abstracts

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• Fats and Oils

EXTRACTION PROCESS TO IMPROVE THE QUALITY AND YIELD OF CRUDE VEGETABLE OILS. L.P. Hayes and R.P. Simms (A. E. Staley Mfg. Co.). *U.S. 3,878,232.* A process for recovering a lecithin rich oil from vegetable seed material which contains lipids and substantially all of the water soluble constituents of the native seed material comprises the steps of: (a) extracting the lipid material from the seeds with a hydrocarbon solvent containing 2–30 parts of monohydric alcohol, (b) separating the resultant miscella, (c) mixing the separated lipids in the presence of a hydrocarbon solvent, water, and alcohol, (d) separating a nonpolar phase containing the lipid extract from the polar phase containing a water-soluble extract, and (e) recovering a lipid concentrate from the nonpolar phase.

ACYLATION OF SYMMETRICAL DIGLYCERIDES WITH FATTY ACID ANHYDRIDE. J. Harwood (SCM Corp.). *3,878,231.* A solvent-free, noncatalytic acylating process for converting a symmetrical 1,3-diglyceride having a secondary hydroxyl into a stereospecific triglyceride comprises the steps of: (a) providing a symmetrical 1,3-diglyceride having identical fatty acids on the glyceride selected from stearic acid and palmitic acid, (b) mixing prior to heating the symmetrical diglyceride with a molar excess of fatty anhydride selected from stearic anhydride, palmitic anhydride, and oleic anhydride, (c) heating the mixture to about 70C to form a liquid phase reaction mixture, and (d) heating the liquid mixture at 70–200C for a time sufficient to acylate completely the secondary hydroxyl with the fatty anhydride to form a stereospecific triglyceride.

PHOTO-OPTICAL METHOD FOR DETERMINING FAT CONTENT IN MEAT. G.F. Button and K.H. Norris (U.S. Secy. of Agriculture). *U.S. 3,877,818.* The method comprises the following steps: (a) illuminating a meat sample with radiation which is then reflected along a predetermined path, (b) systematically changing the wavelength of the reflected radiation over a wavelength band which corresponds to the radiation absorption band of meat fat at an intermediate point along the path, (c) detecting a varying energy level of the reflected radiation as the wavelength is changed (d) measuring the change in energy level divided by the average energy level as the wavelength changes, and (e) calibrating the measurement to correspond with the fat content in the sample.

PURIFICATION OF STEROLS BY DISTILLATION. J.P. Clark, J.A. Demars, and G.G. Wilson (General Mills Chemicals, Inc.). *U.S. 3,879,431.* A process for separating a sterol mixture, obtained from unsaturated vegetable oil, into fractions rich in campesterol or sitosterol comprises distilling the mixture at a vapor temperature of 225–270C and an absolute pressure of 0.05–3.5 mm of mercury. The sterols are present initially in the free form and comprise at least 10% of the feed. The distillate fraction is rich in campesterol, and the residue is rich in sitosterol.

TREATMENT OF WHEY WITH SURFACTANTS. J.R. Moneymaker and B.W. Landfried (Top-Scor Products, Inc.). *U.S. 3,875,315.* A method of producing bakery products comprises the steps of (a) introducing an edible, nonionic, water dispersible surfactant taken from the group consisting of polyoxyethylene (20) mono-diglyceride and polyoxyethylene (20) sorbitan monostearate into an aqueous whey solution, (b) agitating to achieve dispersion, (c) drying the mixture, and (d) incorporating the dried mixture into a flour-containing dough and baking the dough. The surfactants comprise 0.5–5.0% of the dry weight of the mixture.

PREPARATION OF PHOSPHORIC ACID ESTERS OF FATTY ACID MONO- OR DIGLYCERIDES. T. Meguro, H. Takashashi, and K. Arai (Ajinomoto Co.). *U.S. 3,875,196.* The process comprises reacting a mono- or diglyceride ester of stearic acid, myristic acid, palmitic acid, palmitoleic acid, or a mixed acid ester of these with a polyphosphoric acid.

VITAMIN A-ACID ESTERS OF α-TOCOPHEROL AND THEIR PREPARATION. H. Fukawa and K. Tanaka (Nisshin Flour Milling Co.). *U.S. 3,878,202.* The compound indicated in the title is described and claimed.

INTERACTION OF PROXIDIZING METHYL LINOLEATE WITH SOME PROTEINS AND AMINO ACIDS. M. Karel, Karen Schaich and R.B. Roy (Dept. of Nutr. and Food Sci., Mass. Inst. of Technol., Cambridge, Mass. 02139) *J Agric. Food Chem.* 23, 159–63 (1975). Peroxidizing methyl linoleate reactions with protein lysozyme and with other selected proteins and amino acids were studied in model systems. Electron spin resonance established that reactions in the dry state between peroxidizing linoleate and lysozyme result in production of protein free radicals. Ionizing radiation and reaction with peroxides of methyl linoleate produced similar free radicals of carbon atoms in various proteins, and similar sulfur radicals in proteins having free sulfhydryl groups. Peroxides did not, however, break disulfide bonds in proteins. Studies of amino acids concentrated on the isolation and characterization of products of amino acid reactions with linoleate peroxides. Histidine gave several reaction products, one of which was identified as histamine. Methionine was oxidized to methionine sulfoxide, but under some conditions sulfone was formed. Several lysine reaction products were also separated and tentatively identified.

EFFECT OF LIPID ANTIOXIDANTS ON THE STABILITY OF MEAT DURING STORAGE. R.C. Benedict, E.D. Strange and C.E. Swift (Eastern Regional Res. Ctr., Agric. Res. Service, U.S. Dept. of Agric., Philadelphia, Pa. 19118) *J. Agric. Food Chem.* 23, 167–73 (1975). Deteriorative changes in meat may occur from heme and lipid oxidations, producing alterations in color, flavor, and odor. Samples of ground beef with either low levels (*ca.* 3%) or high levels (*ca.* 10%) of polyunsaturation in the added fat were examined for storage produced changes. High polyunsaturation levels increased meat deterioration. The antioxidant effectiveness of five additives (0.005% level) derived from natural sources (α-tocopherol, ascorbic acid, 1-ascorbyl stearate, citric acid, and ascorbic acid with sodium bicarbonate) was examined during 10 days storage. Samples were adjudged to be commercially unacceptable after 1–4 days storage but monitoring was continued to determine differences in the additive's antioxidant action. Ascorbic acid exerted a definite prooxidant action. The other additives showed only a slight effect in decreasing the rate of lipid and heme oxidations compared to untreated samples. A hypothesis of coupled heme-lipid oxidation is presented.

AROMA COMPOUNDS DERIVED FROM OXIDIZED LIPIDS. SOME BIOCHEMICAL AND ANALYTICAL ASPECTS. C. Eriksson (Biochem. Section, Swedish Inst. for Food Preservation Res. (SIK), Fack, S-400 21 Göteborg 16, Sweden) *J. Agric. Food Chem.* 23, 126–9 (1975). The formation of aliphatic aldehydes and alcohols, primarily from unsaturated fatty acids with the participation of lipoxygenase, hemoproteins, alcohol dehydrogenase, and esterase, is briefly reviewed with special regard to plant foods. The controlling or avoiding of aldehyde formation in food systems by the use of alcohol dehydrogenase and of certain sugar-amino reaction products was studied by use of a gas chromatographic technique.

SENSITIVE ANALYSIS OF ETHANOLAMINE- AND SERINE-CONTAINING PHOSPHOGLYCERIDES BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY. F.B. Jungalwala, R.J. Turel, J.E. Evans and R.H. McCluer (Eunice Kennedy Shriver Ctr. for Mental Retardation Inc., Waltham, Mass. 02154) *Biochem. J.* **145,** 517–26 (1975). A highly sensitive method for the separation and quantitative measurement of phospholipids containing primary amino groups, such as phosphatidylethanolamine, phosphatidylserine and lysophosphatidylethanolamine, is described. The method involves a simple and quantitative derivative formation of the phospholipids containing amino groups to their u.v.-absorbing biphenylcarbonyl derivatives. These have molar extinction coefficients of about 23000 at 268 nm. The phospholipid derivatives are then separated and non-destructively determined by high-performance liquid chromatography. The amino phospholipids containing vinyl ether bonds (plasmalogens) can be determined separately from the diacyl- and alkylacyl-amino phospholipids. The lower limit of detection by high-performance liquid-chromatographic analysis of the phospholipid derivatives is about 10–13 pmol or 0.3–0.4 ng of phospholipid P. The quantitative range of

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derivative formation and analysis by high-performance liquid chromatography of the phospholipids containing amino groups was shown to be 10–500 nmol. The method was shown to be applicable to the analysis of phospholipids containing amino groups in tissue samples.

