triton WR 1339-filled liver lysosomes. The lipase was found to be bound to the lysosomal membranes, had a pH optimum of 4.2, and required Triton X-100 in the reaction mixture for maximum activity. The lysosomal lipase had maximum activity against glycerol tridecanoate but had considerable activity against other long chain triglycerides. The lipase was inhibited by NaCl, NaF, iodoacetate, and Hg^{++} ions and was not affected by Ca^{++}, Mg^{++}, ethylenediamine tetraacetate, protamine sulfate, and sodium taurocholate. This is the first clear demonstration of a lipase in lysosomes. It is suggested that the lipase is involved in the intralysosomal digestion of triglycerides entering lysosomes by autophagy.

THE 6-O-METHYLGLUCOSE-CONTAINING LIPOPOLYSACCHARIDE FROM MYCOBACTERIUM PHLEI. IDENTIFICATION OF THE LIPID COMPONENTS. J. M. Keller and C. E. Ballou (Dept. of Biochem., Univ. of Calif., Berkeley, Calif.). *J. Biol. Chem.* **243**, 2905–10 (1968). The 6-O-methylglucose-containing lipopolysaccharide from *Mycobacterium phlei* has been resolved into four components. These differ from each other in total charge owing to the presence of 0, 1, 2, or 3 monoesterified succinate residues. In addition, each component contains four other acyl groups. These have been identified as acetate, propionate, isobutyrate, and octanoate. Preliminary evidence suggests that they are present in the molar ratios of 3:1:1:1. The same lipopolysaccharides have been isolated from *Mycobacterium tuberculosis* H37Ra and *Mycobacterium smegmatis*. However, *M. tuberculosis* (Lederle) yielded a single form of the lipopolysaccharide, which contained only one acyl group, octanoate. The possibility exists that this latter finding is an artifact, resulting from the method of preparation.

THE RELATIONSHIP OF HEPATOMA IN RAINBOW TROUT TO AFLATOXIN CONTAMINATION AND COTTONSEED MEAL. E. W. Jackson, H. Wolf and R. O. Sinnhuber (State of Calif. Dept. of Public Health, Berkeley, Calif.). *Cancer Res.* **28**, 987–91 (1968). A test diet was formulated to approximate the commercial feed associated with the 1960 trout hepatoma epizootic in California. The same diet without the cottonseed meal portion served as the control. A third ration with food grade cottonseed flour substituted for the cottonseed meal was also tested. The trout on the 2 diets with the cottonseed products showed a high incidence of hepatoma. These results confirm previous observations associating the development of hepatoma in trout with the feeding of cottonseed meal. Chemical analyses relate the occurrence of hepatoma to aflatoxin B_1 in the cottonseed components of the test diets. These observations provide cumulative evidence that the hepatoma epizootic in California trout resulted from aflatoxin contamination of cottonseed meal ingredient. Confirmation of the carcinogenicity of the cottonseed flour sample was obtained in a second experiment using a semipurified ration. Initial analysis of the cottonseed flour detected no aflatoxin. Subsequently an improved method detected 2 parts per billion of aflatoxin B_1; this is equivalent to 0.4 ppb in the experimental diet. Results from other studies indicate that the naturally occurring cyclopropene fatty acids and gossypol in

the cottonseed components probably enhanced the carcinogenic action of the minute quantity of aflatoxin.

THE EFFECT OF PHENOBARITAL ON THE TURNOVER OF MICROSOMAL PHOSPHOLIPID IN MALE AND FEMALE RATS. J. L. Holtzman and J. R. Gillette (Lab. of Chem. Pharmacology, National Heart Inst., National Inst. of Health, Bethesda, Md.). *J. Biol. Chem.* 243, 3020–28 (1968). The administration of phenobarbital to rats causes an increase in hepatic microsomal phospholipid. After a tracer dose of $^{32}PO_4$ the specific activities of hepatic phospholipid phosphorus and inorganic phosphate were higher in treated male rats than in controls. No increases were seen in either pool in treated females. These data suggest that phenobarbital enhances synthesis of microsomal phospholipid in male rats but not in females. In addition, phenobarbital reduces the catabolism of microsomal phospholipid in both male and female rats.

