

ABSTRACTS

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

• Fats and Oils

HIGH SPEED LIQUID CHROMATOGRAPHY OF ANTIOXIDANTS AND PLASTICIZERS USING SOLID CORE SUPPORTS. R. E. Majors (Celanese Res. Co., P.O. Box 1000, Summit, N.J. 07901). *J. Chromatographic Sci.*, 8, 338-45 (1970). Commercially available, high-efficiency, liquid chromatography supports were used to separate some industrially important aromatic amine and hindered-phenolic antioxidants and phthalate ester plasticizers. HEPT values of less than a millimeter were obtained for soluted on coated Zipax controlled surface support and on coated Corasil using 2.1 mm, i.d., columns. Efficiencies were somewhat lower using Durapak. The siliceous surface of Corasil exhibited some adsorption effects in liquid-liquid chromatography when using polar solutes. These effects could be partially eliminated by thermal deactivation at 350 C. A thin-layer chromatographic separation of some hindered-phenolic antioxidants on silica gel was used to demonstrate the ability to scale-up to liquid-solid column chromatography using Corasil II. Low levels of antioxidants were quantitatively determined in polyacetal and polyethylene.

THE NATURE OF THE HYDROGEN MIGRATIONS IN THE CYCLIZATION OF SQUALENE OXIDE TO LANOSTEROL. M. Jayme, P. C. Schaefer and J. H. Richards (Crellin Lab. Chem., Calif. Inst. of Technol., Pasadena, Calif. 91109). *J. Amer. Chem. Soc.* 92, 2059-64 (1970). The hydrogen migrations that occur during the conversion of squalene to lanosterol have been shown to take place by a sequence of two 1,2-shifts of hydrogen and not as a single 1,3-hydrogen shift. Squalene labeled with tritium at C-14 was converted to lanosterol with a rat liver homogenate; no tritium is located at C-20 of the resultant lanosterol, whereas the anticipated amount of tritium is found at C-17. Thus, the tritium originally at C-14 of squalene becomes attached to C-17 of the lanosterol, as the result of a sequence of two 1,2-shifts of hydrogen.

HIGH RESOLUTION CHROMATOGRAPHIC SEPARATION OF STEROIDS WITH OPEN TUBULAR GLASS COLUMNS. M. Novotny and A. Zlatkic (Dept. of Chem., Univ. of Houston, Houston, Texas 77004). *J. Chromatographic Sci.* 8, 346-50 (1970). Steroids mixtures were resolved with high-efficiency in open tubular columns as trimethylsilyl-, methoxime-trimethylsilyl-, and heptafluorbutyryl-derivatives. The method combines the advantages of thin-film glass columns with the direct injection procedure. Silicone stationary phases of different polarity were evaluated in this study. Quantitative aspects of the steroid analysis with open tubular glass columns in the nanogram range were investigated. The applications of the high resolution system to the analysis of biological material were demonstrated with samples of urinary steroids and a mixture of sterols with similar structures.

THE TRANS-6 FATTY ACIDS OF PICRAMNIA SELLOWII SEED OIL. G. F. Spencer, R. Kleiman, F. R. Earle and I. A. Wolff (Northern Regional Research Lab., Peoria, Ill. 61604). *Lipids* 5, 285-7 (1970). The C₁₈ monoenoic acids in *Picramnia sellowii* seed oil include both *cis*- and *trans*-6-octadecenoic acids, as well as oleic acid. The hexadecenoic acids are also the *cis*- and *trans*-delta 6-isomers, and the eicosenoic acids have delta 6-unsaturation of undetermined geometric configuration. The C₁₈ polyenoic acids detected are 9,12- and 6,9-octadecadienoic and 9,12,15- and 6,9,12-octadecatrienoic acids. Partial investigation of another species, *Picramnia pentandra*, revealed its oil to have a similar fatty acid composition.

GAS-LIQUID RADIOCHROMATOGRAPHY OF INTACT NATURAL TRIGLYCERIDES. W. C. Breckenridge and A. Kuksis (Dept. of Biochem. and Banting and Best Dept. of Medical Res., Univ. of Toronto, Toronto, Canada). *Lipids* 5, 342-52 (1970). Gas-liquid radiochromatography was successfully applied to the simultaneous analysis of mass and radioactivity of in-

tact standard and natural triglycerides labeled with ¹⁴C in their fatty acid or glycerol moieties. Under optimum conditions, as little as 500 cpm/peak of tristearin could be detected with a relative error of 10%. At higher counting rates, the error was less than 5% and the achieved resolution of radioactivity was only slightly inferior to that of the mass. The counting efficiency of the system was better than 90%. The study showed that the detected radioactivity was proportional to the mass and not the moles of the labeled triglyceride measured in the hydrogen flame ionization detector. Practical application of the system is limited by the need for samples of relatively high specific activity (500-1000 dpm/50 micrograms/peak).

OXIDATION OF FATTY ACIDS BY HEAT-TREATED HEMOPROTEINS. C. E. Eriksson, P. A. Olsson and S. G. Svensson (Swedish Inst. for Food Preservation Res. (SIK) S-400 21 Göteborg, Sweden). *Lipids* 5, 365-6 (1970). The hemoproteins, catalase and peroxidase, after heat treatment which decreased their enzyme activities, became more efficient as heme catalysts of linoleic acid oxidation. These effects might be of importance for preservation and storage of food.

DECOMPOSITION OF LINOLEATE HYDROPEROXIDES: PRECURSORS OF OXIDATIVE DIMERS. T. L. Mounts, D. J. McWeeny, D. D. Evans and H. J. Dutton (Northern Region. Res. Lab, Peoria, Ill. 61604). *Chem. Phys. Lipid* 4, 197-202 (1970). When hydroperoxides are thermally decomposed in the presence of unsaturated fatty acids, dimers are formed in amounts equivalent to the hydroperoxide present. The origin of these dimers has not been shown by any definitive experiment. Radioactively (¹⁴C) labeled materials now have been used to determine whether (1) two molecules of hydroperoxide react, (2) a hydroperoxide and an unoxidized fatty acid molecule form the dimer, or (3) two molecules of unoxidized fatty acid dimerize with hydroperoxide catalysis. Methyl linoleate hydroperoxide and unoxidized methyl linoleate were reacted in experiments, first with the ¹⁴C-labeled hydroperoxide and then with ¹⁴C-labeled ester. The radiotracer experiments indicate that the dimer is formed from a molecule of the hydroperoxide and a molecule of the fatty ester.

CHOLESTEROL AS LIQUIFIER IN PHOSPHOLIPID MEMBRANES STUDIED BY SURFACE VISCOSITY MEASUREMENTS OF MIXED MONOLAYERS. P. Joos (State Univ. of Ghent, Lab. of Physical Biochem., Ghent, Belgium). *Chem. Phys. Lipids* 4, 162-8 (1970). The surface viscosity of cholesterol, distearoyl lecithin, oleoyl-stearoyl lecithin monolayers and mixed monolayers of cholesterol with both lecithins were measured. The presence of cholesterol causes the surface viscosity of the phospholipid monolayer to be reduced, so cholesterol acts as a liquifier. This liquification of the mixed monolayer is a pure physical phenomena and follows from the rate theory of Eyring.

STRUCTURE AND REACTIONS OF A CYANOGENETIC LIPID FROM CORDIA VERBENACEA DC. SEED OIL. D. Seigler, K. Mikolajczak, C. Smith and I. Wolff (Northern Regional Res. Lab., Peoria, Ill. 61604) and R. Bates (Univ. of Arizona, Tucson, Arizona 85721). *Chem. Phys. Lipids* 4, 147-61 (1970). *Cordia verbenacea* DC. (Boraginaceae) seed oil consists of a mixture of cyanogenetic, nonglycerol diesters (35%) and ordinary triglycerides. The nitrogen-containing esters are composed of two ordinary fatty acid moieties (predominantly C₂₀) esterified with a five-carbon dihydroxynitrile containing a terminal methylene grouping. All attempts to isolate this diol in an unesterified form resulted in mixtures of unstable products. The diesters form hydrogen cyanide on treatment with base and also yield formaldehyde upon mild alkaline oxidation. Hydrogen uptake is erratic, and varying degrees of hydrogenolysis with formation of monoesters occur when platinum or palladium is used as catalyst. Hydrolysis of the diesters with barium hydroxide gives a mixture of products which appear to be unsaturated hydroxy lactams.

