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• Fats and Oils

A SIMPLE, SENSITIVE METHOD FOR LIPID PHOSPHOROUS. R.R. Lowry and I.J. Tinsley (Dept. of Ag. Chem., Oregon State Univ., Corvallis, Oregon 97331). *Lipids* 9, 491–2 (1974). A method is described for quantitatively determining lipid phosphorous with a linear range from 0.7–10.0 μg. The method is simple and rapid, requiring one stable reagent and a single extraction with 1-butyl acetate after the phosphorous is converted to inorganic phosphate by means of a perchlorate digestion. The stable complex is read at 310 nm.

DETERMINATION OF BROMINATED VEGETABLE OILS IN SOFT DRINKS BY A COMBINATION OF TOTAL BROMIDE ESTIMATION AND GAS-LIQUID CHROMATOGRAPHY. H.B.S. Conacher and R.K. Chadha (Food Res. Labs., Food Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, Canada K1A0L2). *J. Assn. Off. Anal. Chem.* 57, 801–3 (1974). A procedure is presented for the determination of brominated vegetable oils in soft drinks by a combination of total bromide estimation and GLC. The method for bromide estimation involves conversion of organic bromide to inorganic bromide by potassium hydroxide fusion, followed by iodometric titration of the inorganic bromide. The bromide content of several common brominated oils ranged from 33.5% (olive) to 43.9% (soybean). Recoveries, based on bromide content, on an orange drink fortified with brominated sesame oil in the range 1–25 mgm/10 fluid ounces were 94.3–97.5%. Used alone, this technique will not provide accurate brominated oil determination unless the identity of the oil is known. The latter can be deduced from GLC. The analysis of 6 citrus-based soft drinks, using the combined procedures, showed that 5 drinks contained brominated oil in the range 3.1–5.2 mgm/10 fluid ounces; none was detected in the other drink.

DETERMINATION OF DOCOSENOIC ACIDS IN FATS AND OILS BY GAS-LIQUID CHROMATOGRAPHY. H.B.S. Conacher and R.K. Chadha (Food Res. Lab., Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, Canada K1A0L2). *J. Assn. Off. Anal. Chem.* 57, 1161–4 (1974). A rapid gas-liquid chromatographic (GLC) procedure has been developed for the determination of docosenoic acids in fats and oils. The method involves conversion of a known weight of oil to methyl esters using sodium methoxide-methanol, with a known weight of methyl tetracosanoate used as an internal standard. After acidification and extraction into hexane, esters are analyzed by GLC on a diethylene glycol succinate column. The percentage of docosenoic acids is calculated from the docosenoate and internal standard peak areas. The method is particularly suited to the determination of levels of less than 5% of docosenoic acids.

IMPROVED METHOD FOR FAT AND OIL ANALYSIS BY A NEW PROCESS OF EXTRACTION. E.L. Randall (Calif. Anal. Lab., 401 N. 16th St., Sacramento, Calif. 95814). *J. Assn. Off. Anal. Chem.* 57, 1165–8 (1974). Equipment and procedures have been designed for the rapid and accurate extraction of fats, waxes, and oils from plant and animal tissues. A 2–5 gram sample is oven-dried, immersed in hot ethyl ether for 10 min, raised out of the solvent and further extracted and rinsed with solvent condensate for 20 min. The ethyl ether is removed by evaporation and the residue is weighed. Excellent replication of results and agreement with analysts using Goldfisch and Soxhlet extractors were obtained. Intralaboratory values on feed samples ranged from 0.01 to 0.06%. Interlaboratory values for the same samples ranged from 0.03 to 0.15%. The same values for meat samples, which are less homogeneous, ranged from 0.18 to 0.72%.

DETERMINATION OF SOAP IN REFINED VEGETABLE OILS BY ATOMIC-ABSORPTION SPECTROPHOTOMETRY. D. Gegion (Res. Dept., State Chem. Labs., 16 A. Tsoha Street, Athens, Greece). *Analyst* 99, 745–8 (1974). Soap has been determined, as sodium, in alkali-refined vegetable oils by atomic-absorption spectrophotometry. The oil is treated with absolute ethanol, the mixture dissolved in ethyl methyl ketone and the solution then aspirated. Oil solutions have been compared with standards containing virgin olive oil and known amounts of sodium oleate. Concentrations of sodium oleate in the range 3 to 1,000 ppm in oil show a linear absorption. The method is rapid and accurate and can also be applied to the detection of adultration of virgin oil with refined olive or other vegetable oils.

HARD RED SPRING AND DURUM WHEAT POLAR LIPIDS. I. ISOLATION AND QUANTITATIVE DETERMINATIONS. M.J.Y. Lin (Dept. of Cereal Chem. & Technol., North Dakota State Univ., Fargo, N.D. 58102), V.L. Youngs and B.L. D'appolonia. *Cereal Chem.* 51, 17–33 (1974). Quantitative analysis of both total and individual classes of lipids extracted from hard red spring (HRS) wheat flour and durum wheat semolina was conducted. Preparative thin-layer chromatography was used to determine the distribution of nonpolar and polar lipid fractions. Of the total lipids, HRS wheat flour yielded the highest amount of polar lipids with an average of 49.0%; durum wheat semolina, 37.3%; HRS whole wheat, 29.8% and durum whole wheat, 26.4%. DEAE-cellulose column, thin-layer, gas-liquid and paper chromatography were used to determine the identity, composition, and concentration of individual components of wheat polar lipids extracted from three HRS wheat flours and two durum semolinas. Sixteen polar lipid components were studied and quantitated for each variety. Esterified monogalactosyl monoglyceride, which had not been reported previously, was tentatively identified.

HARD RED SPRING AND DURUM WHEAT POLAR LIPIDS. II. EFFECT ON QUALITY OF BREAD AND PASTA PRODUCTS. M.J.Y. Lin (Dept. of Cereal Chem. & Technol., North Dakota State Univ., Fargo, N.D. 58102), B.L. D'appolonia and V.L. Youngs. *Cereal Chem.* 51, 34–45 (1974). Extraction of wheat flour with petroleum ether resulted in bread with reduced loaf volume and poorer crumb and crust characteristics. However, when the extracted lipids were separated into 5 fractions on a silicic acid column. the baking quality was restored with addition of any one of the fractions, if shortening was present in the formulation. Without shortening, the baking properties were restored only by the fraction rich in digalactosyl diglyceride. The effects on farinogram mixing time, mixing tolerance, water absorption, etc. were also studied. Extracted durum semolina produced spaghetti pasta with higher water absorption and loss of color. Addition of nonpolar lipids restored the color and this plus monogalactosyl diglyceride improved water absorption and firmness of the spaghetti. Neither nonpolar nor polar lipids affected the cooking quality of the spaghetti to any extent.

DETERMINATION AND CONFIRMATION OF HEXACHLOROBENZENE IN FATTY SAMPLES IN THE PRESENCE OF OTHER RESIDUAL HALOGENATED HYDROCARBON PESTICIDES AND POLYCHLORINATED BIPHENYLS. M.V.H. Holdrinet (Provincial Pesticide Residue

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• President's Club .... (Continued from page 306A)

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● **Abstracts** . . . . (Continued from page 324A)

Testing Lab., Ontario Ministry of Ag. & Food, Univ. of Guelph, Ontario, Canada N1G2W1). *J. Assn. Off. Anal. Chem.* **57**, 580–4 (1974). Hexachlorobenzene (HCB) determination and confirmation at low residual levels (parts per billion range) is hampered by the presence of electron-capturing coextractives, other organochlorine pesticides, and poly chlorinated biphenyls PCBs). A method is described to routinely examine lipid material for residual HCB, using a column chromatographic separation system and subsequent derivatization. Following initial extraction and cleanup, organochlorines, PCBs and HCB are successively eluted from a charcoal column. After GLC analysis of each of the fractions, the HCB fraction is subjected to caustic alkali at high temperatures and the hydrolyzed product is methylated to yield the pentachlorophenol methyl ether derivative.

Isolation of volatile N-Nitrosamines in edible vegetable oils and cooked bacon fat. R.H. White, D.C. Havery, E.L. Roseboro and T. Fazio (Div. of Chem. & Physics, FDA, Washington, D.C. 20204). *J. Assn. Off. Anal. Chem.* **57**, 1380–2 (1974). Volatile N-nitrosamines can be isolated from cooked bacon fat by the following procedures: The sample is distilled from alkaline solution and the nitrosamines are extracted with methylene chloride and cleaned up on a silica gel column (procedure A). The same procedures, preceded by an extraction with methylene chloride-sodium hydroxide, are used for isolation of N-nitrosamines from soybean oil samples (procedure B). Gas-liquid chromatography with the thermionic detector was used for the determinative step. Recoveries of 14 N-nitrosamines added to 25 gm soybean oil samples at 10 and 20 parts per billion ranged from 67 to 100% for procedure B; these recoveries were 5–10% higher than those from procedure A. No nitrosamines were detected in 4 commercial samples of soybean oil; however, they were found in cooked bacon fat at levels ranging from 45 to 207 parts per billion.

Lipid autoxidation in mechanically deboned chicken meat. K.E. Moerck and H.R. Ball Jr. (Dept. of Food Sci., North Carolina State Univ., Raleigh, NC 27607). *J. Food Sci.* **39**, 876–9 (1974). Lipid autoxidation was determined in mechanically deboned chicken meat over a 15-day storage period at 4C by thiobarbituric acid (TBA) reaction and fatty acid analyses. Hexaenoic, pentaenoic, tetraenoic and trienoic fatty acids of the phospholipid fraction were the major substrates of autoxidative deterioration. Major oxidative changes occurred after 6 days of storage. No apparent oxidation occurred in the less unsaturated triglycerides even though this fraction comprised 92.6% of the total lipids. Minimal autoxidation occurred when a mixture containing 20% butylated hydroxyanisole, 6% propyl gallate and 4% citric acid in propylene glycol (Tenox !!) was added at 0.01% by weight of fat present. Addition of 1% Aureomycin (chlortetracycline) decreased total bacterial counts and increased TBA values. There was, however, no acceleration in fatty acid oxidation, suggesting that the microorganisms present removed malonaldehyde and possibly other dicarbonyl compounds formed during autoxidation.

The C-20 hydrocarbons of butterfat. G. Urbach and W. Stark (Dairy Res. Lab., Div. of Food Res., Commonwealth Scientific and Industrial Res. Org., Highett, Victoria 3190, Australia). *J. Agric. Food Chem.* **23**, 20–4 (1975). Hydrocarbons were isolated from butterfat by cold-finger molecular distillation at 35°. The three major hydrocarbons were identified as the C-20 compounds, 3,7,11,15-tetramethylhexadec-1-ene (phyt-1-ene), 3,7,11,15-tetramethylhexadec-2-ene (phyt-2-ene), and 3-methylene-7,11,15-trimethylhexadec-1-ene (neophytadiene). The following hydrocarbons were also shown to be present: 2,6,10-trimethyltridecane, *n*-pentadecane, *n*-hexadecane, 5-methylhexadecane, *n*-heptadecane, *n*-octadecane, and 2,6,10,14-tetramethylhexadecane (phytane). Of these saturated hydrocarbons, *n*-octadecane was the most abundant. The total concentration of the hydrocarbons reported here is of the order of 30 ppm of butterfat. Neophytadiene, but not phyt-1-ene or phyt-2-ene, was also isolated from pasture grass.

Stereospecific analysis of high melting triglycerides of bovine milk fat and their biosynthetic origin. D.M. Barbano and J.W. Sherbon (Dept. Food Sci., College of Agric. and Life Sci., Cornell Univ., Ithaca, N.Y. 14850). *J. Dairy Sci.* **58**, 1–8 (1974). Fatty acid composition, triglyceride molecular weight distributions, melting ranges, amount of *cis* and *trans* isomers, and stereospecific fatty acid distributions were determined for high melting triglyceride fractions and bovine milk fat free of them. Distributions of fatty acids on the high melting triglycerides differed from distributions of fatty acids in the rest of the milk fat triglycerides. The significance of these results is evaluated in relation to the biosynthetic origin of high melting triglycerides. Stereospecific distributions of these fatty acids support previous speculations that the monoglyceride pathway may play a significant role in biosynthesis of high melting triglyceride in bovine milk fat.

Method of refining crude synthetic fatty acids. T. Yamashita and S. Ninagawa (Ajinomoto Co.). *U.S. 3,864,370.* The method comprises holding a liquid phase consisting of the crude fatty acids in contact with a solid catalyst at 150–350C until the amount of ester contaminant is substantially reduced and then separating the purified fatty acid from the catalyst. The catalyst is insoluble in the crude fatty acid and inert to the pure fatty acid at the temperatures specified. The catalyst is an oxide of at least one member of the group consisting of aluminum, silicon, titanium, and zirconium.

