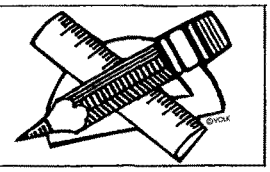
Abstracts



• Drying Oils and Paints

REVIEW OF SOLVENT-FREE LIQUID EPOXY COATING TECHNOLOGY. M. Gaschke and B. Dreher (Ciba-Geigy Corp.). *J. Coatings Technol.* 48(617), 46-51 (1976). Solvent-free liquid epoxy coatings are two-component systems composed either of a polyfunctional aromatic or aliphatic glycidyl ether and a polyamine curing agent with primary and/or secondary amino groups. These epoxy systems exhibit advantages over solvent-containing epoxy coatings as they meet environmental requirements, are more economical, and are chemically resistant. Applications are, however, generally limited by shorter pot-life. Selection of various resin and curing agent combinations and resulting performance characteristics are discussed in detail. Appearance, mechanical properties, and chemical resistance of cured films are explained in terms of reactivity, and chemical reactions. Of particular interest is information on a new solvent-free aliphatic resin-based coating cured with cycloaliphatic polyamines.

EFFECT OF MOLECULAR WEIGHT OF SHORT OIL ALKYD ON PAINT FILM PROPERTIES AND SPRAYABILITY. T. Nagata (Dai Nippon Toryo Co., Ltd.) *J. Coatings Technol.* 48(617), 38-45 (1976). To investigate the effect of the molecular weight of a short oil alkyd resin on paint film properties and sprayability, four enamels were prepared by using sample alkyds with different molecular weights. The mechanical film properties, gloss retention during the accelerated durability test, and sprayability were observed. The experimental results showed that the molecular weight of an alkyd considerably affects the mechanical properties and sprayability of an enamel.

POLYMERIZATION OF ALLYL ETHER OF CARDANOL. T.B. Desai, S.P. Potnis and J.S. Aggarwal (Dept. Chem. Technol., Univ. Bombay). *Paintindia* 26(1), 11-17 (1976). The allyl ether of cardanol could be polymerized to a medium viscosity of about 360 c.p. by heating at 250-290 C for 12 hours in the presence of a mixture of tert. butyl hydroperoxide and di-tert. butyl peroxide (5%) as catalyst. The ether after Claisen's rearrangement at about 220 C for one hour and subsequent reaction with hexamine copolymerized when reacted with styrene, DCO or alkyd resin. All the films had scratch hardness varying between 400 and 700 g. All the films were quite resistant to water, seawater, dilute acid and alkali solutions and white spirit. They were easily attacked by xylene and more so by trichloroethylene.

APPLICATION OF LIQUID DIENE POLYMERS TO ELECTRODEPOSITION COATINGS. R. Kita and A. Kimi (Nippon Zeon Co., Ltd., Kawasaki City, Japan). *J. Coatings Technol.* 48(616), 53-8 (1976). Several liquid polymers prepared from diene monomers, such as butadiene and 1,3-pentadiene, were evaluated as vehicles for electrodeposition coatings. Was found that the necessary maleinization reaction and subsequent water solubilization of these polymers were easy to accomplish, when compared to the natural drying oils. Coated film characteristics were studied first in single component vehicle systems in which the diene polymers were compared to films obtained from conventional alkyds, epoxy esters, and natural drying oils. Unique formulations were then employed, demonstrating well-balanced properties, by combinations of the diene polymers with natural oils.

CRACKING OF CASHEWNUT SHELL LIQUID.-I DESTRUCTIVE DISTILLATION AT ORDINARY PRESSURE. H.M. Khan, S.P. Potnis and J.S. Aggarwal (Dept. Chem. Technol., Univ. of Bombay, Bombay-19). *Paintindia* 26(2), 15-7 (1976). By cracking of cashewnut shell liquid at 500-550 C and fractionation of the cracked product by distillation and alkali separation, 8-9% of phenols having hydrocarbon chains varying between C_4 and C_6 lengths are obtained.

POLY(ARYLENE SULFIDE) COATING COMPOSITIONS CONTAINING POLYETHOXYLATED VEGETABLE OIL. D.E. Higbee (Phillips Petroleum Co.). *U.S. 3,968,289.* The composition comprises at least one poly(arylene) sulfide resin and at least one polyethoxylated vegetable oil. A process for coating a substrate comprises applying a dispersion of the substrate and then heating it in the presence of oxygen to a suitable temperature for a sufficient time to fuse and cure the resin.

• Fats and Oils

THE TOTAL SYNTHESIS AND CHARACTERIZATION OF SIX METHYL BRANCHED ISOMERS OF 8, 11, 14-EICOSATRIENOIC ACID. U.H. Do and H. Sprecher (Dept. of Physiol. Chem., College of Med., Ohio State Univ., 333 West Tenth Ave., Columbus, Ohio 43210) *Chem. Phys. Lipids* 16, 255-66 (1976). Six methyl branched isomers of 8, 11, 14-eicosatrienoic acid were prepared in which a methyl branch was located on carbons 5, 10, 13, 17, 18, and 19. The synthesis and characterization of these isomers are described.

TRACER STUDIES OF CHOLESTEROL DEGRADATION INDUCED BY IONIZED GASES. L. Sanche and J.E. Van Lier (Dept. of Nuclear Med. and Radiobiol., Centre Hosp. Univ., Sherbrooke, Quebec, Canada) *Chem. Phys. Lipids* 16, 225-38 (1976). Multiple molecular layers of cholesterol-4-C^{14} were bombarded in an ultra high vacuum system with various excited molecular, ionic and atomic species derived from oxygen, methane and carbon monoxide. The degradation products were analyzed by thin layer chromatography followed by autoradiography and the decomposition patterns were compared with those obtained from the autoxidation of cholesterol. Bombardment with excited and ionized species derived from both molecular oxygen and carbon monoxide leads to a number of known polar cholesterol oxidation products, similar to those formed during the natural oxidation of cholesterol. In contrast, species derived from methane lead only to the formation of products less polar than cholesterol with none of the established autoxidation products at detectable levels.

METHOD AND COMPOSITION FOR TREATING EDIBLE OILS AND INEDIBLE TALLOWS. R.L. Husch (Interstate Foods Corp.). *U.S. 3,976,671.* A method for upgrading inedible tallows and oils containing free fatty acids comprises contacting the material with 0.1-0.15% of a type X molecular sieve material capable of removing the free fatty acids.

METHOD OF PREPARING A MIXTURE OF FINELY CRYSTALLIZED FAT AND A POWDER. J. Mol (N. V. Houdstermaatschappij Holland Agro). *U.S. 3,973,046.* The method comprises (a) cooling the fat from a melt to a point below its gel point to crystallize the fat partially into a plastic mass; (b) extruding the plastic mass in the shape of a ribbon; (c) dividing the ribbons into small particles by means of a rotating knife located just beyond the extrusion orifice; and (d) simultaneously mixing the particles with a powder such as skimmed milk, whey, starch, dextrose, maltose, saccharose, soya flour, fish solubles, protein, and caseinate. The fat particles are not entirely coated with the powder, and they can be readily dispersed in an aqueous fluid.

PROCESS FOR TEMPERING BEADED FAT QUICKLY. T.B. Galusky and J.B. Ilagan, Jr. (SCM Corp.). *U.S. 3,973,053.* A process for tempering particles having a crystallizable, continuous polymorphic fatty phase with the exterior having been rapidly crystallized to yield an unstable crystal form, comprises passing the particles into a fluidized bed supported with a cooling gas at a temperature and for a time sufficient for the gas to absorb the heat of transformation of the particles into a stabler crystal form. The outlet temperature of the cooling gas is less than the Wiley melting point of the stabler crystal form. The tempered particles withdrawn from the bed resist agglomeration after collection.

INVESTIGATIONS INTO THE CHANGES OF IR AND UV SPECTRAL CHARACTERISTICS AND THE FORMATION OF GEOMETRIC AND POSITION ISOMERS IN THE CASE OF SUNFLOWER OIL, LARD AND BUTTER UNDER THE INFLUENCE OF GAMMA RAYS. D. Stomatov and A. Ivanov (Plovidiver Univ. "P. Hilendarski" Teaching Chair Chem. Technol. Bulgaria). *Seifen, Ole, Fette, Wachse 102*(10),

261–4 (1976). Points examined are the effect of small, medium and large doses (10^4, 10^6 and 10^7) of gamma rays (Co 60) and the after-effect on the change in the IR and UV spectra of sunflower oil, lard and butter. The formation of conjugated dienes (*cis-trans* and *trans-trans*) in sunflower oil and lard and of conjugated trienes in sunflower oil at 10^7 Rad on the one hand and the partial or complete destruction at 10^6 and 10^7 Rad in the case of butter on the other hand. What is found is a comparatively good correlative connection between the peroxide content and the increase in differentiated absorption in sunflower oil and lard during storage after exposure to rays.

HEAT DECOMPOSITION OF HYDROPEROXIDE OF BUTYL OLEATE. I. IN BUTYL PALMITATE. J. Pokorny et al. (Research Institute for Food Technology, 150–38 Prague, Czechoslovakia). *Rev. Fr. Corps Gras* 22, 191–8 (1975). For studying the mechanism of hydroperoxide decomposition, a mixture of butyl palmitate and hydroperoxide of butyl oleate (9/1) has been heated at 150C for two hours. Products of the reaction have been fractionated between n-heptane and 90% methanol, by inclusion in urea, and by chromatography. The resulting fractions have been characterized by chemical methods and by spectroscopy. The reaction mixture consisted of hydrocarbons, aldehydes, ketones, hydroxylated compounds, free fatty acids, and oligomers in small quantities.

STUDY OF OXIDIZED ACIDS OCCURING IN FATS AND OILS. VIII. PRELIMINARY STUDY OF EVOLUTION OF OXIDIZED ACIDS DURING STORAGE OF REFINED OILS. J. Graille et al. (Lab. National Matières Grasses-ITERG, Univ. of Provence, 13331 Marseille Cedex 3). *Rev. Fr. Corps Gras* 22, 205–10 (1975). In refined oils, during long-time storage, oxidized fatty acids are formed and alterations of the oil quality can partially be attributed to these acids. The authors successively study the effect of storage conditions on changes in oxidized acids, then the resulting evolution of the flavor and the response of different simple alteration tests. The authors consider the results preliminary and further study is necessary to complete and confirm them.

RAPID DETERMINATION OF ERUCIC ACID IN RAPESEEDS. A. Prevot et al. (ITERG, Paris; C.N.T.A., Paris). *Rev. Fr. Corps Gras* 22, 211–22 (1975). It was necessary to find a rapid method for erucic acid determination. The method must be suitable for the analysis of 50 to 80 samples of rapeseed oil daily in a factory. The method must be done in a maximum of 10 minutes. The authors elaborated a rapid preparation of methyl esters followed by a gas liquid chromatography on OV17 at 250C which permits the carrying out of C_{22} determination in rapeseed in 5.5 min. Using an automatic injector and a data acquisition system, 120 determinations a day may be performed with higher sensitivity and reproducibility.

NUTRITIONAL VALUE OF PALM OIL AND PALM-KERNEL OIL. A. Bach and P. Metais (Faculté de Pharmacie, Strasbourg, France). *Rev. Fr. Corps Gras* 22, 367–71 (1975). Increased world use of palm oil and palm-kernel oil caused the research in the field of technology and nutrition of these oils. In this paper, the physicochemical differences of palm oil and palm-kernel oil are pointed out. From these differences, the nutritional properties are shown. So the characteristics of palm oil explain its large use in food industry, while palm-kernel oil is more suitable to nutrition of persons suffering from troubles of absorption and transport of fats. The role of medium chain triglycerides is recalled.

PROBLEMS OF FLAVOR IN RELATION TO LIPIDS AND TO THEIR OXIDATION IN VEGETABLES. P. Varoquaux and Cl. Avisse (INRA, Station Technol. Produits Végétaux, B.V. 1540, 21040 Dijon Cedex, France). *Rev. Fr. Corps Gras* 22, 373–8 (1975). Reactions directed and catalyzed by enzymes lead to production and transformation of many organic compounds. Peroxidation of polyunsaturated fatty acids (precursors) can lead to two apparently contradictory phenomena: production of aroma and its alterations. The authors give several reaction schemes, the oxidation of lipids seeming to be the principal way of biosynthesis of aroma. Examples deal chiefly with peas, tomatoes, cucumbers, and cultivated mushrooms.

ANALYSIS OF FRACTION OF SELECTIVELY HYDROGENATED OILS. A. Pelloquin and E. Ucciani (Lab. National Matières Grasses-ITERG, Univ. d'Aix-Marseille, 13331 Marseille Cedex 3). *Rev. Fr. Corps Gras* 22, 379–86 (1975). Selective hydrogenation causes more or less important alterations in diene fraction, the extent of which can be evaluated by the following determinations: remaining linoleic, geometric isomers, conjugated and non-conjugated dienes, and distribution of double bonds. Remaining linoleic was determined with lipoxidase. The geometric isomers can be evaluated with a good approximation by quantitive thin layer silvered chromatography. For conjugated dienes, the alkaline isomerization is substituted by a reaction of isomerization catalyzed by $RhCl(PPh_3)_3$. Finally, the distribution of double bonds next to carboxyl is determined, after reductive ozonolysis, on the basis of aldehyesters. All these methods have been tested on pure products and known mixtures. The extent and the limit are specified for each one. Several examples of application to hydrogenated oils are reviewed.

METHODS OF DETECTION OF BHT AND POLYETHYLENE IN ANIMAL FATS. F. Mordret and N.Le Barbanchon (ITERG, Paris). *Rev. Fr. Corps Gras* 22, 387–90 (1975). The method of BHT determination in animal fats is rapid and consists of extraction with acetonitrile, followed by addition of reagents. The colored complex is extracted with chloroform. Animal fat without antioxidant is used as reference sample. Sensitivity limit equals 10 ppm BHT. The pollution of tallows by polyethylene is quickly detected: tallow is dissolved in chloroform (25 g/100 ml). Turbidity and then flocculation occur, and, after one hour, a film is developed on the surface. Sensitivity limit equals 200 ppm polyethylene. These methods have been subjected to a collaborative study.

NON-PROTEIN AND NON-LIPID COMPONENTS OF OILSEEDS: CHEMICAL COMPOSITION, PROPERTIES, CHARACTERIZATION. M. Rinaudo (Centre Rech. Makromolecules Végétales, C.N.R.S., Grenoble-Isère). *Rev. Fr. Corps Gras* 22, 429–37 (1975). The goal of this work was to point out the main characteristics and properties of these components of oilseeds and their meals: mono- and oligosaccharides, polysaccharides (hemicellulose, cellulose, pectins), and lignine. For each component, the chemical composition and the molecular and macromolecular characteristics are given. Analytical methods which allow their identification and evaluation are reviewed: sulfuric acid hydrolysis gives an insoluble representing the lignine; aqueous ethanol extraction gives the oligosaccharides; pectins are analyzed by decarboxylation; delignination gives cellulose.