STUDY OF THE REFINING PROCESS OF SUNFLOWER OIL WITH BUFFER SOLUTIONS. Kamysan et al. *Maslo-zhir. Prom-St.*, No. 1, 1975, pp. 9–12. A study was made of the effect of pH, the concentration and quantity of buffer solution on the refining process of sunflower oil. A buffer solution of phosphocitric acid was prepared by mixing $Na_2HPO_4 \cdot 2H_2O$ and $C_6H_8O_7$ in a predetermined ratio. Best refining with buffer solutions was obtained at pH 7.75, with 0.2 mole phosphate, and an oil: buffer ratio of 7:1. (Rev. Fr. Corps Gras)

ISOMERIC CONTENT OF INDUSTRIAL FATS HYDROGENATED WITH NICKEL CATALYSTS. I. Kaganowicz, *Tluszcze Jadalne*, 18, No. 6, 1974, pp. 290–1. The *trans* content of hydrogenated fat is independent of the kinds of catalysts studied ("RCH-FS", "Nysel", "Rufert", and "RFF-25"). However, it does depend on the degree of hydrogenation of the oil. At the same degree of hydrogenation, the *trans* content of oils treated with a mixed catalyst (used plus fresh) only is a little higher than that resulting from hydrogenation with a fresh catalyst. (Rev. Fr. Corps Gras)

A RAPID METHOD TO DETERMINE LIPIDS IN SOME FOOD PRODUCTS. Z. Cichon, *Tluszcze Jadalne*, 18, No. 6, 1974, pp. 292–6. It deals with a method developed at the Scientific Institute of Merchandise of Cracovie and uses as solvent a mixture of 1 part by volume of chloroform with 2 parts by volume of ethanol. This method yields comparable results to those of the Soxhlet method and permits a reduction in analysis time by a factor of 12 (30 minutes versus 6 hours). (Rev. Fr. Corps Gras)

CHOICE OF NATURAL ABSORBANTS FOR THE REFINING OF COTTONSEED OIL. A.A. Smidt et al. *Maslo-zhir. Prom-St.*, No. 1, 1975, pp. 13–15. Studies of earths from the Asiatic coast have shown that Kaolin from Angrensk, after thermal activation, has a satisfactory bleaching property, a recycling characteristic and weak oil retention, i.e. it meets the rigorous requirements of processing technology. The chemical composition of Kaolin from Angrensk is as follows: SiO_2, 63.4%; Al_2O_3, 32.8%; Fe_2O_3 + FeO, 1.8%; TiO_2, 0.5%; other impurities, 1.5%. Yield of refined oil is 94.3% and its color corresponds to 5 mg of I_2, and its acid index of 3.35. (Rev. Fr. Corps Gras)

STUDY OF MONOGLYCERIDE ESTERS AND DIACETYLTARTARIC ACID ESTERS. S.V. Minaeva et al. *Maslo-zhir. Prom-St.*, No. 1, 1975, pp. 16–17. Because of lack of detailed analytical techniques for the products of esterification of monoglycerides with diacetyltartaric anhydride, the authors have studied the determination of tartaric acid which can be used as an indirect measure of free and bound diacetyltartaric anhydride. Tartaric acid is determined spectrophotometrically as a complex with sodium metavanadate, which gives total free and bound tartaric acid. The amount of bound tartaric acid is established in samples containing no free tartaric acid. (Rev. Fr. Corps Gras)

THE VOLUMETRIC MASS OF SUNFLOWER FLAKES AS A FUNCTION OF PRESSURE. B.M. Sevjakov et al. *Maslo-zhir. Prom-St.*, No. 2, 1975, pp. 7–10. Under a pressure of 9.8 to 49 KPa, the volume of sunflower flakes decreases by 14–26% and after decompression by 12–21%. With increase in pressure the volumetric mass of the dry flakes increases respectively 16–34 and 15–26%, i.e. in a manner inversely proportional to the decrease in volume; and the volumetric mass of the soaked micella flakes, respectively 12–23 and 10–35%, i.e. to a lesser degree. The maximum variations of the volumetric mass, the volumetric coefficient and the coefficient of volumetric mass of the flakes are observed when they are submitted to a pressure up to 19.6 (KPa.) (Rev. Fr. Corps Gras)

THERMODYNAMIC CHARACTERISTICS AND MAIN TRANSFER COEFFICIENTS FOR SUNFLOWER FLOUR. S.G. Tarasov, *Maslo-zhir. Prom-St.*, The hygroscopic properties and thermodynamic mass transfer characteristics have a great importance on the choice of a cooking process. The object of the present work was to determine the fundamental thermodynamic mass transfer by analysis of sorption and desorption isotherms of sunflower flour. There are:

—the chemical potential of mass transfer of the material.
—the humidity binding energy.
—the true specific isothermic mass capacity.
—the temperature coefficient of the chemical potential.
—the thermogradient coefficient.

(Rev. Fr. Corps Gras)

VARIATION OF MICROFLORA CONTENT IN SUNFLOWER SEEDS. V.G. Scerbakov et al. *Maslo-zhir. Prom-St.*, No. 2, 1975, pp. 3–4. In the present work the microflora composition was studied in sunflower seeds during maturation, post-harvesting and storage. The possibility was considered for storage of sunflower seeds under high humidity and preserved with propionic acid. This was applied with a sprayer while the grains were constantly stirred. The concentrated acid was added at the rate of 1% based on the weight of grain. When treated this way the grains can be stored for a longer time (4–5 months) without development of microflora. (Rev. Fr. Corps Gras)

CONTINUOUS WASHING OF OIL WITH A COLUMN APPARATUS. L.M. Tuckova et al. *Maslo-zhir. Prom-St.*, No. 2, 1975, pp. 12–14. Continuous washing of refined oil can be done with a column apparatus to improve the oil quality, the color and the flavor. The use of a washing column facilitates the work of the filter press. Oil losses with the wash water are infinitesimal and do not exceed 0.06%. During experimentation and exploitation of the equipment no formation of emulsified interphase was observed. (Rev. Fr. Corps Gras)

HYDROGENATION OF COTTON MISCELLA ON A STATIONARY NICKEL-COPPER CATALYST. Ju. Kadirov et al. *Maslo-zhir. Prom-St.*, No. 1, 1975, pp. 18–20. Hydrogenation trials are described on a pilot installation with industrial samples of refined cotton miscella in concentration of 52.3%, acid value 0.23, color of 4.5 red units and in layer of 13 cm thickness. Pressure was 30.3975×10^4 Pa and the rate of hydrogenation 0.2 per hour^{-1}. The content of organic sulfur compounds was determined by a micro method having ±0.000001% precision. Products of hydrogenation have a light color and relatively low acid value (0.28–0.43). Their nickel content does not exceed 2.3–3.1 mg per kilogram. (Rev. Fr. Corps Gras)

COMPOSITION OF COMPONENTS IN SUSPENSION IN PRESSED NON-FILTERED SUNFLOWER OIL. S.I. Danil'cuk et al. *Maslo-zhir. Prom-St.*, No. 2, 1975, pp. 10–12. Total nitrogen content in residues obtained by treating pressed sunflower oil (non-filtered) with buffer solution represent 10.2–1.7%. Carbohydrate content in these residues varies from 12.1 to 16.6%. Pectins and protopecturies were detected in these residues. The free amino acid content in the suspended materials varies from 0.67 to 0.74% based on nitrogen. (Rev. Fr. Corps Gras)

PHOSPHATIDE CONCENTRATE FROM SUNFLOWER FOR THE CONFECTIONARY INDUSTRY. S.N. Volotovskaja, et al. *Maslo-zhir. Prom-St.*, No. 2, 14–15 (1975). Improvement of the hydration step continues to upgrade the phosphatide concentrate from sunflower. The use of separators with depositing phases for oil hydration insures a ratio of phosphatides to oil in the concentrate within the limits of 1.5–2.0:1. Dehydration of residues in the film rotating dryers permit reduction of moisture in the concentrate to 1% at which level the concentrate has a fluid consistency. A liquid consistency can also be obtained by diluting it with oil, but this reduces the fluidizing property of the concentrate for the use of the phosphatides in the production of chocolate products. The phosphatide concentrate contains 61.48% phosphatide P, 0.48% moisture; its consistency is fluid at 20°. When used at a concentration of 0.4% it is entirely effective in fluidizing chocolate masses. Phosphatide concentrates have the following composition:

	Sample 1	Sample 2
Phosphatidylinositol	35.6	28–35
Lysophosphatidylcholine	2.3	1–2
Phosphatidylstearine	2.2	2–4
Phosphatidylcholine	29.6	27–30
Phosphatidylethanolamine	13.2	10–13
Phosphatidic acids	0	2–3
Unidentified material containing P, N and inositol	17.1	0

(Rev. Fr. Corps Gras)