Hydrogenation of fatty acids and their triglycerides. A.G. Hinze (Lever Bros. Co.). *U.S. 3,865,853.* A process for hydrogenating polyunsaturated fatty acids and their triglycerides at 0–100C using 1–5 atm. of hydrogen in the presence of a polar solvent and a supported heavy metal catalyst is described. The heavy metal is Pd(II), the catalyst support is an ion exchange resin consisting of a polystyrene matrix cross-linked with divinyl benzene and at least 2.0 meq/g active sites readily accessible to large molecules. The Pd(II) is introduced into the salt form of the resin when the resin is a cation exchange resin and into the hydroxyl or neutral form when it is an anion exchange resin.

Process for catalytically converting fatty acids. C.B. Linn and F. Baiocchi (C. J. Patterson Co.). *U.S. 3,865,855.* In the process for converting a fatty acid charge to straight and branched chain monocarboxylic fatty acid homologs of the charge with a Friedal-Crafts catalyst, an improvement comprising reacting the fatty acid charge in the presence of a catalytic amount of the Friedal-Crafts catalyst at 45–110C for a time sufficient to produce the desired fatty acid homologs and recovering the homologs from the reaction mixture is described.

Fats with encapsulated flavors. R.T. Darragh and J.L. Stone (Procter & Gamble). *U.S. 3,867,556.* A process for double encapsulating volatile flavors comprises the steps of (a) mixing the volatile flavoring and a heat-release, water-insoluble encapsulating agent having a melting point of 120F or higher; (b) spray-chilling the mixture to form single encapsulated particles; (c) separating the particles; (d) placing them in a fluidized bed and agitating them; and (e) spraying them with a solution of water soluble, oil insoluble encapsulating material, thereby providing double encapsulated flavor particles.

Coating the surface of frozen, fried French fries with atomized fat globules. R.J. Kellermeier, J.T. Knight and B.E. Steljes (Ore-Ida Foods, Inc.). *U.S. 3,865,964.* The process comprises deep fat frying French fry potato pieces, freezing them, and spraying liquid fat onto the surface so as to add 1–6% to the weight of the product. The resultant product has a discontinuous coating of solidified droplets of fat adhering to the surface.

Continuous process for drying and extracting oils from solid materials. R.W. Barns (The French Oil Mill Machinery Co.). *U.S. 3,867,416.* The process comprises the steps of (a) supplying finely divided oil-bearing solid particulate material into the top of an extractor column; (b) introducing extraction solvent vapor into the bottom of the extractor column to pass upwardly through the beds of material and out of the top of the extractor; and (c) controlling the rate of introduction of the vapor so as to keep the particles separated from one another while still permitting the particles to travel downward at a controlled rate. A pool of miscella appears at the top of the bed of material and the particles are dried and extracted as they pass downward through the solvent vapor.

Major fatty acids and proximate composition of dairy products. R.M. Feeley, P.E. Criner, and H.T. Slover (Nutrition Inst., ARS, USDA, Beltsville, Md.). *J. Am. Dietetic Assoc.* **66**, 140–6 (1975). Major fatty acids, moisture, protein, fat, lactose, and ash were determined in several important dairy products, including major cheeses. Samples of milk products, cheeses, wheys, and the original milks from which the products were made were obtained from dairy plants. In addition, samples of cheeses were obtained from local markets. The fatty acid distribution of milk fat was not appreciably altered by processing. Protein and fat values were constant among samples from each cheese. No lactose was detected in the ripened cheese. Mean fatty acid patterns for the different cheeses were not appreciably different from one another although butyric acid showed the greatest sample variation. Procedures for converting fatty acid methyl ester data to fatty acids (free acids or triglycerides) as weight percentages of the food are presented.

THIOL-CATALYZED *CIS-TRANS* ISOMERIZATION OF OLEIC ACID. W.G. Niehaus, Jr. (Dept. of Biochemistry, Pennsylvania State Univ., University Park, Penn. 16802). *Bioorg. Chem.* **3**, 302–10 (1974). Various thiols were found to catalyze the geometrical isomerization of oleic acid to *trans*-Δ^9-octadecenoic acid. The reaction proceeds in neutral aqueous solution at mild temperatures and at relatively low thiol concentration, 5–20 meq/liter. Hydrogen from the medium was not incorporated into the product and no trace of Δ^8 or Δ^{10} octadecenoic acid could be detected among the products. The reaction is proposed to involve the formation of a mixed micelle of fatty acid and thiol, nucleophilic attack of the double bond by thiol, rotation about the former double bond and elimination of the thiol to produce the thermodynamically more stable *trans* isomer. The cationic reagent, 2-mercaptoethylamine, was the most efficient catalyst tested. This system should prove to be useful for the preparation of labeled *trans* unsaturated fatty acids.

STUDY OF TOCOPHEROLS FROM COTTONSEED OIL. N.K. Nadirov et al. *Pishchevaya Tehnol.* **1973**(4), 29–32. The tocopherol content of the crude cottonseed oil is 85–160 mg % g. During the industrial processing of cottonseed oil, the tocopherol content decreases gradually. Some modification in their composition also occurs. The sources with the highest tocopherol content are the condensate of deodorization and the oil extracted from soapstock. (Rev. Franc. Corps Gras)

ABOUT FATTY ACID COMPOSITION OF SOLID PHASE OF MILK FAT. M.F. Kurkova. *Pishchevaya Tehnol.* **1973**(5), 30–3. The composition of fatty acids of solid phase of milk fat depends on the degree and the rate of cooling, as well as on the mechanical action. During the cooling and bracing of milk fat, the processes of crystallization and recrystallization occur, which has as a result the reduction of the aptitude for releasing the liquid fat. (Rev. Franc. Corps Gras)

VARIATIONS OF FATTY ACID COMPOSITION OF LIPIDS FROM SUNFLOWER SEED DURING ITS TECHNOLOGICAL TREATMENT. V.G. Scerbakov et al. *Pishchevaya Tehnol.* **1973**(4), 45–7. Fatty acid compositions of oil obtained by pressing and by extraction do not differ. Certain difference was found in oil obtained from different stages of preliminary pressing. Increasing of the pressure and of the degree of delipidation decreases the content of linoleic acid in oil. Lipids in sediment have less unsaturated fatty acids and more saturated acids comparing with the oil. (Rev. Franc. Corps Gras)

THE COMPOSITION OF FATTY ACIDS OF GLYCERIDES WITH A HIGH MELTING POINT OBTAINED FROM MILK FAT. L.S. Ivanovskaja et al. *Pishchevaya Tehnol.* **1973**(4), 52–4. An increase of the rate and degree of refrigeration of milk fat accompanies a decrease of the content of saturated fatty acids and an increase of unsaturated fatty acids of glycerides with a high melting point. The variation of the melting point of glycerides with a high melting point, separated from milk fat after a different way of cooling, can be explained by modification of their chemical composition. (Rev. Franc. Corps Gras)

STUDY OF THE SOLIDIFICATION OF MILK FAT FRACTIONS BY DILATOMETRIC METHOD. T.A. Stepanenko et al. *Pishchevaya Tehnol.* **1973**(4), 58–61. From the graph of solidification and melting obtained by differential thermal analysis, and from the point of solidification determined in Žukov apparatus, it is possible to establish the temperatures of crystallization of glycerides. To study their chemical composition, it is not only necessary to know the fatty acid composition but also the distribution of glycerides followed by differential solidification curves. (Rev. Franc. Corps Gras)

EQUATIONS OF THERMAL AND MASS TRANSFER OF FUNDAMENTAL METHODS FOR HEXANE REMOVAL FROM MEAL. V.V. Beloborodov et al. *Pishchevaya Tehnol.* **1973**(4), 136–40. The final content of hexane in meal depends not only on the kind of extracted material and solvent used, but also on the way in which the process has been conducted. Although the meal has a good surface for vaporization, its influence on the final content of hexane is weak comparing with the internal diffusibility of solvent. (Rev. Franc. Corps Gras)

INFLUENCE OF MAGNETIC TREATMENT OF ACETONE ON THE EXTRACTION OF COTTONSEED OIL FROM COTTONSEED. Z. Salimov et al. (Institute polytechnic Taskent). *Pishchevaya Tehnol.* **1973**(6), 154–5. To establish the influence of magnetic treatment of organic solvent on the extraction, the authors studied the extraction of oil from cottonseed. The solvent used was acetone. The experiments have been done in vertical column of extraction; internal diameter was 38mm. The preliminary treatment of acetone has been done in an electromagnetic field. The raw material had 31.4% of oil and 7.8% humidity. The results show that this method of extraction has many advantages including better yields of oil. (Rev. Franc. Corps Gras)

EVALUATION OF THE EFFECT OF SOME COMPOUNDS OF HEAVY METALS ON THE THERMAL OXIDATION AND POLYMERIZATION OF FATS. B.A. Sedlacek. *Cesk. Hyg.* **18**, 441–6 (1973). After studying the influence of heavy metals on the thermal oxidation process, the author found that metal ions decrease the peroxides, aldehydes, and unsaturated compound formation in the following order: Fe^{3+}, Mn^{2+}, Cu^{2+}, Co^{2+}, Ni^{2+}, Zn^{2+}, Pb^{2+} and Sn^{2+}. They also decrease the amount of change of viscosity, refraction index, UV spectrum, and color in the same given order. Experiments have been done with sunflowerseed oil heated with 1–100 ppm of metal chlorides. In the food products, the proposed tolerances for heavy metals are less than 1 ppm for Fe^{3+}, Mn^{2+} and Cu^{2+}, less than 0.1 ppm for Pb^{2+} and 1 ppm for others. (Rev. Franc. Corps Gras)

THE INFLUENCE OF HYDROGENATION OF RAPESEED OIL ON ITS DIGESTIBILITY. R. Chichon et al. *Roczniki Technol. Chem. Zywn.* **23**, 221–8 (1973). The lack of essential (unsaturated) fatty acids in hydrogenated oils is accompanied by lower digestibility. The trans isomers of fatty acids, isomers–C$_{18}$, are absorbed as cis isomers. Their presence has no influence on the digestibility of hydrogenated oil unless its melting point is higher than 37C. The low digestibility of hydrogenated rapeseed oil is a result of poor absorption of long chain saturated fatty acids. (Rev. Franc. Corps Gras)

THE KINETICS AND THERMODYNAMICS OF AUTOXIDATION OF METHYL ESTERS OF SOME UNSATURATED FATTY ACIDS. W. Zwierzykowsky et al. *Roczniki Technol. Chem. Zywn.* **23**, 229–48 (1973). A study of the kinetics and thermodynamics of autoxidation of methyl esters of linolenic, linoleic, and oleic acids at 60, 80, and 100C has been done. The experiments were done without and with the addition of 0.0025, 0.005, and 0.01% propyl gallate to methyl esters. The influence of temperature and of the antioxidant on the autoxidation process can be shown by the following order: methyl oleate > methyl linoleate > methyl linolenate. (Rev. Franc. Corps Gras)

THE INFLUENCE OF PHOSPHORIC ACID ON THE COLOR MODIFICATION OF RAPESEED OIL. H. Szemraj. *Tluszcze jad.* **18**, 13–9 (1974). Studies have been done to determine the modifications of pigment concentrations in degummed and crude rapeseed oil. From the technological point of view, the method which uses 0.1% phosphoric acid (conc. 75%, time for mixing 15 min.) is very good. Oil degummed by this method has its green pigment concentration lowered by 80%. At the same time, carotene concentration in this oil is higher; more than 50% of them are preserved. (Rev. Franc. Corps Gras)

COMPARING OF THE GLYCERIDE STRUCTURE AND THE SPEED OF HYDROGENATION OF RAPESEED OIL WITH HIGH AND LOW ERUCIC ACID CONTENT. B. Drozdowski et al. *Tluszcze jad.* **18**, 20–30 (1974). The erucic acid content in rapeseed oil, obtained from variety K-712, is about 16%, which is about three times less than the content in the oil from rapeseed with a high content of erucic acid. The low content of erucic acid in triglycerides of variety K-712 is replaced by oleic and eicosenoic acids. Rapeseed oil with a low erucic acid content can be hydrogenated more rapidly than the oil with a high erucic acid content. (Rev. Franc. Corps Gras)

THE INFLUENCE OF PHOSPHORIC ACID ON THE QUALITY OF REFINED RAPESEED OIL. H. Szemraj. *Tluszcze jad.* **18**, 51–62 (1974). It was found, after industrial realization, that the use of phosphoric acid for degumming of rapeseed oil is favorable for further refining processes and for the quality of the refined oil. This can be seen from the following: the time for oil washing after alkaline neutralization is shorter (by about 30%), less bleaching earth is necessary for bleaching, the quality of the refined oil is better, and the oil has better stability against oxidation. (Rev. Franc. Corps Gras)

Deactivation of the nickel contact by sulphur compounds during soybean oil hydrogenation in the reactor with internal circulation of hydrogenation. B. Drozdowski et al. *Tluszcze jad.* 18, 63–74 (1974). The poisoning of catalyst is a result of selective absorption of some substances. The catalyst obtained by the reduction method is especially sensitive. The authors have done a series of hydrogenation experiments on refined soybean oil with a variable quantity of five different sulphur compounds. The results allow the conclusion that it is better for the industrial hydrogenation of oil with volatile sulphur compounds to use the installation with an external hydrogenation circulation. (Rev. Franc. Corps Gras)

Apparent speed of air during the cooling of rapeseed meal. M. Kubicki. *Tluszcze jad.* 18, 82–8 (1974). The time of cooling is in inverse proportion with the visible speed of air. For example, to obtain a decrease in the temperature of 50C for 60 sec. it is necessary to increase the speed of air by 0.90 m/s for 100 sec. The same effect is obtained with the speed of 0.45 m/s for 180 sec. It is also possible to obtain better results by making a longer contact with the cooling agent. (Rev. Franc. Corps Gras)

• Biochemistry and Nutrition

Effect of broiling, grill frying and microwave cooking on moisture, some lipid components and total fatty acids of ground beef. I.J. Janicki and H. Appledorf (Food Sci. Dept., Univ. of Florida, IFAS, Gainesville, FL 32611). *J. Food Sci.* 39, 715–7 (1974). Raw and cooked ground beef patties were analyzed for moisture, crude fat, total cholesterol and total fatty acid content. The patties were cooked by broiling, grill frying and microwave radiation. In addition, broiled and frozen patties were reheated by microwaves and analyzed. Sixteen fatty acids were identified in the total lipid extract. The fatty acids C14, C16, C16:1, C18, C18:1 and C18:2 accounted for approximately 94% of the total acid measured. Significant percent composition changes occurred in the C16, C18:1 and C18:2 fatty acids as a result of the various cooking methods. The C16 acid underwent the greatest percent loss during cooking and was still further reduced in the microwave reheated precooked patties. The percent of C18:1 and C18:2 acids increased following all cooking treatments. The ratio of unsaturated/saturated fatty acids was increased by all cooking methods with the greatest increase noted in the precooked microwave reheated patties.