ANIMAL SKIN DEGREASING WITH SURFACE ACTIVE AGENTS. J. Pore (Société Prod. Houghton, Puteaux). *Rev. Fr. Corps Gras* 22, 451–8 (1976). The qualitative and quantitative analysis of fats of different animal skins shows the importance of their good degreasing. This degreasing may be done by expression, dry solvent extraction, and wet extraction with or without solvent. The author describes the last process with the use of surface active agents. The influence of several parameters: type of emulsifier, pH, temperature, skin moisture, solvent, etc., is shown. The best results are obtained by a mixture of kerosene and perchlorethylene on one hand, and a non-ionic emulsifier (polyethoxylated fatty alcohol, or castor oil or olein) on the other hand.

SYNTHESIS OF A MIXED TRIGLYCERIDE WITH TWO DIFFERENT FATTY ACIDS: THE SYMMETRICAL AND ASYMMETRICAL PALMITODIOLEIN. L. Fremont and M.Th. Gozzelino (CNRZ–Station Rech. Nutrition, Jouy-en-Josas, France). *Rev. Fr. Corps Gras* 22, 459–67 (1975). Mixed triglycerides containing two different fatty acids: oleic acid and palmitic acid (2:1) are synthesized from glycerol and fatty acid chlorides. The symmetrical triglyceride (OPO) is obtained by acylation of the 1,3-diolein; the unsymmetrical (POO) is obtained from 1-monopalmitin, using a protecting group. Fractional crystallization and column chromatography are employed for purification which is monitored by thin layer chromatography. The respective proportions of the components are determined by GLC and their structure is confirmed by analysis of the products resulting from lipolysis by pancreatic lipase.

QUALITY ASSESSMENT OF CRUDE PALM OILS BY DIRECT BLEACHING WITH ACTIVATED BLEACHING EARTH. G. Hoffmann et al. (Unilever Research, Vlaardingen and Unimills, Zwijndrecht, Netherlands). *Rev. Fr. Corps Gras* 22, 511–7 (1975). The most specific characteristic of palm oil is its high content of carotenoides which give the oil its deep red color. Although the bleachability of red palm oil is evidently connected with the oxidative prehistory of the oil, no chemical data are yet known describing the state of oxidation of oil samples as well as their bleachability. For practical purposes, there is therefore a clear need for a simple and reproducible bleachability test acceptable to crude oil producers and buyers. A one-step Direct Bleachability Test, based on a combination of an earth- and heat-bleach and correlating fairly well with a

(Continued on page 685A)

• **Abstracts** . . . . . (Continued from page 684A)

laboratory-simulated factory process, is a practical method for selecting crude palm oils according to their bleachability next to their FFA and heavy-metal contents. This test is also proposed for acceptance as an international standard.

CONSIDERATIONS ON SAVINGS OF STEAM DURING DEODORIZATION AND NEUTRALIZING DISTILLATION OF FATS. F. Bloemen. *Rev. Fr. Corps Gras* 22, 537–42 (1975). Steam consumption during deodorization can be economized by an appropriate choice of operational pressure in a process which consists of using the motive steam of thermocompressors which has been lost till now. This system inevitably implicates work in several stages, two minimum. In the apparatus passed through at first by the oil, the operational pressure is the drive back pressure of the thermocompressor and the injected steam consists of the motive steam of the thermocompressor and the aspirated steam in the next apparatus. In this one, the operational pressure is the aspiration pressure of the thermocompressors added to the loss of pressure between the latter and the apparatus.

USE OF DIACETYLTARTARIC ACID ESTERS OF MONOGLYCERIDES IN BREADMAKING. R.C. Hoseney, K.H. Hsu and R.S. Ling (Dept. of Grain Science and Industry, Kansas State University, Manhattan, Kansas.) *Baker's Dig.* 50, 28 (1976). Diacetyltartaric Acid esters (DATA) are effective surfactants and dough conditioners. They can replace shortening in a formula and give excellent dough handling properties. In this study, they gave a slightly open-crumb grain but a mixture of distilled monoglycerides (DMG) and DATA gave a crumb grain equal to that of sodium stearoyl-2-Lactylate (SSL). The DATA surfactants were as effective as SSL in overcoming the deleterious effects of foreign proteins. Also, they were effective anti-staling agents and a mixture of DATA and DMG was essentially as effective as SSL.

PEARL MILLET. I. CHARACTERIZATION BY SEM, AMINO ACID ANALYSIS, LIPID COMPOSITION, AND PROLAMINE SOLUBILITY. S.M. Badi, R.C. Hoseney and A.J. Casady. *Cereal Chem.* 53(4), 478–87 (1976). Pearl millet (random mating population from 'Serere 17' × 'Tift 239') grain endosperm is composed of both hard (translucent) and soft (opaque) parts. The hard part has tightly packed, polygonal-shaped starch granules and a matrix protein containing relatively large, embedded protein bodies. The soft endosperm has loosely packed, spherical starch granules covered with a thin sheet of protein. The soft endosperm contains many voids, or air spaces, and no protein bodies. Dry milling of millet and sorghum grain gave similar flour extractions: 58% for millet, and 53% for sorghum grain. Total grain protein recovered in the flour was approximately constant at 45% for both grains. Millet had higher values for lysine, arginine, aspartic acid, threonine, serine, glycine, valine, and methionine, and lower values for glutamic acid, proline, alanine, and leucine than did sorghum grain. Lysine content of millet was 3.6 g/100 g protein, comparable to that in high-lysine corn. The protein bodies in pearl millet were soluble in 70% ethanol at 60° C (30.7% of total protein), and at least part (27.1% of total protein) of the matrix protein was soluble in 100% t-butyl alcohol at room temperature. Two successive extractions under more vigorous conditions (blender) gave about 55% of the total millet protein soluble in either 60° C, 70% ethanol or 60° C, 60% t-butyl alcohol.

EFFECT OF TYPE OF FAT ON STARCH PASTES CONTAINING GLYCEROL MONOSTEARATE. F.T. Orthoefer (Glidden-Durkee, Division of SCM Corporation, Strongsville, Ohio) *Cereal Chem.* 53(4), 561–5 (1976). Studies with a Brabender Amylograph® showed that various types of oils had little or no effect on the viscosity of waxy maize pastes. Addition of various oils to starch-water-glycerol monosterate mixtures showed a characteristic viscosity peak at approximately 56°C during cooling of the gelatinized slurry. The height of the cooling-curve peak was inversely related to the combined *trans* unsaturated fatty acid and saturated fatty acid content of the oil. These effects were apparently owing to the rate of crystallization of the saturated monoglyceride from the various types of oils at 56°C.

PALM OIL STEAM REFINING, TECHNIQUES, OPERATING RESPONSES AND ECONOMICS. C.M. Rowan and D.W. Ruths (Parkson Corp., Ft. Lauderdale, Fla. 33334). *Oleagineux* 30, 423–8 (1975). The increased supply and demand for palm oil increased interest for developing new methods of refining. The centrifugal, alkali-refining methods customarily employed today for seed oil exhibit high yield losses in palm oil because this oil has a high level of carotenes and a high fatty acid content. By comparison with centrifugal alkali refining, the use of steam refining has shown the advantages in oil quality and in the cost of product. The crude oil must be stored in such a way as to avoid oxidation and metallic contamination so as to assure an optimum quality. With process conditions similar to deodorization, it is possible to refine the crude oil by this process with overall yield improvements of 4%. In general, the use of steam refining for palm oil will become more and more common, encouraged by the search for quality and the demands of the market.

PALM OIL PROCESSING. V. COMPARISON OF PROCESSES AND DISCUSSION. G.B. Martinenghi (Univ. of Milan, via De Togni 29, 20123 Milan). *Oleagineux* 30, 475–7 (1975). A review of the various possible treatments of palm oil, based on the most recent experimental and technological processes, is made. This comparison enables the following opinion to be given: a) palm oil fractionation with hexane seems to be the most suitable solvent process; b) not only hydrogenation, but also interesterification and esterification are isomerizing reactions, and, therefore, harmful to the preservation of the linoleic acid "essentiality"; c) blending of the palm oil liquid fraction with oils of low palmitic and stearic acid content seems to be the most advisable operation for reducing to about 6C the permanent clearness of the oil.

WHY SOLVENT EXTRACTION OF PALM OIL IS NOT TO BE RECOMMENDED. T.D. Tjeng and J.J. Olie (Stork Apparatenbouw B. V. Amsterdam, Holland). *Oleagineux* 30, 524–8 (1975). Palm oil is produced by mechanical expelling from the pericarp (pulp); the solvent extraction is not applied for this oil as it is usually used for the extraction of seed oils. Palmfruit pericarp is very much different in composition, particularly with regard to oil/water/solids percentages, from oil seeds. Due to its distinctly different composition, extraction is difficult to attain or only at high cost. Apart from being economically unattractive, there are other disadvantages of solvent extraction of palm oil. At the present state of technology, palm oil production from palmfruits by means of mechanical expelling is still to be preferred to solvent extraction.

SOME APPROACHES TO A SOLUTION OF THE AFLATOXIN PROBLEM THROUGH RESEARCH AND EDUCATION. J.W. Dickens (ARS, USDA, North Carolina Agricul. Exp. Station, Raleigh, N.C. 27607). *Oleagineux* 30, 517–22 (1975). As contamination of peanut kernels by aflatoxin produces a serious problem, precautions are necessary before digging, and during windrowing, combining, processing, and storage. In order to detect the contaminated peanuts, a visual examination of the growth of A. flavus is a simple and effective method; rapid chemical tests exist, but their exactitude depends on that of the sampling and this is again a problem. The official methods of an aflatoxin analysis on the shelled peanuts do not give entire satisfaction. Testing programs for different stages: harvesting, storage, before and after shelling, during processing, are presented. Removal of contaminated kernels, loose shelled kernels, or kernels from damaged pods will be effected by cleaning and screening before shelling; then after this, by the elimination of discolored kernels.

VARIATION IN THE FATTY ACID COMPOSITION OF PALM OIL. B.H. Ng et al. (Malaysian Agricultural Research and Development Inst., Layang-Layang, Johore, Malaysia). *Oleagineux* 31, 1–8 (1976). The possibility of changing the fatty acid composition by selection has been considered in breeding programs for a number of oil crops, including maize, sunflower, safflower, etc. The results show variations in the fatty acid composition of oil from palm Elaeis guineensis and of the oil from E. oleifera. This demonstrates that hybridization programs are in progress. Results of this study are reported in this paper. Methods of sampling are defined to characterize a bunch, a tree, and a group of trees. From the repeatability obtained in the studies of samplings between bunches from the same palms, heritabilities have been estimated for the different fatty acids. Suggestions are made regarding the use of the varieties observed to improve the quality of the oil; the origin of the varieties is discussed.

TESTS AND OXIDATION INDICES. CORRELATIONS BETWEEN PEROXIDE INDEX, ABSORBED OXYGEN, AND DENSITY. H. Weisser and J. Lefebvre (Inst. für Lebensmittelverfahrenstechnik, Karlsruhe Univ., R. F. A.). *Oleagineux* 31, 27–33 (1976). Some methods for measurement of the stability of fats and oils as well as the methods for measurement of the degree

of oxidation of fats are reviewed in the paper. The modified apparatus for determination of the quantity of absorbed oxygen in the first oxidation stage of the vegetable oil is described. A correlation between the results obtained in this apparatus and the peroxide values. Determination of density from the length of oscillation of a tube filled with the oil considered was made. Equations linking the peroxide values with differences in density between the initial oil and the oxidized oil in the case of soya and sunflower oils were made.

CRYSTALLIZATION AND DRY FRACTIONATION OF MALAYSIAN PALM OIL. A.M. Taylor (Van den Berghs and Jurgens Ltd., James Watt Dock, Greenock, Scotland). *Oleagineux* 31, 73–9 (1976). In this article, some of the factors affecting the crystallization of Malaysian palm oil are described. Certain parameters are mentioned and graphs showing typical cooling curves obtained on an industrial scale are given. The fatty acid compositions of three batches of palm oil are given, showing the difference in composition and the resultant cooling curves obtained. The constants and the dilatation figures of oleins and stearines produced from the different types of crystalline formation are tabled. The physical characteristics of palm oil and its fractions and some of the uses to which these products may be put are given. A number of photographs show the different crystalline conditions for each type of cooling curve producing these forms.

THE DETERMINATION OF MICROAMOUNTS OF ARSENIC IN FATS AND OILS BY ABSORPTION SPECTROPHOTOMETRY. H. Hirayama, Z. Shimoda, C. Noguchi, A. Kobayashi, T. Shige, T. Takahashi, K. Tsuji, S. Nakasato, M. Higuchi, T. Murui, Y. Yamakawa, T. Yamashita, M. Tamashita and J. Yoshida (Japan Oil Stuff Inspectors Corp, Tokyo) Yukagaku 25(5), 275–80 (1976). A rapid and precise method for the determination of microamounts of arsenic in fats and oils has been studied. The samples were decomposed by wet-digestion procedure using sulfuric acid and hydrogen peroxide (30%), then, arsenic in the decomposed solution was coprecipitated as the complexes with ferric hydroxide. The coprecipitations were reduced to gaseous arsine by zinc in an acid medium, then arsine gases absorbed into solution of silver diethyldithio carbamate dissolved in pyridine. The absorbance of the arsine reacts solutions were measured at about 530 nm. The most suitable pH for the coprecipitation of arsenic was about 9. The proposed method was evaluated with respect to recovery and reproducibility by carrying out collaborative studies on the samples which were prepared by adding known amounts of arsenic to soybean oil. The results thus obtained showed good agreement with the theoretical values and satisfactory reproducibility.

HEAT CYCLIZATION OF METHYL β-ELEOSTEARATE. N. Totani, Y. Masuda, Y. Totani and N. Matsuo (Dept. of Industrial Chemistry, College of Technology, Seikei University, Musashino-shi) Yukagaku 25(5), 271–4 (1976). Methyl β-eleostearate was prepared by usual method from isomerized tung oil, and solutions with three different concentrations, 77.8, 44.9, and 4.5% of methyl β-eleostearate in methyl myristate were prepared. These samples with three different concentrations were heated at a settled temperature which ranged between 250° C to 500° C. As the results, since heat cyclization of methyl β-eleostearate resulted in formation of cyclic monomer and dimer as two main components, it was considered that the reaction mechanism involved a competitive reaction which formed cyclic monomer and dimer. Moreover, the rate constants and activation energies at each reaction condition from the above mechanism were determined. Next, as the result of maximum conversions to the cyclic monomer from methyl β-eleostearate at each reaction condition were examined, the cyclic monomer was formed readily at a high reaction temperature in a low concentration of methyl β-eleostearate.