CONTACT INACTIVATION OF NICKEL BY PHOSPHOLIPIDS DURING HYDROGENATION OF SOYBEAN OIL. B. Drozdowski, et al. *Tluszcze jadalne*, No. 1, 7–18 (1975). A study was made of the partial poisoning of nickel catalyst on the rate of

hydrogenation of soybean oil. With the same level of phospholipids the lowering of activity was greater with nickel made from formate than with nickel deposited on a support. In addition, the phospholipids increased slightly the selectivity of the process. In contrast, the content of geometric isomers in the unsaturated fatty acids is not much changed. (Rev. Fr. Corps Gras)

STABILIZATION OF SOAPS BY THE USE OF ANTIOXIDANTS. V. Klecan, *Tluszcze, Srodki Piorace, Kosmet.*, 18 (No. 11), 433–42 (1974). Examination was made of antioxidants made by Merck, Givaudan Corp, Lautier & Sons, a product from Hungary and two from Czechoslovakia. Antioxidant activity was studied in a standard soap base by determining peroxide value after 0, 0.5, 1, 2 and 4 hours of UV irradiation. Comparable treatment was applied on highly perfumed commercial products. Good antioxidant properties were obtained with "Plastival X" from Lautier & Sons, and Fats and Stabilizer D-17 from Givaudan in Geneva. (Rev. Fr. Corps Gras)

DECOMPOSITION OF SOAPSTOCK WASHINGS FROM CRUDE FATTY ACIDS BY THE USE OF EJECTOR MIXERS. M.D. Mahamadminov, et al. *Maslo-zhir. Prom-St.*, No. 2, 16–19 (1975). The decomposition process of cotton soapstock can be done continuously by the use of an ejection type mixer. The degree of decomposition increases up to 95–99% with simultaneous lowering of sulfuric acid and steam consumption. To accomplish the decomposition of soapstock and the washing of crude fatty acids, one may use factory equipment for fatty acid distillation, and completing the scheme by ejector mixers and control devices. (Rev. Fr. Corps Gras)

SEPARATOR WITH AUTOMATIC DISCHARGE FOR DEGUMMING OF VEGETABLE OILS. G.J. Smirnov, et al. *Maslo-zhir. Prom-St.*, No. 2, 32–34 (1975). The separator with automatic discharge SOZF/2 can be used successfully in the degumming lines. The hydrated oil contains 0.07–0.24% phosphatides, and the hydration residue, 60–70% moisture, 15–17% oil and 20–23% phosphatides. The output of the separator can be as much as 100 tons per day. The special device for the discharge of mucilage permits improved working conditions and delayed service on the separator without dismounting and drum washing. (Rev. Fr. Corps Gras)

STUDY OF THE ANTIOXIDANT PROPERTIES OF THE BROWN COLOR OF TEA FOR MARGARINE. M.A. Bokucava, et al. *Maslo-zhir. Prom-St.*, No. 2, 15–16 (1975). The yellow and brown coloring materials from tea when added at the rate of 0.1–0.2% by weight of margarine improved the organoleptic score and the color of the product. At the proportions indicated, they constitute efficient stabilizers for the oil phase of the margarine as well as the water and milk phases. The mixture of brown coloring materials of tea with small quantities of tanin, quercetin and ascorbic acid exert a more efficient stabilizing action than that of only one coloring matter at the same level. (Rev. Fr. Corps Gras)

EXTRACTION OF LIPIDS FROM SUNFLOWER GRAIN SHELL. J.P. Macuk, et al. *Maslo-zhir. Prom-St.*, No. 3, 12–15 (1975). The major portion (up to 60%) of sunflower grain shells extractible with hexane goes in the solvent in the first 1 or 2 min at an extraction temp. of 20–40C. The oil content of the shell after extraction for 60 sec with solvent at this same temp. is 1.5 to 3 times lower than that of the shell separated from the meal derived by industrial extraction. In comparison with the oils from extraction and pre-pressing, those from the shells in the cold contain a little more free fatty acids (up to 15%), diene and triene components, as well as primary products of oxidation. (Rev. Fr. Corps Gras)

IMPROVEMENT OF FILTRATION PROCESS FOR HYDROGENATED FATS. S.N. Volotovskaja, et al. *Maslo-zhir. Prom-St.*, No. 3, 16–17 (1975). To improve the filtration process the authors have used kieselguhr (k-700) which is characterized by the following physico-chemical indeces: moisture, 0.1% max; density, 0.56 kg/cu m; molecular composition, 20% 100–40 microns, 80% 40–20 microns; chemical composition, silica 85–86%, iron oxide 3.0%, alumina 2.0%, lime 1.79%, magnesia 0.5%. (Rev. Fr. Corps Gras)

EFFECT OF TITANIUM ON THE STABILITY OF SUNFLOWER OIL DURING THERMAL TREATMENT. V.G. Inzecik, et al. *Pishch. Tekhnol.* No. 1, 98–101 (1975). Titanium can be recommended as construction material for frying equipment. During prolonged heating at 180° in a titanium vessel sunflower oil maintains a low viscosity, a low refraction coefficient, and a practically unchanged iodine number. The total quantity of oxidation products increases a little, but 5 times less than with cast iron and aluminum. (Rev. Fr. Corps Gras)

SELECTIVITY OF HYDROGENATION OF COTTONSEED OIL IN AROMATIC HYDROCARBONS ON A FIXED CATALYST. N.G. Krupenja, et al., *Pishch. Tekhnol.* No. 1, 59–61 (1975). The selectivity of hydrogenation of cottonseed oil on a supported Ni-Al-Pd catalyst increases with a rise in temp. and decreases with the lowering of the hydrogen pressure and the molecular weight of the aromatic hydrocarbons. The effect of the aromatic hydrocarbons in decreasing selectivity is in the order: benzene, m-xylene, o-xylene, p-xylene, toluene, isopropyl benzene. (Rev. Fr. Corps Gras)

CONTINUOUS INDUSTRIAL PRODUCTION OF POWDERED VEGETABLE CREAM. M. Kubicki, et al. *Tluszcze jadalne.* 19 (No. 1), 19–29 (1975). The composition of powdered vegetable creams is as follows: skimmed milk 90.0%, vegetable oils 8.9%, soy lecithin 0.5%, sugar 0.6%. This product is designed for use in confectionary products, those of bakeries, nutrient concentrates, as well as substitutes for natural cream in the local economy. The production technology of powdered vegetable creams includes the following steps: cooling of skimmed milk, concentration of the milk and production of an emulsion with it, its atomic drying, fluidizing and powdering. (Rev. Fr. Corps Gras)

EFFECT OF CERTAIN NON LIPID MATERIALS ON THE QUALITY OF CRUDE AND REFINED GLYCERIN. N.V. Ivanova, et al. *Maslo-zhir. Prom-St.*, No. 3, 25–27 (1975) (Russian). The characteristics are given for crude and distilled glycerine prepared by hydrolysis at 225 and 25° and treatment of the glycerinated water with lime water, followed by filtration and evaporation in vacuum. The largest effect obtained with animal grease was by treating with activated decolorizing earth which lowered the non volatile organic residue. Positive results were also obtained by washing with a 10% NaCl solution and by refining with concentrated sulfuric acid. With bone grease, the lowest amount of non volatile organic residue was obtained by earth bleaching and by treatment with concentrated sulfuric acid. (Rev. Fr. Corps Gras)

• Biochemistry and Nutrition

STEROL BIOSYNTHESIS IN THE ECHINODERM ASTERIAS RUBENS. A.G. Smith and L.J. Goad (Dept. of Biochem., Univ. of Liverpool, P.O. Box 147, Liverpool L69 3BX, U.K.) *Biochem. J.* 146, 25–33 (1975). [2-^{14}C]mevalonic acid injected into the echinoderm *Asterias rubens* (Class Asteroidea) was effectively incorporated into the non-saponifiable lipid. The most extensively labelled compounds were squalene and the 4,4-dimethyl sterols with much lower incorporations into the 4α-monomethyl and 4-dimethyl sterol fractions. Labelled compounds identified were squalene, lanosterol, 4,4-dimethyl-5α-cholesta-8,24-dien-3β-ol, 4,4-dimethyl-5α-cholesta-7,24-dien-3β-ol, 4α-methyl-5α-cholesta-7,24-dien-3β-ol and 4α-methyl-5α-cholest-7-en-3β-ol; these are all intermediates in sterol biosynthesis. The major sterol in *A. rubens*, 5α-cholest-7-en-3β-ol, was also labelled showing that this echinoderm is capable of sterol biosynthesis *de novo*. With the body-wall and stomach tissues radioactivity accumulated in squalene and the 4,4-dimethyl sterols, but with the gonads and pyloric caecae there was a more efficient incorporation of radioactivity into the 4-demethyl sterols, principally 5α-cholest-7-en-3β-ol.