ESSENTIAL FATTY ACIDS, PLASMA PROTEIN BOUND IODINE, AND THE THYROID GLAND. D. Gambal and F. W. Quackenbush (Dept. of Biochem., Creighton Univ., Omaha, Nebraska 68131, and Dept. of Biochem., Purdue Univ., Lafayette, Ind. 47907). *Proc. Soc. Expt. Biol. Med.* 127, 1137–8 (1968). Plasma protein bound iodine (PBI) of female rats fed an essential fatty acid (EFA) deficient diet for 15 weeks was higher than that of controls receiving dietary EFA, even though weight of the thyroid gland was less in deficient rats. After refeeding EFA to the deficient rats either as soybean oil or the colony stock diet for 3 weeks, the PBI concentration was decreased to the control values and the weights of the thyroid gland increased. Thiouracil added to the EFA-deficient diet lowered the PBI concentration in plasma and increased the weight of the thyroid gland. These data suggest that the increase in plasma PBI in EFA-deficiency is not dependent on TSH but the control mechanism that regulates the secretion of thyroidal iodine is dependent on essential fatty acids.

FEATURES OF TUMOR ENHANCEMENT BY CROTON OIL. J. V. Frei (Dept. of Pathology, Faculty of Med., McGill Univ., Montreal, Quebec, Canada). *Cancer Res.* 28, 947–49 (1968). Because of the possibility of cocarcinogenic effects of substances to which many people are exposed, the mechanism of action of one such agent was examined in 2-stage tumor induction experiments. The appearance of new tumors was studied at the end of a series of croton oil treatments, or between treatments given at long intervals in mouse epidermis given a single pretreatment with a carcinogen. During a series of treatments with croton oil, the tumor-enhancing effect of any single treatment persisted for 2 to 3 weeks. Tumors were enhanced by as few as 2 croton oil treatments when given 3 weeks apart, and it was also demonstrated that the concentration of croton oil was more important in tumor enhancement than the absolute amount.

BILE ACIDS AND LIPID METABOLISM. I. STIMULATION OF BILE LIPID EXCRETION BY VARIOUS BILE ACIDS. C. Entemnan, R. J. Holloway, M. L. Albright and G. F. Leong (Inst. for Lipid Res., Berkeley, Calif. 94704 and U. S. Naval Radiological Defense Lab., San Francisco 94135). *Proc. Soc. Expt. Biol. Med.* 127, 1003–6 (1968). An increased excretion of biliary free cholesterol and phospholipid was shown to be produced by infusion of various bile acids into the isolated perfused rat liver system. The derivatives studied were the sodium salts of taurocholic, glycocholic, chenodeoxycholic, deoxycholic, lithocholic, hyodeoxycholic and dehydrocholic acids. Hence, the major bile acids, normally found in the enterohepatic circulation of the rat, can exert stimulatory effects on bile lipid excretion.

CHAIN ELONGATION OF α- AND γ-LINOLENIC ACIDS AND THE EFFECT OF OTHER FATTY ACIDS ON THEIR CONVERSION IN VITRO. K. Christiansen, Y. Marcel, M. Gan, H. Mohrhauer and R. T. Holman (Univ. of Minn., The Hormel Inst., Austin, Minn.). *J. Biol. Chem.* 243, 2969–74 (1968). The chain elongations of α- and γ-linolenic acids with malonyl coenzyme A with rat liver microsomes were studied. γ-Linolenic acid was converted to eicosatrienoic acid in about 70% yield, whereas α-linolenic acid was only converted to about 30% under the same conditions. Unsaturated acids of the linoleic acid family present in the incubation mixture increased the conversion of both linolenic acids. The conversion of γ-linolenic acid was inhibited most effectively by trienoic acids: 9,12,15-octadecatrienoic, 5,8,11-octadecatrienoic, and 5,8,11-heptadecatrienoic acids. α-Linolenic acid was mainly inhibited by its own metabolic products, eicosapentaenoic and docosahexaenoic acids, when these were added. Saturated fatty acids inhibited the conversion of both acids, but in quite different fashions. The inhibition of α-linolenic acid was independent of the chain length of the saturated acids, whereas γ-linolenic acid was most effectively inhibited by tetradecanoic and pentadecanoic acids. The strong inhibition by the saturated fatty acids of the elongation of unsaturated fatty acids may serve as a regulation of the composition of tissue lipids.