QUANTITATIVE DETERMINATION OF NEUTRAL LIPIDS ON THIN LAYER-FID CHROMATOGRAPHY. M. Tanaka, T. Itoh and H. Kaneko (Division of Chemistry, School of General Studies, Kitasato University, Kanagawa) Yukagaku 25(5), 263–5 (1976). Responses of sterol, fatty acid, sterol ester and triglyceride on a quantitative thin layer chromatographic apparatus which was equipped with a flame ionization detector were determined with six kinds of neutral lipid mixtures. These responses were represented as relative responses against triglyceride response and converged within maximum error of 5 ~ 10% (S.D.) over a range of loads (2 ~ 10 μg lipid). All of the relative responses were in proportion to the weight ratio. It was found that the method is very superior and convenient means for the quantitative estimation of neutral lipid compositions.

STUDIES ON THE BEHAVIOR OF TRACE COMPONENTS IN OILS AND FATS DURING PROCESSING FOR EDIBLE USE. III. VARIATION IN THE AMOUNT OF ANTIOXIDIZING MATTERS. H. Kanematsu, T. Maruyama, I. Niiya, M. Imamura, K. Suzuki, Y. Kutsuwa, I. Murase, H. Mizutani, Z. Morita and T. Matsumoto (Japan Institute of Oils & Fats, Other Foods Inspection, Foundation, Tokyo) Yukagaku 25(4), 234–40 (1976). Residual quantity of α-tocopherol, BHA and BHT added to oils was examined after purification and hydrogenation processes, and the following results were obtained. (1) α-Tocopherol, BHA and BHT concentration in the oil hardly changed after deacidification, but a large amount of sodium hydroxide slightly reduced the amount of α-tocopherol. (2) α-Tocopherol, BHA and BHT concentration in the oil decreased slightly by use of activated clay for decolorization, and the rate of reduction of BHA and BHT was smaller than α-tocopherol. Use of an adsorbent containing activated carbon increased the reduction rate to a slight extent. (3) BHA and BHT were completely removed from the oil even by treatment at 160° C, the temperature lower than that used for usual deodorization treatment, but 50% of α-tocopherol remained even by treatment at 250° C, although the decrease became greater at higher temperatures of deodorization treatment. (4) Change in the concentration of α-tocopherol by hydrogenation of the oil depended on the kind of catalyst used, and α-tocopherol concentration decreased in the order of Ni, Ni-Cu, Pd-C, and Cu-Cr catalyst. By the use of a Ni catalyst, concentration of α-tocopherol hardly changed when hydrogenated at an atmospheric pressure, irrespective of temperature, but under a high-pressure, the rate of decrease became greater with increasing temperature. In contrast, concentration of BHA and BHT decreased markedly by the use of Cu-Cr or Cu-Ni catalyst at atmospheric pressure, but the decrease was small under other conditions.

THERMAL REACTION OF SAFFLOWER OIL FATTY ACIDS AND METHYL ESTERS IN THE PRESENCE OF MAGNESIUM IODIDE. H. Shiina and T. Hashimoto (National Chemical Laboratory for Industry, Tokyo) Yukagaku 25(4), 194–8 (1976). Thermal reaction of safflower oil fatty acids in the presence of magnesium iodide was studied under the following reaction conditions: concentration of magnesium iodide 5, 2.5, and 1 wt %, temperature 200° C; concentration of magnesium iodide 5 wt %, temperature 180, 160 and 140° C. The conjugation and monoenoic acid formation reactions using fatty acids proceeded more remarkable than those in the case of safflower oil under the same reaction conditions. The maximum amounts of conjugated and monoenoic acids formed from fatty acids under above reaction conditions were 53 and 73%, respectively. When methyl ester of safflower oil fatty acids were heated in the presence of 5 wt % of magnesium iodide at 200° C, the conjugation reaction did not take place. In order to clarify the reason why conjugation reactions does not take place using methyl ester as a starting material, substances formed by heating methyl oleate as well as methyl esters of safflower oil fatty acids with magnesium iodide were examined. As a result of analyses of substances formed, it was found that methyl iodide and magnesium soap were formed. When methyl ester was heated with magnesium iodide, methyl iodide and magnesium soap were formed without the liberation of iodine from magnesium iodide. It is considered that the absence of liberated iodine in the reaction mixture results in none of conjugation reaction.

• Biochemistry and Nutrition

LIPIDS OF NITROBACTER AND EFFECTS OF CULTURAL CONDITIONS ON FATTY ACID COMPOSITION. T.B. Auran and E.L. Schmidt (Dept. of Microbiol., Univ. of Minnesota, Minneapolis, Minn. 55455) *Biochim. Biophys. Acta* 431, 390–8 (1976). The nitrite-oxidizing autotroph, *Nitrobacter* was studied with respect to fatty acid composition and lipids. One fatty acid, shown to be *cis*-11-octadecenoic acid (*cis*-vaccenic) accounted for almost 96% of the total fatty acids of the extractable lipids of *Nitrobacter agilis, Nitrobacter winogradskyi* and each of several isolates from Minnesota and Moroccan soils studied. The *cis*-vaccenic acid was high in all organisms, ranging from 85 to 95% when grown at 27° C in the log growth phase, the other major acid was palmitic (16:1). All converted *cis*-vaccenic acid to a 19-carbon cyclopropanecarboxylic acid upon entering the stationary growth phase. The 11-carbon cyclopropanecarboxylic acid was not degraded when stationary phase cells were reinoculated into fresh

medium. In *N. agilis* the levels of *cis*-vaccenic acid ranged from 86.8% when grown at 33° C to 95.6% when grown at 19° C. Addition of acetate or casein hydrolyzate to the inorganic medium had virtually no effect on the fatty acid composition of *N. agilis*, while propionate effected both qualitative and quantitative changes. In all organisms phosphatidylcholine made up a large portion of the extractable lipids. The distribution was phosphatidylcholine, 54%; phosphatidylethanolamine, 23%; phosphatidylglycerol, 10%; and neutral lipids, 11% for *N. agilis*.

ANALYSIS OF LIPIDS IN DAIRY WASTEWATERS. A.P. Hansen, S. Saad, V.A. Jones and R.E. Carawan (Dept. of Fd. Sci, North Carolina State Univ., Raleigh, N.C. 27607) *J. Dairy Sci.* **59**, 1222 5 (1976). A Rapid Fat Method was developed for routine analysis of dairy wastewaters. The new method using ammonium hydroxide to dissolve the protein and ethyl and petroleum ether for fat extraction proved to be superior to the standard Soxhlet Method using either hexane or trichlotrifluoroethane as extracting solvents. From 1 to 5% more fat was recovered by the Rapid Fat Method than by the Soxhlet Method using hexane. Test results can be obtained in 1.5 h as compared to 6 h for the Soxhlet Method. Equipment required for the Rapid Fat Method is available in most dairy plants.

EFFECT OF HYPERTENSION ON THE ENTRY OF ^{125}I-LABELLED LOW DENSITY LIPOPROTEIN INTO THE AORTIC INTIMA IN NORMAL-FED RABBITS. K.N. Bretherton, A.J. Day and S.L. Skinner (Dept. of Physiol., Univ. of Melbourne, Parkville, Victoria, Australia) *Atherosclerosis* **24**, 99–106 (1976). The entry of [^{125}I]-labelled low density lipoprotein (LDL) into different regions of the aortic intima has been studied over a 6 hour period in both normotensive and renal hypertensive rabbits fed a normal diet. Studies have also been carried out in previously hypertensive rabbits in which the blood pressure was normalized with parenteral hydralazine during the six hour period, in which entry was studied. In the normotensive rabbits entry into the aortic intima was less that 1 μg of LDL protein/100 mg dry defatted weight over the 6 hour period with greatest entry into aortic arch intima and significantly less into both the thoracic and abdominal aortic intimae. Hypertension increased the entry into the arch and into the thoracic and abdominal segments but this was only statistically significant for the aortic arch. The entry of [^{125}I] LDL into the intima in those rabbits in which the hypertension had been normalized was similar to that for the hypertensive rabbits. The results suggest that hypertension in the normal fed rabbit increases lipoprotein entry into the arterial wall by as effect on vessel wall permeability rather than by a direct effect of filtration pressure.

ALTERATIONS IN LIPID ACYL GROUP COMPOSITION AND MEMBRANE STRUCTURE IN CELLS TRANSFORMED BY ROUS SARCOMA VIRUS. T.M. Yau, T. Buckman, A.H. Hale and M.J. Weber (Dept. of Radiol., Case Western Reserve Univ., Cleveland, Ohio 44106) *Biochemistry* **15**, 3212–9 (1976). The acyl group composition of the phospholipids from normal chick embryo fibroblasts and from cells transformed by Rous sarcoma virus was determined by gas-liquid chromatography. Rous-transformed cells had less arachidonate (20:4) and more oleate (18:1) in membrane lipids than normal, growing cells. Normal density-inhibited cells had the lowest ratio of 18:1/20:4. Associated with the decreased content of 20:4 in the transformed cells was a decreased motional freedom of an incorporated spin-labeled fatty acid analogue. Arrhenius plots for uptake of 2-deoxyglucose revealed an increased apparent activation energy in the transformed cells, suggesting that the hexose transport carriers were sensitive to the changes in membrane composition and structure in fully transformed cells. However, the development of the changes in fatty acid composition occurred relatively slowly in the course of transformation, indicating that the observed compositional alterations are not likely to be a primary cause of the early changes in membrane function associated with malignant transformation.

ATHEROGENIC HYPERLIPOPROTEINEMIA INDUCED BY CHOLESTEROL FEEDING IN THE PATAS MONKEY. R.W. Mahley, K.H. Weisgraber and T. Innerarity (Comparative Atherosclerosis and Arterial Metabolism Section, Lab. of Experimental Atherosclerosis, Natl. Heart and Lung Inst., Bethesda, Maryland 20014) *Biochemistry* **15**, 2979–85 (1976). Patas monkeys were studied for 2 years on three dietary regimes: commercial chow (control diet); semipurified diet plus lard (fat-fed); and semipurified diet plus lard and cholesterol (cholesterol-fed). The control and fat-fed animals had similar lipoproteins which were equivalent to the human very low density, low density (LDL), and high density lipoproteins. An additional lipoprotein referred to as LDL-II appeared to be equivalent to the human Lp(a). The cholesterol-fed animals developed accelerated atherosclerosis associated with a hypercholesterolemia which was characterized by the appearance of β-migrating lipoproteins (B-VLDL) in the $d < 1.006$, an increase in the intermediate lipoproteins and LDL, and the appearance of LDL-II which contained a prominence of the arginine-rich apoprotein. The arginine-rich apoprotein was also a prominent component of the B-VLDL and intermediate lipoproteins. Characterization of this apoprotein revealed that it contained 11.5 mol % arginine, had a molecular weight of ~ 34,000, and coelectrophoresed with the arginine-rich apoprotein of man, dog, swine, rat, and rabbit.

EFFECT OF STORAGE AND FATTY ACID ESTERS ON THE UTILIZATION OF XANTHOPHYLL FROM MARIGOLD MEAL BY LAYING HENS. C.N. Coon and J.R. Couch (Depts. of Poultry Sci., and Biochem. and Biophys., Agr. Experimental Station, Texas A&M Univ., College Station, Texas 77843) *Poult. Sci.* **55**, 841–7 (1976). The feeding of two different harvests of marigold meal on an equivalent analyzed basis to laying hens produced no difference in NEPA numbers, β-carotene equivalents, and fan yolk scores for their eggs. This indicates that there are no structure rearrangements in the xanthophylls which are traceable to the storage of the marigold meal. Marigold meal samples were shown to lose from 21–28% of the xanthophyll content over a 10 month period in a refrigerated environment. Hens fed extracts from saponified marigold meal produced eggs with NEPA numbers 15% higher than did those from hens fed nonhydrolyzed marigold meal. The biological availability of marigold meal was 51% for nonhydrolyzed marigold and 66% for saponified marigold compared to β-apo-8′-carotenoic ethyl ester stabilized beadlets. The digestibilities of marigold and alfalfa meal xanthophylls were 88% and 96%, respectively, when fed to hens at a concentration of 33 mg/kg diet. The hydrolysis of the 61% natural esterified xanthophyll in marigold meal increased the digestibility to 97%. The data suggest the esterified xanthophylls in marigold meal decreases the bioavailability for egg yolk pigmentation.

THE EFFECT OF A NONABSORBABLE LIPID, SUCROSE POLYESTER, ON THE ABSORPTION OF DIETARY CHOLESTEROL BY THE RAT. F.H. Mattson, R.J. Jandacek and M.R. Webb (Miami Valley Lab., The Procter & Gamble Co., P.O. Box 39175, Cincinnati, Ohio 45247) *J. Nutr.* **106**, 747–52 (1976). The absorption of cholesterol from diets containing various proportions of triglycerides and an unabsorbable fat, sucrose polyester (SPE), was determined in rats. Each replacement of 1% dietary triglyceride with SPE resulted in a 1.2% decrease in cholesterol absorption. The SPE was a mixture of the hexa-, hepta- and octa-esters of long chain fatty acids. The physical properties of this material are similar to those of the usual dietary triglycerides. Relative to these studies, cholesterol was found to be equally soluble in triolein or SPE. If water was present as well, the solubility of the sterol was decreased by the same amount in both fats. The distribution coefficients of cholesterol between an oil phase of either triolein or SPE and a micellar phase simulating that found in the lumen of the intestinal tract were identical. These two types of fats differ in that SPE is neither digested nor absorbed. The decrease in cholesterol absorption is attributed to the continued presence of an oil phase of SPE in the lumen of the intestine. Dietary cholesterol distributes itself between this oil phase and the micelluar phase. That portion in the oil phase is not absorbed but is egested in the feces.

VITAMIN E SUPPLEMENTATION AND GLUTATHIONE PEROXIDASE ACTIVITY. N.Y.J. Yang, I.B. MacDonald and I.D. Desai (Div. of Human Nutr., Univ. of British Columbia, Vancouver, B.C., Canada) *Proc. Soc. Exp. Biol. Med.* **151**, 770–4 (1976). Both excess dietary vitamin E and vitamin E deficiency in rats can significantly depress the activity of GSH peroxidase in liver and plasma of rats. Of all the six levels of vitamin E tested in this study, the dietary level of vitamin E found to maintain the maximum activity of GSH peroxidase in tissues of rats was somewhere between 25 and 250 IU/kg diet. This study conclusively indicates that the excess dietary vitamin E represses GSH peroxidase activity.