Influence of wine intake on mouse growth, reproduction and changes in triglyceride and cholesterol metabolism of offspring. G.S. Stoewsand and J.L. Anderson (N.Y. State Agr. & Exp. Sta., Cornell Univ., Geneva, NY 14456). *J. Food Sci.* 39, 957–61 (1974). The objectives of this study were to feed a varietal wine to two generations of laboratory mice for 26 weeks each and compare growth, body weight changes, reproduction and blood cholesterol and triglyceride levels with those of mice fed a 12%-ethanol solution or distilled water. Wine intake had no observed effect on development in either generation; however, a slower rate of maturity occurred. Effects were observed on cholesterol and triglyceride metabolism: (1) Wine fed to parents and continued as the exclusive liquid fed to offspring caused elevated levels of blood and liver triglyceride and liver cholesterol; (2) on the other hand, wine-fed offspring born from control (water-fed) parents showed lowered levels of blood triglyceride. In addition, males from this treatment (wine-fed mice from control parents) exhibited lowered levels of liver cholesterol and triglyceride. No changes in blood cholesterol were observed.

Compositional and metabolic growth effects in the bovine. Muscle, subcutaneous and serum total fatty acids. A.L. Hecker, D.A. Cramer and D.F. Hougham (Dept. of Animal Sci., Colorado State Univ., Fort Collins, CO 80521). *J. Food Sci.* 40, 144–9 (1975). The composition of fatty acid profiles were determined on muscle, subcutaneous and serum lipids from 28 days of age to slaughter on 27 cattle. Significant increases in C14:0, C14:1, C16:1 and C18:1 and decreases in C18:0 and C18:2 occurred in muscle lipids with increase in age. In subcutaneous fats, unsaturated fatty acids increased and except for C16:0, saturated fatty acids decreased. Serum fatty acids were highly variable except for a significant decrease in C14:0 and C16:0. Serum lipid was much more saturated than muscle or subcutaneous fats. Breed and sex effects were small and inconsistent. Periods of greatest change were during the first 12 months of age.

Compositional and metabolic growth effects in the bovine. Muscle, Subcutaneous and Serum Fat Classes. A.L. Hecker, D.A. Cramer, D.K. Beede and R.W. Hamilton (Dept. of Animal Sci., Colorado State Univ., Fort Collins, CO 80521). *J. Food Sci.* 40, 140–3 (1975). Muscle, subcutaneous fat and blood serum were collected periodically from 27 calves from birth to slaughter to study effects of growth on lipid classes. Extracted lipids were separated into classes with thin layer chromatography. Muscle fat classes underwent several changes. Phospholipids, free fatty acids and cholesterol decreased and triglycerides increased. The majority of the changes occurred by 8–10 months of age. The effect of growth on subcutaneous fat classes was negligible except with phospholipids and free fatty acids, which decreased. Serum lipid classes displayed reasonably constant concentrations during growth. Breed and sex effects on muscle, subcutaneous and serum fat classes were of a minor and inconsistent nature.

Effect of the fat content of ground beef on the heat inactivation of poliovirus. J.A. Filppi and G.J. Banwart (Dept. of Microbiology, Ohio State Univ., Columbus, OH 43210). *J. Food Sci.* 39, 865–8 (1974). An indicator virus, polio type 1, was inoculated into ground beef containing 3, 27 and 47% fat, and heated at 50, 60, 70 and 80C for different time intervals to determine the thermal resistance of the virus. The resistance of the virus to inactivation at the various temperatures tested was found to increase as the fat content of the meat samples increased. The results of this investigation provide evidence that poliovirus in ground beef containing fat levels approaching 30% are resistant to levels of heating commonly employed during cooking in the home or restaurant.

Plasma cholesterol concentrations in squirrel monkeys as influenced by diet and phenotype. H.B. Lofland, D.C. Jones, T.B. Clarkson and R.W. St. Clair (Arteriosclerosis Res. Ctr., Dept. of Pathology & Comparative Medicine, The Bowman Gray School of Medicine, Winston-Salem, NC 27103). *J. Food Sci.* 40, 2–7 (1975). Monkeys making either a high (hyperresponders) or low (hyporesponders) plasma cholesterol response to dietary cholesterol were fed 0.75 milligrams cholesterol per calorie of diet for 3 months. Dietary fat was butter or safflower oil. Absorption of cholesterol and excretion of cholesterol and bile acids were measured. Hyporesponders absorbed significantly less dietary cholesterol than did hyperresponders, which may in part explain their lower plasma cholesterol response to cholesterol feeding. Bile acid excretion increased after the first month of cholesterol feeding; this may be one determinant of final plasma cholesterol concentration. There was no difference in per cent absorption of cholesterol between butter and safflower oil diets. However, those monkeys fed butter consumed more diet and absorbed more cholesterol than did those fed safflower oil. Plasma cholesterol concentrations also were higher for butter-fed monkeys.

Nonnutritive fiber and lipid metabolism. D. Kritchevsky, S.A. Tepper and J.A. Story (Wistar Instit. of Anatomy & Biol., 36th St. at Spruce, Philadelphia, PA 19104). *J. Food Sci.* 40, 8–11 (1975). Rats were fed semi-synthetic (SS) diets which contained cellulose as the nonnutritive fiber (NNF) and their serum and liver lipid levels were compared with those of chow-fed rats. Serum cholesterol and triglyceride levels were reduced by 35 and 62%, respectively. Liver cholesterol levels were 41% lower but triglycerides were unchanged. The rats were fed (^{14}C)-cholesterol and the chow group excreted 228% more labeled acidic steroid. Serum cholesterol levels were generally lower when alfalfa was substituted for cellulose in the SS diets. Several other types of NNF were also tested. Sugar cane pulp, bran and oat hulls bound significant amounts of NaTC. NNF appears to play an active role in cholesterol metabolism, either by interference with absorption, enhancement of oxidation or some other mechanism.

Lipids in atherosclerosis. F.A. Kummerow (Burnsides Res. Lab., Univ. of Ill., Urbana, IL 61801). *J. Food Sci.* 40, 12–7 (1975). The presence of cholesterol and polyunsaturated fatty acids (PUFA) in culinary fats and oils are considered important to the development of atherosclerosis because a decrease in the consumption of cholesterol containing animal fats and an increase in the consumption of PUFA has decreased serum cholesterol levels in human subjects. High serum cholesterol and high triglyceride levels represent a risk factor in the development of atherosclerosis in the coronary arteries, the cause of 90% of all heart disease. However, the type of PUFA in the serum lipids and in the cell membranes in the arteries may be even more crucial to the development of atherosclerosis. In the process of preparing culinary fats and oils, the "essential" PUFA in natural fats are reduced in amount by hydrogenation and thus stabilized towards oxidative rancidity. In current practice, a major share of the PUFA are also converted to isomeric trans fatty acids. Rabbits, swine and human subjects fed fats which contained trans fatty acids had higher serum cholesterol levels and the aortas of these rabbits and swine had a higher cholesterol level than those fed natural fats. It therefore seems desirable to prepare culinary fats devoid of trans fatty acids.

EFFECTS OF DIETARY PROTEIN AND CARBOHYDRATE ON PLASMA CHOLESTEROL LEVELS IN RELATION TO ATHEROSCLEROSIS. K.K. Carroll and R.M.G. Hamilton (Dept. of Biochem., Univ. of Western Ontario, London, Ontario, Canada NGA 3K7). *J. Food Sci.* 40, 18–23 (1975). The hypercholesterolemia which develops in rabbits on cholesterol-free semisynthetic diets appears to be primarily dependent on the protein component of these diets, although the effect can be modified by dietary carbohydrate and dietary fat. There is also evidence that dietary protein and carbohydrate, as well as dietary fat, can influence the level of serum cholesterol in other animal species and in humans.

VITAMIN E, STEROIDS, AND LIVER MICROSOMAL HYDROXYLATIONS. M.P. Carpenter and C.N. Howard, Jr. (Biomembrane Res. Lab., Okla. Med. Res. Foundation). *Am. J. Clin. Nutr.* 27, 966–79 (1974). An enzyme system that is tightly bound to the endoplasmic reticulum of liver carries out the hydroxylations of a wide variety of substrates, which include a large number of drugs, carcinogenic hydrocarbons, as well as endogenous substrates as fatty acids and steroids. The activity of this pathway is influenced by the age, species, strain, sex, and prior treatment of the animal. Exposure of animals to insecticides, carcinogens, and drugs results in increased activity. The regulation of this liver mixed-function oxidase pathway in terms of "normal" physiological components has not been extensively studied. The aim of the present study was to determine whether the effect of α-tocopherol on microsomal oxidases was mediated via androgens or if the effect was independent of these steroids. Drug metabolism, microsomal cytochromes, and lipid peroxidation by liver microsomes of control rats, fed a vitamin E-supplemented diet, and experimental rats, fed a vitamin E-deficient diet were compared. Identical analyses were also made of control and experimental rats that were castrated, adrenalectomized, or both castrated and adrenalectomized. The specific activities were not decreased in vitamin E-supplemented animals after castration, unlike those of the vitamin E-deficient rats.

THE COMPLETE AMINO ACID SEQUENCE OF C-I (APOLP-SER), AN APOLIPOPROTEIN FROM HUMAN VERY LOW DENSITY LIPOPROTEINS. R.S. Shulman, P.N. Herbert, Katherine Wehrly and D.S. Fredrickson (Molec. Disease Brch., Natl. Heart and Lung Inst., Natl. Inst. of Health, Bethesda, Md. 20014). *J. Biol. Chem.* 250, 182–90 (1975). C-I was prepared from very low density lipoproteins of patients with familial type V hyperlipoproteinemia. Peptides from tryptic digests of unmodified and succinylated C-I, chymotryptic peptides, and the products of cyanogen bromide cleavage were isolated and characterized. Sequence analysis of tryptic peptides was performed by the dansyl (5-dimethylaminonaphthalene-1-sulfonyl) technique and hydrolytic regeneration of the amino acid residues from the phenylthiocarbamyl derivatives. Alignment of the tryptic fragments within the cyanogen bromide and succinyl-tryptic peptides was confirmed by the overlap chymotryptic peptides. The complete amino acid sequence of C-I, 57 residues in length, does not reveal any obvious basis for its lipophilic properties.

ACTIVATION OF BEE VENOM PHOSPHOLIPASE A_2 BY FATTY ACIDS, ALIPHATIC ANHYDRIDES AND GLUTARALDEHYDE. A.J. Lawrence and G.R. Moores (Dept. of Cell Biol, Univ., Glasgow G11 6NU, Scotland). *FEBS Letters* 49, 287–91 (1975). The phospholipase from Bee venom, a small cationic protein (mol. wt 14629, pI 10.5 ± 1.0) of known primary structure hydrolyses long-chain phosphatidyl phospholipids most rapidly in dilute aqueous solutions of organic solvents (e.g. *n*-propanol) where it shows product activation which becomes more pronounced as the solvent concentration is decreased. Activation of lipases is a common phenomenon of possible importance in many regulatory processes and the explanations proposed concentrate on possible modification of the substrate by the activator to increase attraction to, or penetration of the surface by the enzyme. The Bee venom enzyme is activated by fatty acid anions (e.g. palmitate, oleate) with a minor contribution from lysolecithin, and both products are inhibitory although this is masked at low concentrations. The kinetics of the system are deceptively simple, an individual progress curve having a near linear slow phase followed after a brief transition by a fast, activated phase. Whilst the rate in the activated phase is highly dependent on substrate concentration, that in the slow phase is not, showing that activation, which increases V_{max} approx. 25-fold appears to decrease affinity for the substrate. This result is more readily explained (given in detail in a later paper) by postulating that activators modify the enzyme not the substrate, a conclusion strongly reinforced by the experiments presented here.