MYOCARDIAL EXTRACTION OF LABELED LONG-CHAIN FATTY ACID ANALOGS. N.D. Poe, G.D. Robinson, Jr. and N.S. MacDonald (Lab. of Nuclear Med. and Radiation Biol., Univ. of Calif., Los Angeles, Calif. 90024) *Proc. Soc. Exp. Biol. Med.* 148, 215–8 (1975). The single circulation myocardial extraction of terminally iodinated hexadecenoic acid (77 ± 11.0%) is approximately two times the extraction of 18 carbon fatty acids (33 ± 5.2%) prepared by iodination of double bonds. The results compare favorably with natural 18 carbon stearic (70 ± 7.5%) and oleic (61 ± 7.8%) acids labeled with carbon-11 in the carboxyl group. It is concluded that terminally radioiodinated long chain fatty acids can be used as substitutes for *in vivo* investigations of fatty acid distribution and in particular may be useful as a regional myocardial blood flow indicator.

REGULATION OF LIPOGENESIS AND THE TOTAL ACTIVITIES OF LIPOGENIC ENZYMES IN A PRIMARY CULTURE OF HEPATOCYTES FROM PRENATAL AND EARLY POSTNATAL CHICKS. A.G. Goodridge, A. Garay and Panee Silpananta (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Ontario,

Canada M5G 1L6) *J. Biol. Chem.* **249,** 1469–75 (1975). Hepatocytes prepared from the livers of 18- or 19-day-old chick embryos and maintained in culture medium containing serum for 3 days exhibited marked induction of the lipogenic pathway. Incorporation of [U-^{14}C]glucose into fatty acids and the total activities of malic enzyme, fatty acid synthetase, and ATP-citrate lyase increased by 1000-, 47-, 21-, and 4.5-fold, respectively. When L-triiodothyronine was added to the culture medium, the activities increased a total of 2500-, 140-, 40-, and 8-fold, respectively. The increases in the rate of fatty acid synthesis and total activity of malic enzyme were inhibited by bovine serum albumin, human thyroxin-binding prealbumin, and rabbit anti-thyroxin serum. Glucagon, cAMP, and free stearate also inhibited the induction of lipogenesis and its associated enzymes. These compounds also inhibit fatty acid synthesis and elevate fatty acyl-CoA levels in freshly prepared hepatocytes. Hence, glucagon and free fatty acids exert both long and short term regulation over fatty acid synthesis, possibly via changes in the intracellular concentration of fatty acyl-CoA.

SPECIFIC BINDING OF 1α,25-DIHYDROXYCHOLECALCIFEROL TO NUCLEAR COMPONENTS OF CHICK INTESTINE. P.F. Brumbaugh and M.R. Haussler (Dept. of Biochem., Col. of Med., Univ. of Ariz., Tucson, Ariz. 85724) *J. Biol. Chem.* **250,** 1588–94 (1975). Specific binding of 1α,25-dihydroxycholecalciferol to macromolecular components of small intestinal mucosa nuclei is demonstrated in vitamin D-deficient chicks. The nuclear 1α,25-dihydroxycholecalciferol-macromolecule complex was isolated on sucrose density gradients and sediments at 3.7 S in the presence of 0.3 M KCl. Agarose gel fitration of the nuclear component indicated an apparent molecular weight of 47,000. The nuclear receptor complexes could not be distinguished from previously described cytoplasmic 1α,25-dihydroxycholecalciferol-binding components by the ultracentrifugation and chromatographic procedures employed. The association of the ^{3}H-sterol with the nuclear component is thermolabile and is destroyed by treatment with pronase, but not by nucleases; the receptor component is therefore presumed to be a protein. Experiments employing incubation of 1α,25-dihydroxy[^{3}H] cholecalciferol with reconstituted cytosol-chromatin from non-target tissues indicate a requirement for both intestinal cytosol and chromatin for maximal formation of the nuclear hormone-receptor complex.

EFFECTS OF ADENOSINE DEAMINASE ON CYCLIC ADENOSINE MONOPHOSPHATE ACCUMULATION, LIPOLYSIS, AND GLUCOSE METABOLISM OF FAT CELLS. J.N. Fain and P.B. Wieser (Div. of Biol. and Med. Sci., Brown Univ., Providence, R.I. 02912) *J. Biol. Chem.* **250,** 1027–34 (1975). In fat cells isolated from the parametrial adipose tissue of rats, the addition of purified adenosine deaminase increased lipolysis and cyclic adenosine 3′:5′-monophosphate (cyclic AMP) accumulation. Adenosine deaminase markedly potentiated cyclic AMP accumulation due to norepinephrine. The increase in cyclic AMP due to adenosine deaminase was as rapid as that of theophylline with near maximal effects seen after only a 20-sec incubation. The increases in cyclic AMP due to crystalline adenosine deaminase from intestinal mucosa were seen at concentrations as low as 0.05 μg per ml. Further purification of the crystalline enzyme preparation by Sephadex G-100 chromatography increased both adenosine deaminase activity and cyclic AMP accumulation by fat cells. The effects of adenosine deaminase on fat cell metabolism were reversed by the addition of low concentrations of N^{6}-(phenylisopropyl)adenosine, an analog of adenosine which is not deaminated. The effects of adenosine deaminase on cyclic AMP accumulation were blocked by coformycin which is a potent inhibitor of the enzyme. The present results lend further support to the hypothesis that adenosine is an important modulator of hormone action on fat cells.

COMPARISON OF THE LIPOPROTEIN PROFILES AND THE EFFECT OF N-PHENYLPROPYL-N-BENZYLOXYACETAMIDE IN PRIMATES (38473). P. Hill, W.G. Martin and J.F. Douglas (Naylor Dana Inst. for Disease Preven., Am. Hlth. Found., New York, N.Y. 10021) *Proc. Soc. Exp. Biol. Med.* **148,** 41–9 (1975). Analytical ultracentrifugation showed Cebus and Rhesus monkeys had two low density components while only one was present in Squirrel monkeys. In untreated or W1372 treated monkeys, neither chylomicrons nor very low density lipoproteins were detected on analytical ultracentrifugation. Chylomicrons were not observed on agarose gel electrophoresis. Ultracentrifugal analysis showed W1372 treatment decreased the amount of LDL in all animals and also the HDL in Cebus monkeys on an atherogenic diet. Both untreated and W1372 treated Cebus monkeys on an atherogenic diet had abnormal amounts of LDL and HDL, while the LDL in treated animals occurred as multiple peaks. This was also evident on agarose gel electrophoresis. Accumulation of lipids in the liver and decrease of serum lipids indicated W1372 prevented release of lipoproteins from the liver.

FAT DEFICIENCY IN RATS DURING DEVELOPMENT OF THE CENTRAL NERVOUS SYSTEM AND SUSCEPTIBILITY TO EXPERIMENTAL ALLERGIC ENCEPHALOMYELITIS. D.P. Selivonchick and Patricia V. Johnston (Dept. of Food Sci., Univ. of Ill. at Urbana-Champaign, Urbana, Ill. 61801) *J. Nutr.* **105,** 288–300 (1975). On day 14 of gestation, Sprague-Dawley rats were assigned to a diet adequate in fat (C), a fat-deficient diet (FD), or a fat-deficient diet supplemented with ethyl linoleate (FD-S). The same diets were continued during lactation. On weaning, the offspring were fed the same diets as their mothers. Rats were killed at 21 and 33 days, and the lipid compositions of brain, brain myelin, and spinal cord myelin were determined. Experimental allergic encephalomyelitis (EAE) was induced in animals from each group at 54 days of age. Acute EAE occurred after 13 days, and on day 14 (day 68 of age), the rats were killed. Body, brain, and brain myelin developments were slower in the FD and FD-S rats during early life. At 68 days, brain myelin from all groups reached mature composition, although body and brain weights of FD and FD-S rats remained lower than those of controls. With the exception of a slightly lower plasmalogen content at 33 and 68 days, the composition of spinal cord myelin from FD and FD-S rats was similar to that of C rats throughout the period of study. It was concluded that fat deficiency during development leads to increased susceptibility to EAE, and that a supplement of a source of linoleic acid has a marked protective effect against EAE.