LIPOPROTEIN LIPASE ACTIVITY IN THE BOVINE CORPUS LUTEUM DURING THE ESTROUS CYCLES AND EARLY PREGNANCY. M. Shemesh, A. Bensadoun and W. Hansel (Cornell Univ., Ithaca, New York 14853) *Proc. Soc. Exp. Biol. Med.* **151**, 667–9 (1976). Lipolytic activity measured at pH 8.6 in bovine corpora lutea

exhibited classical properties of lipoprotein lipase (LPL) in terms of serum and heparin stimulation and NaCl inhibition. LPL activity was measured in 23 corpora lutea collected at different stages of the estrous cycles and early pregnancy. The LPL activity in cyclic corpora lutea (μmole FA released/hr/100 mg acetone powder) was low at Days 4–8 of the estrous cycle (3.1 ± 1.5: mean ± SE) and at Days 19–20 (1.6 ± 0.6). However, high activity of the enzyme was found at Days 12–15 of the cycle (11.8 ± 1.8); these concentrations were significantly ($P < 0.01$) elevated over those found at Days 4–8 and 19–20. The enzyme activity began to decline at Days 16–18 of the estrous cycle (5.1 ± 1.7). Low enzyme activity was found in the corpora lutea removed from two cows at Day 22 of pregnancy. Progesterone concentrations were measured in 16 of the 23 corpora lutea and a good correlation ($r = 0.75$, $P < 0.01$) was found between lipoprotein lipase and progesterone concentrations of the tissue. The data suggest that LPL may be involved in controlling the transfer of fatty acids, including arachidonic, from plasma lipoprotein to luteal tissue.

OUTER MEMBRANE OF SALMONELLA TYPHIMURIUM: ACCESSIBILITY OF PHOSPHOLIPID HEAD GROUPS TO PHOSPHOLIPASE C AND CYANOGEN BROMIDE ACTIVATED DEXTRAN IN THE EXTERNAL MEDIUM. Y. Kamio and H. Nikaido (Dept. of Bacteriology and Immunology, Univ. of California, Berkeley, Cal. 94720) *Biochemistry* **15**, 2561–70 (1976). Whole cells of *Salmonella typhimurium* were treated with *Bacillus cereus* phospholipase C or with CNBr-activated dextran. If phosphatidylethanolamine head groups are exposed and accessible on the outer surface of the outer membrane of these cells, it was expected that these groups would be hydrolyzed by the former agent, and become covalently coupled to the latter agent. With strains producing lipopolysaccharides of S or Rc type, results did not indicate the presence of any accessible head groups on the outer surface. In contrast, with strains that produce outer membranes containing less complete lipopolysaccharides (Rd or Re type) and reduced amounts of proteins, both methods clearly showed the presence of exposed phosphatidylethanolamine head groups. These data can be most easily explained by assuming that the outer membrane of S and Rc strains either contains all phospholipid molecules in its inner leaflet or has proteins that completely cover up the head groups at its outer surface.

MINIMAL LEVELS OF DIETARY OILS, GRAIN OILS OR SUPPLEMENTARY OIL, AFFECTING THE COMPOSITION AND STABILITY OF CARCASS FAT AND MEAT OF BROILERS. I. Bartov and S. Bornstein (Div. of Poultry Sci., Agr. Res. Organization, The Volcani Ctr., Bet Dagan, Israel) *Poult. Sci.* **55**, 1036–46 (1976). Three experiments were conducted to examine the effect of low levels of dietary oil, supplied either by added soybean oil or originating from the grain (corn or milo), on the composition and stability of carcass fat and meat of broiler fed glucose-starch-soybean meal diets. The addition of 0.3% soybean oil or 20% yellow corn or 40% milo sufficed to increase markedly the degree of unsaturation of abdominal fat, mainly due to the increase in linoleic acid concentration, accompanied by an enhanced susceptibility to oxidation. Further increase in the degree of unsaturation of the carcass fat, due to higher levels of dietary oils, promoted further decrease in its stability in the cases of dietary soybean and milo oils, but not with corn oil. Moreover, differences in the degree of unsaturation of the carcass fat of broilers, fed either corn or milo as the sole grain (in the absence of added antioxidant and vitamin E), were not markedly reflected in the stability of either abdominal fat or meat, presumably due to the higher α-tocopherol content in tissues of broilers fed corn. Corn-oil-derived linoleic acid was deposited into adipose tissue at a significantly higher rate than that originating from milo or soybean oils.

TOTAL FATTY ACID COMPOSITION OF DUCK FATTY TISSUES. A.S. Pereira and W.J. Stadelman (Animal Sci Dept., Purdue Univ., West Lafayette, Indiana 47907) *Poult. Sci.* **55**, 1464–6 (1976). Total lipids extracted from duck fatty tissues were fractionated on thin layer plates into polar lipids and neutral lipids. Neutral lipids were similarly fractionated into their components. Fatty acid methyl esters from total lipids were fractionated by gas-liquid-chromatography. Results indicated that duck fatty tissues are mostly formed by neutral lipids and that triglycerides comprise the vast majority of neutral lipids. Results also indicated that the major fatty acids in duck lipids are: oleic > palmitic > linoleic > stearic > palmitoleic. About 73% of all fatty acids present belong to the C-18 series. The unsaturation level for duck lipids is about 73%.

THE ENCEPHALOPATHIC ACTION OF FIVE-CARBON-ATOM FATTY ACIDS IN THE RABBIT. P.F. Teychenne, I. Walters, L.E. Claveria, D.B. Calne, J. Price, B.B. Macgillivary and D. Gompertz (Dept. of Med., Royal Postgraduate Med. Schl., London) *Clin. Sci. Mol. Med.* **50**, 463–72 (1976). Five-carbon-atom organic acids (C-5 acids) have been administered intravenously to rabbits with ventriculocisternal perfusion and continuous electro-encephalographic recording (EEG). The concentration of the acids in the cerebrospinal fluid (CSF) perfusate have been compared with changes in integrated low-frequency activity in the EEG. The C-5 acids investigated were those accumulating in inborn errors of metabolism, i.e. isovaleric acid, β-methylcrotonic acid, tiglic acid and α-keto- and α-hydroxy-isovaleric acid. Their activity was compared with that of valeric acid. Valeric acid and isovaleric acid produced coma and pronounced increase in slow-wave electrical activity and these changes paralleled the increase in concentration of the acids in the CSF perfusate. It is concluded that all the C-5 acids tested have encephalopathic activity although this is lessened by the presence of either a double bond or an oxygenated functional group.

TIME SEQUENCE OF LIPOGENIC CHANGES IN ADIPOSE TISSUE OF RATS WHEN CONVERTED FROM AD LIBITUM FEEDING TO MEAL-EATING. M.K. Armstrong, D.R. Romsos and G.A. Leveille (Dept. Fd. Sci. and Human Nutr., Michigan State Univ., East Lansing, Michigan 48824) *J. Nutr.* **106**, 884–91 (1976). This study was undertaken to establish the time sequence of lipogenic changes in adipose tissue of rats when converted from ad libitum feeding to meal-eating. Rats were fed a high carbohydrate diet 2 hours/day for 0 to 10 days (meal-eating). The high speed supernatant fraction from homogenized epididymal fat pads was assayed for citrate cleavage enzyme, acetyl CoA carboxylase, fatty acid synthetase and malic enzyme activities. The effects of meal-feeding on in vitro and in vivo rates of fatty acid synthesis in adipose tissue as well as the amounts of glycogen deposited in the adipose tissue were measured. During the first 10 days of meal-feeding, the lipogenic enzyme activities were actually decreased or unchanged in the meal-fed rats but during this time the in vitro and in vivo rates of fatty acid synthesis were progressively increased in the meal-fed rats. Glycogen levels in the adipose tissue of meal-fed rats were greater than the levels in the nibblers. The initial hyperlipogenesis observed in the meal-fed rat appears to be due to changes in substrate uptake by the adipose tissue and/or alterations in enzyme activation in the adipose tissue rather than to changes in the quantity of enzyme present in the tissue.

LIPID-LOWERING ACTIVITY OF PHYTOSTANOLS IN RATS. M. Sugano, F. Kamo, I. Ikeda and H. Morioka (Lab. of Nutr. Chem., Dept. of Food Sci. and Tech., Kyushu Univ. Schl. of Agr., Fukuoka, Japan) *Atherosclerosis* **24**, 301–9 (1976). In the present study, the hypocholesterolemic activity of phytosterols and phytostanols was compared. Phytostanols were prepared by hydrogenating a phytosterol mixture from corn oil and were fed at different levels (0.1–1.0%) to male rats for 10 to 14 days with or without cholesterol (1.0%). In an appropriate combination with cholesterol, phytostanols showed significantly greater activity in lowering the plasma and possibly liver cholesterol levels in comparison with the corresponding phytosterols. The stanols further stimulated the fecal recovery of cholesterol. The rate of intestinal absorption of phytostanols appeared obviously lower than that of phytosterols and thus the deposition into plasma and liver lipids was almost negligible.

RESULTS OF COLESTIPOL THERAPY IN TYPE II HYPERLIPOPROTEINEMIA. A.M. Lees, M.A. McCluskey and R.S. Lees (Arteriosclerosis and Clin. Res. Ctrs., Mass. Inst. of Tech., 40 Ames St., Cambridge, Mass. 02142) *Atherosclerosis* **24**, 129–40 (1976). Twenty-five patients with well defined Type II hyperlipoproteinemia were treated with a divided 15 g daily dose of colestipol, a bile acid sequestrant, for periods of up to 20 months. The patients were divided into 3 groups: Those with no obvious sequelae, those with arcus corneae, xanthomas, and/or xanthelasmas only, and those with atherosclerotic complications. Colestipol lowered plasma cholesterol in all 3 groups, but reduced it to normal or near-normal levels in only 9 of the 25 patients (36%). The response of plasma triglycerides was highly variable; the mean for each group was elevated by the drug. Colestipol was well-tolerated and its effect did not diminish with time. It is a useful drug in the treatment of hypercholesterolemia.

THE EFFECT OF ILEAL BYPASS ON STEROL BALANCE AND PLASMA CHOLESTEROL IN THE WHITE CARNEAU PIGEON. K.J. Flynn, J.F. Schumacher, M.T.R. Subbiah and B.A. Kottke (Mayo Clinic and Mayo Foundation, Rochester, Minn. 55901) *Atherosclerosis* 24, 75–80 (1976). The effect of ileal bypass on steady-state sterol balance and plasma cholesterol was studied in sham operated (SO) and ileal bypass (IB) White Carneau pigeons 6 months (Group I) and 18 months (Group II) after surgery while fed their usual cholesterol-free diet. Unlike what has been noted in other animals, the bile acid (BA) and neutral sterol (NS) excretion (mg/kg per day) in IB was not statistically different from that in SO. Group I: BA, 40.2 (SO) vs 39.0 (IB); NS, 13.3 (SO) vs 17.3 (IB). Group II: BA, 55.7 (SO) vs 54.1 (IB); NS, 9.57 (SO) vs 8.84 (IB). IB pigeons had only slightly lower plasma cholesterol levels (postoperative) than SO pigeons. Group I, 329 (SO) vs 271 (IB) mg/dl ($P < 0.05$); Group II, 374 (SO) vs 312 (IB) mg/dl. This study indicates that the response to ileal bypass by White Carneau pigeons in terms of cholesterol excretion and plasma cholesterol changes is different than what has been observed in other species.

CHOLESTEROL METABOLISM FOLLOWING PORTACAVAL SHUNT IN THE PIG. H.P. Chase and T. Morris (Dept. of Pediatrics, Univ. of Colorado Med. Ctr., Denver, Colo. 80220) *Atherosclerosis* 24, 141–8 (1976). Portacaval shunting resulted in lower serum cholesterol and low density lipoprotein levels in comparison with values for littermate control pigs. Triglyceride levels were lower in the shunted animals only while receiving a low fat diet. The reductions in serum cholesterol and triglyceride levels of shunted pigs while receiving a standard pig diet were shown to be related to reduced hepatic synthesis of cholesterol and triglycerides.

HYPERCHOLESTEROLEMIA AND AORTIC COLLAGEN SYNTHESIS IN RABBIT AORTAS. R.O. Langner and J.B. Modrak (Univ. of Connecticut, College of Pharmacy, Storrs, Conn. 06268) *Atherosclerosis* 24, 149–53 (1976). Male adult New Zealand rabbits were fed a 2% cholesterol diet for 30 or 60 days in order to determine the effect of hypercholesterolemia on aortic collagen synthesis. Collagen synthetic activity was estimated by measuring tissue prolyl hydroxylase activity and the amount of tissue collagen was estimated by measuring tissue hydroxyproline levels. Following 30 or 60 days of feeding there was a significant increase in both tissue and serum cholesterol indicating the onset of hypercholesterolemia. Measurement of collagen synthetic activity and tissue collagen levels demonstrated no increase over control tissues. These data therefore indicate that hypercholesterolemia is not a direct stimulus of tissue collagen synthetic activity.

LIPID METABOLISM IN CULTURED AORTIC SMOOTH MUSCLE CELLS AND COMPARISON WITH OTHER CELL TYPES. PART 1. COMPOSITION OF CELLS GROWN IN HYPERLIPEMIC SERUM. J.D. Pearson (Sir William Dunn Schl. of Pathology, Univ. of Oxford, Oxford, Great Britain) *Atherosclerosis* 24, 233–42 (1976). The lipid compositions of cultured rabbit aortic smooth muscle cells, adventitial fibroblasts and skin fibroblasts were determined for cells grown in media containing either normolipemic or hyperlipemic serum. No significant changes were found in cell phospholipid composition. Each of the three cell types responded similarly to hyperlipemic serum, accumulating esterified cholesterol and triglycerides.

INHIBITORY EFFECT OF SYNTHETIC PHOSPHOLIPID VESICLES CONTAINING CHOLESTEROL ON THE FERTILIZING ABILITY OF RABBIT SPERMATOZOA. B.K. Davis (Worcester Foundation for Exper. Biol., Shrewsbury, Mass. 01545) *Proc. Soc. Exper. Biol. Med.* 152, 257–61 (1976). Suspensions of dimyristoyl and dipalmitoyl phosphatidylcholine vesicles bearing 10 to 40 (w/w) % cholesterol inhibited the fertilizing ability of uterine-capacitated rabbit spermatozoa at concentrations of 1 to 10 mg of lipid/ml. Recovery of fertilizing ability by treated sperm cells was observed following insemination into the uterus 5 to 6 hr before ovulation. Vesicles lacking the sterol were not inhibitory under the conditions employed. Suspensions of cholesterol (0.4 to 4 mg of sterol/ml) without phospholipid, in contrast, inhibited fertilization. Implication of cholesterol in sperm decapacitation by seminal plasma membrane vesicles is discussed in terms of these results.