THE CONVERSION OF CHOLEST-5-EN-3β-OL INTO CHOLEST-7-EN-3β-OL BY THE ECHINODERMS ASTERIAS RUBENS AND SOLASTER PAPPOSUS. A.G. Smith and L.J. Goad (Dept. of Biochem., Univ. of Liverpool, P.O. Box 147, Liverpool L69 3BX, U.K.). *Biochem. J.* 146, 35–40 (1975). The echinoderms *Asterias rubens* and *Solaster papposus* (Class Asteroidea) metabolize injected [4-^{14}C] cholest-5-en-3β-ol to produce labelled 5α-cholestan-3β-ol and 5α-cholest-7-en-3β-ol. Conversion of 5α-[4-^{14}C] cholestan-3β-ol into 5α-cholest-7-en-3β-ol was demonstrated in *A. rubens*. Incubations of *A. rubens* with [4-^{14}C]-cholest-4-en-3-one resulted in the production of labeled 5α-cholestan-3-one, 5α-cholestan-3β-ol and 5α-cholest-7-en-3β-ol. [4-^{14}C]Sitosterol was metabolized by *A. rubens* to give 5α-stigmastan-3β-ol and 5α-stigmast-7-en-3β-ol. The significance of these results in relation to the presence of Δ^7 sterols in starfish is discussed.

CHANGES IN AORTIC GLYCOSAMINOGLYCANS AND LIPOPROTEIN LIPASE ACTIVITY IN RATS WITH AGE AND ATHEROMA. S.T. Vijayakumar, S. Leelamma and P.A. Kurup (Dept. of Biochem., Univ. of Kerala, Trivandrum-695001 (India). *Atherosclerosis* 21, 1–14 (1975). The changes in the individual glycosaminoglycans of the aorta and in lipoprotein lipase activity of the aorta, liver and heart have been studied at various stages in the development of mild atheroma in the rat. Three responses were seen: Hyaluronic acid initially decreased, then increased; Heparan sulphate and chondroitain sulphates A and C initially increased, then decreased. Chondroitin sulphate-B and heparin increased with progressing lipid infiltration and decreased markedly only in the later stages. Ageing changes were also investigated in the rat aorta: total cholesterol, phospholipids and triglycerides increased progressively from weaning to 9 months of age. Hyaluronic acid decreased after weaning, reach a minimum at 6 months and then increased thereafter. Heparan sulphate and chondroitin sulphate-C reached a maximim at 6 months and then decreased thereafter. Chondroitin sulphates A and B showed a similar but less marked pattern of change with age. Heparin progressively increased with age. Aortic lipoprotein lipase activity increased in the early stages of atheroma and then decreased as the lipid infiltration became more severe. The ageing study showed that enzyme activity was quite high at weaning, decreased considerably at 3 months, but thereafter fell only slightly.

PROSTAGLANDIN METABOLISM. II. IDENTIFICATION OF TWO 15-HYDROXYPROSTAGLANDIN DEHYDROGENASE TYPES. S.C. Lee and L. Levine (Dept. of Biochem., Brandeis Univ., Waltham, Mass. 02154). *J. Biol. Chem.* 250, 548–52 (1975). Homogenates of several mammalian tissues were measured by radioimmunoassay for 15-hydroxyprostaglandin dehydrogenase activity. Two types of enzyme activity were detected. One, which uses NAD^+ as cofactor much more effectively than $NADP^+$, was found in monkey lung, heart, liver, kidney, and spleen and in chicken heart and dog lung. A second type, which uses $NADP^+$ as a cofactor more effectively than NAD^+, was found in monkey and human brain and red blood cells and in swine kidney. These two types of 15-hydroxyprostaglandin dehydrogenase were partially purified from monkey brain and chicken heart. In addition to different cofactor requirements, the two partially purified enzymes could be distinguished by chromatographic properties, their relative affinities for prostaglandin E_2 and $F_{2\alpha}$, and their sensitivities to inhibition by reduced pyridine nucleotides, thyroid hormones, and prostaglandin B_2.

Lipid deficient extender for bovine spermatozoa: its development and use in measuring freezing-induced lipid loss. G.H. Coulter and R.H. Foote (Dept. of Animal Sci., Cornell Univ., Ithaca, N.Y. 14850). *J. Dairy Sci.* **58**, 82–7 (1975). To facilitate the measurement of lipid losses from spermatozoa due to freezing, three low-lipid seminal extenders containing lactose, bovine serum albumin, or soybean protein were evaluated as potential cryoprotectants. All extenders were formulated to have an osmotic pressure within the range of 270 to 330 mosmol and a pH of 6.8 to 7.0. Soybean protein (Promine-D) maintained the highest post-thaw motility of spermatozoa with similar survival for spermatozoa frozen in ampules and straws. The extender derived from testing several components consisted of Tris (hydroxymethyl) aminomethane (245 mM), and citric acid monohydrate (78 mM), as the buffering compounds; and fructose (69 mM), glycerol (7% vol/vol), and Promine-D (1.5% wt/vol). Post-thaw sperm motility of approximately 40% was not different from the Tris-egg yolk control. Fertility of fresh rabbit semen treated with the extender was normal. After freeze-thawing, protected spermatozoa contained more lipid (1.61 versus 1.20 $\mu g/10^6$ sperm) and lost less glutamic oxaloacetic transaminase enzyme (102 versus 108 Karmen units) than when Promine-D was not incorporated. However, even with protection by soybean protein, spermatozoa lipid content decreased from 2.43 to 1.61 $\mu g/10^6$ sperm after one freeze-thawing. The lipid status of spermatozoa frozen and thawed in conventional bull seminal extenders containing large amounts of lipid is unknown.

Serum insulin, glucose, and free fatty acids in the cow and fetus during gestation (38449). J.S. Grigsby, W.D. Oxender, H.D. Hafs, D.G. Britt and R.A. Merkel (Dept. of Food Sci. and Human Nutr., Dairy Sci. and Animal Husbandry, Mich. State Univ., East Lansing, Mich. 48824). *Proc. Soc. Exp. Biol. Med.* **147**, 830–4 (1974). Insulin, free fatty acids (FFA) and glucose were measured in blood sera from 37 primiparous Holstein heifers and their fetuses on Day 90, 180, or 260 of gestation. Blood was collected from the uterine artery and the uterine vein of the heifers, by cardiac puncture in the 90-day fetuses and from an umbilical artery and vein in 180- and 260-day fetuses. The average serum insulin concentration was higher ($P < 0.05$) in male than in female fetuses although the average of the two increased ($P < 0.05$) during gestation. The overall mean of fetal insulin was only 55% of that of the dam ($P < 0.05$) and the difference was greatest at 90 days gestation. Fetal FFA decreased ($P < 0.05$) during gestation, but maternal FFA increased ($P < 0.05$) as pregnancy progressed. Maternal FFA were higher ($P < 0.01$) than fetal FFA and the heifers carrying male fetuses had higher ($P < 0.05$) average FFA concentrations than heifers with male fetuses. Average fetal glucose decreased ($P < 0.05$) from Day 180 to 260 of gestation and the overall mean of fetal glucose was lower ($P < 0.05$) than maternal glucose. We conclude that, during gestation, fetal insulin increased while FFA and glucose decreased. In contrast, maternal insulin decreased and FFA increased but glucose remained constant.

Possible stabilizing effect of vitamin E on microsomal, membrane-bound, selenide-containing proteins and drug-metabolizing enzyme systems. A.T. Diplock (Dept. of Biochem., Royal Free Hosp., Schl. of Med., Univ. of London, 8, Hunter Street, WCIN IBP, United Kingdom). *Am. J. Clin. Nutr.* **27**, 995–1004 (1974). Recent work in our laboratory has indicated that a biologically active form of selenium in rat liver may be selenide, which can be derived by an intracellular mechanism from administered $Na_2{}^{75}SeO_3$. It has been demonstrated that the selenide is protein bound, is particularly located in subcellular loci that have an electron-transport function (namely, mitochondria and smooth endoplasmic reticulum), and that the presence of substantial amounts of selenile in rat liver subcellular organelles is dependent on the presence of vitamin E in the diet of the animals. In the present communication, further studies on the selenide of rat liver smooth endoplasmic reticulum will be presented. It will be shown that the inductive effect of phenobarbitone on the microsomal drug-metabolizing enzyme system of normal rats is accompanied by a large increase in the uptake of selenium and its conversion to selenide; when vitamin E is withdrawn from the diet, this effect cannot be demonstrated.

Regulation of long chain fatty acid activation in heart muscle. J.F. Oram, J.I. Wenger and J.R. Neely (Dept. of Physiol., Milton S. Hershey Med. Ctr., Penn. State Univ., Hershey, Penn. 17033). *J. Biol. Chem.* **250**, 73–8 (1975). Regulation of fatty acid activation was studied in whole tissue homogenates of rat heart. The palmityl-CoA synthetase activity was proportional to the fatty acid to albumin ratio in the incubation medium with maximal activity occurring at a molar ratio of about 5. Heart muscle has about twice as much carnitine as liver but in both tissues 100% of whole tissue carnitine was located in the cytosolic space. The ratio of carnitine to CoA-SH in the cytosolic space was estimated to be about 100 in heart and 17 in liver. This high ratio in cardiac muscle may function to channel fatty acids toward oxidation rather than toward synthesis of complex lipids.

Radio-enzymic assay of oxo steroids by their reduction with the tritiated form of reduced Nicotinamide-Adenine Dinucleotide. J.K. Norymberski, N. Stoddart and J.B. Wolstenhome (Unit for Endocrine Chem., Dept. of Zool., Univ. of Sheffield, Sheffield S10 2TN, U.K.). *Biochem. J.* **145**, 47–51 (1975). A method of analysis is proposed based on the enzyme-catalysed transfer of tritium from $[^3H]NADH$ to suitable substrates. Its practicability is demonstrated on the examples of oestrone and progesterone with the respective use of the $3\beta,17\beta$- and $3\alpha,20\beta$-hydroxy-steroid oxidoreductase. Specificity is tested by application to the analysis of the plasma of pregnant women and measurement of the $^3H/^{14}C$ ratios on purification of the enzymic reduction products.

Glucogenic and ketogenic capacities of lard, safflower oil, and triundecanoin in fasting rats. R.L. Anderson and R.W. Boggs (The Proctor & Gamble Co., Miami Valley Laboratories, Cincinnati, Ohio 45247). *J. Nutr.* **105**, 185–9 (1975). The glucogenic and ketogenic capacities of lard, safflower oil, and triundecanoin were compared. Rats were fed diets containing 30% of either lard (a ketogenic fat), triundecanoin (a glucogenic fat), or safflower oil (a fat high in linoleic acid). After 61 days, the rats were fasted for 72 hours. Plasma glucose and ketone body concentrations and carcass fatty acid loss were measured during fasting. The lard-fed animals, which lost mostly saturated even-chain length fatty acids during fasting, did not maintain their prefasting plasma glucose levels and became ketotic. The animals that had been fed triundecanoin (which mobilized considerable odd-chain fatty acid) maintained their prefasting plasma glucose levels and did not become ketotic. The animals fed safflower oil (which mobilized massive amounts of linoleic acid) showed even lower levels of plasma glucose and higher levels of ketone bodies than did the animals fed lard. This failure of safflower oil to avert fasting hypoglycemia suggests that linoleic acid is oxidized in a manner more like the saturated fatty acid of lard than like the glucogenic odd-chain fatty acid (undecanoic).

Metabolism of prostaglandins E, A, and C in serum. H. Polet and L. Levine (Dept. of Biochem., Brandeis Univ., Waltham, Mass. 02154). *J. Biol. Chem.* **250**, 351–7 (1975). Three prostaglandin-metabolizing enzymes were detected in human serum. One enzyme was a dehydrase that converted prostaglandin E to prostaglandin A, the second was a prostaglandin A isomerase that converted prostaglandin A to prostaglandin C and the third was a prostaglandin C isomerase that converted prostaglandin C to prostaglandin B. All three were inactivated by sulfhdryl blocking agents. In human serum, only prostaglandin C isomerase had high activity, whereas the two other enzymes had very low activity. In rabbit serum both isomerases were very active, but dehydrase activity could not be detected. Prostaglandin C isomerase activity was also found in crystallized human serum albumin and rabbit serum albumin.