GAS-LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY OF SYNTHETIC CERAMIDES CONTAINING PHYTOSPHINGOSINE. S. Hammaestrom (Dept. of Med. Chem., Royal Veterinary College, Stockholm, Sweden). *J. Lipid Res.* 11, 175-82 (1970). Ceramides containing phytosphingosine as base and one of the fatty acids 16:0, 18:0, 20:0, 22:0, 23:0 and 24:0, were prepared by direct coupling in the presence of a mixed carbodiimide. The ceramides were analyzed as the 1,3,4-tri-O-

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trimethylsilyl ether derivatives by gas-liquid chromatography-mass spectrometry. Gas chromatographic data is presented, and structures of mass spectral ions are suggested. The structures are supported by mass spectra of the homologous ceramides, by deuterium-labeling experiments and by high resolution mass spectrometry. Some ions, formed by cleavage between C-3 and C-4 in the long-chain base, indicate the phytosphingosine nature of the ceramide.

LIQUID-GEL CHROMATOGRAPHY ON LIPOPHILIC-HYDROPHOBIC SEPHADEX DERIVATIVES. J. Ellingboe, E. Nyström and J. Sjövall (Dept. of Chem., Karolinska Institutet, Stockholm, Sweden). *J. Lipid Res.* 11, 266-73 (1970). Hydrophobic long-chain alkyl ethers of Sephadex have been synthesized and tested for use in liquid chromatography. With columns prepared in such polar solvents as methanol, reversed-phase systems are obtained where compounds separate in order of decreasing polarity. In such nonpolar solvents as heptane, straight-phase systems are formed, and separations occur in order of increasing polarity. The retention volume of a compound is determined mainly by its polarity, the type and degree of substitution of Sephadex, and the nature of the solvent system. Examples are given of straight- and reversed-phase separations of waxes, fatty acids, glycerides, glycerol ethers, sterols, bile acids and hormonal steroids. The Sephadex derivatives are simple to make, the columns are easy to prepare and they can be used over long periods of time.

STABILITY OF FATTY ACID MONOLAYERS AND THE RELATIONSHIP BETWEEN EQUILIBRIUM SPREADING PRESSURE, PHASE TRANSFORMATIONS, AND POLYMORPHIC CRYSTAL FORMS. R. E. Heikkilä, C. N. Kwong and D. G. Cornwell (Dept. Physiol. Chem., Ohio State Univ., Columbus, Ohio 43210). *J. Lipid Res.* 11, 190-4 (1970). Force-area isotherms were obtained for hexadecanoic, octadecanoic, eicosanoic and docosanoic acid monolayers at different compression rates. Equilibrium spreading pressures were determined both by monolayer collapse and by spreading from the bulk phase. Monolayers formed metastable phases at all pressures above their equilibrium spreading pressures and at all surface areas smaller than the surface areas at their equilibrium spreading pressures. These metastable phases collapsed to stable phases at the equilibrium spreading pressures of the fatty acids. Collapse phenomena and compression experiments at very slow compression rates suggested that a previously unrecognized phase transformation occurred at the equilibrium spreading pressure. The surface area at this phase transformation corresponded to the cross-sectional area of the C-form of the fatty acid crystal.

SOLUTION OF FATTY ACIDS FROM MONOLAYERS SPREAD AT THE AIR-WATER INTERFACE: IDENTIFICATION OF PHASE TRANSFORMATIONS AND THE ESTIMATION OF SURFACE CHARGE. R. E. Heikkilä, D. W. Deamer and D. G. Cornwell (Dept. Physiol. Chem., Ohio State Univ., Columbus, Ohio 43210). *J. Lipid Res.* 11, 195-200 (1970). The contraction or decrease in area of fatty acid monolayers maintained at a constant surface pressure of 16 dynes/cm was studied as a function of fatty acid chain length, unsaturation, temperature and the hydrogen ion concentration in the subphase. The data were consistent with the hypothesis that fatty acid solution from the monolayer into the subphase was the mechanism for film loss. Autoxidative reactions did not contribute significantly to film loss since contraction occurred with saturated fatty acid monolayers and with unsaturated fatty acid monolayers in an anaerobic environment. The decrease in area per unit time or the solution rate was inversely proportional to chain length and directly proportional to the degree of unsaturation. The solution rate from the monolayer increased in a sigmoidal fashion with an increase in subphase pH, and the apparent surface pK_a was estimated as the point where the solution rate was half-maximum.

ROUTE TO THE POLYACETYLENIC C_{18} ACIDS CONTAINING 1-EN-4-YNE UNSATURATION. A. G. Fallis, E. R. H. Jones and V. Thaller. *Chem. Comm.* 1969, 924-5. A modified Wittig procedure makes possible the synthesis of 1-en-4-yne systems;

ethynyl group protection with the trimethylsilyl group facilitates iodoacetylene formation for subsequent coupling reactions. (World Surface Coatings Abs. No. 333)

SOLID AND LIQUID MONOMOLECULAR FILM AT OIL/H₂O INTERFACES. E. S. Lutton, C. E. Stauffer, J. B. Martin and A. J. Fehl. *J. Colloid & Interface Sci.* 30, 283-90 (1969). Discontinuities in slopes of interfacial tension vs. temp. (γ vs. T) are observed for triglyceride oil/H₂O systems, the discontinuities being seen when the oil contains low to moderate percentages of certain oil-soluble, water-insoluble surface-active components such as propylene glycol monoester or monoglyceride. It is proposed that such a γ vs. T break involves melting of a monomolecular layer adsorbed at the interface. The large change in slope at the break can be interpreted from the equation $(\delta H/\delta A)_{P,T} = \gamma - T(\delta\gamma/\delta T)_{P,A}$ with the change in $(\delta H/\delta A)$ at the break corresponding approximately to the heat of fusion of a monolayer. Estimated areas per mol. in the two regions, above and below the break, are of the order of 60 Å² and 20 Å², and are thus compatible with the hypothesis. (World Surface Coat. Abs. No. 334)

THE DILATOMETRIC CHARACTERISTICS OF MARGARINE OILS AS RELATED TO THOSE OF THE INDIVIDUAL CONSTITUENTS OF THE BLEND. E. Sambue, M. Naudet and G. Reymond (ITERG, Marseille). *Rev. Franc. Corps Gras* 17, 221-33 (1970). Within a specified temperature range, it is possible to calculate the dilatometric characteristics of a series of oils containing different proportions of the same ingredients from the specific volume (or possibly from the S.F.L.) of the constituents by empirical linear equations. Constants for these equations may be calculated from the specific volume (or the S.F.L.) of a single blend of the constituents. The best results are obtained when the proportions of the different constituents in the sample do not differ by more than $\pm 10\%$ from the proportions in the reference mixture.