EFFECT OF DIETARY α TOCOPHEROL ON LIVER MICROSOMES AND MITOCHONDRIA OF AGING RATS. L.S. Grinna (Dept. of Biol., Univ. of Calif., Los Angeles, Calif. 90024) *J. Nutr.* 106, 918–29 (1976). Rats of three age groups were fed tocopherol deficient or supplemented diets for 16 weeks or until signs of tocopherol deficiency were apparent. Erythrocyte hemolysis and liver tocopherol content were used as measurements of the tocopherol status of the rats. The following measurements were made on liver microsomal and mitochondrial fractions of all three groups; phospholipid content, lipid peroxidation, fatty acid patterns, pigment fluorescence, ANS fluorescence and the activities of several membrane bound enzymes. Eleven week-old rats displayed signs of vitamin E deficiency after consuming the diet for 7 weeks. Forty-two-week-old rats displayed borderline deficiency signs after 16 weeks of consuming the diet whereas 67-week-old rats displayed no deficiency signs. The need for dietary tocopherol, therefore, appeared to decrease with increasing animal age. Age related alterations in membrane compositional and functional parameters were not modified by either tocopherol deficient or supplemented diets. Tocopherol does not appear to stabilize microsomal membrane composition or function although mitochondrial membranes appear to be labilized by the dietary manipulation of the vitamin.

PURIFICATION AND CHARACTERIZATION OF LIPOPROTEIN LIPASE FROM HUMAN HEART. J.-S. Twu, A.S. Garfinkel and M.C. Schotz (Res., Vet. Adm. Wadsworth Hosp. Ctr., Los Angeles, Calif. 90073) *Atherosclerosis* 24, 119–28 (1976). Human heart lipoprotein lipase was purified by affinity chromatography on heparin-Sepharose 4B. When crude extracts of heart acetone powder were applied to columns, about 40% of total lipase activity was bound to the gel and then eluted with 1.5 *M* NaCl. At this stage the eluted enzyme was purified 1900-fold. Disc gel electrophoresis yielded a single protein band corresponding with lipolytic activity. Minimum molecular weight of the protein was 60,000 as determined by polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate. The purified enzyme was highly unstable; however, its activity could be partially stabilized at −20°C by bovine serum albumin, glycerol, or ethylene glycol. The activity of the purified enzyme had a pH optimum between 7.8 and 8.0; required serum for full enzymatic activity; apoC-II could be substituted for serum; was inhibited by apoC-I in the presence of activated substrate; was markedly inhibited by NaCl; and was stimulated by heparin.

CELLULAR STUDIES OF MAMMARY TISSUE FROM COWS HORMONALLY INDUCED INTO LACTATION: LACTOSE AND FATTY ACID SYNTHESIS. R.J. Collier, W.J. Croom, D.E. Bauman, R.L. Hays and D.R. Nelson (Dept. of Dairy Sci., University of Illinois, Urbana, Ill. 61801) *J. Dairy Sci.* 59, 1226–46 (1976). Temporal changes in ability of mammary gland to synthesize lactose and fatty acids were identified during the treatment of cows hormonally induced to lactate, and animal differences were compared to subsequent milk production. Hormonal treatment involved 17 β-estradiol + progesterone on days 1 to 7 and dexamethasone on days 17 to 19. Mammary tissue obtained by biopsy on days 0, 8, 16, and 26 of treatment was examined for biosynthetic capacity by tissue slice incubations. In terms of peak daily milk yield, one cow was very successful (>30 kg), two were intermediate (9 to 10 kg), and one cow was unsuccessful (<3 kg). Differences between cows in the capability to synthesize lactose and fatty acids were evident as early as day 8 and were further magnified by day 16. In particular, the tissue from the successful cow was undergoing lactogenesis by day 8 while this was not evident until the day 16 biopsy sample in the less successful cows. In contrast to the other cows, tissue from the unsuccessful animal regressed in its ability to synthesize lactose and fatty acids between animals in measurements of metabolic capacity were consistent with subsequent milk production.

VITAMIN E AND SELENIUM INTERRELATIONS IN THE DIET OF ATLANTIC SALMON (SALMO SALAR): GROSS, HISTOLOGICAL AND BIOCHEMICAL DEFICIENCY SIGNS. H.A. Poston, G.F. Combs, Jr., and L. Leibovitz (Tunison Lab. of Fish Nutr., U.S. Fish and Wildlife Serv., Cortland, New York 13054) *J. Nutr.* 106, 892–904 (1976). Either simultaneous or separate dietary deficiencies of vitamin E and selenium in Atlantic salmon during first 4 weeks of feeding caused twice the mortality shown in fish fed both supplemental vitamin E (0.5 IU/g dry diet) and selenium (0.1 μg/g). Subsequent dietary repletion with both vitamin E and selenium significantly reduced mortality during the following 2 weeks. Larger salmon (0.9 g initial mean weight), with vitamin E deficiency with or without selenium resulted in the following deficiency signs: extreme anemia, pale gills, anisocytosis, poikilocytosis, elevated plasma protein, exudative diathesis, dermal depigmentation, in vitro ascorbic acid-stimulated peroxidation in hepatic micro-

somes, yellow-orange liver color, yellow-brown intestinal contents, enlarged gall bladder distended with dark green bile, low vitamin E in carcass fat and water, and a response to handling characterized by a transitory fainting with interruption in swimming. A deficiency of dietary selenium suppressed plasma glutathione peroxidase activity. Supplemental selenium with vitamin E significantly increased tocopherol activity in hepatic, but not carcass tissues. Supplements of both vitamin E and selenium were necessary to prevent muscular dystrophy.

THE EFFECT OF A LONG-TERM EXCESS OF PYRIDOXINE ON THE FATTY ACID COMPOSITION OF THE MAJOR PHOSPHOLIPIDS IN THE RAT. C.B. Delorme and P.J. Lupien (Centre de Recherches sur les Maladies Lipidiques, and Centre de Recherches en Nutr., Dept. Biochim. Faculte de Medecine, Univ. Laval, Quebec, Canada G1K 7P4) *J. Nutr.* 106, 976–84 (1976). The effect of a long-term excess of pyridoxine on the fatty acid spectrum of phosphatidylcholine, lysophosphatidylcholine and phosphatidylethanolamine of liver, plasma and kidneys in rats was studied to determine whether this response might be opposite to that observed during a deficiency. As a function of time, the fatty acid composition of the phospholipids generally changed similarly in both the control group and the pyridoxine-treated group. Though differences did occur between the two groups, particularly on day 14 of the treatment, they generally disappeared by day 22. We therefore attributed the major part of the changes occurring in the pyridoxine-treated rats to the age or development of the rats rather than to the pyridoxine treatment itself. In general, the proportion of arachidonic acid increased with time in the phospholipids of both groups while that of linoleic acid decreased. The magnitude of these changes and the proportion of the different fatty acids in the various phospholipids were not uniform from one phospholipid to another or from one tissue to another. Possible mechanisms were discussed.

UTILISATION OF EXOGENOUS FATTY ACIDS BY RAT EPIDIDYMAL FAT CELLS IN VITRO. E.D. Saggerson (Dept. of Biochem., Univ. of College London, Gower St., London WC1E 6BT, U.K.) *Biochim. Biophys. Acta* 431, 371–7 (1976). When isolated rat fat cells are incubated with radioactively labelled palmitate the extracellular fatty acid pool is diluted by fatty acids of endogenous origin. Using fat cell concentration as an experimental variable, a simple graphical procedure has been devised to correct for the difficulty such precursor dilution causes in measurement of oxidation and esterification of exogenous fatty acids. After application of such corrections it was calculated that extracellular palmitate was utilised for oxidation with a composite K_m of approx. 7 μM. The composite K_m for palmitate esterification was 29 μM (no other substrates present, albumin included at 10 mg/ml).

SKIN SURFACE LIPIDS OF THE GUINEA PIG. D.T. Downing and D.M. Sharaf (Depts. of Dermatology and Biochem., Boston Univ. School of Med., Boston, Mass. 02118) *Biochim. Biophys. Acta* 431, 378–89 (1976). Skin surface lipids of the guinea pig were found to contain sterol esters (33%), wax diesters (diacyl alkanediols) (24%), glycerol ether diesters (28%), free fatty alcohols (6%) and free sterols (9%). The sterol esters and diacyl alkanediols contained saturated fatty acids (40 and 67%, respectively) having straight and singly-branched chains and mono-unsaturated acids (60 and 33%, respectively) derived predominantly by Δ^9-desaturation of C_{15} and C_{16} straight-chain saturated fatty-acid precursors. The 1-*O*-alkylglycerols and fatty acids from the glycerol ether diesters were both entirely saturated series containing straight, branched and multi-branched chains. Both the free and the esterified sterols consisted principally of cholesterol with a small proportion of lathosterol.

FUNCTION OF PHOSPHATIDYLGLYCEROL MOLECULAR SPECIES IN MEMBRANES. ACTIVATION OF MEMBRANE-BOUND SN-GLYCEROL 3-PHOSPHATE ACYLTRANSFERASE IN ESCHERICHIA COLI. M. Ishinaga, M. Nishihara, M. Kato and M. Kito (Res. Inst. for Food Sci., Kyoto Univ., Uji, Kyoto 611, Japan) *Biochim. Biophys. Acta* 431, 426–32 (1976). *sn*-Glycerol 3-phosphate acyltransferase (EC 2.3.1.15) bound to the elaidate-enriched membranes of an unsaturated fatty acid auxotroph of *Escherichia coli* had a lower specific activity than the acyltransferase associated with the wild-type membranes. The 1-saturated-2-*cis*-unsaturated and 1,2-di-*cis*-unsaturated molecular species of phosphatidylglycerol activated this enzyme. However, these molecular species did not change the original temperature profile obtained by Arrhenius plots of the enzyme activity bound to the elaidate-enriched membranes.

SPHINGOLIPID BASE METABOLISM. SPHINGANINE-1-PHOSPHATE LYASE: IDENTIFICATION OF ETHANOLAMINE 1-PHOSPHATE AS PRODUCT. T. Shimojo and G.J. Schroepfer, Jr. (Depts. of Biochem. and Chem., Univ. of Illinois, Urbana, Illinois 61801) *Biochim. Biophys. Acta* 431, 433–46 (1976). Ethanolamine 1-phosphate has been characterized as a product of the action of rat liver microsomal sphinganine 1-phosphate lyase on *erythro*-sphinganine 1-phosphate. The product was characterized by various forms of chromatography, gas-liquid chromatography-mass spectral analysis of appropriate derivatives, and by conversion to ethanolamine. The results of detailed studies of the mass spectral fragmentation of the tetratrimethylsilyl derivative of ethanolamine 1-phosphate are also reported.

BIOSYNTHESIS OF PROSTAGLANDIN $F_{2\alpha}$ FROM ARACHIDONIC ACID AND PROSTAGLANDIN ENDOPEROXIDES IN THE UTERUS. P. Wlodawer, H. Kindahl and M. Hamberg (Dept. of Chem., Karolinska Inst., S-104 01 Stockholm, Sweden) *Biochim. Biophys. Acta* 431, 603–14 (1976). Formation of prostaglandin $F_{2\alpha}$ in the cow and guinea pig uterus microsomes was studied using ^{14}C-labeled arachidonic acid and prostaglandin H_2. The total conversion of arachidonic acid was of a low order and underwent fluctuations during the estrous cycle of the guinea pig, being the highest towards the end of the cycle. Injections of β-estradiol-3-benzoate also resulted in higher activity of the uterine prostaglandin synthetase. The uterine prostaglandin synthesizing system appeared to differ in several respects from that present in seminal vesicles, with regard to the proportions of the products formed and the effects of various agents, e.g. reduced glutathione. An inhibiting factor which suppressed the fatty acid cyclo-oxygenase was found to be present in uterine preparations. Prostaglandin endoperoxide (prostaglandin H_2) was very efficiently reduced to prostaglandin $F_{2\alpha}$ by cow and guinea-pig uterus microsomes. Prostaglandin G_2 also gave rise to prostaglandin $F_{2\alpha}$. Prostaglandin E_2, on the other hand, was not reduced. Both the inhibiting factor and the endoperoxide reducing activity are likely to be parts of a highly specialized mechanism that modulates prostaglandin $F_{2\alpha}$ formation in the uterus.

THE INHIBITORY EFFECT OF VITAMIN E ON DESFERRIOXAMINE-INDUCED IRON EXCRETION IN RATS. C. Hershko and E.A. Rachmilewitz (Dept. of Hematology, Hadassah Univ. Hosp., Hebrew Univ. Hadassah Med. Schl., Jerusalem, Israel) *Proc. Soc. Exp. Biol. Med.* 152, 249–52 (1976). The influence of vitamin E on the mobilization and excretion of storage iron induced by DF was studied in normal and iron-overloaded rats. Vitamin E administration in pharmacologic doses resulted in complete inhibition of the effect of DF on storage iron in iron-overloaded rats while no such effect could be demonstrated in rats with normal iron stores. The mechanism of the observed inhibition of DF action by vitamin E is at present unknown. Nevertheless this drug interaction has to be considered in view of ongoing therapeutic trials where both antioxidants and iron chelating drugs are administered simultaneously to thalassemic patients with transfusion induced iron overload.

EFFECTS OF CALCIUM AND PHOSPHATIDYL SERINE IN RAT MAST CELL REACTION TO DEXTRAN. J.H. Baxter and R. Adamik (Lab. of Cellular Metabolism, Natl. Heart and Lung Inst., Natl. Insts. of Health, Bethesda, Maryland 20014) *Proc. Soc. Exp. Biol. Med.* 152, 266–71 (1976). Histamine release from Sprague-Dawley rat mast cells by dextran was completely inhibited by the absence of exogenous Ca^{2+} (in contrast to release from the same cells by antigen). Also, spontaneous leakage of histamine from the cells increased in the absence of Ca^{2+}, and cell responsiveness was not completely restored by readding Ca^{2+}. We found no effective substitute for Ca^{2+} in the release reaction. Ca^{2+} was not maximally effective immediately when added back to Ca-deficient cells, but almost the full effect of diluting Ca^{2+} in the medium (which decreased release) and of adding PS (which increased release) were very rapidly established, suggesting that both Ca^{2+} and PS might act (in part) at superficial cell sites. Release from activated cells could be stopped short by adding glucose or by diluting the cell-dextran mixture with normal buffer, as well as by adding EDTA, which deserves further study.