Cholesterol in aqueous solution: Hydrophobicity and self-association. D.B. Gilbert, C. Tanford and J.A. Reynolds (Dept. of Biochem. and Dept. of Med., Duke Univ. Med. Ctr., Durham, N.C. 27710). *Biochem.* **14**, 444–8 (1975). Free energies of transfer of cholesterol monomer from water to organic solvents show that the hydrophobicity of this sterol molecule is significantly less than predicted from hydrophobic surface area considerations. It is suggested that this phenomenon may arise from unusual orientation of water molecules at the surface of the solute. From the direct measurement of the hydrophobic free energy of transfer and comparison with thermodynamic data on micelle formation reported previously we calculate specific attractive interactions between cholesterol monomers in the micelle of 2–4 kcal/mol, which suggests the possibility of self-association (phase separation) in mixed micellar systems such as sterol-lipid complexes.

Effect of the essential oils of garlic and onion on alimentary hyperlipemia. A. Bordia, H.C. Bansal, S.K. Arora and S.V. Singh (Dept. of Med. and Cardiol., Ravindra Nath Tagore Med. Col. and Hosp., Udaipur, Rajasthan (India). *Atherosclerosis* 21, 15–19 (1975). The effect of garlic and onion on alimentary hyperlipemia, induced by feeding 100 g butter, has been studied in 10 healthy subjects. The freshly extracted juice of 50 g of garlic or onion, as well as an equivalent amount of their ether-extracted essential oils, was administered randomly on four different days during a one-week period. Garlic and onion have a significant protective action against fat-induced increases in serum cholesterol and plasma fibrinogen and decreases in coagulation time and fibrinolytic activity. The essential oil fraction, which contains all the taste and odour, exactly duplicated the beneficial effects of whole garlic and onion. It is, therefore, concluded that the active principle of garlic and onion is the essential oil, which chemically is a combination of sulphur-containing compounds, mainly allyl propyl disulphide and diallyl disulphide.

Influence of dietary fats on atherosclerosis, coagulation and platelet phospholipids in rabbits. S. Renaud and P. Gautheron (I.N.S.E.R.M., Unite 63, 22 Avenue du Doyen-Lepine, 69500 Lyon-Bron (France). *Atherosclerosis* 21, 115–24 (1975). Male rabbits were fed for six months diets comprising cholesterol (0.1%) and either butter alone (10%) or butter (5%) plus cacao butter, coconut oil, olive oil, or corn oil (4.5%). These fats could be classified according to their atherogenicity as follows, in decreasing order: butter, olive oil, coconut oil, cacao butter, and corn oil. The severity of the atherosclerotic lesions was correlated with the plasma cholesterol. By contrast, concerning their effect on the recalcification plasma (platelet-rich) clotting time (PCT), these fats could be classified in the following way: cacao butter, butter, coconut oil, olive oil and corn oil. The values of the PCT were significantly correlated with the ratio stearic/linoleic acid in the dietary fats, the clotting activity and the fatty acid composition of the platelet phospholipid fractions examined (phosphatidyl serine + phosphatidyl inositol), but not with the concentration of these fractions in platelets. Butter was the only fat able to induce severe alterations at the same time in coagulation (presumably through an increase in the activity of certain platelet phospholipids), lipemia and arterial wall morphology.

The relationships between the phospholipid pool and the base-exchange reaction in the Ca^{2+}-stimulated incorporation of ethanolamine into brain microsomal phospholipids. A. Gaiti, M. Brunetti and G. Porcellati (Instituto di Chimica Biologica, Facoltà di Medicina, Univ. di Perugia, Policlinico Monteluce, 06100 Perugia, Italy). *FEBS Letters* 49, 361–4 (1975). It has been shown it recent years that a Ca^{2+}-dependent base-exchange system occurs in purified brain microsomes which converts in vitro, at the expense of membrane-bound phospholipids, labelled free ethanolamine, serine and choline into the corresponding phosphoglycerides. Little information has been given, however, about the type of phospholipid which participates in the reaction at the nerve membrane level. The experiments described here are aimed therefore at an examination of the type and degree of exchange that takes place in vitro at the brain microsomal level between endogenous phospholipid and choline, ethanolamine or L-serine, when the microsomal membranes are prelabelled in vitro in their PE either with 1,2-[^{14}C]ethanolamine by the base-exchange reaction or with radioactive CDPE by de novo synthesis of PE. It is shown that different degrees of displacement of the lipid-bound labelled ethanolamine are obtained by the exchange in vitro dependent on the mechanism of prelabelling the PE-containing microsomes. The result points to the existence in brain of at least two biochemically different pools of microsomal PE.

Lipid composition of bovine serum lipoproteins. D. Stead and V.A. Welch (Biochem. Dept., Natl. Inst. for Res. in Dairying, Shinfield, Reading, RG2 9AT, England). *J. Dairy Sci.* 58, 122–7 (1975). The four classes of lipoproteins (one of very low density, two of low density, and one of high density) were isolated from the serum of a lactating Friesian cow. The proportions of protein and of the different lipid classes were determined in each lipoprotein. Triglycerides predominated in the very low density lipoprotein, and cholesteryl esters and phospholipids in the others. The triglycerides of the very low density lipoprotein were richer in oleic acid than were those of the low density lipoproteins but its cholesteryl esters were relatively poorer in linoleic and linolenic acid than were those of any of the others. Phytanic acid (3,7,11,15-tetramethylhexadecan-1-oic acid) was in all lipoproteins except those of very low density; it was not in cholesteryl esters but was abundant in triglycerides, particularly in those of the low density lipoproteins. Hydrolysis of the triglycerides of very low density lipoprotein with pancreatic lipase showed that 82% of their stearic acid was esterified to the 1- and 3-positions of glycerol and that 64% of their palmitic acid was esterified to the 2-position.

Effects of intraruminal and intra-abomasal additions of cod-liver oil on milk fat production in the cow. J.A. Pennington and C.L. Davis (Dept. of Dairy Sci., Univ. of Ill., Urbana 61801). *J. Dairy Sci.* 58, 49–55 (1975). Four Holstein cows were used in a modified switchback design to show the effect on milk-fat synthesis of (1) control diet, (2) control diet plus 225 g/day of cod-liver oil in rumen, and (3) control diet plus 225 g/day of cod-liver oil in abomasum. Mean milk yield (kg/day), fat production (kg/day), and milk-fat percentage were (1) 21.87, .79, 3.63; (2) 22.99, .70, 3.05; and (3) 23.02, .75, 3.28. Compared to the post-treatment control period, only one cow decreased in milk-fat percentage on 3 while all cows decreased in milk-fat percentage on 2. Proportions of carbons 16:0, 16:1, 18:0, 18:1, 18:2, and *trans*-monoene fatty acids of the milk fat were (1) 30.31, 3.24, 10.15, 30.48, 2.59, 7.91; (2) 29.23, 3.92, 6.48, 30.65, 3.44, 26.37; and (3) 26.30; 3.72, 10.56, 30.10, 2.96, 9.84. Proportions of rumen volatile fatty acids were not significantly affected by treatment. Proportions of carbons 16:0, 18:0, 18:1, 18:2, and 18:3 fatty acids in the rumen ingesta were (1) 17.28, 47.92, 21.71, 10.59, 2.46; (2) 19.55, 25.90, 37.21, 11.97, 5.39; and (3) 16.90, 50.80, 19.66, 9.11, and 3.23. Fatty acid composition of blood-serum phospholipids were affected by treatment.

Biohydrogenation of sterols and fatty acids by the intestinal microflora. H. Eyssen and G. Parmentier (Rega Inst., Univ. of Leuven, 10 Minderbroedersstraat, B-3000 Leuven, Belgium). *Am. J. Clin. Nutr.* 27, 1329–40 (1974). Bacteria in the cecum and the large intestine transform endogenous and exogenous sterols and fatty acids into a variety of metabolites. Biohydrogenation of unsaturated fatty acids and 5β-H reduction of Δ^5-3β-hydroxy steroids are typical metabolic activities of the indigenous microflora in the intestine of the rat and several other mammalian species. The microorganisms responsible for these transformations all are strict anaerobes. A Δ^5-steroid-reducing bacterium has been isolated in pure culture. The isolation of an octadecenoic acid-producing microorganism will be described in this paper. Stearic acid-producing bacteria have been shown to be present in the intestine of conventional rats, but have not yet been isolated in pure culture. Fatty acid-reducing microorganisms also have been isolated from the rumen. In this paper we present a review of our investigations on the biohydrogenation of sterols and C-18 fatty acids by the intestinal microflora of the rat.

Simplified method for the long-term study of turnover and body masses of cholesterol by input-output analysis. P. Samuel and S. Lieberman (Rockefeller Univ., New York, N.Y. 10021). *Am. J. Clin. Nutr.* 27, 1214–20 (1974). A simplified, labor-saving procedure is proposed for the long-term follow-up of plasma cholesterol specific activity decay curves, using computerized input-output analysis. During the initial 2 weeks after tracer injection, frequent (4 to 6 or more) blood samples are obtained. For the following 40 weeks blood is taken only once a month. During the last 4 weeks of the experiment, blood samples are obtained weekly or twice weekly (method A). Seventeen patients were studied for 50 to 66 weeks. When the computer used data points obtained only every fourth week (in the midsection of the curves), the mean error incurred in the parameters of the analysis (compared to the full analysis of weekly data points) were: I_T (sum of absorbed dietary and biosynthesized cholesterol); 2.6% smaller; M_a (rapidly exchangeable mass of cholesterol): unchanged; M (minimum value for total exchangeable mass of cholesterol): 5.9% smaller: M-M_a (remaining mass of cholesterol): 9.5% smaller. Another simplified method (method B) consists of weekly follow-up of the decay of specific activity for the initial 12 weeks after tracer injection. During the following (circa) 30 weeks no blood samples are obtained for 4 weeks. When the results of this procedure were compared to full curve analyses the mean differences were: I_T: 2.1% smaller; M_a: unchanged; M: 9.3% smaller; M-M_a: 14.9% smaller.

STRUCTURE AND SYNTHESIS OF MILK FAT XI. EFFECTS OF HEPARIN ON PATHS OF INCORPORATION OF GLUCOSE AND PALMITIC ACID INTO MILK FAT. R.D. McCarthy and G.D. Coccodrilli, Jr. (Lipids Lab., Dept. of Dairy Sci., Penn. State Univ., University Park 16802). *J. Dairy Sci.* **58**, 164–8 (1975). Intravenous injection of heparin increases lipoprotein lipase activity of circulating serum presumably by removing the enzyme from its location on the capillary endothelium. The incorporation of carbon-14 uniformly labeled glucose and carbon-14 1-labeled palmitic acid into fractionated milk fat triglycerides was studied in both normal and heparin treated lactating goats. The objective was to remove lipoprotein lipase from the mammary gland capillaries and to contrast normal milk fat synthesis with a situation presumed to cause the gland to be solely dependent on the phosphatidic acid pathway. The studies with labeled glucose indicated that under normal conditions there are two sources of milk glyceride glycerol; while following heparin injections, there is a single glycerol pool providing most of the glyceride glycerol. The investigations with labeled palmitic acid indicated that under normal conditions there are two sources of palmitic acid coming from the blood which enter nonequilibrating cellular pools. Palmitic acid from both pools is available for triglyceride synthesis. Following heparin injections there appears to be a common intracellular pool of pre-formed palmitic acid derived from the blood. The data indicate that lipoprotein lipase operating on blood triglycerides yields a 2-monoglyceride which subsequently enters the gland and is utilized for milk fat synthesis.

EFFECT OF α-RETINYL ACETATE ON GROWTH OF HAMSTERS FED VITAMIN A-DEFICIENT DIETS. G.H. Clamon, M.B. Sporn, J.M. Smith and W.R. Henderson (Lung Cancer Branch, Natl. Cancer Inst., Bethesda, Maryland 20014). *J. Nutr.* **105**, 215–9 (1975). The capacity of the α isomer of retinyl acetate to support growth in hamsters fed a vitamin A-deficient diet was assessed over a 40-fold dose range. Although decreased relative potency of the α isomer, as compared with the β isomer, was found, sustained weight gain and survival for 6 months were achieved with a weekly intraperitoneal dose of 300 μg of the α isomer. An intraperitoneal dosage of α-retinyl acetate resulted in greater activity than an oral dosage.

SOURCES OF CHOLESTEROL IN THE INTESTINAL LYMPH IN RATS FED A CHOLESTEROL-FREE DIET (38448). K.J. Ho and C.B. Taylor (Dept. of Pathology, Univ. of Ala. in Birmingham, Med. Ctr., Birmingham, Ala. 35294). *Proc. Soc. Exp. Biol. Med.* **147**, 826–9 (1974). The intestinal lymphatics were sussessfully cannulated in 10 adult male Sprague-Dawley rats fed a cholesterol-free diet; 40–60 days prior to cannulation, these animals received an intracardiac injection of a single dose of cholesterol-4-^{14}C. The intestinal lymph was collected over a period of 6 hr. The animals were then sacrificed. The cholesterol and its specific activity in plasma, liver, and mucosa of various segments of gastrointestinal tract were measured and the sources of cholesterol in the intestinal lymph were determined by comparison of their relative specific activities. Of the total cholesterol in the intestinal lymph, 0.491 μM/hr, 81.5% or 0.398 μM/hr was derived from exchangeable cholesterol in the intestine considered to be the same pool as the plasma cholesterol, and 18.5% or 0.088 μM/hr was synthesized *de novo* in the intestinal mucosa. The latter accounted for 22% of the daily turnover of the plasma cholesterol.