LIPOGENESIS AND GLYCERIDE SYNTHESIS IN THE RAT: RESPONSE TO DIET AND EXERCISE. R.W. Askew, G.L. Dohm, V.H. Doub, Jr., R.L. Huston and P.A. Van Natta (Letterman Army Inst. of Res., Presidio of San Francisco, Calif. 94129) *J. Nutr.* **105,** 190–9 (1975). The responses of hepatic and adipose tissue malic enzyme (ME), citrate cleavage enzyme (CCE), glucose-6-phosphate dehydrogenase (G6PD), and glyceride synthetase (GS) to exercise training and exhaustive exercise and the potential to a high fat or high carbohydrate diet to modify these responses were studied in male Carworth rats. Characteristic elevation and depression of ME, CCE, and G6PD were observed in rats fed the high carbohydrate and high fat diets, respectively. GS was decreased in skeletal muscle, liver, and adipose tissues of high carbohydrate-fed rats. Exhaustive exercise performed immediately prior to sacrifice did not significantly alter ME or CCE activities in either liver or adipose tissues, but decreased adipose tissue G6PD in untrained rats. Exhaustion was also associated with decreased GS activity in muscle and liver. Physical training was associated with a significant increase in GS in muscle and adipose tissues.

INTERACTION OF STEROIDS WITH NUCLEIC ACIDS. S.K. Arya and J.T. Yang (Dept. of Biochem. and Biophys. and Cardiovas. Res. Inst., Univ. of Calif., San Francisco, Calif. 94143) *Biochemistry* **14,** 963–9 (1975). 17β-Estradiol and testosterone bind to both native and denatured DNA, and to RNA and poly(A) · poly(U). Binding affinity depends on the conformation of nucleic acid. Lowering the electrolyte concentration and raising the temperature increase the binding of 17β-estradiol to native DNA and decrease that to denatured DNA. In 0.01 *M* NaCl and at 37°, more 17β-estradiol is bound to native DNA than to denatured DNA. Higher binding of steroid to denatured DNA relative to native DNA at low temperature and high ionic strength is related to larger fraction of binding sites per unit nucleotide in denatured DNA. In addition to 17β-estradiol and testosterone, 17α-estradiol, 17β-estradiol-3-methyl ether and 19-nortestosterone also stabilize the structure of nucleic acids and poly(A) · poly(U) against thermal denaturation. The 17β-estradiol induced elevation of the T_m of DNA is diminished by methanol or high NaCl concentration. These results indicate the involvement of hydrogen bonding and hydrophobic interactions between steroids and nucleic acids. The results of binding isotherms and optical studies suggest a conformational dependence of the binding of steroids to nucleic acids.

SPECIFIC INTERACTIONS OF LINOLEIC ACID HYDROPEROXIDES AND THEIR SECONDARY DEGRADED PRODUCTS WITH ENZYME PROTEINS. S. Matsushita (Res. Inst. for Food Sci., Kyoto Univ., Kyoto, Japan) *J. Agric. Food Chem.* **23,** 150–4 (1975). The interaction of the enzymes, RNase, trypsin, pepsin and lipase with

pure linoleic acid hydroperoxides and their secondary degraded products were examined in connection with the toxicity of oxidized lipids under mild conditions. The correlation of the inactivation of the enzymes to the incorporation of the autoxidized lipid products into the proteins and the consequent damage to the amino acid residues of the proteins was investigated. Polymerization of RNase by the autoxidized lipid products was determined.

INVOLVEMENT OF CYTOCHROME P-450 IN THE INTRACELLULAR FORMATION OF LIPID PEROXIDES. P.J. O'Brien and A. Rahimtula (Dept. of Biochem., Memorial Univ. of Newfoundland, St. John's, Newfoundland, Canada) *J. Agric. Food Chem.* 23, 154–8 (1975). Organic hydroperoxides greatly increase the effectiveness of hemoproteins in catalyzing lipid peroxidation. Using this technique it has been shown that the heat-labile catalyst responsible for liver microsomal lipid peroxidation was cytochrome P-450. Evidence for this included inhibitor studies and reconstitution studies. Cytochrome P-450 had similar kinetics and turnover number to plant lipoxygenases and was more effective than other hemoproteins and hematin. A mechanism is proposed for lipid peroxidation in which the catalyst acts as a peroxide with lipid as a hydrogen donor. A similar mechanism involving other hemoproteins is also presumably involved in the oxidative deterioration of lipid containing foods.

EFFECT OF DIETARY CARBOHYDRATES AND FATS ON INORGANIC IRON ABSORPTION. E.K. Amine and D.M. Hegsted (Dept. of Nutr., Harvard Schl. of Public Health, Boston, Mass. 02115) *J. Agric. Food Chem.* 23, 204–8 (1975). The effects of modifying the dietary carbohydrate and fat upon the availability of iron to rats were studied. In general, iron utilization was greatest with diets containing lactose, less in diets containing sucrose, and least with diets in which the carbohydrate was supplied as starch. However, the effect of the carbohydrate was not uniform when iron sources of differing availability were tested. Diets high in fat favored iron utilization and iron absorption was greater in diets in which the fat was supplied as coconut oil than in those in which the fat was supplied as corn oil.

CIRRHOSIS OF CHOLINE DEFICIENCY IN THE RHESUS MONKEY. POSSIBLE ROLE OF DIETARY CHOLESTEROL (38541). A.J. Patek, Jr., S. Bowry and K.C. Hayes (Med. Div., Veterans Admin. Hosp., Boston, Mass. 02130) *Proc. Soc. Exper. Biol. Med.* 148, 370–4 (1975). One of five rhesus monkeys fed a diet deficient in choline and protein for 31 months developed signs of cirrhosis at 26 months. Five other monkeys were fed the same diet for 14 months, at which time cholesterol comprising 2% of the diet was added. There followed a sharp rise in hepatic lipids. One monkey developed marked hypercholesterolemia and showed signs of cirrhosis 2 months after cholesterol supplementation. The findings indicate that the rhesus monkey is susceptible to choline-deficiency cirrhosis. They suggest that cholesterol supplementation accelerates this process.

BIOSYNTHESIS OF PHOSPHOLIPIDS AND NEUTRAL LIPIDS OF MONKEY KIDNEY CELLS (LLC-MK-2) INFECTED WITH CHLAMYDIA TRACHOMATIS STRAIN LYMPHOGRANULOMA VENEREUM. V.S.C. Fan and H.M. Jenkin (Hormel Inst., Univ. of Minn., Austin, Minn. 55912) *Proc. Soc. Exper. Biol. Med.* 148, 351–7 (1975). The biosynthesis of phospholipids and neutral lipids in normal and monkey kidney cells infected with lymphogranuloma venereum were compared using ^{14}C-acetate and ^{14}C-serine in pulse-chase experiments. Synthesis of phospholipids and neutral glycerolipids were inhibited in infected cells. Phosphatidyl ethanolamine (PE) synthesis decreased in infected cells within 36 hr after infection. Spingomyelin synthesis decreased after 48 hr of infection. The synthesis of PE in the infected cell followed a similar pathway found in bacteria and could be distinguished from the normal host cell. An explanation of the parasitic nature of chlamydial infection based on the requirement for lipid precursors has been proposed.

LIPOPROTEIN LIPASE OF OVARIAN FOLLICLES IN THE DOMESTIC CHICKEN (GALLUS DOMESTICUS) (38537). J.D. Benson, A. Bensadoun and D. Cohen (Poult. Sci. Dept. & Div. of Biol. Sci., Cornell Univ., Ithaca, N.Y. 14850) *Proc. Soc. Exper. Biol. Med.* 148, 347–50 (1975). A lipase, bearing the characteristics of adipose tissue lipoprotein lipase (LPL) has been characterized in avian ovarian granulosa cells. The activity is low in cells from follicles weighing less than 0.5 g; in heavier follicles which have entered the rapid growth phase, significant activity (1μ mole fatty acid/mg protein/hr) could be identified. Granulosa LPL provides follicular tissues with the requisite enzyme system to hydrolyze very low density lipoprotein triglyceride en route to the oocyte.

PROSTAGLANDIN METABOLISM. I. CYTOPLASMIC REDUCED NICOTINAMIDE ADENINE DINUCLEOTIDE-DEPENDENT PROSTAGLANDIN E 9-KETOREDUCTASE ACTIVITIES IN MONKEY AND PIGEON TISSUES. S.C. Lee and L. Levine (Dept. of Biochem., Brandeis Univ., Waltham, Mass. 02154) *J. Biol. Chem.* 249, 1369–75 (1974). Homogenates of pigeon heart, brain, lung, liver, and the formed elements of blood and of monkey brain, liver, spleen, kidney, lung, uterus, heart, and the formed elements of blood contain an enzyme which catalyzes the reduction of the 9-keto group of prostaglandin E to form prostaglandin F. The prostaglandin E 9-ketoreductase in all of these tissues uses NADPH much more effectively than NADH and is found in the cytoplasmic fraction. In monkey liver, there is a second prostaglandin 9-ketoreductase, which is present in the microsomal fraction and uses NADH much more efficiently than NADPH. The activities of the prostaglandin 9-ketoreductases are extremely sensitive to the oxidized cofactors, and *in vivo* may be regulated by the relative concentrations of reduced and oxidized coenzymes. Such enzyme activities may, in turn, regulate the diverse physiological processes involving these two classes of prostaglandins.