CLEAVAGE OF CHOLESTEROL SIDE CHAIN ASSOCIATED WITH CYTOCHROME P-450, FLAVOPROTEIN, AND NONHEME IRON-PROTEIN DERIVED FROM THE BOVINE ADRENAL CORTEX. M. J. Bryson and M. L. Sweat (Dept. of Obstetrics and Gynecol., Univ. of Utah College of Med., Salt Lake City, Utah 84112). *J. Biol. Chem.* 243, 2799–2804 (1968). Cholesterol side chain cleavage has been shown to be dependent on the electron carrier chain involving a cytochrome P-450. The reaction is markedly inhibited by carbon monoxide. The cytochrome oxidase system inhibits the cleavage reaction by diverting the flow of electrons through the cytochrome oxidase pathway. Inhibition is reversed by cyanide. Steroid products resulting from the cleavage reaction are pregnenolone, progesterone, 11-deoxy-corticosterone, and corticosterone. These products were isolated and identified by paper chromatographic techniques and recyrstallization to radiochemical homogeneity.

A NOTE ON THE INTESTINAL ABSORPTION OF CHOLESTERYL ETHERS IN THE RAT. B. Borgstrom (Div. of Physiological Chem., Chem. Center, Univ. of Lund, Lund, Sweden). *Proc. Soc. Expt. Biol. Med.* 127, 1120–5 (1968). Insulin, labeled with ^{131}I, was injected intracisternally in normal and vagotomized dogs. In both types of experiments a significant fall in plasma glucose concentration was observed. The amount of insulin which passed into the blood from the cerebrospinal fluid, as determined by the amount of insulin-^{131}I in the plasma, was more than sufficient to account for the observed hypoglycemia. These findings indicate that insulin enters the blood after intracisternal insulin administration is most likely due to a peripheral rather than a central effect of insulin.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. XIX. PREPARATION AND GENERAL PROPERTIES OF PALMITYL THIOESTERASE. E. M. Barnes, Jr. and S. J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, N. Carolina). *J. Biol. Chem.* 243, 2955–62 (1968). Palmityl thioesterase of *Escherichia coli* has been purified 260-fold. Its molecular weight is estimated at 22,000 by sedimentation velocity. The enzyme catalyzes the hydrolysis of long chain fatty acyl thioesters of acyl carrier protein or coenzyme A to form free fatty acid and the respective thiol. The enzyme is readily inhibited by di-isopropyl fluorophosphate. Palmityl thioesterase was found to exhibit specificity for fatty acyl thioesters of chain length greater than C_{10} and palmityl, palmitoleyl and *cis*-vaccenyl thioesters are the preferred substrates. The enzyme was shown to be capable of mediating the synthesis of free fatty acids by preparations of the *E. coli* fatty acid-synthesizing system. Palmityl thioesterase activity is also present in highly purified preparations of pigeon liver fatty acid synthetase. The pigeon liver thioesterase was shown to be specific for fatty acyl-coenzyme A thioesters of C_{16} and C_{18} chain length.

RESISTANCE CHANGES IN LIPID BILAYERS: IMMUNOLOGICAL APPLICATIONS. P. Barfort (Electronics Res. Lab., Univ. of Calif., Berkeley), E. R. Arquilla and P. O. Vogelhut. *Science*

160, 1119–21 (1968). The electrical resistance of a bimolecular lipid membrane in 0.1 M NaCl decreases if antibody and complement are present on one side of the membrane and the homologous antigen is added to the other side. The reaction occurs within minutes and requires less than 0.1 μl of antiserum.