LIPID SOLUBILITY AND DRUG PENETRATION OF THE BLOOD BRAIN BARRIER (38444). W.H. Oldendorf (Res. and Neurol. Services, Wadsworth Hosp. Ctr., Vet. Administration, Los Angeles, Calif. 90073). *Proc. Soc. Exp. Biol. Med.* **147**, 813–6 (1974). Lipid/water partition coefficients of 19 radiolabeled drugs were correlated with uptake by brain during a single microcirculatory passage following carotid arterial injection. Uptake was measured relative to a simultaneously injected diffusible reference. When the lipid/water partition coefficient was greater than about 0.03 a substantial fraction of the drug penetrated the blood-brain barrier and for most drugs above this range, uptake was essentially complete. These data suggest there is probably little reason to greatly exceed this degree of lipid solubility when designing drugs for blood-brain barrier penetration and central nervous system effects.

COLESTIPOL THERAPY OF HYPERLIPIDEMIA IN MAN (38419). B.A. Sachs and L. Wolfman (Dept. of Med., Montefiore Hosp. and Med. Ctr., Bronx, N.Y. 10467). *Proc. Soc. Exp. Biol. Med.* **147**, 694–7 (1974). Colestipol, a bile acid-sequestrant anion exchange resin, was given in doses of 15 g/day to 18 patients with familial hyperlipoproteinemia, and its effect compared to seven patients with this disorder treated with placebo. No alterations in diet were made. The colestipol significantly lowered plasma cholesterol and phospholipid levels and produced little alteration in triglyceride concentration. The resin had good patient acceptability and appeared to be an effective addition to methods available for the treatment of hyperlipoproteinemia, particularly type II.

EFFECTS OF ARACHIDONIC ACID ON SYSTEMIC ARTERIAL PRESSURE, MYOCARDIAL CONTRACTILITY AND PLATELETS IN THE DOG (38408). J.C. Rose, M. Johnson, P.W. Ramwell and P.A. Kot (Dept. of Physiol. and Biophysics, Georgetown Univ. Med. Ctr., Washington, DC 20007). *Proc. Soc. Exp. Biol. Med.* **147**, 652–5 (1975). The bisenoic prostaglandin precursor, arachidonic acid (AA), in a single dose intravenously, produced a marked vasodepressor response in dogs, and a weak and variable effect on myocardial contractility. This response differed from the vasodepressor effect of PGE$_2$ in that the onset of effect was delayed (15 sec for AA, 4.5 sec for PGE$_2$) and PGE$_2$ always caused a pronounced increase in myocardial contractility. Arachidonic acid caused thrombocytopenia and increased aggregability of platelets. All AA effects were inhibited by aspirin. The monoenoic prostaglandin precursor, dihomo-γ-linolenic acid, in doses equivalent to that of AA, had no effects. The data suggest that AA exerts its effects through conversion to an intermediate in the biosynthesis of PGE$_2$ and not PGE$_2$ itself.

EFFECT OF VITAMIN E ON δ-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY IN WEANLING RABBITS WITH CHRONIC PLUMBISM. R.S. Bartlett, J.E. Rousseau, Jr., H.I. Frier and R.C. Hall, Jr. (Dept. of Nutr. Sci., Univ. of Conn., Storrs, Conn. 06268). *J. Nutr.* **104**, 1637–45 (1974). Lead inhibits several enzymes in the heme synthesis pathway with δ-aminolevulinic acid dehydratase (ALAD) being the most sensitive. Vitamin E has a stimulatory effect on heme synthesis, apparently through its action on ALAD and on δ-aminolevulinic acid synthetase (ALAS). To study the possible effects of vitamin E in alleviating lead toxicity, rabbits were fed for 12 weeks a basal ration plus lead, either 25 mg/kg body weight/day, or no lead, and one of four supplementary *dl*-α-tocopheryl acetate intakes equivalent to either 0,1,3, or 9 mg of *dl*-α-tocopherol/kg body weight/day. Equalized feeding of the basal ration was employed. Body weight was unaffected. In the lead-fed groups, plasma tocopherol was higher, whole blood lead concentration twice and liver lead four times greater. The concentration of liver lead increased 8 μg/100 g of fresh liver for each 10% increase in dietary tocopherol for those rabbits receiving vitamin E and lead. ALAD activity was depressed by lead; however, its activity was unaltered by vitamin E. Hematocrit levels were found to be lower in the plus-lead groups, incidence of basophilic stippling of erythrocytes greater, and urinary δ-aminolevulinic acid (UALA) and porphobilinogen greater. In rabbits fed lead, UALA concentration was increased by 1.02 mg ALA/100 ml for each 10% increase in vitamin E. Based upon these findings, it is suggested that vitamin E may have had an effect on the enzyme ALAS, rather than on ALAD.

CONCURRENT AND SUBSEQUENT SERUM CHOLESTEROLS OF BREAST- AND FORMULA-FED INFANTS. G. Friedman and S.J. Goldberg (Dept. of Pediatrics, Univ. of Ariz., Col. of Med., Tucson, Ariz. 85724). *Am. J. of Clin. Nutr.* **28**, 42–5 (1975). Animal studies have suggested that feeding a high-cholesterol diet early in life will reduce serum cholesterol of later life. We tested this hypothesis by comparing the serum cholesterol of breast-fed children and bottle-fed children. The former type of feeding has a cholesterol content 26–52 mg of cholesterol/8 ounces, and the latter type of feeding has 4 mg/8 ounces. Serum cholesterols were determined by the Wybenga technique. At the end of 4–6 months, both groups were switched from their original feeding to skim milk. The parents were counseled to avoid high-cholesterol content foods such as eggs and to limit the intake of the more moderate cholesterol dietary forms. Our objective was to achieve a cholesterol intake of 200 mg/day for both groups. The serum cholesterol was evaluated at the following ages: 2–4 months, 12 months, 18–24 months, and 15–19 years. The same child was not necessarily followed longitudinally. Our results indicate that breast-fed children had significantly higher serum cholesterols than bottle-fed children at ages 2–4 months and 12 months. After 1 year, no significant difference in serum cholesterol was found when the two groups were compared. We concluded that no protection against high serum cholesterol in later life occurred as the result of initial feedings high in cholesterol.

Biogenesis of mitochondria. Phospholipid synthesis in vitro by yeast mitochondrial and microsomal fractions. G.S. Cobon, P.D. Crowfoot and A.W. Linnane (Dept. of Biochem., Monash Univ., Clayton, Vic. 3168, Australia). *Biochem. J.* **144,** 265–75 (1974). The ability *in vitro* of yeast mitochondrial and microsomal fractions to synthesize lipid *de novo* was measured. The major phospholipids synthesized from *sn*-[2-^{3}H]glycerol 3-phosphate by the two microsomal fractions were phosphatidylserine, phosphatidylinositol and phosphatidic acid. The mitochondrial fraction, which had a higher specific activity for total glycerolipid synthesis, synthesized phosphatidylglycerol, phosphatidylethanolamine, phosphatidylinositol, phosphatidylserine and phosphatidic acid, together with smaller amounts of neutral lipids and diphosphatidylglyrerol. Phosphatidylcholine synthesis from both S-adenosyl[*Me*-^{14}C]methionine and CDP-[*Me*-^{14}C] choline appeared to be localized in the microsomal fraction.

Edible oils having hypocholesterolemic properties. R.J. Jandacek (Procter & Gamble). *U.S. 3,865,939.* A food composition having hypocholesterolemic activity comprises at least one edible oil homogeneously mixed with 2–6% of a plant sterol and 0.5–15% of a solubilizing compound selected from the group consisting of saturated and unsaturated fatty acids having 6–18 carbon atoms, monoesters of these fatty acids with polyhydric alcohols, and alkanols having 6–18 carbon atoms.

Nutritive content of college meals. M.A. Walker and L. Page (Consumer and Food Economics Inst., ARS, USDA, Hyattsville, Md.). *J. Am. Dietetic Assoc.* **66,** 146–52 (1975). Two samples, each composed of two breakfasts, two noon meals, and two evening meals for seven consecutive days, were collected from fifty colleges. Laboratory analyses were made on the composited meals for: total solids, crude fat, total nitrogen, crude fiber, vitamin A, beta carotene, vitamin D, thiamine, riboflavin, niacin, folacin, vitamin B$_6$, and vitamin B$_{12}$. The proximate compositions varied considerably; the percentages of calories derived from protein ranged from 11 to 18; from fat, 37–48; and from carbohydrate, 37–49. The meals met or exceeded the RDA's for 19–22 year olds for protein, vitamin A, riboflavin, and niacin in all schools. About ⅓ of the meals were below the allowances for vitamin D; 40% for vitamin B$_{12}$; 60% for thiamine; and 75% for folacin and vitamin B$_6$.

Vitamin E adequacy of vegetable oils. J.G. Bieri and R. Poukka Evarts (Nat. Inst. of Arthritis, Metabolism, and Digestive Diseases, Bethesda, Md.). *J. Am. Dietetic Assoc.* **66,** 134–9 (1975). Young male rats were fed diets containing 20% fat in the form of soybean oil (E:PUFA = 0.60), corn oil (0.49), safflower oil (0.35), or hydrogenated shortening (0.83) made predominantly from soybean oil and their vitamin E status assessed for 27 weeks. The alpha and gamma tocopherol contents of these samples were, respectively, soybean oil, 15, 108 mg/100 g; corn oil, 22, 76 mg/100 g; safflower oil, 26, 2 mg/100 g; and the shortening, 16, 81 mg/100 g. On the bases of growth rate, *in vitro* red cell hemolysis, plasma creatine phosphokinase activity, and testicular development, soybean oil, corn oil, and the shortening provided adequate vitamin E. Rats fed safflower oil had slight red cell hemolysis but were normal in other respects. When the tocopherols in corn oil were reduced by 50%, by dilution with stripped oil, vitamin E status still appeared normal. Tissue levels of alpha and gamma tocopherols were determined in all groups. Limitations of specifying a fixed dietary E:PUFA ratio are discussed.

• Edible Proteins

Edible protein fibers based on casein. W.J. Lecluse (Cooperative Condensfabriek "FRIESLAND"). *U.S. 3,865,959.* A method for producing an edible fibrous protein product comprises (a) preparing an aqueous solution of casein in dilute sodium hydroxide; (b) shaping the solution into fibers; (c) contacting the fibers with an aqueous solution of at least one compound selected from the group consisting of calcium gluconate and calcium lactate until a portion of the sodium ions in the fibers is replaced by calcium ions; and (d) contacting the fibers with an aqueous solution of phosphate ions.

Process for obtaining full fat oilseed protein beverages. G.C. Mustakas (U.S. Secy. of Agriculture). *U.S. 3,865,802.* The process comprises the following steps: (a) suspending full fat oilseed flour in water at 150–212F, pH 3.5–4.5, for a time sufficient to inactivate lipoxygenase enzyme; (b) cooling the suspension and holding it at 50–75F for a time sufficient to precipitate lipid-protein present in the flour; (c) separating the precipitated lipid-protein from the resulting liquid whey; (d) resuspending the precipitated lipid-protein in water at pH about 9; (e) heating the suspension to 205–212F for 1–5 minutes; (f) cooling the suspension to 70–75F and adjusting the pH to about 7; (g) extracting the fat contained in the neutralized suspension from step (f) with a suitable solvent; and (h) removing the water from the defatted suspension from step (g).

Method for preparing protein food product. T. Sakita and G. Taguchi (Nisshin Seiyu Kabushiki Kaisha). *U.S. 3,864,502.* A spinning solution is prepared by mixing a protein curd with an alkaline solution in an inline mixer. Part of the mixture is recycled to the inlet side of the inline mixer which is under pressure. The pressure is then released and the mixture passed into an open tank after which it is filtered and passed through a spinnerette.

Process for producing soybean food paste. D. Fukushima, T. Hattori, and A. Arai (Kikkoman Shoyu Co.). *U.S. 3,865,956.* The process comprises dry roasting soybeans or defatted soybeans having a moisture content of 17% or less at 130–300C, atmospheric pressure, for 4 seconds to 30 minutes; pulverizing the beans to 200 microns or less; mixing the resulting powders with an edible fat or oil which is solid or semi-solid at room temperature; and kneading the resulting mixture.