THE PRODUCTION AND USE OF THE SOAPSTOCK AND GUMS OBTAINED FROM PROCESSING SUNFLOWER OIL. IV. USE OF SUNFLOWER PRESSCAKE ENRICHED WITH SOAPSTOCK AND GUMS IN ANIMAL FEEDING. V. Stojanov *et al.* *Maslo-Sapunema Prom., Byul.* 6(1), 17-35 (1970). Sunflower presscake was enriched with 9% gums and with 11% soapstock and fed to various species of animals. Its digestibility in chickens as well as its effect on meat production in chickens, swine, cattle and sheep was determined. Enriched presscake gave better results than unenriched presscake. Enrichment with soapstock was not as good as enrichment with gums. (Rev. Franc. Corps Gras)

USE OF FILTER AIDS DURING POLISHING FILTRATION OF SUNFLOWER OIL. G. Mecenov *et al.* *Maslo-Sapunema Prom., Byul.* 6(1), 51-57 (1970). The use of diatomite in the filtration of deodorized, winterized sunflower oil was studied. A method was developed which gave a five-fold improvement in yield over the usual procedure and also considerably improved the clarity of the filtered oil. (Rev. Franc. Corps Gras)

THE EFFECT OF TRANSESTERIFICATION ON THE GLYCERIDE STRUCTURE OF FATS. J. Marcinkiewicz *et al.* *Roczniki Technol. Chem. Zywosci* 17, 21-27 (1969). Mixtures of rapeseed oil, containing 45.1% erucic acid, and beef tallow, 48C m.p., were transesterified at 80C for 1 hour using 0.3% sodium methylate in xylene. The weight ratios of the two oils were 50/50, 40/60, and 30/70, and the melting points of the products were, respectively, 25.8, 30.1, and 36C. They were free of behenic acid and isomers, both of which are undesirable for hydrogenation purposes. (Rev. Franc. Corps Gras)

COMPARISON OF THE SOLUBILITIES OF SOY AND RAPESEED LECITHINS IN LIQUID AND HYDROGENATED RAPESEED OILS. W. Przyklek. *Tluszczce Jadalne* 14(2), 76-80 (1970). Soy lecithin did not dissolve in warm or cold refined rapeseed oil nearly as well as rapeseed lecithin did. This difference was more pronounced at lower temperatures. In hydrogenated rapeseed oil, the solubility difference was significant only at 40C. (Rev. Franc. Corps Gras)

ANTIFUNGAL AGENTS SUITABLE FOR THE PRESERVATION OF OILSEEDS. M. T. Juillet (Service de Documentation, ITERG, Paris). *Rev. Franc. Corps Gras* 17, 247-57 (1970). Infestation of stored oilseeds by fungi causes, among other problems, an increase in oil acidity. A number of antifungal agents used to inhibit this growth are reviewed and discussed. Among these are derivatives of quinoline and of thiocarbamic acid. Others such as various benzene derivatives and maleic hydrazide are also covered. In each case, average usage levels and toxicity are mentioned. Finally, different methods of application are briefly mentioned.

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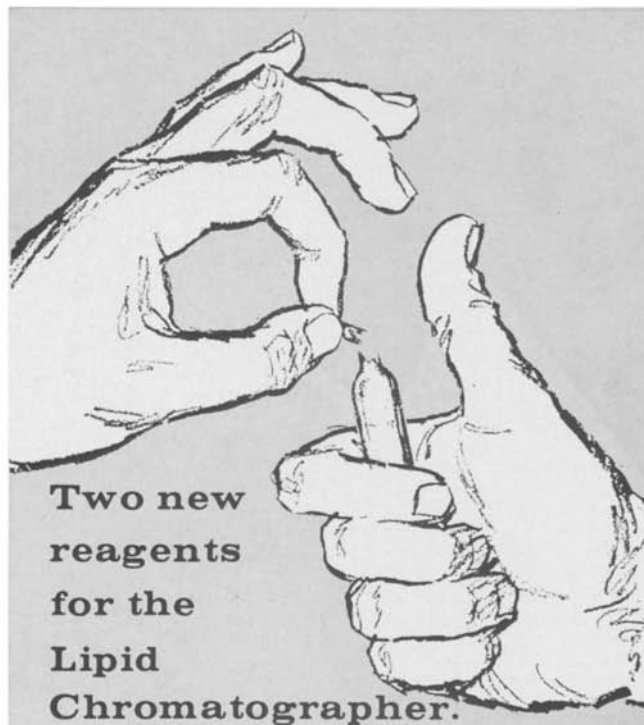
HYDROGENATION OF SOYBEAN OIL WITH SUPPORTED PALLADIUM CATALYSTS. I. V. Slotgauer *et al.* (Pedagogical Inst. of Khabarovsk). *Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* 1970, 138-140. The catalysts were prepared by introducing a finely ground activated earth into an alcoholic solution of PdCl₂ of known concentration. Contact of the Pd with the support lasted for 10-12 hours and was followed by evaporation of the solvent and drying for 3 hours at 110C. Next, the catalysts were fixed by calcination at 600C for 5 hours and reduced by the following procedure: (1) drying for 1 hour at 105C, (2) gradual elevation of the temperature to 230C during 1 hour, and (3) reduction at 230C for 35 minutes. For the hydrogenation, 9.2 g of refined and bleached soybean oil were taken. The run was halted after absorption of 350-400 ml of hydrogen. The amounts of Pd were varied between 0.02 and 0.2% of the weight of support. The results showed that the rate of hydrogenation was greater for catalysts containing 0.1% Pd than for catalysts containing 0.2% Pd, which can be explained by an increase in the distribution of active phase on the surface. In the sample containing 0.02% Pd, the active phase achieved the widest distribution but the quantity of metal was insufficient for the zero order reaction of linoleic acid. Dilution of the active phase on the support resulted in less isomerization, which improved the selectivity. Maximum selectivity was obtained at 200C. The maximum rate of hydrogenation was obtained with a catalyst containing 0.1% metal. (Rev. Franc. Corps Gras)

THE COMPOSITION AND PHYSIOLOGICAL EFFECTS OF HEATED SOYBEAN OIL FRACTIONS. I. CHEMICAL STUDY. B. Potteau, M. Lhuissier, J. Leclere (Food Research Station, I.N.R.A., 7 rue Sully, 21-Dijon), F. Custot, R. Mezonnet and R. Cluzan. *Rev. Franc. Corps Gras* 17, 143-53 (1970). Soybean oil containing 8% linolenic acid was heated under nitrogen for 12 hours at 275C and then fractionated by urea adduction and distillation. The adduct-forming fraction amounted to 76.2% of the total fatty acids. The distillable, non-adducting fraction amounted to 6.7% and was further fractionated with urea into a linoleic acid fraction (4%) and one containing cyclic monomers (2.7%). This latter fraction displayed a characteristic GLC pattern. The non-distillable, non-adducting fraction (17%) could not be further fractionated by urea and consisted of polymeric material. Analysis of the urea adducting fraction showed an almost total disappearance of linolenic acid and loss of significant amounts of linoleic acid. These results were similar to those of other workers who heated soybean oil in air at 200C.

II. PHYSIOLOGICAL STUDY. *Ibid.*, 235-245. Young rats were fed either fresh or heated soybean oil at levels of 10 and 20% of the diet. Other groups were fed the fractions separated from the heated oil in amounts equivalent to those separated from 20 g of oil in each 100 g of the diet. The fractions examined were the monomers, the polymers and the urea adductable acids. Two other groups of rats were fed the fatty acids from fresh oil at 20% of the diet or linoleic acid at 0.6% of the diet. All of the diets containing fractions had 0.6% of linoleic acid added. Feeding continued for three months. During that time, mortality, feed consumption, weight gain and feed efficiency were recorded. On a small group of animals, the dry matter, lipids and calcium in the feces and calcium and thiamin in the urine were determined. At the end of the experimental period, the animals were sacrificed, histological examination made and composition of the depot fats determined. The results of the study were somewhat confusing in that certain responses to feeding the heated oil were not evident in any of the groups fed the fractions. However, the results did show that growth was retarded in animals receiving 20% of the diet as heated oil, the polymeric fraction was poorly absorbed, the heated oil caused a decrease in thiamin excretion, the fatty acid composition of the depot fats was modified according to the composition of the dietary lipids and the liver and kidney weights of the group fed the monomeric fraction increased.

GLYCERIDE COMPOSITION OF THE OIL OBTAINED FROM THE TUBERCLES OF CYPERUS ESCULENTUS. H. Niewiadomski, J. Mareinkiewicz and J. Salmonowicz (Tech. Univ., Gdansk, Poland). *Riv. Ital. Sostanze Grasse* 46, 106-9 (1969). The analysis of the glyceride composition of *Cyperus esculentus* oil before and after hydrogenation has been carried out. Analysis by lipase hydrolysis showed an even degree of hydrogenation of the unsaturated acids, independently of their position in the triglyceride. The results indicate that it is not possible to produce a cocoa-butter-like fat by hydrogenation of *Cyperus esculentus*.