A PERSPECTIVE VIEW OF DIETING TO LOWER THE BLOOD CHOLESTEROL. H.M. Whyte and N. Havenstein (Dept. of Clin. Sci., John Curtin Schl. of Med. Res., Australian Natl. Univ., Canberra, Australia) *Am. J. Clin. Nutr.* 29, 784–90 (1976). As a guide to physicians, patients, and potential patients concerned with the prospect and practicalities of changing the diet to lower the blood cholesterol in the hope of preventing disease, estimates have been made of the importance of various

items of food which figure prominently in relation to this topic. The measure of importance adopted is the predicted contribution to the plasma-cholesterol concentration which will result from regular consumption of average servings of these foods, the prediction being based on the content of fatty acids and cholesterol. The major contributors, each adding more than 10 mg/100 ml to the plasma level, include brains, double servings of meat, one egg per day, and butter. At the other extreme, polyunsaturated oils and margarines actively lower plasma cholesterol while oysters, skim milk, and nuts have practically no effect. The relative importance of items, including the newer polyunsaturated ruminant meats and other products, has been charted for easy reference. The culinary costs involved in a cholesterol-lowering diet, considered not in monetary terms but as debits and credits in the food statement, must be balanced against the potential benefits to be gained from disease prevention.

DIFFERENTIAL EFFECTS OF HIGH DIETARY LEVELS OF VITAMIN A ON THE VITAMIN E-SELENIUM NUTRITION OF YOUNG AND ADULT CHICKENS. G.F. Combs, Jr. (Dept. of Poultry Sci., Auburn Univ. and Agr. Experiment Station, Auburn, Alabama 36830) *J. Nutr.* **106**, 967–75 (1976). Experiments were conducted to determine the nature of the interaction of high levels of vitamin A and vitamin E-selenium nutrition in the chicken. Results showed that chicks were protected from the vitamin E-selenium deficiency disease exudative diathesis (ED) by a high dietary level of vitamin A (1.0×10^6 IU/kg) which moderately depressed growth. A greater concentration (1.5×10^6 IU/kg) of vitamin A in the diets of hens fed a low vitamin E diet hastened their depletion of plasma tocopherols and increased plasma glutathione peroxidase (GSH · px) activity. At hatching the progeny of vitamin A-fed hens were severely depleted of plasma tocopherols but had normal plasma GSH · px activities. They showed increased susceptibility to ED when fed selenium deficient, vitamin E-free diets for 2 weeks. Absorption studies using ligated duodenal loops or oral doses indicated that high-level dietary vitamin A promoted the enteric absorption of selenium but interfered with the absorption of vitamin E. The dual nature of these effects was related to the ED-protective influence of vitamin A when fed to chicks, and the ED-stimulative influence on progeny when vitamin A was fed to dams.

THE EFFECT OF TWO ISOMERIC OCTADECENOIC ACIDS ON THE LIPID METABOLISM AND GROWTH OF NOVIKOFF HEPATOMA CELLS. D.E. Wennerstrom and H.M. Jenkin (The Hormel Inst., Univ. of Minnesota, Austin, Minn. 55912) *Biochim. Biophys. Acta* **431**, 469–80 (1976). The origin and metabolism of octadecenoic acid (18:1) was examined in intact Novikoff rat hepatoma cells by using labeled precursors and two isomeric octadecenoic acids which differed in their abilities to stimulate cell growth in a serum-free medium. The isomers (*cis*-6-18:1 and *cis*-9-18:1) were measured in the cellular lipid by ozonolysis and reduction of the ozonides. The results indicate that the 18:1 fatty acid accumulated in the cell lipid by uptake of the preformed acid from the medium. The *cis*-6-18:1 was more extensively metabolized than the *cis*-9-18:1 to 16:1 and 20:1 fatty acids by chain shortening and chain elongation. Both isomers inhibited de novo fatty acid synthesis from acetate by cells suspended in a serum-free medium. The isomers did not exert coordinate control of both fatty acid and cholesterol biosynthesis in the Novikoff cells.

MEASUREMENT OF THE CURVATURE-ELASTIC MODULUS OF EGG LECITHIN BILAYERS. R.M. Servuss, W. Harbich and W. Helfrich (Inst. fur Atom- und Festkörperphysik, Freie Univ., Königin-Luise-Str. 28–30, D 1000 Berlin 33) *Biochim. Biophys. Acta* **436**, 900–3 (1976). The first determination of the curvature-elastic modulus κ of a bilayer is presented. The method is based on the microscopic study of thermally fluctuating bilayer tubes. For egg lecithin at room temperature we obtain $\kappa = (2.3 \pm 0.3) \cdot 10^{-12}$ erg.

SPHINGOLIPID BASE METABOLISM. STEREOSPECIFIC UPTAKE OF PROTON IN THE ENZYMATIC CONVERSION OF SPHINGANINE 1-PHOSPHATE TO ETHANOLAMINE 1-PHOSPHATE. T. Shimojo, T. Akino, Y. Miura and G.J. Schroepfer, Jr. (Depts. of Biochem. and Chem., Univ. of Illinois, Urbana, Illinois 61801) *J. Biol. Chem.* **251**, 4448–57 (1976). D-*erythro*-(2*S*,3*R*)-Sphinganine 1-phosphate was incubated with rat liver microsomes in the presence of tritiated water. [^{3}H]Ethanolamine 1-phosphate was isolated and converted, through a combination of enzymatic and chemical reactions, to [^{3}H]glycine. The labeled glycine was incubated with D-amino acid oxidase, an enzyme which, in the catalysis of the conversion of glycine to glyoxylic acid, specifically removes the hydrogen in the *S* configuration at carbon atom 2 of glycine. Essentially complete retention of the labeled hydrogen occurred upon conversion of glyoxylic acid. The combined results indicate that the conversion of D-*erythro* (2*S*,3*R*)-sphinganine 1-phosphate to palmitaldehyde and ethanolamine 1-phosphate, catalyzed by sphinganine-1-phosphate lyase of rat liver microsomes, proceeds with the stereospecific incorporation of 1 atom of solvent hydrogen into the *R* configuration of ethanolamine 1-phosphate.

THE EFFECT OF HASHISH COMPOUNDS ON PHOSPHOLIPIDS PHASE TRANSITION. D. Bach, A. Raz and R. Goldman (Lab. of Membranes and Bioregulation, Weizmann Inst. of Sci., Rehovot, Israel) *Biochim. Biophys. Acta* **436**, 889–94 (1976). The interaction of hashish compounds, Δ^1-tetrahydrocannabinol and cannabidiol, with dipalmitoyl phosphatidylcholine was investigated using differential scanning calorimetry. Both drugs affect the transition of dipalmitoyl phosphatidylcholine from the gel to liquid crystalline state, decreasing both the melting temperature and the enthalpy of melting. At a drug to dipalmitoyl phosphatidylcholine ratio of approx. 1:5, two peaks appear in the transition profile, suggesting a phase separation in the drug dipalmitoyl phosphatidylcholine mixture.

THE EFFECT OF PHOSPHOLIPASES AND PROTEASES ON THE BINDING OF γ-AMINOBUTYRIC ACID TO JUNCTIONAL COMPLEXES OF RAT CEREBELLUM. C.T. Giambalvo and P. Rosenberg (Section of Pharmacol. and Toxicology, Univ. of Connecticut, Schl. of Pharmacy, Storrs, Conn. 06268) *Biochim. Biophys. Acta* **436**, 741–56 (1976). A preparation enriched in junctional complexes, as judged by marker enzymes and electron microscopy, was prepared from rat cerebellum. The junctional complexes were incubated with γ-amino [^{14}C] butyric acid at 25° C for 10 min, using [^{3}H] sucrose as a marker for entrapped space. Total binding was determined in the absence of, and non-specific binding in the presence of, an excess of unlabelled γ-aminobutyric acid. The difference between the two binding values, i.e. the specific binding, was saturable and reversible, and showed positive cooperativity with a Hill number of about 2. The specific binding was inhibited by N-methylbicuculline, picrotoxinine and imidazole-4-acetic acid, but not by curare, strychnine or L-2,4-diaminobutyric acid. The above compounds had little effect on the non-specific binding, but addition of ethylene-diaminetetraacetic acid decreased non-specific binding by 80%. Trypsin, pronase, phospholipase A_2, lysolecithin and sodium dodecyl sulfate decreased binding. Phospholipase C increased the specific binding by 260%. Phospholipids competed with γ-aminobutyric acid for binding, with phosphatidylethanolamine being more potent than phosphatidylcholine. These results lend support for Watkins' hypothesis that phosphatidylethanolamine competes with γ-aminobutyric acid for binding to the receptor protein.

KINETICS AND STABILITY OF ALAMETHICIN CONDUCTING CHANNELS IN LIPID BILAYERS. L.G.M. Gordon and D.A. Haydon (Physiol. Lab., Univ. of Cambridge, Downing St., Cambridge, U.K.) *Biochim. Biophys. Acta* **436**, 541–56 (1976). It is already well-established that conduction in lipid bilayers containing alamethicin arises from the presence of complexes in which there are several molecules of the polypeptide. It is with the nature of these complexes that this paper is primarily concerned. While it is clear that increasing alamethicin concentration and increasing potential across the membrane favour their formation, the nature of the reactions involved has not yet been elucidated. Attempts have therefore been made to clarify the sequence of events leading to the establishment of a complex in its conducting state. It has been concluded that the most likely mechanism involves, initially, a non-field-dependent aggregation of the alamethicin, in the plane of the membrane, into non-conducting oligomers. These then appear to undergo movement normal to the membrane (which is field dependent) to form the conducting species. The corresponding rate constants are very sensitive to the lipid composition of the membrane and a variety of different systems has been examined in order to clarify the origins of this effect. The only conclusion from this part of the work is that lipid fluidity might be involved.

^{31}P NMR STUDIES OF UNSONICATED AQUEOUS DISPERSIONS OF NEUTRAL AND ACIDIC PHOSPHOLIPIDS. EFFECTS OF PHASE TRANSITIONS, P^2H AND DIVALENT CATIONS ON THE MOTION IN THE PHOSPHATE REGION OF THE POLAR HEADGROUP. P.R. Cullis and B. De Kruyff (Dept. of Biochem., Oxford Univ., South Parks Rd., Oxford OX1 3QU, U.K.) *Biochim. Biophys. Acta* **436**, 523–40 (1976). The 129 MHz (non-proton decoupled) and 36.4 MHz (proton decoupled) ^{31}P NMR spectra arising

from unsonicated aqueous dispersions of well defined species of phospholipid have been investigated. The phospholipids employed (and the parameters varied) include phosphatidylcholine (temperature), phosphatidylethanolamine (temperature), phosphatidic acid (temperature and p^2H) and phosphatidylglycerol (temperature, p^2H and Ca^{2+} (or Mg^{2+})) concentration. At $p^2H = 7$ the ^{31}P NMR spectra arising from saturated species of phosphatidylcholine, phosphatidylethanolamine and phosphatidylglycerol become progressively broader as the temperature is reduced below the phase transition, demonstrating reduced motion in the phosphate region of the polar headgroup. The observed narrowing of the ^{31}P NMR spectra of aqueous dispersions of phospholipids as the temperature is raised toward the hydrocarbon transition temperature is discussed in terms of the "pretransition" observed in calorimetric studies.

20-METHYLCHOLESTEROL. Y. Letourneux, G. Bujuktur, M.T. Ryzlak, A.K. Banerjee and M. Gut (The Worcester Foundation for Exp. Biol., Shrewsbury, Mass. 05145) *J. Org. Chem.* 41, 2288–92 (1976). Three syntheses of 20-methylcholesterol, resting on the alkylation of a C-20 anion with iodomethane, are described. The NMR signals of the 21- and the 28-methyl group are discussed in relation to the stereochemistry at C-20 of cholesterol and of 20-isocholesterol.

MASS SPECTROMETRIC ANALYSIS OF PERMETHYLATED GLYCOSPHINGOLIPIDS II. COMPARATIVE STUDIES ON DIFFERENT BLOOD-GROUP ACTIVE AND RELATED ERYTHROCYTE MEMBRANE GLYCOSPHINGOLIPIDS. P. Hanfland and H. Egge (Inst. für Experimentelle Hämatologie und Bluttransfusionswesen and Inst. für Physio. Chem., Univ. of Bonn, Germany) *Chem. Phys. Lipids* 16, 201–14 (1976). Three isomeric ceramide tetrasaccharides-P blood-group active globoside, lacto-N-neotetraosyl ceramide as ABH blood-group precursor, both isolated from human erythrocytes and "asialo ganglioside" from human brain as reference standard—and two ceramide pentasaccharides—H blood-group active glycosphingolipid, obtained from blood-group B active ceramide hexasaccharide of human B erythrocytes after -galactosidase treatment and ceramide pentasaccharide from rabbit erythrocytes with B-like blood-group activity - were investigated by mass spectrometry after permethylation. Differences in the composition of the ceramide residues can also be deduced from the mass spectra.

ESTIMATION OF SURFACE AREA AND COUNTERION BINDING CHARACTERISTICS IN FATTY AMINE MONOLAYERS FROM DESORPTION KINETICS. G.S. Patil, R.H. Matthews, and D.G. Cornwell (Dept. of Physiol. Chem., Ohio State Univ., Columbus, Ohio 43210) *J. Lipid Res.* 17, 197–202 (1976). The surface area per molecule of an un-ionized fatty amine is very similar to the surface area per molecule of an un-ionized fatty acid. Surface area increases with ionization in both fatty amine and fatty acid films. However, fatty amine cations have much smaller surface areas than the corresponding fatty acid anions. Thus counterion binding is stronger with fatty amine cations than with fatty acid anions. Surface area data show that counterion binding affinities for fatty amine cations decrease in the strong field sequence $Cl^- > Br^- > I^- > SCN^-$. Furthermore, surface areas in the presence of the most strongly bound counterions, Cl^- and Br^-, increase significantly with an increase in subphase ionic strength. These data are consistent with the formation of strong ion-pair bonds and their disruption with an increase in ionic strength. These data show that fatty amine cations form larger micelles when they desorb in the presence of strongly bond counterions. Anions enhance the solubility of a fatty acid anion in the sequence $Cl^- < I^- < SCN^-$, which is characteristic of chaotropic anions that disrupt water structure.

MECHANISM OF SALT-MEDIATED INHIBITION OF LIPOPROTEIN LIPASE. C.J. Fielding and P.E. Fielding (Cardiovascular Res. Inst., Univ. of Calif., San Francisco, Calif. 94143) *J. Lipid Res.* 17, 248–56 (1976). The activity of lipoprotein lipase isolated from rat postheparin plasma has been determined with synthetic lipids, in the presence and absence of apoprotein of the natural substrate very low density lipoprotein, as a function of medium ion-pair concentration of a number of different inorganic salts. The several kinetic effects of lipoprotein protein on lipase activity were specifically and quantitatively reversed in the presence of molar sodium chloride or solutions of equivalent effective ion concentrations of other salts. Salt-mediated inhibition was fully reversible by dilution and was independent of substrate concentration. Inhibition was a function of the identity of the salt anion within a Hofmeister (lyotropic) series: $I^- > SCN^- > NO_3^- > Cl^- > F^-$, and, in these terms, was not significantly different for a series of inorganic chlorides (Li^+, Na^+, K^+, Cs^+). The effects of salts on the natural lipoprotein substrates, chylomicrons, and very low density lipoproteins were similar to those obtained with a synthetic lipid-protein substrate complex. These findings are discussed in the light of recent ideas on the activation of lipoprotein lipase.