Treatment of soybean spent solubles by means of yeast cultivation. H. Sugimoto (Central Res. Lab., Kikkoman Shoyu Co., Ltd., Noda-shi, Chiba-ken, Japan). *J. Food Sci.* **39,** 934–8 (1974). The yeast cultivation on soybean spent solubles derived during the preparation of soybean proteins by means of a combination of isoelectric precipitation and heat-coagulation, was investigated in order to eliminate biological or chemical oxygen demand (BOD or COD) and to produce single-cell proteins (SCP) simultaneously. Two yeasts especially suitable for this purpose were employed and in one case 97% of carbohydrates and nearly 90% of organic acids in the solubles were consumed after 60 hours of aerobic cultivation. In this case, the yeast cells, containing about 34% crude protein, were harvested with a recovery of 29%. 84% of BOD or 80% of COD of the spent solubles was removed through this process. The results indicate the possibility of a practical preliminary treatment of the spent solubles, and simultaneously producing SCP from a cost-free raw material.

Some factors influencing gelation and stability of soy protein dispersions. J.N. Ehninger and D.E. Pratt (Dept. of Foods & Nut., Purdue Univ., West Lafayette, IN 47907). *J. Food Sci.* **39,** 892–6 (1974). Factors which influence gelation and stability of soy protein dispersions were investigated. The viscosity tended to increase exponentially as the concentration increased. The exponential change in viscosity was pH dependent with little thickening occurring below pH 5.5. At pH 6.5 and 6.0, smooth consistent gels were obtained. Stability of the dispersions increased as the viscosity increased. The addition of 5% sucrose tended to slightly increase viscosity of sodium soy proteinate dispersions. However, dextrose increased viscosity of sodium soy proteinate dispersions when 10% was used. The influence of sucrose and dextrose on viscosity of dispersions was markedly affected by pH. The higher level of NaCl (0.2M) decreased the viscosity and stability of both isolates.

Whole soybeans as a means of increasing protein and calories in maize-based diets. R. Bressani, B. Murillo, and L.G. Elias (Div. of Agr. & Food Sci., Inst. of Nutr., Central Am. and Panama, Carretera Roosevelt, Zone 11, Guatemala City, Guatemala, C.A.). *J. Food Sci.* **39,** 577–80 (1974). One factor responsible for protein-calorie malnutrition in children is the deficiency of good quality protein and calories in their habitual diets. Present studies were conducted to improve both these qualities by the addition of soybeans to maize before studies were conducted to improve both these qualities by the addition of soybeans to maize before processing. Tortillas made from 85% maize and 15% soybeans (processed together by the lime-cooking treatment used for maize) had a higher protein and calorie content than the maize control and was very acceptable in both appearance and taste. Higher levels of soybean were tested and it was found that over 28% would no longer improve protein quality and yields of the resultant products decreased. The mixture of 72% maize and 28% soybean gave a food preparation with 18% protein, 10% fat and a high-protein quality as measured by its Protein Efficiency Ratio.

AN ENZYMATIC-CHEMICAL METHOD FOR EXTRACTION OF COTTONSEED PROTEIN. E.A. Childs (Dept. of Food Technol. & Sci., Univ. of Tenn., Knoxville, TN 37901). *J. Food Sci.* 40, 78–80 (1975). Experiments were undertaken to improve the extraction of protein from heat-treated cottonseed meal by treating the meal with proteolytic enzymes. A two-stage chemical technique (water and 0.075% NaOH) extracted approximately 15% of the cottonseed meal protein. Papain treatment did not markedly increase the amount of protein extracted but trypsin treatment increased protein extraction fivefold. The increased efficiency of trypsin resulted from the increased amounts of protein extracted in the NaOH fraction. Greater than 50% of cottonseed protein could be extracted from meal held at 204C for 30 min.

PROTEIN QUALITY AND SUPPLEMENTARY VALUE OF COTTONSEED FLOUR. M.L. Harden and S.P. Yang (Dept. of Food & Nutr., College of Home Ec., Texas Tech Univ., Lubbock, TX 79409). *J. Food Sci.* 40, 75–7 (1975). Amino acid analyses and rat growth studies were used to determine the quality of proteins in glanded, glandless and liquid cyclone processed (LCP) cottonseed flours using casein and soybean oil meal as references. The cottonseed proteins contained approximately the same amount of methionine and threonine but slightly less lysine as compared to soybean and casein. The greatest deviation in net protein utilization (NPU) for all diets occurred at the 10% protein level, while NPU values varied slightly at 20% protein levels. Young rats fed the glanded cottonseed flour died within 5 days. When LCP and glandless cottonseed flours were substituted for 18.8% of wheat flour in a yeast bread, the protein content increased from 10.48% to 19.06% and 21.13%, respectively. Amino acid data and NPU value showed that LCP and glandless cottonseed flours made significant improvement to the nutritive value of a wheat flour yeast bread.

IMPROVEMENT OF SHELF LIFE OF PARTIALLY DEFATTED PEANUTS BY INTROMISSION OF NITROGEN INTO THE INTERSTICES OF THE PEANUTS. J. Pominski, H.M. Pearce Jr., H.L.E. Vix and J.J. Spadaro (USDA Southern Reg. Res. Ctr., ARS, New Orleans, LA 70179). *J. Food Sci.* 40, 192–4 (1975). Two procedures were devised to improve the shelf life of partially defatted peanuts (over 50% oil removed) by introducing nitrogen into the porous interstices of the defatted peanuts after roasting. One method consisted of cooling oil-roasted defatted peanuts in nitrogen and holding the peanuts under nitrogen until canned under vacuum; and the second method by cooling the oil-roasted defatted peanuts in air and holding the peanuts under nitrogen until canned under vacuum. Shelf-life studies showed that partially defatted peanuts with nitrogen in the interstices have longer shelf life than those containing air.

PROTEIN-LIPID FILMS AS MEAT SUBSTITUTES. L.C. Wu and R.P. Bates (Food Sci. Dept., Univ. of Florida, IFAS, Gainesville, FL 32611). *J. Food Sci.* 40, 160–3 (1975). Techniques have been developed for the formation, recovery and utilization of protein-lipid films. Manipulation of the films derived from a variety of pure and mixed protein-lipid systems—soybean, soy protein isolate, peanut, glandless cottonseed and milk—resulted in textured, high protein food ingredients suitable as meat extenders and substitutes. Important parameters influencing the organoleptic properties of the film products are protein source and content, protein:lipid ratio, moisture content, pressure, temperature and film alignment during fabrication. By varying conditions, a range of formulated products possessing organoleptic properties similar to animal protein foods can be produced. Fabrication of film foods represents an alternative process for producing textured protein foods.

PREPARATION AND EVALUATION OF SOY-FORTIFIED GLUTEN-FREE BREAD. G.S. Ranhotra, R.J. Loewe and L.V. Puyat (Nutrition Lab., American Inst. of Baking, Chicago, IL 60611). *J. Food Sci.* 40, 62–4 (1975). Studies were undertaken to develop a formula for the production of gluten-free bread for individuals suffering from gluten-intolerance. The addition of 20–40% soy protein isolate to unmodified wheat starch not only raised the protein content of the resultant breads substantially but improved the physical characteristics as well. These breads had good volume and appearance, exhibited excellent internal characteristics, compared very favorably with wheat bread in taste and flavor and were inexpensive to produce. All starch breads were appreciably higher in moisture content than the wheat bread. Protein quality as assessed by rat-feeding studies showed that the protein efficiency ratio of soy-fortified starch-breads was appreciably higher than that of the wheat bread.

• Drying Oils and Paints

WATER-DILUTABLE COATING COMPOSITIONS CONTAINING MALEINIZED OIL AND RESOLE. M.R. Rifi (Union Carbide Corp.). *U.S. 3,867,323.* The composition, which is thinnable with water and contains free carboxyl groups, is the reaction product of: (a) an adduct of (i) an alpha, beta ethylenically unsaturated carboxylic acid anhydride, and (ii) a drying or semidrying composition comprising at least one ethylenically unsaturated fatty acid or an ester thereof with a polyhydric alcohol, a compound having at least one vicinal epoxide group, or an epoxy alcohol; and (b) a resole containing methylol groups. The adduct and the resole are chemically bonded through ester groups resulting from the reaction of the methylol groups with the anhydride groups.

UTILIZATION OF BY-PRODUCTS OF LAC INDUSTRY. R.K. Banerjee, A.K. Ghosh and S.C. Sengupta (Indian Lac Res. Inst., Namkum, Ranchi). *Paintindia* 24(11), 19–21 (1974). During the refining of sticklac to seedlac and seedlac to shellac, unavoidable by-products such as wash water containing sufficient amount of lac, wax and dye, molamma, kunhi, kiri, etc. are obtained. The latter by-products contain 50–75% of lac along with wax and other impurities. The various technics developed for economical reclamation of the valuable end products from the by-products and their suitable utilization are reviewed. It is felt that the recovery and proper utilization of these will consequently add to the overall economy of the lac industry especially when the demand for the lac has increased and the total production is reduced.

BNSL: CHEMISTRY AND UTILIZATION. S.P. Potnis and I.S. Aggarwal (Univ. Dept. of Chem. Technol. Bombay 19). *Paintindia* 24(11), 16–8 (1974). About 500 tons of bhilawan nuts are collected from the forest of Madhya Pradesh in India. The pericarp of the nut contains about 32% black, corrosive and vesicant liquid (BNSL), the bhilawan nut-shell liquid. Various methods of extraction of BNSL from the nut are outlined. The solvent extracted BNSL contains about 46% of a catechol derivative, Bhilawanol, having a long unsaturated carbon side chain ($C_{15}H_{27}$) in three positions. The rest of the tarry material is mostly a mixture of high boiling phenols and hydrocarbons. Various methods of converting BNSL into resins are summarized.

CALCULATION OF THE COMPOSITION OF OIL ALKYDS. K. Hájek, J. Eichler and J. Kitzler (Res. Inst. for Synthetic Resins and Varnishes, Pardubice/CSSR). *Farbe u. Lack* 81(1), 26–32 (1975). The mode of calculation discussed is based on Patton's formulations. According to these the composition of oil alkyds may be detailed in oil length, excess of polyols and gelling constant. The suggested procedure makes the calculation possible also if a practically unlimited number of reaction components is present.

WATER-BASED STOVING ENAMELS FROM SATURATED POLYESTER RESINS. J. Dörffel (Central Res. and Devpt. of Chem. Werke Hüls AG, Marl.). *Farbe u. Lack* 81(1), 10–5 (1975). Acidic polyester resins which may be used for water-based paints may be prepared from monomers of suitable composition by one-stage condensation of the polyester units or in two stages by addition of polycarboxylic anhydrides to hydroxydic resins. The polyesters of different origins show rather similar gel chroratograms and result after cross-linking with aminoplasts in coats of the same quality. The viscosity properties of the resins are investigated on model polyesters after thinning with water. The effects of type and amount of the auxiliary solvent, the neutralizing agent and the resin composition are discussed. Further the storage stability of aqueous polyester solutions is investigated in its dependency from the diols used for the preparation of the resins. Considering the facts established a paint resin thinnable with water was developed which showed high storage stability and which may be used with only small levels of auxiliary solvents in sprayable paints. A comparison of coats obtained with this resin and coats with high-quality oil-free alkyd resins shows that the films obtained with the water-thinnable paint are equivalent to films of conventional materials.

• Detergents

Motion of a spin probe in hexagonal and lamellar potassium palmitate. J. Brotherus and P. Tömälä (Dept. Biochem. and Dept. Wood and Polymer Chem., U. of Helsinki, Finland). *Colloid & Polymer Sci.* 252(7/8), 543–6 (1974). Nitroxyl radical Tempol dissolved in the hexagonal liquid-crystalline phase of potassium palmitate experienced a homogeneous time averaged environment. In the lamellar phase the radicals were distributed in two environments of different solvent polarities, which was demonstrated by simulation of the spectra. In both phases the nitroxyl probes were able to tumble comparatively freely (the rotational correlation time was 0.15–0.9 ns).

Phase equilibria in the water-dodecane-pentaoxyethylene dodecylether system. F. Harusawa, S. Nakamura and T. Mitsui (Shiseido Labs., Yokohama, Japan). *Colloid & Polymer Sci.* 252(7/8), 613–9 (1974). Phase diagrams have been determined as a function of temperature for the following binary and ternary systems: water-pentaoxyethylene dodecylether system and water-dodecane systems containing 10, 20, 30, and 40 wt. % of pentaoxyethylene dodecylether. X-ray diffraction examinations revealed that the two lyotropic mesophases (neat phase and middle phase) are formed in the binary system. In the ternary systems, the mutual solubility of water and oil increases remarkably at a medium temperature near the phase inversion temperature in emulsion. The marked increase in mutual solubility is illustrated in the phase diagram as a narrow transparent region which has been regarded as a micro-emulsion. The electrical conductance, viscosity and type of flow behavior of the ternary system vary with temperature, corresponding to the structural changes of the system. The rheograms of the ternary systems have exhibited various types of flow behavior such as Newtonian flow, pseudoplastic hysteresis and dilatant hysteresis. Besides, differential scanning analysis has revealed endothermic peaks corresponding to phase transitions.