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OCCURRENCE AND POSSIBLE PROTECTIVE FUNCTION OF CARBON DIOXIDE IN OILSEEDS. D. S. Sankara Rao and K. T. Achaya (Regional Research Lab., Hyderabad, India). *J. Sci. Food Agr.* 20, 531-4 (1969). The carbon dioxide content of four oilseeds and their components have been determined using Warburg flasks by treatment with trichloroacetic acid and measurement of the released gas as barium carbonate. All the oilseeds contained CO₂, with high contents in the hulls and kernels of castorseed and in the annular spaces of cottonseed and groundnut (and possibly castor). Isolated castor and cottonseed oils absorbed large quantities of the gas, but lost most of it in 2-6 hrs. of exposure. Gassed groundnut and safflower oils when subsequently exposed to the atmosphere showed superior storage stability to untreated controls over long periods. Storage of oilseed and oils under CO₂ appears advantageous.

CONTRIBUTION TO THE STUDY OF HYDROPEROXIDE FORMATION IN THE COURSE OF FAT AUTOXIDATION. M. Piretti, P. Capella and U. Pallotta. (Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 46, 652-8 (1969). A mixture of hydroperoxides formed through autoxidation of methyl oleate at 80C was examined with the aid of several analytical techniques (TLC, GLC, GLC-MS and IR). The results showed that, under the prevailing experimental conditions, the hydroperoxide mixture contains a number of isomers of which about 76.5% are in the trans configuration and about 23.5% are in the cis configuration. The separation of the cis and trans isomers revealed that both fractions contain the following positional isomers of the hydroperoxide group and of the double bond: 8-OOH, Δ₉; 9-OOH, Δ₁₀; 10-OOH, Δ₈; 11-OOH, Δ₉.

DETERMINATION OF MOISTURE AND OIL IN THE SEED OF WINTER RAPE. I. COMPARISON OF OVEN METHODS FOR THE DETERMINATION OF MOISTURE. M. Hughes (Nat. Inst. of Agr. Engineering, Silsoe, England). *J. Sci. Food Agr.* 20, 741-44 (1969). The method for estimating moisture in winter rape seed (*Brassica napus*) by drying at 130C for 1 hr. gives results significantly higher than methods of drying at 103C and 105C. For the routine estimation of moisture in large numbers of samples a convenient method is to dry 10 g. of whole seed for 16 hrs. This method compares favorably with results obtained on milled samples dried at 103C for 5 hrs. or 105C for 16 hrs.

II. COMPARISON OF EXTRACTION METHODS FOR THE ESTIMATION OF OIL. *Ibid.*, 745-7. The rate of oil extraction from moist and dry rape seed was compared over an extraction time of 20 hrs. and the results showed oil to be more readily extractable from oven-dried seed. Three methods based on extraction of single samples were compared with a method in which a number of samples, contained in individual satchets, were extracted in one large extractor. No significant differences were found between any of the methods used, and it is proposed that, where oil content is the only analysis required on a large number of samples, the multiple extraction method of oven-dried seed is satisfactorily quick and accurate.

NEW TROPICAL SEED OILS, III. COMPONENT ACIDS OF LEGUMINOUS AND OTHER SEED OILS. J. A. Cornelius, T. W. Hammonds, J. B. Leicester, J. K. Ndabahweji, D. A. Rosie and G. G. Shone (Tropical Products Inst., London, England). *J. Sci. Food Agr.* 21, 49-50 (1970). The fatty acid compositions are reported for 26 seed oils of tropical origin.

EXPERIMENTAL INVESTIGATIONS ON THE GLYCERIDE STRUCTURE OF NATURAL FATS, III. OLEA EUROPAEA AND GLYCINE HISPIDA. L. Goldberg Federico, A. Farini, T. Benelli and A. Daghetta (Univ. of Milan, Milan, Italy). *Riv. Ital. Sostanze Grasse* 46, 102-9 (1969). The triglycerides of olive oil and of soybean oil have been subjected to gas chromatography and to saponification with pancreatic lipase, both in the naturally occurring state and after separation by degree of unsaturation. Elaboration of the results produced a fatty acid distribution which is in good agreement with the one calculated according to Van der Waal's method based on the theory of 1,3-random-2-random distribution.

APPLICATIONS OF DENSITOMETRY TO THE QUANTITATIVE ANALYSIS OF LIPIDS BY TLC. E. Fedeli and F. Camurati (National Center for Lipochem., Milan, Italy). *Riv. Ital. Sostanze Grasse* 46, 97-101 (1969). Densitometric techniques which allow a direct reading to be made on thin-layer chromatograms can represent a valid method for the quantitative analysis of fatty materials. Examples and experimental results are reported for several applications (e.g. elaidinic acids, glycerides with various degrees of unsaturation, etc.).

INVESTIGATIONS ON THE PHENOLIC SUBSTANCES PRESENT IN OLIVE OIL. G. Montedoro and C. Cantarelli (Univ. of Perugia, Perugia, Italy). *Riv. Ital. Sostanze Grasse* 46, 115-24 (1969). The results of qualitative and quantitative studies on the phenolic substances present in olive oil are reported. Results are also reported confirming the important antioxidant role played by these substances in olive oil.

THE SEED OILS OF PRUNUS PERSICA SIEB. G. Lotti and G. Anelli (Univ. of Pisa, Pisa, Italy). *Riv. Ital. Sostanze Grasse* 46, 110-4 (1969). The seed oils extracted from sixty cultivars of peaches, mainly grown in the Italian region of Tuscany, have been examined and their chemical characteristics, fatty acid composition and behavior under U.V. and I.R. have been determined. The results indicate that plant variety can have an important effect on both oil content of the seeds and fatty acid composition, while behavior under U.V. light remains largely unaffected.

CHINESE MALLOW OIL SEEDS. G. L. Giovetti and A. Decanale (Sicile, Pordenone, Italy). *Riv. Ital. Sostanze Grasse* 46, 650-1 (1969). Physico-chemical data and fatty acid composition are reported for the oleaginous plant Chinese mallow (*Abutilon avicennae Gaertn.*). The oil obtained from these seeds has been processed into edible oil of satisfactory quality and the residual meal appears to be suitable as cattle feed.

FATTY ACIDS, CHOLESTEROL AND PROXIMATE ANALYSIS OF SOME READY-TO-EAT FOODS. B. R. Standal, D. R. Bassett, P. B. Policar and M. Thom (Univ. of Hawaii, Honolulu). *J. Am. Dietetic Assoc.* 56, 392-6 (1970). Analytical data pertaining to the fatty acid composition and cholesterol content of several processed and prepared foods are reported.

CONTRIBUTION TO THE STUDY OF HYDROPEROXIDE FORMATION IN THE COURSE OF FAT AUTOXIDATION, II. GC-MS OF THE REACTION PRODUCTS. P. Capella, M. Piretti and A. Strocchi (Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 46, 659-67 (1969). Combined gas chromatography-mass spectrometry methods have been used to study the molecular structure of methyl oleate hydroperoxides obtained at 80C. Due to the lack of suitable reference compounds, identification was obtained through the use of the mass spectra of a series of derivatives, prepared by means of reactions excluding the formation of artifacts.

SEED LIPIDS OF WATER PLANTS. G. Lotti and V. Averna (Univ. of Pisa, Pisa, Italy). *Riv. Ital. Sostanze Grasse* 46, 688-72 (1969). The analytical characteristics, fatty acid composition and UV and IR data of the seed lipids obtained from a group of water and marsh plants were determined. All of these lipids were found to contain very high levels of polyunsaturated acids, and, in almost all cases, conjugated dienes and trienes.

ANTIOXIDANT PROPERTIES OF AMINO ACIDS. J. Sliwiok and J. Siechowski (Silesian Univ., Katowice, Poland). *Riv. Ital. Sostanze Grasse* 47, 73-5 (1970). Experiments were carried out to test the possible antioxidant properties of several amino acids on soybean oil. Of the amino acids studied, methionine and cystine were shown to have antioxidant properties, while cysteine appeared to have pro-oxidant properties.