SOLUBILIZATION AND PARTIAL CHARACTERIZATION OF RAT LIVER SQUALENE EPOXIDASE. T. Ono and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge, Mass. 02138) *J. Biol. Chem.* 250, 1571–79 (1975). The microsomal enzyme system from rat liver which catalyzes squalene epoxidation requires a supernatant protein and phospholipids. It has now been found that these two cytoplasmic components can be replaced by Triton X-100. The same detergent solubilizes the microsomal squalene epoxidase and the resulting supernatant can be separated into two components, A and B, by DEAE-cellulose chromatography. Neither Fraction A nor B alone has significant squalene epoxidase activity but combining the two affords a reconstituted system 5-fold higher in specific epoxidase activity than that of the original microsomes. FAD and Triton X-100 in addition to molecular oxygen and NADPH are required in the reconstituted system. The reconstituted epoxidase system is not inhibited by either carbon monoxide, potassium cyanide, or o-phenanthroline but Tiron at 1mM was inhibitory (50%). Erythrocuprein has no effect on epoxidation. No evidence has been found for the participation of hemoproteins (P_{450} or cytochrome b_5) in squalene epoxidation. Component B appears to be identical with the flavoprotein NADPH-cytochrome *c* reductase. Component A may be a flavorprotein with an easily dissociable prosthetic group.

LIPID SPECIFICITY OF β-HYDROXYBUTYRATE DEHYDROGENASE ACTIVATION. A.K. Grover, A.J. Slotboom, G.H. De Haas and G.G. Hammes (Dept. of Chem., Cornell Univ., Ithaca, N.Y. 14850) *J. Biol. Chem.* 250, 31–8 (1975). Beef heart mitochondrial β-hydroxybutyrate dehydrogenase forms a catalytically active complex with lecithin and is inactive in the absence of lecithin. The specificity of the activation process was probed by studying the interaction of the enzyme with phospholipids and other compounds. The compounds were tested for their ability to form active complexes with the enzyme, for the stability of the complex formed, and for the correlation between the activator concentration and the level of activation. A hydrophobic chain followed sequentially by a negative and a positive charge, as in stearylphosphorylcholine, is the minimal structural requirement of an activator. However, the stability of the enzyme-activator complex depends strongly on the aggregation state of the activators, complexes of appreciable stability being formed only with those phospholipids which exist in bilayer membrane-like structures. The maximal activity and the strength of the lipid-protein interactions depend on the nature of the aliphatic chains of the lipids. Lecithins with saturated and unsaturated fatty acid chains activate the enzyme, but the latter form somewhat more stable complexes. Micellar structures rapidly inactivate the enzyme. The activation energy of the initial velocity of the reaction catalyzed by a series of enzyme-lecithin complexes is in the range 13.6 to 15.4 Cal per mol.

GLYCOSPHINGOLIPIDS OF HUMAN KB CELLS GROWN IN MONOLAYER, SUSPENSION AND SYNCHRONIZED CULTURES. S. Chatterjee, C.C. Sweeley and L.F. Velicer (Depts. of Biochem. and Microbiol. and Public Hlth., Mich. State Univ., East Lansing, Mich. 48823) *J. Biol. Chem.* 250, 61–6 (1975). Studies have been carried out on the glycosphingolipids of

human KB cells grown in monolayer and suspension culture, and by synchronization of the latter with a double thymidine (2 mM) block. The predominant gangliosides in these cells were AcNeu-Gal-Glc-Cer and AcNeu-Gal-GalNAc-Gal-(AcNeu)-Glc-Cer. The principal neutral glycosphingolipids were Glc-Cer, Gal-Glc-Cer, Gal-Gal-Glc-Cer, and GalNAc-Gal-Gal-Glc-Cer. Incubation of KB cell (grown in monolayer and subsequently in suspension culture) for 48 hours with 4-1-^{14}C galactose resulted in appreciable incorporation of radioactivity into all of the principal glycosphingolipids of these cells. These experiments confirmed that KB cells are capable of synthesizing their constituent glycosphingolipids. KB cells grown in suspension culture showed a 2- to 3-fold increase in the concentration of Glc-Cer, Gal-Glc-Cer, and AcNeu-Gal-Glc-Cer when compared with monolayer culture. Concomitantly there was a decrease in the levels of Gal-Gal-Glc-Cer, GalNAc-Gal-Gal-Glc-Cer, and AcNeu-Gal-GalNAc-Gal(AcNeu)-Glc-Cer. Thus, the occurrence of tissue culture-dependent changes in the level of glycosphingolipids is demonstrated.

THE PRIMARY STRUCTURE OF HUMAN PLASMA HIGH DENSITY APOLIPOPROTEIN GLUTAMINE I (ApoA-I). I. THE AMINO ACID SEQUENCE OF CYANOGEN BROMIDE FRAGMENT II. T. Delahunty, H.N. Baker, A.M. Gotto, Jr. and R.L. Jackson (Dept. of Med., Baylor College of Med., and The Methodist Hosp., Houston, Tx. 77025) *J. Biol. Chem.* 250, 2718–24 (1975). Apolipoprotein glutamine I (apoLP-Gln-I or apoA-I) is one of the major constituents of human plasma high density lipoproteins. The protein has 245 amino acid residues, including 3 residues of methionine, and is lacking isoleucine, cystine, and cysteine. Cleavage of apoLP-Gln-I with cyanogen bromide yields four fargments, designated in their order of elution from Bio-Gel P-30 as CNBr I, II, III, and IV. In the present study, we report the complete amino acid sequence of the NH_2-terminal fragment, CNBr II, a peptide that contains 90 amino acid residues.

REVERSIBLE TESTIS INJURY IN THE VITAMIN E-DEFICIENT HAMSTER. K.E. Mason and S.I. Mauer (Dept. of Anat., Univ. of Rochester Schl. of Med. and Dentistry, Rochester, N.Y. 14620) *J. Nutr.* 105, 484–90 (1975). Syrian hamsters fed four different vitamin E-deficient diets from the time of weaning showed, after 60 days or more, progressive testicular atrophy. Histologically, there was a decrease in size of seminiferous tubules, reduced spermatogenic activity, marked thinning of the germinal epithelium, loss of orderly arrangement of germ cells, and accumulation of acid-fast pigment in Sertoli cells. In 75 hamsters, comparisons were made between the histology of one testis and epididymis surgically ablated after 75–160 days and the other organs obtained at necropsy after 10, 20, 30, and 40 days of vitamin E therapy. Daily oral supplements of 2 mg of d-α-tocopheryl acetate proved marginally beneficial, whereas supplements of 10 mg daily were highly effective in repairing the germinal epithelium, in causing the reappearance of spermatozoa in ducts of the epididymis, and in removing acid-fast pigment. The testis injury in the vitamin E-deficient hamster, with respect to both the degenerative changes in the germinal epithelium and their repairability after vitamin E therapy, stand in striking contrast with the irrevocable testis injury characteristic of the vitamin E-deficient rat.

FUNCTION OF THE FAT-SOLUBLE VITAMINS. H.F. DeLuca, (Dept. of Biochem., Col. of Agric. and Life Sci., Univ. of Wisc.-Madison, Madison, Wisc. 53706) *Amer. J. Clin. Nutr.* 28, 339–45 (1975). Much has been learned about the function of the fat-soluble vitamins in recent years. Their mechanisms are divergent ranging from a role in transcription of DNA or differentiation to a direct enzymatic activation of the γ-carboxylation of glutamate residues of a preexisting protein. Thus the only resemblance so far among these physiologically active agents is their lipid solubility. However, in general the fat-soluble vitamins play important roles in specialized functions carried out by highly differentiated organisms.

LIPID METABOLISM IN THE COW DURING STARVATION-INDUCED KETOSIS. P.E. Brumby, M. Anderson, B. Tuckley, J.E. Storry and K.G. Hibbitt (Natl. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, U.K.) *Biochem. J.* 146, 609–15 (1975). Concentrations and compositions of liver, serum and milk lipids of cows were measured during 6 days starvation and serum lipids during 60 days re-feeding. The concentration of free fatty acid in serum increased fivefold during starvation. The content of total lipid in liver (g/100g of liver dry matter) doubled owing to a 20-fold increase in triglyceride, an eightfold increase in cholesterol ester, a threefold increase in free fatty acid and a 20% increase in cholesterol. There were no changes in the content or composition of liver phospholipids. Starvation lowered the concentrations of total lipid, phospholipid and cholesterol ester of dextran sulphate-precipitable serum lipoproteins. Total lipid and cholesterol ester concentrations in lipoproteins of $d > 1.055$ and in lipoproteins not precipitable by dextran sulphate decreased from day 4 of the starvation period and during the first 20 days re-feeding. During starvation there were decreases in percentages of stearic acid and increases in oleic acid in serum free fatty acids and triglycerides and in liver neutral lipid. Throughout starvation total milk lipid yield decreased, yields and percentages of C_{4-14} fatty acids decreased and percentages of C_{18} fatty acids increased. It is suggested that accumulation of triglyceride in liver may be caused by increased uptake of plasma free fatty acids without corresponding increase in lipoprotein secretion.