Analysis of fluorescent whitening agents in U.S. home laundry detergents. J. Schulze, T. Polcara and P. Stensby (Ciba-Geigy Corp., Greensboro, N.C. 27409). *Soap/Cosmetics/Chemical Specialties* 50(11), 46–52 (November, 1974). A thin-layer chromatographic procedure, applicable to the 10 fluorescent whitening agents (FWA) commonly used in U.S. household detergents, is described. The FWA's are extracted from the detergent using a mixture of acetone/water/ammonium hydroxide (90/10/5) and separated on TLC plates using suitable solvent systems. Following elution, the FWA's are identified by comparison with standards. When desired, quantitative determination can be achieved by visual comparison of the TLC spots with known amounts of the standards or by utilization of a fluorescence spectrophotometer equipped with a TLC plate scanning accessory.

Bleach additives for detergent systems. P.M. Dibello, R.J. Fuchs and P.P. Carfagno (FMC Corp.). *Soap/Cosmetics/Chemical Specialties* 50(8), 46–55 (August, 1974). The chemical and physical properties, use conditions and performance requirements for chlorinated isocyanurates and active oxygen compounds in household, industrial and institutional bleaches, sanitizers and detergents are examined. The dry storage stability of chlorinated isocyanurates with common inorganic detergent and bleach components is related to the hygroscopicity of the components. High temperature compatibility tests with organic compounds indicate that sodium dichloroisocyanurate dihydrate (available chlorine 56%) is much more stable than anhydrous sodium dichloroisocyanurate (available chlorine 63%), potassium dichloroisocyanurate (available chlorine 59%), or the double salt: 4 moles potassium dichloroisocyanurate: 1 mole trichloroisocyanuric acid (available chlorine 66%). These findings suggest potential applications for isocyanurates in dishwasher compounds, scouring powders, chlorinated cleaners and sanitizers, and chlorine dry bleaches. For household detergents, bundle test data indicated that sodium carbonate peroxide or sodium perborate gave significant improvement over no bleach at use levels as low as 15 ppm active oxygen. Current work is centered on developing activators for improving the performance of peroxygens at temperatures under 120F. Some compounds appear promising, but nothing has been developed which has gained widespread commercial acceptance.

Superfatted soap. K. Tomlinson (Colgate-Palmolive Ltd., Salford, G.B.). *Rev. Franc. Corps Gras* 20, 697–700 (1973). Starting from the idea that the consumer of toilet soap would like improved lather, the author describes such improvement of soap, also methods and apparatus allowing measurement this characteristic. Consumer panels confirmed analytical data but consumers do not confirm their choice, though it is established they are able to recognize superfatted soap.

Some technical aspects of soap perfumery. P. Grosso (Givaudan S.A., Vernier, Geneve). *Rev. Franc. Corps Gras* 20, 615–23 (1973). The creation of a successful perfume for soap depends first of all on knowing the interaction of each essential constituent of the soap base on each of the synthetic and natural products entering into the perfumery composition and on the finished perfume itself. Simple examples studied by odor and by G.L.C. show the influence on the perfume of the soap base. The perfume's stability in soap base can be studied by an olfactive panel or by chemical analysis. Chemical analysis can be carried out rapidly by the technique of extracting the perfume from its support and by the technique of head space analysis. Both methods and also the method which consists of introducing the perfume directly into the G.L.C. without extraction are described and discussed.

NMR—A new instrumental tool for the analysis of cosmetic ingredients. R. Kaplan and S.F. Laczynski (Avon Products, Inc., Suffern, N.Y. 10901). *J. Soc. Cosmet. Chem.* 25(9), 507–14 (1974). A basic introduction into the theory and quality control applications of a 60 megahertz NMR spectrophotometer is given. Quantitative methods for evaluation of iodine number, ester value, hydroxyl number and moles of ethoxylation on cosmetic raw ingredients are presented. Determination of alcohol-water ratios on finished ingredients are shown to comply with a time-consuming distillation method. Determinates affecting accuracy and precision in compliance with classical wet chemistry tests for the above are also discussed.

The economic future for petrochemicals. J.D. McVey (Ashland Chem. Co., Columbus, O). *Tenside Detergents* 11(5), 266–9 (1974). A review of the present-day position of petrochemicals and a look towards the future, with special reference to surfactant raw materials, in the United States.

Comparison of polarity of organic compounds with reference to their structural influence by tensammetry. S.K. Sharma (Dept. of Chem., Birla Inst. Tech. and Science, Pilani (Rajasthan), India). *Colloid & Polymer Sci.* 252(5), 396–9 (1974). In agreement with calculations based on the DLVO theory of colloid stability, it was found possible to separate two different colloidal species by chemical control of the surface potentials. The materials used in the experiments were (i) quartz and synthetic rutile and (ii) quartz and hematite. The suspensions contained 2.2 wt. % solid and each component had an average particle radius of about 0.1 μm. The quartz had a z.p.c. of about 2, the rutile and hematite 4.5 and 6 respectively. Two regions of selective coagulation were found in both the quartz/rutile and the quartz/hematite system. In each region the hematite or rutile underwent coagulation and the quartz remained stable, while both components retain a negative surface potential. From stability and zeta-potential measurements, calculations were made to determine the values of the effective Hamaker constant of the materials. The results agree within experimental error with other reported values.

The development of phosphate-free detergents in the United States. W.M. Linfield (Eastern Regional Res. Center, Philadelphia, Pa. 19118). *Tenside Detergents* 11(5), 260–6 (1974). The major published American research in the field of phosphate-free detergents is reviewed. Investigations in this area carried out by industry as well as by the Federal Government are discussed. The pertinent literature covers various attempts to develop organic or inorganic phosphate substitutes. The formulation of those detergents which are based upon novel surfactants as well as those formulated from tallow soap, lime soap dispersing agents and builders are discussed in detail.

Synthesis of a surfactant labelled with iodine-131. J. Barycki, P. Mastalerz and R. Tyke (Inst. Organic and Physical Chem., Tech. U., Wroclaw). *Tenside Detergents* 11(5), 258–9 (1974). p-Iodobenzyl cetyl dimethyl ammonium bromide labelled with ^{131}I was prepared starting with p-toluidine and cetyl dimethyl amine. The reaction sequence involved the preparation of labelled p-iodotoluene from p-toluidine, bromination of p-iodotoluene with N-bromosuccinimide and quaternization of cetyl dimethyl amine with p-iodobenzyl bromide. This new surfactant proved to be useful as collector in ion flotation and, when labelled with ^{131}I, enables a continuous recording of collector concentration in the studies of ion flotation kinetics.

THE EFFECT OF THE ELECTRICAL FIELD ON THE INTERFACIAL TENSION OF THE SYSTEM WATER/ORGANIC LIQUID. J.V. Spurny (Chair. for Physical Chem., U. of Regensburg). *Tenside Detergents* **11**(5), 254–8 (1974). Two mechanisms are described which can serve to explain the changes in interfacial tension at the phase boundary of two liquids under the influence of an electrical field: the classic "electrocapillary adsorption" and "electroadsorption." Both mechanisms are discussed in connection with the ionic character of the surface-active substance dissolved in the system and the behavior of the system in the cathodic and anodic region.

DETERMINATION OF FATTY ACIDS IN NONIONIC SURFACTANTS. M. Bares and J. Zajić (Prague Inst. Chem. Technol., Prague). *Tenside Detergents* **11**(5), 251–4 (1974). A new selective and rapid method for the determination of unreacted fatty acids of alkali soaps in fatty ester ethoxylates is described. The method is based on the principle of the two-phase titration of fatty acids in an alkaline medium using Hyamine 1622 as cationic titration solution. The reproducibility of the method is about ±2.0 relative %. The results obtained were satisfactory.

DETERMINATION OF SULTONES IN A-OLEFIN SULFONATES. E. Martinsson and K. Nilsson (Mo Do Kemi AB, Stenungsund, Sweden). *Tenside Detergents* **11**(5), 249–51 (1974). In the production of a-olefin sulfonate range of surfactants, 1,3-sultones are decomposed by alkaline hydrolysis. Described are two methods of determining the hydrolyzed sultones in the final product. Sultone concentrations in excess of 500 ppm were separated from sulfonates by a continuous liquid-liquid extraction using ethanol/water and petroleum ether. Sultones down to 10 ppm were separated from the sulfonates by liquid adsorption chromatography on silica gel with petroleum ether as eluant. After alkaline hydrolysis, the sultones were determined quantitatively, either by two phase titration or extraction of a methylene blue complex.

WASHING ACTION AND BIODEGRADATION OF DETERGENT BUILDERS. K. Merkenich (Benkiser-Knapsack GmbH, Ladenburg/Neckar), K. Henning and H. Gudernatsch (Hoechst AG-Werk Knapsack, Knapsack/Köln). *Seifen-Öle-Fette-Wachse* **100**(18), 433–9, 458–60 (1974). A survey is given of builders for detergents which have been described in the technical literature for substitution or partial replacement of sodium tripolyphosphate. These substances can be divided into the following groups: inorganic builders, nitrogen-free and nitrogen-containing polycarboxylic acids of low molecular weight, cyclic polycarboxylic acids, polymeric polycarboxylic acids and modified surface active materials. Their suitability was tested by determining the sequestration, dispersing power and washing performance. The last one was determined in combination with normally used detergent components in laboratory and domestic washing machines using soiled test fabrics. In addition to the washing performance the degree of incrustation of fabric and heating elements of the washing machines were also measured. Biodegradability was examined. For this test the biochemical oxygen demand was determined by the so-called dilution method and/or by means of the Warburg apparatus. Partial replacement of sodium tripolyphosphate by sodium sulfate, soda ash or silicate did not yield satisfactory results. Of the organic substances that were tested only NTA and a few homo- and copolymers of maleic acids as well as polyacrylic acid resulted in noteworthy washing results. However, in the case of NTA. biodegradation requires several days of adaptation and decreases with falling ambient temperature. The polymeric polycarboxylic acids were all resistant to biodegradation even after an adaptation of several months.

PERFORMANCE OF NO-PHOSPHATE DISHWASHER DETERGENTS. R.E. Madden, T.G. Edwards, C.B. Kaiser and R.G. Jaglowski (Amway Corp.). *Soap/Cosmetics/Chemical Specialties* **50**(9), 38–40 (Sept., 1974). Laboratory hard water filming tests and consumer panel evaluation tests were carried out on formulations containing reduced levels of phosphorus (8.7%) or no phosphorus in comparison with commercial formulations containing STP. Well water containing 30 grains/gallon hardness was used for the filming tests. The consumer tests involved paired comparisons for a two week period of home use. Phosphate substitutes included sodium citrate, sodium carbonate, hydrous silicates, sodium sulfate, sodium gluconate, and NTA. The data showed that those no-phosphate systems capable of preventing glassware filming in hard water give inferior cleaning performance. Those with adequate cleaning potential do not prevent filming. Performance of the no-phosphate detergents was judged to be so poor that many homemakers might discontinue use of the automatic dishwasher if they were the only products available.

NONPHOSPHATE AUTOMATIC DISHWASHER DETERGENT. P.A. Finck (Colgate-Palmolive Co.). *U.S. 3,826,748.* An alkaline dishwasher detergent capable of inhibiting overglaze attack and essentially free of inorganic phosphates, contains at least 25% of a water soluble aminopolycarboxylic compound, 1–20% sucrose, and 1–20% overglaze protector.

DETERGENT COMPOSITION. M.Y. Demangeon and M.P.H. Rasmussen (Colgate-Palmolive Co.). *U.S. 3,826,749.* A controlled foam profile detergent composition contains a C_{11}-C_{13} alkyl benzene sulfonate, a sodium soap of C_{14}-C_{22} fatty acid, an ethoxylated dinonyl phenol and an alkaline builder salt.

TETRABORATE COMPOSITION. L.L. Schwalley, W.C. Teach and J.W. Kiene (U.S. Borax & Chemical Corp.). *U.S. 3,839,214.* A laundry treating composition having effective stain removal properties for household stains consists of a mixture of 85–99% sodium tetraborate decahydrate and 0.1–2% polyvinylpyrrolidone having an average molecular weight of 15,000–40,000.

MULTI-PURPOSE CLEANING CONCENTRATE. C.J. Roscoe. *U.S. 3,839,234.* A water-dilutable cleaning composition which does not leave a residue consists of the following: 5–60 parts of a glycol ether, 5–60 parts of a glycol, 2–30 parts of a monohydroxy alcohol, an aqueous ammonium hydroxide solution equivalent to 2–30 parts of a 28% solution, 1–15 parts of an amine and 1–15 parts of a liquid synthetic detergent which does not form a film or residue when a water solution of it dries.

METHOD OF ISOTHERMAL SULFONATION. R. Susuki, S. Tanimori, S. Toyoda and T. Ogoshi (Lion Fat & Oil Co.). *U.S. 3,839,391.* An improvement has been made in the process for sulfonating organic material selected from the group consisting of alkylaryl hydrocarbons, olefin hydrocarbons, aliphatic alcohols and ethoxylates, and alkyl phenols and ethoxylates whereby the initial stages of the sulfonation are retarded to effect the rection under isothermal conditions. ■