APPLICATIONS OF GAS CHROMATOGRAPHY-MASS SPECTROMETRY TO THE STUDY OF AROMATIZING SUBSTANCES. E. Fedeli (Nat. Center for Lipochem., Milan, Italy). *Riv. Ital. Sostanze Grasse* 47, 14-18 (1970). Results are presented on an investigation of olive oil flavor, based on a combined gas chromatography-mass spectrometry method.

PROBLEMS RELATED TO THE TRANSPORT AND STORAGE OF PEANUT SEEDS AND MEALS. R. D'Agata (Olefici Italiani, Porto Marghera, Italy). *Riv. Ital. Sostanze Grasse* 47, 67-72 (1970). Problems connected with the transport and storage of peanut seeds and meals are discussed, with special reference to the presence of *Aspergillus flavus* and to suitable means for reducing aflatoxin formation.

A STUDY ON THE COMPOSITION OF BEECHNUT OIL. G. Bionda, E. Tassara and E. Carlisi. (Univ. of Genoa, Genoa, Italy).

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Riv. Ital. Sostanze Grasse 47, 76-9 (1970). Analytical data, fatty acid composition and UV and IR spectra of beechnut oil have been determined. The oil is of a semi-drying type and appears suitable for use as an edible oil.

A STUDY OF THE ABNORMAL ANALYTICAL VARIATIONS IN MOUNTAIN BUTTER. G. Valentini (Prov. Chem. Lab., Udine, Italy). *Ind. Aliment.* 9(2), 52-8 (1970). The results are presented of a study concerning certain analytical anomalies which are consistently observed in butters produced at elevations greater than about 4,000 ft. above sea level.

SYNERGISTIC ANTIOXIDANT COMPOSITIONS FOR NATURAL OLEAGINOUS MATERIALS. G. W. Ahrens. 3,502,594. Liquid, lipid-soluble, antimicrobially-active synergistic antioxidant compositions for natural phospholipid-containing, non-hardening type oleaginous materials are provided. These compositions consist essentially of edible, antimicrobially active, liquid phenylic aromatic alcohols selected from the group having the OH group on a straight side chain of 1-3 CH₂ groups attached to a benzene ring carrying permanently solvated therein minor amounts of a synergistic antioxidant system formed between synergistically active ratios of delta-ascorbic acid and alpha-tocopherol.

DUAL STAGE STEAM STRIPPING OF VEGETABLE OILS AT DUAL PRESSURES. R. D. Good (Blaw-Knox Co.). U.S. 3,503,854. A process is described, comprising a two-stage stripping system for removing residual solvent from solvent-extracted oil, in which both stages are operated at subatmospheric pressure, the first stage being at relatively higher pressure (200-400 mm Hg absolute) and the second stage at relatively lower pressure (50-100 mm Hg absolute), with the stripping gas or vapor from the second (high vacuum) stage being compressed and reused in the first stage.

OZONIZATION OF VEGETABLE OILS IN AN IMPROVED AQUEOUS MEDIUM. R. E. Beal (U.S. Sec'y of Agr.). U.S. 3,504,038. The formation of a tenacious creamlike phase that limits the ozonization of a polyunsaturated vegetable oil in an aqueous medium and leads to wasteful utilization of ozone is prevented by the prior addition of a C₈-C₆ aldehyde.

PROCESS FOR SEPARATING SATURATED FROM UNSATURATED FATTY ACIDS. A. Koebner and T. Thornton (Marchon Products Ltd.). U.S. 3,506,695. Fatty acids of high polarity may be separated from fatty acids of low polarity with which they are admixed by dissolving the mixture in an aqueous solution of aryl or alkaryl sulfonates and then cooling the solution to crystallize out the low polarity acids, while the high polarity acids may be recovered by dilution of the sulfonate solution to yield a fatty acid oily layer.

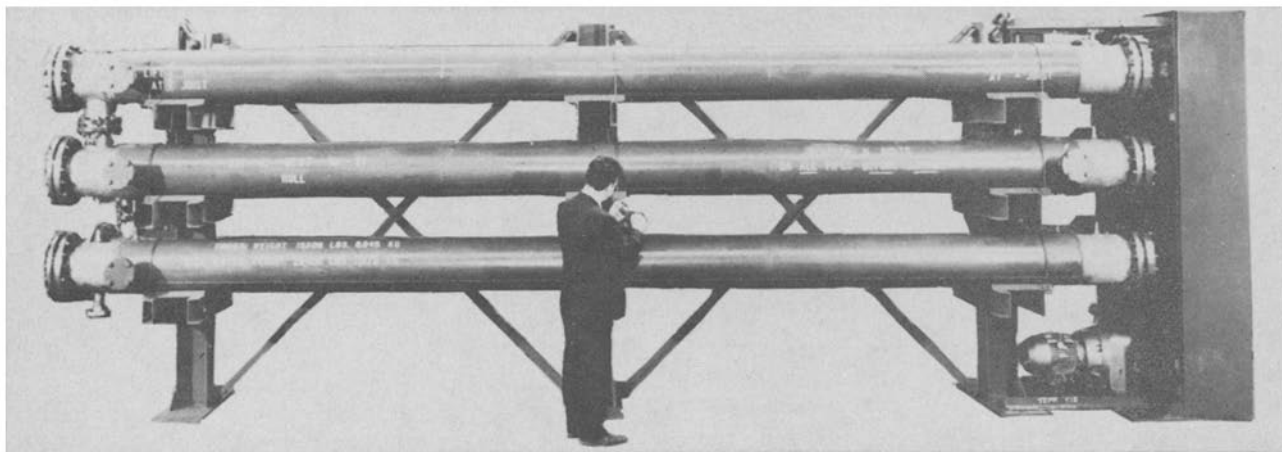
CONTINUOUS HIGH TEMPERATURE STEAM DEODORIZATION OF EDIBLE OILS. J. S. Baker and J. B. Edwards (Procter & Gamble Co.). U.S. 3,506,696. A process is described for continuous high temperature (350-500F) steam deodorization of edible oils in a packed chamber through which hot, deaerated oil is passed downward, countercurrent to a stream of steam. The process has high capacity (5000-10,000 lbs. per hr. per sq. ft. of chamber cross section), low steam usage (0.1-1.0% by wt. of the oil), rapidity and moderate vacuum requirements.

RECOVERY OF FATTY AND ROSIN ACIDS. P. D. Patrick, Jr., F. J. Ball and J. C. McManus, Jr. (Westvaco Corp.). U.S. 3,510,468. A process is described which involves the sulfoalkylation of aqueous solutions of soaps of fatty and rosin acids with a water-soluble sulfite and an aliphatic or aromatic aldehyde at a temperature of 150 to 550F until certain of the non-acid constituents are made water soluble and apt to be separated from the acids upon acidification of the soap, resulting in a product having improved color and odor. Further color and odor improvements occur when sulfoalkylation is used in combination with a solvent extraction of the soap.

GLYCERIDE OILS. P. J. Seip (Lever Bros. Co.). U.S. 3,510,501. Alkali refining of vegetable oils is accomplished by separately heating the oil and an aqueous alkali solution, then bringing them into contact with each other in a neutralization zone essentially free from obstruction at a temperature of 105-170C. The refined oil is subsequently separated from the soap-containing alkali solution formed by neutralization.

(Continued on page 378A)

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Scientist Says Single Cell Protein May Become Important World Protein Source

Some three hundred years ago a Dutch naturalist, Leeuwenhoek, peered through his microscope at a shimmering drop of sunlit pond water and launched mankind into the great biological revolution that continues today. Leeuwenhoek had discovered the single celled organism, a simple yet complete living entity.

Today, A. E. Humphrey, a prominent chemical engineer from the University of Pennsylvania, prophesied that scientists may well turn to these single celled organisms to answer what may prove to be twentieth century man's most crucial problem: hunger.

Delivering the keynote address at the 18th Annual Pfizer Research Conference, sponsored by the firm's Agricultural Division, Dr. Humphrey stated that protein obtained from single cell organisms grown on cheap substrates, such as crude oil, is meeting with initial success in certain parts of the world.