STABILITY OF α-TOCOPHEROL DURING ALFALFA DEHYDRATION AND STORAGE. A. L. Livingston, J. W. Nelson and G. O. Kohler (Western Reg. Res. Lab., Agr. Res. Service, U. S. Dept. of Agr., Albany, Calif.). *J. Agr. Food Chem.* 16, 492–95 (1968). Losses of α-tocopherol during commercial-scale alfalfa dehydration ranged from 5 to 33%. The larger losses occurred at meal moisture levels of less than 3%. Although α-tocopherol was lost rapidly, the total related isoprenoid reducing compounds actually increased in dehydrated alfalfa meal during storage.

DIETARY β-SITOSTEROL AS AN INTERNAL STANDARD TO CORRECT FOR CHOLESTEROL LOSSES IN STEROL BALANCE STUDIES. S. M. Grundy, E. H. Ahrens, Jr. and G. Salen (The Rockefeller Univ., New York 10021). *J. Lipid Res.* 9, 374–87 (1968). Considerable amounts of neutral sterols are "lost" during their passage through the intestinal tract. a) Since plant sterols are largely nonabsorbable in man, they should be totally recovered in the feces; yet in many patients significantly less plant sterol than expected was recovered, the loss amounting to as much as 56% of daily intake. b) In two patients in whom cholesterol-^{14}C and β-sitosterol-^{3}H were instilled into the terminal ileum, from which neither sterol is absorbed, the feces contained 25% less of each isotope than was instilled. c) In four patients fed radioactive cholesterol daily until the isotopic steady state was closely approximated, 28–50% of the isotope could not be accounted for. On the other hand, in five patients fed radioactive cholesterol daily until the isotopic steady state was approximated, input equalled output as predicted. Since the amount of β-sitosterol absorbed in man is limited (5% or less), this sterol can be used as an internal standard for upward correction of the figure obtained for the amount of neutral steroids excreted. The use of β-sitosterol for this purpose is based on three considerations: (a) it passes through the intestine in the same physicochemical state as cholesterol; b) it accompanies cholesterol at every step of its isolation and chromatographic measurement; and c) it is lost to the same extent as cholesterol. Excretion data for fecal neutral steroids can therefore be corrected for irregular fecal flow as well as for the "unexpected loss" referred to.

BOVINE MILK LIPASE. I. ISOLATION FROM SKIM MILK. P. F. Fox and N. P. Tarassuk (Dept. of Food Sci. and Tech., Univ. of Calif., Davis). *J. Dairy Sci.* 51, 826–33 (1968). A procedure was developed for the isolation of milk lipase from skim milk. Fresh skim milk is coagulated with rennet, separating curd and whey by centrifugation, with most of the lipase accompanying the curd. The lipase is solubilized from the curd by maceration in 1 M NaCl and centrifugation. The supernatant is half-saturated with $(NH_4)_2SO_4$, the precipitate collected, dissolved, dialyzed and fractionated on DEAE-cellulose. The lipase-rich fraction is made to 30% (v/v) with dimethylformamide and then to half-saturation with $(NH_4)_2SO_4$. Under these conditions, the lipase remains soluble and is finally purified by filtration through Sephadex G-200. The homogeneity of the preparation was established by ultracentrifugation and starch gel electrophoresis. Specific activity was about 500 times that of skimmilk, with an over-all yield of 10%. The sedimentation coefficient was calculated to be 7.5 S, and the molecular weight about 210,000. With milk fat as substrate, pH optimum was 9.2 and temperature optimum 37C.