SYNTHESIS OF 11, 12-$^2H_2$- AND 11, 12-$^3H_2$-LABELED CHENODEOXYCHOLIC AND LITHOCHOLIC ACIDS. A.E. Cowen, A.F. Hofmann, D.L. Hachey, P.J. Thomas, D.T.E. Belobaba, P.D. Klein and L. Tokes (Gastroenterology Unit, Mayo Clinic and Mayo Foundation, Rochester, Minn.) *J. Lipid Res.* 17, 231–8 (1976). Deuterium- and tritium-labeled chenodeoxycholic acid and lithocholic acid were prepared by catalytic reduction of their respective 11 derivatives. Structures of the intermediates and their isotopic purity were verified by chemical ionization and electron impact mass spectrometry and by nuclear magnetic resonance spectroscopy. Experimental conditions for reductive deuteration were defined which gave complete reduction of the olefin and a product of high isotopic purity. Conditions for optimal tritiation were developed with which little exchange of protons with the solvent occurred; the product had high specific activity. To test biological stability of the label, the ^3H-labeled chenodeoxycholic acid was administered simultaneously with ^{14}C-labeled chenodeoxycholic acid to two healthy subjects and the $^3H/^{14}C$ ratio in bile was determined daily for several days. The ratio remained identical to that administered, suggesting that the 11, 12-^3H label in chenodeoxycholic acid is stable during enterohepatic cycling and can be used for valid estimates of bile acid kinetics in man by the isotope dilution technique.

ISOLATION, CHARACTERIZATION, AND BIOLOGICAL ACTIVITY OF RETINYL PHOSPHATE FROM HAMSTER INTESTINAL EPITHELIUM. J.P. Frot-Coutaz, C.S. Silverman-Jones, and L.M. De Luca (Differentiation Control Section, Experimental Pathology Branch, Natl. Cancer Inst., Natl. Insts. of Health, Bethesda, Maryland 20014) *J. Lipid Res.* 17, 220–30 (1976). Epithelial cells from hamster small intestine, in short term culture, incorporate [carbinol-^{14}C] retinol into a compound that is identical to synthetic retinyl phosphate, as judged by chromatography on DEAE-cellulose, silicic acid, and thin layers of silica gel. The biological compound displays the same absorption spectrum as does synthetic retinyl phosphate with a maximum at 325 nm. Hydrolysis with mild alkali yields anhydroretinol, as it does for synthetic retinyl phosphate, with absorption maxima at 388, 368, and 346 nm. Enzymic hydrolysis by alkaline phosphatase releases 9% of the radioactivity as [^{14}C] retinol. Under the same conditions, 9% of synthetic retinyl phosphate is hydrolyzed to retinol. The biological compound was tested for biological activity. At a concentration of 5.5×10^{-8}M it was as active as retinol and retinyl phosphate in reversing keratinization induced in hamster tracheal epithelium by vitamin A deficiency. It is concluded that hamster intestinal cells synthesize retinyl phosphate.

QUANTITATIVE ANALYSIS OF INDIVIDUAL BILE ACIDS BY GAS-LIQUID CHROMATOGRAPHY: AN IMPROVED METHOD. D.C. Jones, G.W. Melchior and M.J.W. Reeves (The Atherosclerosis Center, Dept. of Pathology, Bowman Gray School of Med., Winston-Salem, North Carolina 27103) *J. Lipid Res.* 17, 273–7 (1976). The quantitative analysis of individual bile acids by gas-liquid chromatography has been improved by column oven temperature programming and by a new liquid phase, SP-2401. The method is fast; bile acids are well resolved; retention times are reproducible; detector responses are linear and sensitive to 0.1 μg; and there is little adsorption onto the liquid phase. The method has been successfully used for bile, and it has the potential for use on serum.

PHOSPHATIDYLGLYCEROL IN LUNG SURFACTANT. III. POSSIBLE MODIFIER OF SURFACTANT FUNCTION. M. Hallman and L. Gluck (Dept. of Pediatrics, Univ. of California, San Diego, La Jolla, California 92093) *J. Lipid Res.* 17, 257–62 (1976). Lamellar bodies and alveolar lavage from adult mammalian lung contain unusually high concentrations of phosphatidylglycerol that could serve as a sensitive indicator of surfactant. Phosphatidylglycerol was absent and phosphatidylinositol was correspondingly prominent in surfactant from the preterm rabbit fetus. Phosphatidylglycerol rapidly appeared and phosphatidylinositol decreased following the delivery. Surfactant isolated from the prematurely born rabbit or from humans with respiratory distress syndrome never contained phosphatidylglycerol. Comparison between lamellar bodies from fetal and postnatal

rabbits revealed remarkably similar composition except for the acidic phospholipids; however, the physicochemical properties were different. The compressibility of the surface film (i.e. the ratio of the fractional decrease in surface area and the corresponding decrease in surface tension) at low surface tensions was higher with fetal than with postnatal surfactant, whereas the difference in minimum surface tensions was small. These data suggest that phosphatidylglycerol is not an essential component required for the formation of the complex, but it improves the properties of surfactant in stabilizing the alveoli.

SIDE CHAIN HYDROXYLATION OF CHOLESTEROL, CAMPESTEROL, AND β-SITOSTEROL IN RAT LIVER MITOCHONDRIA. L. Aringer, P. Eneroth and L. Nordstrom (Dept. of Chem., Karolinska Inst. and the Hormone Lab., Dept. of Obstetrics and Gynecology, Karolinska Sjukhuset, S-104 01 Stockholm 60, Sweden) *J. Lipid Res.* 17, 263–72 (1976). The extent of the side chain hydroxylation of cholesterol, campesterol (24α-methylcholesterol), and β-sitosterol (24α-ethylcholesterol) in rat liver mitochondria has been compared. Two β-sitosterol metabolites, tentatively identified by liquid chromatography, thin-layer chromatography, gas-liquid chromatography combined with radioactivity detection, and gas-liquid chromatography-mass spectrometry as the 26- and 29-hydroxy derivatives, were formed in the proportion 1:1. The sum of 26-hydroxy- and 29-hydroxy-β-sitosterol obtained amounted only to about one-fourth of the yield of 26-hydroxycholesterol. Campesterol appeared to give rise only to 26-hydroxycampesterol (tentatively identified), which was formed in similar yields as 26-hydroxycholesterol (0.2–0.4%). The formation of 29-hydroxy-β-sitosterol but not of 28-hydroxycampesterol indicates that the ω-hydroxylation of the steroid side chain is dependent on the length of the side chain. The ratio between the yields of 26- and 25-hydroxycholesterol ranged between 2 and 3, and that between 26- and 24-hydroxycholesterol was about 10.

AN IMPROVED AND SIMPLIFIED RADIOISOTOPIC ASSAY FOR THE DETERMINATION OF FREE AND ESTERIFIED CARNITINE. J.D. McGarry and D.W. Foster (Depts. of Internal Med. and Biochem., The Univ. of Texas Health Sci. Ctr. at Dallas, Dallas, Texas 75235) *J. Lipid Res.* 17, 277–81 (1976). The radioisotopic assay for carnitine first described by Cederblad and Lindstedt and modified by Bøhmer et al has been improved and simplified. As a result, the assay yields a linear response over a wide range of carnitine concentrations without the need for excessive amounts of labeled acetyl-CoA. In addition, it will measure very small quantities of carnitine even in the presence of excess acylcarnitine. The method allows rapid determination of free and esterified carnitine in small volumes of plasma (50 μl is sufficient) without the need for prior deproteinization of the samples.

ISOLATION OF DISATURATED PHOSPHATIDYLCHOLINE WITH OSMIUM TETROXIDE. R.J. Mason, Jean Nellenbogen, and J.A. Clements (Cardiovascular Res. Inst., Univ. of California Med. Ctr., San Francisco, California 94143) *J. Lipid Res.* 17, 281–4 (1976). A simple, rapid, inexpensive method for isolating disaturated phosphatidylcholine from adult rat lung has been devised. Total lipids are reacted with osmium tetroxide dissolved in carbon tetrachloride, and the disaturated phosphatidylcholine is isolated on a column of neutral alumina. More than 99% of the fatty acids in the phosphatidylcholine fraction are saturated and 94% of this material migrates as phosphatidylcholine on subsequent thin-layer chromatography.

RAPID SCREENING OF LIPID METABOLISM IN MONOLAYER CELL CULTURES. E.A. Dosado, A.W. Hsie, and F. Snyder (Med. and Health Sci. Div., Oak Ridge Assoc. Univ. and the Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, Tenn. 37830) *J. Lipid Res.* 17, 285–8 (1976). Monolayer cell cultures grown on coverslips in the presence of radioactive lipid precursors were embedded in silica gel layers for extraction and resolution of the labeled products directly by thin-layer chromatography. The method permits rapid screening of lipid metabolism in tissue cultures with a small number of cells.

GAS-LIQUID CHROMATOGRAPHY OF BILE ACIDS: A NEW LIQUID PHASE FOR BOTH ACETATE AND TRIMETHYLSILYL DERIVATIVES. R. Galeazzi, E. Kok, and N. Javitt (Div. of Gastroenterology, New York Hosp.-Cornell Med. Ctr., New York, N.Y. 10021) *J. Lipid Res.* 17, 288–90 (1976). Polymetaphenoxylene (PPE-20) has been found to be more useful than cyclohexane dimethanol succinate (HI-EFF-8-BP) for trimethylsilyl derivatives of bile acids and to be preferable to trifluoropropyl substituted silicone (OV-210, QF-1) for analysis of their acetate derivatives.

THE METABOLISM OF 3α, 7α, 12α-TRIHYDROXY-5β-CHOLESTAN-26-OIC ACID INTO CHOLIC ACID: AN ENZYME ASSAY USING HOMOGENATES OF HUMAN LIVER. R.F. Hanson, H.L. Sharp and G.C. Williams (Gastroenterology Units, Dept. of Internal Med. and Pediatrics, Univ. of Minnesota, Minneapolis, Minn. 55455) *J. Lipid Res.* 17, 294–7 (1976). An enzyme assay was developed to measure the conversion of the bile acid precursor, 3α, 7α, 12α-trihydroxy-5β-cholestan-26-oic acid (THCA), into cholic acid using homogenates of human liver biopsies. The average rate of metabolism of THCA into cholic acid was found to be 3.9 ± 0.5 (± 1 SD) pmoles of cholic acid formed/mg liver/minute in twelve normal liver biopsies. This assay system can be used to determine if the syndrome of neonatal cholestasis associated with a metabolic block in the conversion of THCA into cholic acid is transmitted as a genetic trait.

PREPARATIVE ISOLATION OF CEREBROSIDES (GALACTOSYL AND GLUCOSYL CERAMIDE). N.S. Radin (Mental Health Res. Inst. and Dept. of Bio. Chem., Univ. of Michigan, Ann Arbor, Michigan 48109) *J. Lipid Res.* 17, 290–3 (1976). An improved method for isolating cerebrosides from natural sources is described. The method is particularly suited to large scale work and can be adapted to the isolation of sphingolipids that are less polar than the gangliosides. It is based on the use of sodium sulfate to absorb the water from chloroform-methanol tissue extracts, the use of triiodide to cleave the ether linkage of plasmalogens, and the use of alkaline methanolysis to cleave the ester linkages of the glycerolipids. The final separation of the lipids is done with a silica gel column.

EFFECTS OF FASTING ON BILE ACID METABOLISM AND BILIARY LIPID COMPOSITION IN MAN. W.C. Duane, R.L. Ginsberg and L.J. Bennion (Phoenix Clinical Res. Section, Natl. Inst. of Arthritis, Metabolism and Digestive Diseases, Phoenix Indian Med. Ctr., Phoenix, Arizona 85016) *J. Lipid Res.* 17, 211–9 (1976). The effects of a four to six day fast on gallbladder bile lipid composition, bile acid pool size, bile acid composition, and cholic acid metabolism have been determined in normal human subjects. Total bile acid pool size and cholic acid pool size were measured before and after fasting by a one-sample technique previously validated in our laboratory. The rate of synthesis of cholic acid and its fractional turnover rate before fasting were measured using standard techniques. Estimates of fasting cholic acid synthesis rate and fractional turnover rate were calculated as daily averages from the change in cholic acid pool size, in combination with the change in cholic acid specific activity, during the fasting period. Since these estimates are approximate, a maximum value for cholic acid synthesis rate during fasting was also determined by assuming that the entire change in cholic acid specific activity during the fasting period occurred instantaneously. Reduction in synthesis rate was confirmed by the determination of maximum fasting synthesis of cholic acid, which averaged 61.1% lower than synthesis in the fed period. Fasting had no consistent effect on total bile acid pool size, cholic acid pool size, or bile acid species composition.

THE USE OF PHOSPHOLIPID VESICLES FOR IN VITRO STUDIES ON CHOLESTERYL ESTER HYDROLYSIS. P. Brecher, J. Chobanian, D.M. Small and A.V. Chobanian (Cardiovascular Inst. and Dept. of Med., Boston Univ. Schl. of Med., Boston, Massachusetts 02118) 17, 239–47 (1976). Radiolabeled cholesteryl oleate was incorporated into vesicles prepared from egg yolk lecithin and utilized as a substrate for studies of sterol ester hydrolases present in rat liver homogenates. The cholesteryl oleate was shown to be associated with vesicles (unilamellar liposomes) using Sepharose 4B chromatography. With this substrate, two different cholesteryl ester hydrolytic enzymes were demonstrated in subcellular fractions from the liver homogenates. In the lysosome-rich fraction an acid hydrolase was present, while in the cytosol fraction (150,000g supernatant), hydrolytic activity was shown to occur with an optimum pH between 8 and 8.5. The substrate was characterized by Sepharose chromatography both before and after incubation with the liver fraction and was not dramatically altered even by rigorous incubation conditions. These studies demonstrate the applicability of cholesteryl ester-containing vesicles as a useful substrate for studying cholesteryl ester hydrolysis in vitro.