"Used today to augment animal feeds," said Dr. Humphrey, "this protein, commonly referred to as 'Single Cell Protein' (SCP) is being developed by many scientists and companies in various parts of the world. Plants to produce up to 16,000 tons a year are presently being constructed and plans for plants with production capabilities of up to one million tons a year are being considered."

In addition, the scientist noted, SCP runs as high as 75% protein and has a "nutritionally attractive amino acid profile." Amino acids, found in all living cells and tissue,

are important as building blocks of proteins and synthesis of many key biological substances, including enzymes.

"Because of the high nutritional quality and the physical characteristics of SCP," said Dr. Humphrey, "some thought has been given about by-passing animals on the food chain and producing a protein food in a meat analog form for direct human consumption."

"Although SCP appears to have a bright future," he said, "it is not without its problems, toxicity being the most important. Preliminary evidence, however, indicates that toxicity will be overcome as the attendant technology advances."

"With such barriers overcome," concluded Dr. Humphrey, "single cell protein may eventually become an important world protein source, a source that could prove to be the decisive factor in tipping the scale of hunger in favor of man."

Director of the University of Pennsylvania's School of Chemical Engineering, Dr. Humphrey is a noted authority in the area of fermentation for production of biochemicals, pharmaceutical compounds and protein for human and animal consumption. He received his Ph.D. in chemical engineering from Columbia University in 1953 and has lectured extensively both in the United States and abroad. As author or co-author, Dr. Humphrey has published more than 60 papers and the book, *Biological Engineering*, a text used in many universities in the United States and abroad.

ABSTRACTS: FATTY ACID DERIVATIVES

(Continued from page 377A)

• Fatty Acid Derivatives

SYNTHESES AND POLYMERISATION OF METHYL 12- AND 18-VINYLOXYSTEARATES. G. N. Tewari, P. C. Chatterjee and J. S. Aggarwal. *Makromol. Chem.* 126, 173-6 (1969). Methyl 12- and 18-vinyloxystearates were prepared by vinyl trans-etherification with ethyl vinyl ether. Stannic chloride initiated cationic polymerisation of these monomers in cyclohexane to yield colourless viscous liquids having a degree of polymerisation of about 20. The ester groups in the polymers were hydrolysed to give the corresponding polyacids and were reduced to give the corresponding polyols. (World Surface Coat. Abs. No. 334)

FATTY ACIDS, PART 25; THIN LAYER AND GAS-LIQUID CHROMATOGRAPHIC PROPERTIES OF SOME DIUNSATURATED C₁₈-ESTERS. F. Gunstone and M. Lie Ken Jie (Dept. of Chem., The Univ. of St. Andrews, The Purdie Building, St. Andrews, Scotland). *Chem. Phys. Lipids* 4, 131-8 (1970). The chromatographic (GLC and silver ion TLC) properties of 13 octadecadienoic esters and the *cis,cis*- and *trans,trans*-dienoates derived from them are investigated. The possibility of predicting GLC behavior (ECL) is discussed.

PART 26; THIN LAYER AND GAS LIQUID CHROMATOGRAPHIC PROPERTIES OF SOME CIS-OCTADECENYL COMPOUNDS. *Ibid.*, 139-46. The methyl *cis*-octadec-2 to 17-enoates have been converted to the corresponding alcohols, acetates, trifluoroacetates, aldehydes and hydrocarbons for investigation of their chromatographic (GLC and silver ion TLC) properties.

RICINOLEATE AS OIL-WATER DEMULSIFIER. E. G. Foehr (Chevron Research Co.). *U.S. 3,505,307*. Monoricinoleate esters of di- and trihydroxy alkyl compounds are used as demulsifiers for lubricant oils contaminated with water.

• Biochemistry and Nutrition

AN ANALYSIS OF THE INTERACTION OF PROTEIN WITH LIPID MONOLAYERS AT THE AIR/WATER INTERFACE. P. J. Quinn and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council, Inst. of Animal Physiol., Babraham, Cambridge CB2 4AT, U.K.). *Biochem. J.* 116, 671-80 (1970). Measurements have been made of the interaction of cytochrome c, bovine serum

albumin and synthetic oxytocin with low-pressure (2 dyn/cm) monolayers of stearic acid, phosphatidylcholine and phosphatidylethanolamine. ¹⁴C-Carboxymethylation of the cytochrome c and albumin followed by surface-radioactivity determinations have shown that only a proportion of the protein added to the subphase is bound to the monolayers and that initially the degree of binding is dependent on the protein concentration. The binding is irreversible in the sense that the adsorbed protein cannot be removed by transferring the film containing the interacted protein to a fresh subphase containing no protein.

TURNOVER OF THE GLYCEROLIPIDS OF PUMPKIN LEAVES. P. G. Roughan (Plant Physiol. Div., Dept. of Sci. and Indust. Res., Palmerston, North, New Zealand). *Biochem. J.* 117, 1-8 (1970). Between 1 and 5% of the ¹⁴C recovered from pumpkin leaves within 15-60 min after pulse-labelling with ¹⁴CO₂ was in the lipids. The specific radioactivity of the phospholipids was higher than that of the glycolipids. Phosphatidylcholine had five times the specific radioactivity of monogalactosyl diglyceride, and the specific radioactivity of neither galactolipid changed significantly between 1 and 48 hr after labelling. It therefore seemed unlikely that the galactose moieties of the galactolipids were involved in the transport of assimilated compounds across the chloroplast membrane. Within 60 min of the application of acetate-1-¹⁴C to the surfaces of mature, intact, pumpkin leaves, 70% of the recovered ¹⁴C was in the lipid fraction. From a comparison of the changes with time of labelling of fatty acid fractions from phosphatidylcholine, phosphatidylethanolamine, phosphatidylglycerol and monogalactosyl diglyceride, it is suggested that the primary site of linolenic acid biosynthesis in leaf cells is within the phosphatidylcholine molecule.

EFFECT OF LOW DIETARY LEVELS OF GLUCOSE, FRUCTOSE AND SUCROSE ON RAT LIPID METABOLISM. S. Mukherjee, M. Basu and K. Trivedi (Dept. Applied Chem., Univ. Calcutta, Calcutta, India). *J. Atheroscler. Res.* 10, 261-72 (1969). The effects of dietary carbohydrates on lipid metabolism have been investigated in rats maintained on diets containing 12% glucose, fructose or sucrose and appreciable quantities of starch. The changes in hepatic rates of synthesis and catabolism of cholesterol and fatty acids as well as of triglycerides and phospholipids were studied to determine the relative influence of the three sugars on serum lipid concentrations. Marked increase in serum cholesterol results from feeding a sucrose diet, while elevation of serum neutral

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ABSTRACTS: BIOCHEMISTRY AND NUTRITION

lipids is obtained with regimens containing fructose and sucrose. The effects are mainly due to the stimulation of rates of lipogenesis, associated with increments in the activities of enzymes of the hexose monophosphate oxidative pathway in the liver, coupled with relative lowering of the catabolic rate of specific lipid classes on respective carbohydrate regimens.

COMPARATIVE REQUIREMENTS OF LINOLEIC ACID FOR MALE AND FEMALE CHICKS. H. Menge (U.S. Dept. of Agr., Beltsville, Md. 20705). *Poultry Sci.* 49, 178-83 (1970). Duplicate experiments were conducted with 12 replicated groups of separate sexes of chickens to establish the 18:2 requirements of males and females to 6 weeks of age. The 18:2 was supplied by graded levels of safflower oil added to an essential fatty acid-deficient diet. Significant differences between experiment, sex, dietary treatment and a sex \times treatment interaction were found by the least squares method. The 18:2 requirements of males and females were found to be approximately 3.6% and 1.8% of total metabolizable calories, respectively. These values are equivalent to 1.2% and 0.6% dietary 18:2. Thus, the requirement of the male for 18:2 was found to be twice that of the female.

THYROXIN PHASES THE CIRCADIAN FATTENING RESPONSE TO PROLACTIN. A. H. Meier (Dept. of Zoology and Physiol., Louisiana State Univ., Baton Rouge, La. 70803). *Proc. Soc. Exp. Biol. Med.* 133, 1113-16 (1970). The diurnal fattening response to prolactin in the Golden Topminnow, *Fundulus chrysotus*, involves a circadian periodicity of fattening sensitivity to the hormone. Phasing of the rhythm in fish kept in continuous light can be obtained by injections of thyroxin. A phase angle of 18 hr between the time of thyroxin injection and the time of prolactin injection results in conditions favoring the accumulation of fat stores. Phase angles of 6 hr do not promote fattening.