SPECIFIC DISTRIBUTION OF SHORT-CHAIN FATTY ACIDS IN MOLECULAR DISTILLATES OF BOVINE MILK FAT. W. C. Breckenridge and A. Kuksis (Dept. Biochem. and Banting and Best Dept. of Medical Res., Univ. of Toronto, Toronto, Canada). *J. Lipid Res.* 9, 388–93 (1968). Triglycerides with a total of 35–44 acyl carbon atoms have previously been shown to account for nearly 50% of bovine milk fat. About 80% of this material was isolated by molecular distillation and a representative fraction of these glycerides was subjected to a stereospecific analysis. Of the 29 mole per cent of C_4–C_8 fatty acids present in the analyzed fraction, at least 95% were specifically attached to the glycerol molecule in the position corresponding to carbon 3 of *sn*-glycerol 3-(dihydrogen phosphate) (L-α-glycerophosphate). The distribution of the other fatty acids (C_{10} or greater) did not show such marked specificity for either the 1- or the 2-position. The data support the hypothesis that the short-chain fatty acids are esterified with long-chain diglycerides, or are substituted in glycerophosphatide intermediates, during the final step in the biosynthesis of milk fat triglycerides.

MORPHOLOGICAL AND LIPID ANALYSIS OF THE ALVEOLAR LINING MATERIAL IN DOG LUNG. T. N. Finley, S. A. Pratt, A. J. Ladman, L. Brewer and M. B. McKay (Depts. of Med. and Anatomy, The Univ. of New Mexico School of Med., Albuquerque, New Mexico 87106). *J. Lipid Res.* 9, 357–65 (1968). Endobronchial saline lavage was used to obtain acellular material and cells from the dog lung. The centrifuged lavage fluid yielded a sediment consisting of an upper white layer and a lower brown layer. The white layer was strongly surface-active. It consisted of a mixture of lipids and proteins; the composition of the lipid portion was the same in three dogs. The predominant lipids were phosphatidyl choline, cholesterol and cholesteryl esters; 75–88% of the fatty acids in each phospholipid fraction were saturated. Electron microscopy showed a strong morphological resemblance between the white layer and alveolar lining material *in situ*.

SEPARATION OF BILE ACIDS OF RAT BILE BY THIN-LAYER CHROMATOGRAPHY. C. M. Siegfried and W. H. Elliott (Dept. of Biochem., St. Louis Univ. School of Med., St. Louis, Missouri 63104). *J. Lipid Res.* 9, 394–5 (1968). The common bile acids of rat bile (chenodeoxycholic, hyodeoxycholic, cholic, α-muricholic, and β-muricholic acids) are completely separated by a new thin-layer chromatographic system.

FERRIC CHLORIDE SPRAY DETECTOR FOR CHOLESTEROL AND CHOLESTERYL ESTERS ON THIN-LAYER CHROMATOGRAMS. R. R. Lowry (Dept. of Agr. Chem., Oregon State Univ., Corvallis, Oregon 97331). *J. Lipid Res.* 9, 397 (1968). The use of a stable solution of ferric chloride for the detection of cholesterol and cholesteryl esters on thin-layer chromatographic layers is described. Its advantages over the commonly used Carr-Price reagent are listed, and the levels of sensitivity for the new reagent are shown. Detection of other lipid classes is also possible.

• Detergents

THE ANALYSIS OF ALKANE SULFONATES BY MEANS OF ION EXCHANGERS. M. Mutter (Unilever Research Lab., Vlaardingen, Holland). *Tenside* **5**, 138–40 (1968). The quantitative analysis of alkane sulfonates by means of ion exchangers is described. The components of this material are: alkane monosulfonates (principal component), alkane disulfonates and polysulfonates, inorganic sulfates and chlorides. Informative qualitative analysis can be carried out and the selectivity of quantitative separations can be checked by means of thin-layer chromatographic methods.

DETERGENTS IN RESIDUAL WATERS. D. Talamazzi (Mira Lanza, S.p.A., Genoa, Italy). *Riv. Ital. Sostanze Grasse* **45**, 151–4 (1968). The effects attributed to the presence of surfactants in surface waters are reviewed.

THE PROBLEM OF SURFACTANT BIODEGRADABILITY IN ITALY. G. Jacini (Fats and Oils Exper. Station, Milan, Italy). *Riv. Ital. Sostanze Grasse* **45**, 155–7 (1968). A review.