MEMBRANE PROPERTIES OF THERMOPLASMA ACIDOPHILA. M.J. Ruwart and A. Haug (Dept. of Biophys. and the MSU/AEC Plant Res. Lab., Mich. State Univ., East Lansing, Mich. 48824) *Biochemistry* 14, 860–6 (1975). Plasma membranes were isolated from *Thermoplasma acidophila*, a mucoplasma-like organism which grows optimally at pH 2 and 59C. Cells in concentrated suspensions were lysed by titrating to pH 9.3. The membranes were purified by washing at pH 10 and centrifuging in a discontinuous sucrose gradient. Membrane purity was assessed by electron microscopy, determination of deoxyribonucleic acid content, and polyacrylamide gel electrophoretic behavior. Gel patterns and amino acid composition of cells and membranes were found to differ significantly. The lipid contained small amounts of fatty acid esters and larger amounts of branched long-chain alkyl ethers.

METABOLISM OF MEVALONATE IN RATS AND MAN NOT LEADING TO STEROLS. A.M. Fogelman, J. Edmond and G. Popjak (Res. and Med. Services, Veterans Admin., Wadsworth Hosp. Ctr., and the Dept. of Med. and Biol. Chem., Schl. of Med., Univ. of Calif., Los Angeles, Los Angeles, Ca. 90024) *J. Biol. Chem.* 250, 1771–5 (1975). C-5 mevalonate appears as CO_2 in the breath of rats and men almost immediately after administration either by injection or by mouth. Adult rats exhaled up to 6.5% of a dose of *RS*-[5-^{14}C]mevalonate (13% of the utilizable *R*-enantiomer) in the breath in 100 min. The $^{14}CO_2$ was not derived either from the metabolism of cholesterol biosynthesized from [5-^{14}C]mevalonate or from the metabolism of the unnatural S-enantiomer of mevalonate. The amount of $^{14}CO_2$ expired in the breath was the same whether the [5-^{14}C]mevalonate was given intravenously or in a drink of water to man. One normocholesterolemic man dissipated 12%, a mildly non-familial hypercholesterolemic man dissipated 7% of a dose of [5-^{14}C]mevalonate in 24 hours (calculated as a per cent of the *R*-enantiomer). The observations support the hypothesis of the existence of a metabolic shunt of intermediates of sterol biosynthesis, derived from mevalonate, not leading to sterols.

THE ENZYMATIC FORMATION OF SPHINGOMYELIN FROM CERAMIDE AND LECITHIN IN MOUSE LIVER. M.D. Ullman and N.S. Radin (Mental Hlth. Res. Inst., Univ. of Mich., Ann Arbor, Mich. 48104) *J. Biol. Chem.* 249, 1506–12 (1974). The conversion of ^{14}C-labeled fatty acylsphingosine and phosphatidyl [^{14}C] choline to sphingomyelin could be demonstrated in lyophilized microsomes from mouse liver. Radioactive CDP-choline did not act as a choline donor. No cofactors were needed, although CDP-choline and P-choline exerted some stimulatory action. The unnatural ceramide, acetyl threo-sphingosine, could be converted to the corresponding sphingomyelin but this reaction required Mn^{2+} and CDP-choline. Evidence from isotopic trapping experiments was interpreted to indicate that the P-choline transfer from lecithin to ceramide did not go through free CDP-choline, choline, or P-choline. The transferase was found in kidney, lung, liver, spleen, and heart (in decreasing order of activity) but not in brain. The enzyme was inhibited by diglyceride and lysolecithin.

A NEW APOPROTEIN OF HUMAN PLASMA VERY LOW DENSITY LIPOPROTEINS. F.A. Shelburne and S.H. Quarfordt (Dept. of Med., Duke Univ. Med. Ctr., and Cooperative Lipid Lab., Veterans Admin. Hosp., Durham, N.C. 27705) *J. Biol. Chem.* 249, 1428–33 (1974). A new apoprotein has been isolated from delipidated human very low density lipoproteins by Sepharose 6B chromatography in 6 M guanidine hydrochloride. The water-in-soluble protein was noted to be unique to the plasma very low density and chylomicron fractions. This protein was shown to be homogeneous by urea-DEAE-cellulose chroma-

tography, rechromatography in a guanidine-Sepharose system, sodium dodecyl sulfate polyacrylamide gel electrophoresis, and isoelectric focusing. The molecular weight of this apoprotein obtained by guanidine gel filtration, sedimentation equilibrium in guanidine hydrochloride, and by sodium dodecyl sulfate polyacrylamide gel electrophoresis was 33,000. The amino acid content was significantly different from any previously characterized very low density lipoprotein apoprotein, containing relatively more arginine. By the dansylation and cyanate techniques the NH_2-terminal amino acid was found to be lysine. Digestion with carboxypeptidase revealed the COOH-terminal sequence to be -Leu-Ser-Ala-COOH.

RELATIONSHIP OF RAISED ATHEROSCLEROTIC LESIONS TO FATTY STREAKS IN 19 LOCATION-RACE GROUPS. R.E. Tracy and Vivian Toca (Dept. of Pathol., La. State Univ. Med. Cntr., New Orleans, La. 70112) *Atherosclerosis* 21, 21–36 (1975). Atherosclerosis was graded by gross inspection of Sudan-stained arterial intimal surfaces estimating percent surface involved by raised lesions (R), fatty streaks (F), and no lesions (N). The right coronary artery and abdominal aorta of over 20,000 cases, 25–69 years of age, from 19 location-race groups were used. Cases were classed by sex, broad cause of death categories, and age. Raised lesions expressed as a percentage of all types of lesions was found at each age to have approximately a constant ratio to the percentage surface involved with all types of lesions. This was true over the range of surface involvement within age, sex, and cause of death classes, but between classes the ratio was not constant.

EFFECTS OF ORAL CONTRACEPTIVE STEROIDS ON VITAMIN AND LIPID LEVELS IN SERUM. J.L. Smith, G.A. Goldsmith and J.D. Lawrence, (The Nutr. Sect., Schl. of Public Hlth. and Tropical Med., New Orleans, La. 70112) *Am. J. Clin. Nutr.* 28, 371–6 (1975). The results of a comprehensive study to determine the effects of oral contraceptive agents on nutrient metabolism have been reported. The group of women using oral contraceptive agents was found to have significantly higher levels of hemoglobin, packed cell volume, serum vitamin A, total lipids, triglycerides, vitamin E, and α_1-protein and significantly lower levels of serum and red cell folacin, vitamin B_{12} and albumin. The biological significance of many of these differences has not been elucidated satisfactorily.

LIPOXYGENASE FROM WHEAT. AN EXAMINATION OF ITS REACTION CHARACTERISTICS. J.M. Wallace and E.L. Wheeler (Western Regional Lab., ARS, USDA, Berkeley, Ca. 94710) *J. Agric. Food Chem.* 23, 146–50 (1975). Four lipoxygenase fractions were separated from wheat germ extract by DEAE-cellulose chromatography. The activity vs. pH curves for all four fractions varied as a function of linoleic acid substrate concentration. This behavior is interpreted as demonstrating a pH-dependent substrate inhibition of lipoxygenase. Evidence is presented that, in addition to linoleic acid hydroperoxide, an unidentified product was formed in the aerobic reaction of wheat germ lipoxygenase with linoleic acid.

EFFECTS OF DIET ON LIPOPROTEIN LIPASE ACTIVITY IN THE RAT. C.L. Weisenburg Delorme and K.L. Harris (College of Agric., Univ. of Minn., St. Paul, Minn. 55101) *J. Nutr.* 105, 447–51 (1975). The effects of diet upon the activities of lipoprotein lipase (LPL) of adipose tissue, skeletal muscle, and heart were studied. Two groups of rats were fed diets high in carbohydrate or high in fat for 14 days. Another group was fed a stock diet and fasted 18–20 hours prior to the determination of tissue LPL activity. In the carbohydrate-fed rats, LPL activity was high in adipose tissue (14.78 $\pm$ 1.30 units) and low in skeletal muscle (8.47 $\pm$ 0.85 units) and heart (9.71 $\pm$ 0.94 units), whereas in fasted rats, LPL activity was high in skeletal muscle (15.41 $\pm$ 1.98 units) and heart (18.99 $\pm$ 0.97 units) and low in adipose tissue (3.29 $\pm$ 0.87 units). In fat-fed rats LPL activity was intermediate in adipose tissue (7.93 $\pm$ 0.62 units) and high in skeletal muscle (14.44 $\pm$ 0.86 units) and heart (15.07 $\pm$ 1.12 units). These results suggest that removal processes may be important factors in the response to diet of the kinetics of chylomicron and very low density lipoprotein triglyceride metabolism, and that skeletal muscle may play an important role in the process.