IDENTITY OF VERY LOW DENSITY LIPOPROTEINS OF PLASMA AND LIVER GOLGI APPARATUS. R. W. Mahley, T. P. Bersot, V. S. LeQuire and W. V. Brown (Pathology Dept., Vanderbilt Univ., School of Med., Nashville 37203). *Science* 168, 380-2 (1970). In the rat, very low density lipoproteins isolated from hepatocyte Golgi apparatus, liver perfusates and whole plasma appear identical in many respects. With specific immunochemical techniques and polyacrylamide-gel electrophoresis, it can be demonstrated that the very low density lipoproteins from all three sources contain the same major lipoprotein apoproteins.

METABOLISM OF CEREBROSIDE IN THE INTESTINAL TRACT OF THE RAT. A. Nilsson (Div. of Physiol. Chem., Chem. Center, Univ. of Lund, Lund, Sweden). *Biochim. Biophys. Acta* 187, 113-21 (1969). (3-³H)Sphingosin- or (9,10-³H₂)palmitoyl-labeled glucosyl-ceramide and (6-³H)-galactosyl-labeled galactosyl-ceramide were fed to intact rats and to rats with a thoracic duct fistula. The data obtained from analyses of the thoracic duct lymph, of the small intestine and intestinal contents and of the feces indicated that to a large extent the substrates were absorbed and metabolized in the small intestine. About 20-42% of the fatty acid portion was recovered in lymph triglycerides and lecithin, and labeled hexose was transported in a water-soluble form by the portal vein. The low recoveries of radioactivity in lymph lipids in experiments with (3-³H)sphingosin-labeled glucosyl-ceramide and earlier data indicated that 55-60% of the sphingosin portion was absorbed and metabolized to fatty acids in the mucosal cells. The remainder appeared in the feces as intact cerebroside and ceramide. Rat pancreatic juice and human intestinal contents did not hydrolyze glucosyl-ceramide. The analyses of the small intestine and intestinal contents 2-3 hr. after feeding the substrates also indicated that the hydrolysis of dietary cerebroside occurs in the mucosal cells after absorption. An active biosynthesis of cerebroside, in which dietary sphingosin bases take part, occurs in the mucosal cells.

THE BI-DIRECTIONAL TRANSFER OF CHOLESTEROL IN NORMAL AORTA, FATTY STREAKS AND ATHEROMATOUS PLAQUES. H. B. Lofland and T. B. Clarkson (Dept. Pathology, Wake Forest Univ., Winston-Salem, N.C. 27103). *Proc. Soc. Exp. Biol. Med.* 133, 1-10 (1970). Isotope cholesterol was administered per os for 30 days to cholesterol-fed White Carneau pigeons. At weekly intervals and for 100 days after cessation of isotope administration, subgroups were killed and their aortas were divided into normal tissue, fatty streaks and atherosclerotic plaques. The results indicated that in normal aorta the influx of free cholesterol greatly exceeds that of cholesteryl esters. There appeared to be no net positive cholesterol balance. In fatty streaks, the influx of both free and esterified cholesterol was greater than for normal tissue, and influx rates exceeded those for efflux. In plaques, still greater rates of influx and efflux were seen, and the influx of cholesteryl esters frequently exceeded that of free cholesterol, and like fatty streaks, plaques appeared to be in positive cholesterol balance.

(Continued on page 380A)

• Oilseed Meal Grinding . . .

(Continued from page 360A)

known as the single stage grinding system. The advent of front end dehulling equipment makes this system even more popular. In the single stage system, the incoming meal is first passed over a sifter, and the material that is already down to size passes into the conveying stream. The overs from the sifter then are passed to as many mills as necessary to keep up with plant production requirements. After grinding, the finished material is returned to the original sifter and the overs are passed through the mills once again. Usually the amount of overs returned to the mills for grinding a second time, rarely exceeds 20%. These mills are usually 1800 rpm pulverizers in this system.

Most of the pulverizers supplied to the industry today are either replacements or additions to existing systems, rather than newly constructed plants or facilities. As such, it is more likely to find modifications and additions to either the single or two-stage grinding systems, rather than the simple flow patterns suggested here. However, when new facilities are planned today, they probably will include the extractor, desolventizer-toaster, dryer and cooler, and then the single stage on-stream grinding set up, as outlined.

Grinding systems in soybean plants today are usually operated on a 24 hr/day basis and the capacity of the pulverizing equipment usually allows for a very comfortable grinding rate. Grinding facilities should not operate at 100% full load capacity, so that ammeter readings would not have to be constantly watched to prevent overloading. It is far better to assume a given capacity based on 70% to 80% full load readings. By so doing the equipment can be permitted to run continuously without problem. Typical of some of these safe, very conservative grinding rates giving an acceptable finished product are as follows: Solvent extracted soybean meal, 300-400/hp/hr; solvent extracted cottonseed meal, 275 lb/hp/hr; solvent extracted linseed meal, 300 lb/hp/hr.

The processing of soybeans by pulverizers, particularly through the scientific particle reduction phase, has given our company an opportunity to contribute to this phenomenal success story. We are happy to have been able to contribute our part to this most dynamic oilseed processing industry.

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(Continued from page 379A)

QUANTITATIVE RELATIONSHIP BETWEEN AMOUNT OF DIETARY FAT AND SEVERITY OF ALCOHOLIC FATTY LIVER. C. S. Lieber and L. M. DeCarli (Section of Liver Dis. and Nutr., Bronx Veterans Admin. Hosp., New York, N.Y.). *Am. J. Clin. Nutr.* 23, 474-8 (1970). To assess the quantitative relationship between fat content of the diet and lipid accumulation in the liver after alcohol ingestion, rats were given various isocaloric liquid diets, containing 18% of total calories as protein and 36% as ethanol or isocaloric carbohydrate. The remainder of the calories consisted of varying amounts of fat (2, 5, 10, 15, 25, 35 or 43% of total calories) and corresponding amounts of carbohydrate. Dietary fat consisted of ethyl linoleate (2% of total calories), to avoid essential fatty acid deficiency, and an olive-corn oil mixture. After 24 days of ethanol and 43% of calories at fat, hepatic triglycerides increased seven- to eightfold. With 35% of calories as fat, the increase was fivefold and with 25%, only two- to threefold. No significant decrease in hepatic lipid accumulation was achieved by further reduction in the dietary fat; a diet with 25% of calories as fat (about half that of the average United States diet) appears, therefore, to be optimal for minimizing the steatogenic effects of ethanol. An excess of dietary protein did not affect the ethanol-induced steatosis, and even a combination of a high protein-low fat diet did not achieve full protection against the ethanol-induced hepatic deposition of lipids in the liver. The ethanol effect persisted unchanged for periods up to 3-5 months.

HEPATIC LIPID METABOLISM IN HYPOPHYSECTOMIZED AND GROWTH HORMONE-TREATED HYPOPHYSECTOMIZED RATS. J. P. Liberti, R. S. Navon, E. S. Longman and P. F. Jezyk (Dept. of Biochem., Medical College of Virginia, Health Sci. Div., Virginia Commonwealth Univ., Richmond, Va. 23219). *Proc. Soc. Exp. Biol. Med.* 133, 1346-50 (1970). Changes which occur in hepatic lipid metabolism of hypophysectomized and bovine growth hormone-treated hypophysectomized rats were studied. Synthesis of lipids, as measured by the ability of tissue slices to incorporate ^3H -glycerol into lipids, decreased rapidly following hypophysectomy. Three weeks after hypophysectomy, glycerol incorporation was approximately 40% of that in normal rats and remained depressed over the experimental period. Synthesis of acidic lipids was not appreciably affected by hypophysectomy but labeling of all other classes of lipids, particularly triglycerides, was diminished.