THE DETERMINATION OF LIQUID SURFACE TENSION BY THE METHOD OF MAXIMUM BUBBLE PRESSURE. J. Spurny and B. Dobias (Czech. Acad. of Sci., Prague, Czechoslovakia). *Tenside* **5**, 77–9 (1968). A modified instrument for the relative determination of liquid surface tension by the bubble pressure method is described. In this method, pressure is indicated by a column of water above the gas bubble. The instrument must first be standardized by means of a liquid of known surface tension, as well as with water, whose surface tension can be obtained from tables.

DETERMINATION OF ANIONIC-ACTIVE DETERGENTS BY TWO-PHASE TITRATION, II. V. W. Reid, G. F. Longman and E. Heinerth (Shell Research Ltd.). *Tenside* **5**, 90–6 (1968). The second official report of the Commission Internationale d'Analyses (CIA) deals with additional aspects of the two-phase titration of anionic-active detergents not examined in detail in the previous report on the subject. It is shown that methods of standardization of the cationic titrant based on alkyl benzene sulfonates give similar standardization values to those based on sodium lauryl sulfate. Further data on reproducibility are provided. Detailed procedures for the determination of hydrolyzable anionic-active detergents are described.

THIN-LAYER CHROMATOGRAPHIC ANALYSIS OF POLYOXYETHYLENE NONYLPHENOL ETHER. S. Hayano, T. Nihongi and T. Asahara (Univ. of Tokyo, Japan). *Tenside* **5**, 80–2 (1968). The R_m values of the addition products of nonylphenol and ethylene oxide, separated by chromatography, bear a linear relationship to the number of ethylene oxide units in the molecule. From the experimental results the free energies necessary to transfer each component from the stationary into the mobile phase have been calculated. The molecular weight distribution of the adducts was also determined by densitometry.

THE RELATION BETWEEN THE SURFACE ACTIVE PROPERTIES AND THE POLARITY OF FATTY ACID MONOGLYCERIDES. R. Reinhardt and W. Wachs (Univ. of Berlin–Charlottenburg, Germany). *Tenside* **5**, 125–31 (1968). The relationships between surface active properties of alpha-monoglycerides of stereo- and position-isomeric octadecene acids and their polarity or HLB value have been investigated. The tests used involved the use of film weighing and coalescence determination, the determination of critical micelle concentration and gas chromatographic constants (retention indices). The various results suggest the existence of a relationship between the different quantities measured and the degree of polarity (or HLB value) of these non-ionic surfactants.

DETECTION OF SUBNANOGRAM QUANTITIES OF HEXACHLOROPHENE BY ELECTRON CAPTURE GAS CHROMATOGRAPHY. P. J. Porcaro and P. Shubiak (Res. Dept., Givaudan Corp., Clifton, N.J. 07014). *Anal. Chem.* **40**, 1232–7 (1968). The widespread use of hexachlorophene has posed a need for its detection and estimation at levels heretofore unattainable. A method is described for detection in the subnanogram region by gas chromatography. An electron capture detector is employed which utilized no radioactive source. The chemical activity of the phenol posed chromatographic problems which were solved by the use of special column parameters and silylating techniques. An illustrative application of the method is made to the quantitative recovery of hexachlorophene from skin. Other vehicles may also be investigated at these levels, after suitable isolation.

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NOTES ON THE REACTION BETWEEN POLYETHYLENE OXIDE DERIVATIVES WITH POLYALCOHOLS. K. Labancz (Univ. of Budapest, Budapest, Hungary). *Tenside* 5, 86–90 (1968). The results of viscometric determinations on mixtures of polyoxyethylene oxide compounds (polyoxyethylene sorbitan monolaurate and stearate as well as polyethylene glycol) with glycerin and water indicate that the separation of the mixtures occurring, for example, when polyoxyethylene sorbitan monostearate is in the presence of concentrated sugar solutions is due to dehydration caused by complex formation.