MEASUREMENT OF TWO PLASMA TRIGLYCERIDE LIPASES BY AN IMMUNOCHEMICAL METHOD: STUDIES IN PATIENTS WITH HYPERTRIGLYCERIDEMIA. H. Greten, R. DeGrella, G. Klose, W. Rascher, J.L. de Gennes and E. Gjone (Klinisches Inst. fur Herzinfarktforschung, Med. Univ. Heidelberg, 69 Heidelberg,

Germany) *J. Lipid Res.* 17, 203–10 (1976). Postheparin plasma lipolytic activity consists of two hydrolytic activities, hepatic triglyceride lipase and lipoprotein lipase. These two enzymes were separated and partially purified by means of ammonium sulfate precipitation and affinity chromatography using Sepharose with covalently linked heparin and concanavalin A, respectively. Antibodies were produced against hepatic triglyceride lipase and they did not cross react with lipoprotein lipase. Optimal conditions for selective precipitation of hepatic lipase and specific measurement of these two lipases were investigated. This method was applied to the study of 15 patients with hypertriglyceridemia and 8 patients with familial lecithin-cholesterol-acyltransferase deficiency of whom 6 also had a marked elevated plasma triglyceride concentration. All patients had normal values of hepatic plasma lipase. These studies emphasize the necessity for differentiating between triglyceride lipase activity of hepatic and extrahepatic origin in evaluating patients with impaired triglyceride metabolism.

IMPROVED METHODS FOR THE STUDY OF HEPATIC HMG CoA REDUCTASE: ONE STEP ISOLATION OF MEVALONOLACTONE AND RAPID PREPARATION OF ENDOPLASMIC RETICULUM. C.D. Goodwin and S. Margolis (Depts. of Physio. Chem. and Med., Johns Hopkins Schl. of Med., Baltimore, Maryland 21205) *J. Lipid Res.* 17, 297–303 (1976). Two new methods are described for the study of hepatic 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase. Endoplasmic reticulum was rapidly prepared by diluting a 10,000 *g* supernatant with buffer containing 8 mM calcium chloride. The yield of protein and the specific activity of HMG CoA reductase in the pellet subsequently obtained by low speed centrifugation were nearly identical to those in the microsomal pellet prepared by ultracentrifugation. This technique may be particularly useful in studies of the rapid, in vitro modulation of the enzyme. Mevalonolactone was extracted into benzene from the HMG CoA reductase assay mixture with an efficiency of 58%. There was less than 1% extraction of HMG CoA, acetoacetate, or β-hydroxybutyrate. The extracted mevalonolactone was at least 98% pure as judged by thin-layer chromatography with four different solvent systems. These improved methods should significantly aid studies of the physiological importance of HMG CoA reductase.

STUDIES ON NUTRITIVE VALUE OF SYNTHESIZED FATTY ACID. Y. Nakayama, Y. Totani, N. Totani and N. Matsuo (Dept. of Industrial Chemistry, College of Technology, Seikei University, Tokyo) Yukagaku 25(4), 231–3 (1976). Mixed fatty acids synthesized by air oxidation of paraffin were obtained from the Soviet Union. The mixed fatty acids were fractionated to C_{5-6}, C_{7-9}, C_{14-16} and C_{17-20} fractions by vacuum distillation, molecular sieve and the other methods, and these fractions were esterified with ethanol by usual method. Then, the nutritive value of each ester was compared with salad oil fatty acid ethyl ester prepared from commercial salad oil by feedings in Wister strain rats. The rats were fed 10% of each ester or controlled ester mixed with basal diets. As the results, there was no difference between the weight gain of the sample ethyl esters prepared from synthesized fatty acids and the salad oil fatty acids ethyl ester.

EFFECT OF SOME WHEAT MILL-FRACTIONS ON BLOOD AND LIVER LIPIDS IN CHOLESTEROL-FED RATS. G.S. Ranhotra, R.J. Loewe and L.V. Puyat (Nutrition Laboratory, American Institute of Baking, 400 E. Ontario, Chicago, IL 60611) *Cereal Chem.* 53(4), 540–8 (1976). Young male rats fed an atherogenic diet containing cholesterol showed, at 2 weeks, a sharp increase in their serum cholesterol levels which gradually declined over the next 6 weeks. When sucrose in the diet (50%) was substituted, in entirety, with three wheat fractions (flour, germ, and bran), elevation in serum cholesterol levels was significantly less pronounced throughout, in germ- and bran-fed rats, and, to a lesser extent, in those fed patent flour. This occurred in bran-fed rats in spite of higher intake of cholesterol. Effect on serum triglyceride levels was inconsistent; still, some lowering of levels was observed in flour- and germ-fed rats. In rats fed a cholesterol-free diet, substitution of sucrose with wheat fractions did not lower serum cholesterol levels, and some reduction in triglyceride levels occurred only in flour-fed rats. Livers of cholesterol-fed rats showed marked infiltration of cholesterol and increase in weights; these changes, however, were much less pronounced in germ- and bran-fed rats. Liver triglycerides were little affected. In cholesterol-fed rats, substituting sucrose with bran lowered chylomicron and β-lipoprotein fractions, and some reduction in β- and pre-β-fractions was also observed in rats fed patent and whole wheat flours.

• Edible Proteins

METHOD OF PREPARING DENSE, UNIFORMLY LAYERED VEGETABLE PROTEIN MEAT ANALOGUE. LaV.G. Wenger, E.J. Osterhaus and O.B. Smith (Wenger Manufacturing). *U.S. 3,970,761.* A vegetable protein material together with sufficient water is heated and worked under pressure under conditions leading to layering and finally extruded as a dense, layered meat analogue.

PROCESS FOR PREPARING A PROTEIN CONCENTRATE WITH MINIMAL PROTEIN DENATURATION. G.B. Karnofsky (Dravo Corp.). *U.S. 3,970,764.* An improvement in the desolventizing step following solvent extraction of oilseed material is claimed. The solvent is driven from the residue by direct contact with a recirculating stream of superheated solvent vapor containing water. The superheated vapor is obtained by mixing vapor originating from the residue with vapor originating outside the desolventizer.

VEGETABLE PROTEIN EXTRACTION. M.J.A. Groux, A. Dalan, J. Kruseman and P. Yves (Soc. d'Assist. Tech. pour Produits Nestle). *U.S. 3,968,097.* A process for the preparation of a soluble protein fraction comprises extracting a protein-containing vegetable material with an aqueous medium at pH 1.5–3, separating the aqueous extract from the insolubles, treating the extract to gel filtration at a pH below 4, and recovering the soluble protein fraction by elution.

PRODUCTION OF HYDRATABLE, TRANSLUCENT TO GLASSY, PROTEINACEOUS PRODUCTS. L. Sair and D.W. Quass (Griffith Laboratories). *U.S. 3,968,268.* A method of preparing an unpuffed, proteinaceous food product comprises subjecting a moist proteinaceous material, containing 10–50% water and 40% or more protein on a dry weight basis, to working under mechanical pressure with added heat to convert it to a hot, moist, plastic, extrudable mass. The hot plastic mass is extruded through an elongated, temperature-controlled die under nonpuffing conditions to produce the product which may be characterized as having texture and retaining its structural integrity under retorting conditions.

PROTEIN FOOD PRODUCT. B.M. Payne, J.R. Cloute, E.A. Johnson, A.V. Brown, Jr., and E.V. Oborsh (Ralston Purina Co.). *U.S. 3,968,269.* A method for producing a porous food product having the texture and organoleptic properties of meat comprises (a) mixing a vegetable protein containing material and a meat source; (b) mechanically working the mixture at elevated temperatures and pressures to produce a flowable substance; and (c) extruding the mixture into a lower pressure zone to form the expanded, porous product.

PROCESS FOR THE PRODUCTION OF OILSEED ISOLATES. P.L. Carey (Ralston Purina Co.). *U.S. 3,966,702.* A process for the production of an impurity-free protein extract from oilseeds comprises extracting ground, defatted oilseed material with an alkaline extractant to provide an extract having a pH of at least 8.5 and passing the extract through activated carbon to remove the impurities.

PROCESS FOR PREPARING SOY PROTEIN CONCENTRATE. R.D. Daftary (Archer Daniels Midland Co.). *U.S. 3,971,856.* A process for preparing a full-fat soy protein concentrate which is bland in taste, light in color, and contains all of the original protein comprises the steps of: (1) holding dehulled, cracked soybeans in water at 180–212 F for 10–50 minutes; (2) removing the soybeans from the water; (3) washing them with fresh hot water; and (4) drying the washed soybeans to 8–15% moisture.

THE PROCESSES OF OBTAINMENT OF PROTEIN CONCENTRATES AND ISOLATES BY PHYSICO-CHEMICAL METHODS. INDUSTRIAL PROCEDURES APPLIED TO SOYBEAN. D. Nicolas and V. Kadane (Central Soya Chemurgy, Bruxelles). *Rev. Fr. Corps Gras* 22, 439–49 (1975). Soybeans are selected according to protein content which is influenced by genetic, environmental, and agricultural factors. The quality of the beans used for the extraction of proteins is given in the paper. Industrial procedures for the preparation of flakes are described; the different systems of desolventizing are particularly reviewed, the quality of proteins being directly related to these techniques. Then, the processes of isolation and concentration of soyproteins are reviewed. The properties of isolates and concentrates are given according to the process used.

EXTRACTION AND PURIFICATION OF PROTEINS BY CHEMICAL PROCESS: SUNFLOWER MEAL AND HORSE-BEAN FLOUR. L. Petit et al.

(I.N.R.A., Station Bioch. et Physicoch. Céréales C.E.R.D.I.A., 91305 Massy, France). *Rev. Fr. Corps Gras 22*, 517–20 (1975). The authors describe the research at the Station de Biochimie et Physicochimie of INRA for the isolation of proteins from sunflower meal and horse-bean flour. The process used for the isolation of protein from soybeans may be employed, but it gives isolates with dark color. Improvement of the process which has been patented allow the amelioration of these two data. They consist of purification of the intermediate products and give an isolate with 16% N content from the sunflower meal and 15.5% from horse-bean flour.

PURIFICATION OF PROTEINS OF SUNFLOWER MEALS BY ULTRAFILTRATION. J. Culioli and J.L. Maubois (Lab. Rech. Technol. Laitière, I.N.R.A., Rennes, France). *Rev. Fr. Corps Gras 22*, 521–5 (1975). The commercial meals are dispersed in 10 times their weight of soda solution. Extraction of proteins is carried out by shaking for 10 to 15 min., at pH 10–11, with Na_2So_3 (0.15–0.5%) at about 40C. Solutions thus obtained are clarified, then subjected to the ultrafiltration which is discontinuous. The concentrates of proteins have 20% of dry matter and a relation N × 6.25/E.S.T. reaching to 90%. These concentrates are dried by atomization. Proteins are precipitated by acids at pH 4.8. After washing and drying, the relation N × 6.25/E.S.T. is above 95%.

SEPARATION OF PROTEIN FROM VEGETABLE SOURCES. A.L. Morehouse and R.C. Malzahn (Grain Processing Corp.). *U.S. 3,966,971*. The process comprises washing a vegetable protein source material with water maintained at a pH of minimum protein solubility, digesting the washed material in water at pH 2–6 in the presence of acid phytase, and separating a liquid extract containing soluble protein from the insoluble digestion residue.

TREATMENT OF SOYA. P.G. Banks and W. Pringle (The British Arkady Co.). *U.S. 3,966,992*. A process for eliminating or destroying the trypsin inhibitor in soya without significantly affecting the quality of the soya protein comprises heating a mixture of soya and whey at the boiling point of water for a period of time and with an amount of whey sufficient to destroy or eliminate the trypsin inhibitor. The pH of the mixture is below 5.5.

VEGETABLE PROTEIN PRODUCT AND PROCESS. A.A. Levinson and K.B. Basa (National Can Corp.). *U.S. 3,966,977*. A process for producing a proteinaceous food product having enhanced protein content and the fibrous, chewy texture of meat comprises contacting a compacted, defatted protein-containing seed meal in shard form with an aqueous solution of pH 2–6.5 containing a polyhydric alcohol having bacteriostatic properties at 105 C and superatmospheric pressure. The treatment is continued for a time sufficient to solubilize and extract a portion of the nonproteinaceous component and render the starting material porous while at the same time increasing its protein content. Then the product is recovered from the liquor and dried to 12–50% moisture. It contains sufficient polyhydric alcohol to render it resistant to bacterial attack when packaged without sterilization or canning. The protein-containing starting material is characterized as having a portion of its surface a densified, tough, partially denatured skin which is resistant to hydration.

PROCESS FOR TREATING OLEAGINOUS SEED MATERIAL. K.W. Becker, K.C. Baczewski, and D.J. Klein (Dravo Corp.). *U.S. 3,966,982*. A process for treating a defatted oleaginous seed material to extract soluble nonproteinaceous materials to form a proteinaceous concentrate comprises the steps of (a) contacting the starting material with a first carbohydrate selective solvent under conditions to extract a portion of the nonproteinaceous materials; (b) expressing the slurry of solids from step (a) to separate a first miscella stream from a first solids-solvent stream; (c) contacting the first solids solvent stream with a second carbohydrate selective solvent to extract the remaining nonproteinaceous material; and (d) expressing the slurry from step (c) to separate a second miscella stream from a second solids-solvent stream.

• Detergents

ACIDIC SURFACTANT COMPOSITION. F.R. Kappler, J.D. Ciko, and J.J. Kramer (BASF Wyandotte Corp.). *U.S. 3,969,282*. An acidic, stable, homogeneous, mobile liquid biodegradable surfactant composition consists of (a) at least one liquid hydrophilic nonionic surfactant, (b) at least one salt-free liquid biodegradable alkyl benzene sulfonic acid, (c) 0.0001–1% hydrogen peroxide, and (d) 0–95% water. A method of washing soiled textiles comprises use of the surfactant composition and a water soluble alkaline substance which provides an ammonium, sodium, or potassium ion in an amount sufficient to convert the sulfonic acid to the corresponding salt.

METHOD OF MANUFACTURING SALT OF α-SULFOFATTY ACID ESTER. O. Okumura, T. Sakatani, K. Ohbu, and M. Nagayama (Lion Fat & Oil Co.). *U.S. 3,969,375*. The method comprises flowing a film of the fatty acid ester through a first reaction zone in contact with an SO_3-inert gas mixture at 50–85 C for 0.5–30 seconds to form an intermediate sulfonated reaction product; flowing a film of the intermediate sulfonated reaction product; flowing a film of the intermediate product through a second reaction zone in contact with the SO_3-inert gas mixture at 95–150 C for 3–120 seconds to form an α-sulfofatty acid ester reaction product; and immediately neutralizing the reaction product with an alkali metal hydroxide, aqueous ammonia, or an ethanolamine. The finished product is of low color value and contains at least 80% α-sulfofatty acid ester.

LIQUID DETERGENTS CONTAINING CHELIDAMIC ACIDS. B.-D. Cheng (Colgate-Palmolive Co.). *U.S. 3,966,649*. A detergent composition consists of 19% $RO(C_2H_4O)_3SO_3Na$ wherein R is a mixed C_{12-15} normal primary alkyl group, 12% sodium sulfate, 10.3% of a condensation product of higher fatty alcohol of 14–15 carbon atoms with 11 moles of ethylene oxide, 22% chelidamic acid, 10.3% linear dodecyl benzene sulfonate, 8.6% isopropyl alcohol, and the balance water. ●