ROLE OF PHOSPHOLIPID IN THE INTERMEDIATE STEPS OF THE SODIUM-PLUS-POTASSIUM ION-DEPENDENT ADENOSINE TRIPHOSPHATASE REACTION. K.P. Wheeler (Schl. of Biol. Sci., Univ. of Sussex, Falmer, Brighton BN1 9QG, U.K.) *Biochem. J.* 146, 729–38 (1975). The phosphorylation and dephosphorylation steps of the $(Na^+ + K^+)$-dependent ATPase (adenosine triphosphatase) (EC 3.6.1.3) reaction have been compared in 'normal' lipid-depleted and 'restored' membrane ATPase preparations. Partial lipid depletion was achieved by a single extraction with Lubrol W, and 'restoration' by adding pure phosphatidylserine. γ^{32}P-labelled ATP was used for phosphorylation. The main findings were as follows. Partial lipid depletion decreased but did not prevent Na^+-dependent phosphorylation, although it virtually abolished both Na^+-dependent and $(Na^+ + K^+)$-dependent ATPase activities. 'Restoration' with phosphatidylserine produced an increment in phosphorylation that was the same in the presence and absence of added $Na^+ \cdot K^+$ decreased the extent of Na^+-dependent phosphorylation of the depleted enzyme without producing a corresponding release of $P_i \cdot K^+$ rapidly decreased the extent of phosphorylation of the 'restored' enzyme to near-background value, with a concomitant release of $P_i \cdot Na^+$-dependent ATP hydrolysis was not restored. The turnover of the 'restored' enzyme seemed to be higher than that of the 'normal' enzyme. The reaction sequence is discussed in relation to these results and the fact that the depleted enzyme retained about 50% of K^+-dependent phosphatase activity.

SELENIUM AND CHROMIUM IN HUMAN NUTRITION. O.A. Levander (Nutrition Inst., A.R.S., U.S.D.A., Beltsville, Md.). *J. Am. Diet. Assoc.* 66, 338–44 (1975). Present knowledge of the nutritional aspects of these two essential trace minerals is reviewed. Of specific interest is the section dealing with selenium because of its vitamin E-sparing activity. Aspects reviewed include deficiency signs, symptoms, and causes in humans and animals; occurrence in tissues; occurrence in foods; physiological role of selenium; and its possible significance in human health. Some data on the selenium content of selected foods, i.e., frozen convenience foods, and food groups are presented. Selenium is an integral part of glutathione peroxidase which destroys lipid peroxides, thus accounting for the relationship between selenium and vitamin E. So far, selenium has not been linked with a specific disease in man. Chromium plays a role in normal carbohydrate metabolism and specifically in glucose tolerance.

LIPID METABOLISM IMPROVING AND ANTI-ATHEROMATIC AGENT. M. Kobayashi (Amano Pharmaceutical Co.). *U.S. 3,875,007.* There is claimed a lipolytic substance GA-56, of high intestinal absorbability, capable of specifically hydrolyzing chylomicrons and low density lipoproteins. It has a molecular weight of about 30,000 and elemental analysis of C: 45.72%, H: 6.85%, O: 26.05%, N: 14.38%, and S: 0.34%.

• Edible Proteins

EFFECTS OF LIPOPEROXIDES ON PROTEINS IN RAW AND PROCESSED PEANUTS. A.J. St. Angelo and R.L. Ory (Southern Regional Res. Ctr., Agric. Res. Service, U.S. Dept. of Agr., New Orleans, La. 70179) *J. Agric. Food Chem.* 23, 141–50 (1975). Oxidative degradation of unsaturated lipids in peanuts produces hydroperoxides and their subsequent breakdown products, acids, alcohols, aldehydes, and ketones. These compounds have been reported by others to damage proteins, enzymes and amino acids. In the present investigation, lipid-protein interaction was examined in deoiled meals and in the proteins extracted from raw and roasted whole peanuts and peanut butter. Polyacrylamide electrophoresis was used as the principal technique to compare proteins before and after storage under conditions designed to promote peroxidation of lipids. Disc gels of deoiled residues from peanuts were stained for protein and lipid. The Sudan stains, which are used extensively for detecting lipoproteins in mammalian tissues, were not sensitive enough to detect the small amount of lipid bound to peanut proteins, but Rhodamine 6G and Oil Red 0 were satisfactory. Details of these procedures and observations on the effects of peroxidized lipid-protein interactions on electrophoretic mobility and on solubility of various protein fractions are discussed.

FORTIFICATION OF FOODSTUFFS WITH N-ACYL DERIVATIVES OF SULFUR-CONTAINING L-AMINO ACIDS. R.A. Damico and R.W. Boggs (Procter & Gamble). *U.S. 3,878,305.* A proteinaceous foodstuff comprises an edible sulfur-containing amino acid deficient protein and a nutritionally supplemental amount of N-acyl L-methionine. The N-acyl substituent is derived from fatty acids having 2 to 9 carbon atoms. The foodstuff is essentially free of N-acyl D-methionine.

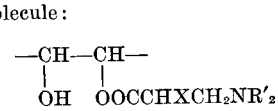
• Drying Oils and Paints

POLYMERIC COMPOSITIONS. J. Mathai and J.J. Chettiath (The Sherwin-Williams Co.). *U.S. 3,879,320.* The compositions are prepared by coreacting at 50 C or above in the presence of an organic peroxide 50–95% of an aliphatic vinyl ester and 5–50% of an epoxidized fatty oil or epoxidized fatty acid ester having at least one epoxide group per molecule.

RUST PREVENTING PAINT. M. Nagahisa, S. Nagao, M. Kimura, K. Machihara, and S. Yamamoto (Kansai Paint Co.). *U.S. 3,876,574.* The paint comprises as a film forming material the reaction product of (a) the reaction product of (1) an aliphatic polycarboxylic acid containing two carboxyl groups derived from tall oil dimer acid, linseed oil dimer acid, or maleic acid with a monocarboxylic acid derived from linseed oil fatty acid, soybean oil fatty acid, tall oil fatty acid, rosin acid, or benzoic acid, and (2) 0.2–0.7 equivalent of a metal oxide or hydroxide; and (b) 0.1–0.7 equivalent of a trihydric aliphatic alcohol or trihydric aliphatic alcohol containing an amino nitrogen selected from the group consisting of glycerine, trimethylolethane, trimethylolpropane, and trimethylolaminoethane.

RADIATION CURABLE COMPOSITIONS OF ACRYLATED EPOXIDIZED SOYBEAN OIL AMINE COMPOUNDS USEFUL AS INKS AND COATINGS AND METHODS OF CURING SAME. G.W. Borden, O.W. Smith, and D.J. Trecker (Union Carbide Corp.). *U.S. 3,878,077.* The compositions are the same as those described in *U.S. 3,876,518* by the same patentees.

ACRYLATED EPOXIDIZED SOYBEAN OIL AMINE COMPOSITIONS. G.W. Borden, O.W. Smith, and D.J. Trecker (Union Carbide Corp.). *U.S. 3,876,518.* The compositions comprise an acrylated epoxidized soybean oil amine compound having the following group in the molecule:



X is hydrogen or methyl, R′ taken singly is alkyl of 1 to 15 carbon atoms or phenyl, and the two R′ groups taken together with the nitrogen atom attached thereto form a heterocyclic ring containing 5 or 6 atoms. This compound is the reaction product of (a) epoxidized soybean oil reacted with at least 2 moles of acrylic acid or methacrylic acid and (b) 5–40 mole per cent, based on acrylyl groups, of an organic amine of the formula R'_2NH wherein R′ is defined as above and a photosensitizer.

FILM-FORMING COMPOSITIONS COMPRISING AUTOXIDIZABLE MATERIAL. J. Gillan and L. Polgar (Delux Australia Ltd.). *U.S. 3,878,148.* A film-forming composition comprises autoxidizable esterification residues of unsaturated fatty acids and at least one moiety per molecule with a structure of a specific type.

APPLICATION OF THE ACID/BASE CONCEPT. P. Sorensen (KVK, Koege Chem. Works Ltd. Denmark). *J. Paint Technol.* 47(602), 31–9 (1975). The acid/base concept (electron donor-acceptor properties) is useful when describing the interaction between pigments, binders, and solvents. It is possible to characterize the acid/base properties of the individual components and their mutual relationship. Color strength, gloss and flocculation properties will change when dispersing pigments in binders with different acid/base properties. Some anomalies appearing when using the solubility parameter concept may successfully be explained by the acid/base concept.