METABOLISM OF ARYLSULPHONATES BY MICRO-ORGANISMS. R. B. Cain and D. R. Farr (Univ. of Newcastle-upon-Tyne, England). *Biochem. J.* 106, 859–77 (1968). Species of *Pseudomonas* capable of degrading arylsulphonates and detergents of the alkylbenzenesulphonate type were isolated from sewage and river waters. Benzenesulphinate, benzenesulphonate and toluene-p-sulphonate were rapidly degraded by these organisms with the release of the sulphonate group as sulphite; homologues with a chain length up to 16 C atoms also released sulphite. Sulphite oxidation to sulphate in the medium can occur non-enzymically. Growth on benzenesulphonate and toluene-p-sulphonate elicited a catechol 2,3-oxygenase, which effected a *'meta'* cleavage of the ring. The metabolic route was determined as: benzenesulphonate → catechol → 2-hydroxymuconic semialdehyde → formate and 4-hydroxy-2-oxovalerate → acetaldehyde and pyruvate; the enzymes catalyzing these steps were all inducible. Toluene-p-sulphonate was degraded via 2-hydroxy-5-methylmuconic semialdehyde to formate and 4-hydroxy-2-oxohexanoate and the latter was cleaved to propionaldehyde and pyruvate, which were oxidized rapidly by toluene-p-sulphonate-grown cells but slowly by fumarate-grown organisms. The specificity of the catechol 2,3-oxygenase induced by the arylsulphonates, towards catechol and methylcatechols, varied during the purification and suggested that 3-methylcatechol was probably oxidized by a separate enzyme. Detergents of the alkylbenzenesulphonate type also induced a catechol 2,3-oxygenase in these bacteria. A few isolates, after growth on benzenesulphonate, opened the ring of catechol by an *'ortho'* route to form *cis-cis*-muconate. The enzymes to degrade this intermediate to β-oxoadipate were also present in induced cells.

ALKALI METAL PERBORATES. W. J. Rosenfelder (U.S. Borax & Chem. Corp.). *U.S. 3,375,198.* Dry, granular alkali metal perborate is produced by mixing with agitation a particulate alkali metal metaborate and hydrogen peroxide in the presence of water not exceeding the amount required to form a product having no uncombined water. Preferably no more than 80% of the theoretical amount of water is used. The alkali metal metaborate can also be formed in situ by reaction of sodium tetraborate with sodium hydroxide. Composite granules having a core of sodium borate and an adherent shell of sodium perborate can be formed.

CLEANER-DISINFECTANT COMPOSITION. R. H. Trimmer (Colgate-Palmolive Co.). *U.S. 3,375,199.* A solid, granular free flowing detergent composition suitable for hard surface cleaning and disinfection consists essentially of 35–55% by wt. of sodium carbonate, 15–25% by wt. of sodium tripolyphosphate, 20–30% by wt. of sodium bicarbonate, about 2% by wt. of sodium lauryl alcohol sulfate and about 3–4% by wt. of o-benzyl-parachlorophenol. A solution of this product containing 0.5–2% by wt. of solids has a pH of 9.6–10.0 and exhibits effective disinfecting action against a broad spectrum of microorganisms.

SYNTHETIC DETERGENT BAR. R. A. Haass and V. Lamberti (Lever Bros. Co.). *U.S. 3,376,229.* An improved detergent-containing hand bar is claimed, containing isethionate esters, soaps and fatty acids as the minor ingredients. The invention provides a minor amount of unesterified isethionate to be used as firming agent.

OBSERVATION OF FIBER SURFACE BY SCANNING ELECTRON MICROSCOPE OF NATURAL SOIL AND ARTIFICIAL SOIL. Haruhiko Arai and Iwao Maruta (Kao Soap Co., Tokyo). *Yukagaku* 17, 363–4 (1968). Adhering states of soils on naturally soiled cloth and artificially soiled cloth indicated that the natural soils were gathered between fibers by mechanical forces in a stick adhesion on the fiber surface, while the artificial soils looked like an aggregated adhesion on the fiber surface.