LIPASE IN PANCREAS AND INTESTINAL CONTENTS OF CHICKENS FED HEATED AND RAW SOYBEAN DIETS. S. Lepkovsky and F. Furuta (Dept. of Poultry Husbandry, Univ. of Calif., Berkeley, Calif. 94720). *Poultry Sci.* 49, 192-98 (1970). Lipase activity was measured in: pancreases of intact chickens and in pancreases of chickens with ileostomies; intestinal contents from intestines of intact and operated chickens; intestinal contents voided through an ileostomy; and cecal contents from intact chickens. After one feeding of raw soybean diet, the level of lipolytic activity in the pancreases of the chickens was reduced to about one-half of that found at fasting, and was in marked contrast to the small decreases of lipolytic activity in the pancreases of chickens fed heated soybean diet.

AORTIC RUPTURE, BODY WEIGHT, AND BLOOD PRESSURE IN THE TURKEY AS INFLUENCED BY STRAIN, DIETARY FAT, BETA-AMINOPROPIONITRILE FUMARATE AND DIETHYLSTILBESTROL. L. M. Krista, P. E. Waibel, J. H. Sautter and R. N. Shoffner (Depts. Animal Sci. and Vet. Pathol., Univ. of Minn., St. Paul, Minn. 55101). *Poultry Sci.* 48, 1954-60 (1969). Three strains of Broad White male turkeys were utilized to determine the effects of dietary fat, beta-aminopropionitrile (BAPN), and diethylstilbestrol (DES) on blood pressure (BP), incidence of aortic rupture (AR), and body weight (BW). While 10% of animal fat increased BW significantly it did not alter blood pressure or provoke aortic rupture in an experiment of low natural incidence. BAPN at 0.01% did not influence these measures but at 0.015% decreased BW slightly, increased incidence of AR, and did not affect BP. DES did not alter BW but it resulted in reduced BP and greater incidence of AR. Three strains of turkeys were used. Two strains showing greater body weight gains and higher blood pressure also were afflicted to a greater extent by aortic rupture as compared to the third strain. One of the higher incidence strains showed a greater susceptibility to aortic rupture as induced by DES. With one generation of selection for higher and lower blood pressures, the incidence of natural aortic rupture was approximately twice as high in the high lines of all three strains.

Northern California Section

The Northern California Section of the AOCS held its first meeting of the year on Friday, May 8, 1970, at the Claremont Hotel in Berkeley, Calif. After dinner, the attending members and guests heard a very interesting speech by H. C. Knapp about Ecology in the San Francisco Bay Area. Of particular interest was the Procter-Cologne Water Quality Control Act, which was adopted by the State of California and which took effect on Jan. 1, 1970.

Mr. Knapp has been Senior Engineer with the San Francisco Bay Regional Quality Control Board since 1945. His prior experience has been with the Central Valley, Colorado River Basin, and the North Coastal Regional Water Quality Research Boards. He was also Research Engineer with Richmond Laboratory of the California (now Chevron) Research Corporation and Research Engineer with Jackson Laboratory of E. I. duPont de Nemours & Company.

Mr. Knapp is a member of the American Institute of Chemical Engineers, the American Chemical Society and the Water Pollution Control Federation.

As usual, the Northern California Section was pleased and honored to have Mr. and Mrs. G. C. Cavanagh attend this meeting.

Mr. F. E. Sullivan, Chairman of the Section was the photographer at the meeting, and we thank him for his excellent photography.



Left to right: M. H. Abed, Secretary of AOCS North California Section; H. C. Knapp, speaker of evening; and Bob Hood, Industrial Manager, De Laval Separator Co.



Left to right: Ed Henry, Manager, Brookside Division, Safeway Stores; G. C. Cavanagh, AOCS Past President.

INFLUENCE OF DIETHYLSTILBESTROL ON THE TURKEY WITH SPECIAL REFERENCE TO HISTOLOGICAL CHANGES IN THE AORTA. L. M. Krista, J. H. Sautter and P. E. Waibel. *Ibid.*, 1961-68. Physiological and metabolic changes were induced by DES treatment. Even though distinct morphological differences are hard to establish, the levels of DES could be related to changes in bodyweight, blood pressure, carcass composition, general conformation and secondary sex characteristics. The lowest level of DES did not influence bodyweight, blood pressure or aortic rupture, but an increase in body fat and liver size was observed. The medium level of DES resulted in a significant reduction in weight gain at 12 weeks of age, a significant decrease in blood pressure at eight weeks of age and a significant increase in aortic rupture, plaque formation, and degeneration. The highest level of DES had an obvious toxic effect on the birds as indicated by debilitated appearance and depressed weight gains by six weeks of age.

PHOSPHOLIPIDS: LOCALIZATION IN SURFACE MEMBRANES OF TETRAHYMENA. K. E. Kennedy and G. A. Thompson, Jr. (Dept. of Botany, Univ. of Texas, Austin, Tex. 78712). *Science* 168, 989-91 (1970). Approximately 60% of the phospholipids from the membrane sheath of *Tetrahymena pyriformis* cilia contain 2-aminoethylphosphonic acid. This is more than twice the concentration found in total cell lipids. The resistance of these lipids to hydrolytic enzymes suggests that they increase the stability of the surface membranes.

EFFECT OF TEMPERATURE ACCLIMATIZATION ON THE FATTY ACID COMPOSITION OF GOLDFISH INTESTINAL LIPIDS. P. Kemp and M. W. Smith (Depts. Biochem. and Physiol., Agr. Res. Council. Inst. Anim. Physiol., Babraham, Cambridge, U.K.). *Biochem. J.* 117, 9-15 (1970). The fatty acid composition of whole goldfish whole intestinal mucosa, intestinal mucosal membranes and individual phospholipids extracted from mucosal membranes were measured; fish adapted to different temperatures being used. Alterations of the adaption temperature did not noticeably affect the fatty acid composition of the whole-fish lipids, but there were marked changes in the fatty acids extracted from homogenates of goldfish intestinal mucosa. These changes were more pronounced in a membrane fraction prepared by these homogenates.

EFFECTS OF STARVATION OF THE FATTY ACID COMPOSITION OF ADIPOSE TISSUE AND PLASMA LIPIDS OF SHEEP. H. D. Jackson and V. W. Winkler (Physiol. and Pharmacol., Purdue Univ., Dept. of Biochem. and Dept. Veterin., Lafayette, Ind. 47907). *J. Nutr.* 100, 201-07 (1970). Six mature ewes were fasted for 24 days to study the effect of prolonged fasting on the fatty acid composition of subcutaneous adipose tissue, plasma nonesterified fatty acids (NEFA) and plasma neutral lipids. Tissue and blood samples were collected every 2 days throughout the fast. The apparent rate of fatty acid mobilization from adipose tissue during the first four days of the fast was greater for palmitate than for oleate and stearate. From days 4 through 8 the percentage of oleate in adipose tissue increased and that of stearate decreased. These two fatty acids then remained essentially constant through day 14; however, the percentage of palmitate in adipose tissue decreased steadily from day 0 through day 14. While myristate, palmitoleate and linoleate were present only at low levels in adipose tissue, these and the three major fatty acids mentioned above were all readily mobilized during the prolonged fast.

EFFECT OF KIDNEY BEANS, WEIGHT GAINS AND UNSATURATED FAT ON INCIDENCE OF LIVER NECROSIS IN RATS. H. F. Hintz and D. E. Hogue (Dept. of Animal Sci., Cornell Univ., Ithaca, N.Y. 14850). *Proc. Soc. Exp. Biol. Med.* 133, 931-33 (1970). Liver necrosis of rats fed a torula yeast diet can be prevented by the addition of vitamin E or selenium. Kidney beans have been reported to influence the vitamin E nutrition of sheep and chickens, but the effect of beans on liver necrosis in rats has not been reported. However, raw kidney beans reduce feed intake of rats and Naftalin reported that food restriction decreased the incidence of liver necrosis in rats fed a vitamin E deficient casein diet. These trials were conducted to determine the effect of kidney beans or food restriction on the incidence of liver necrosis in rats fed torula yeast diets.

EFFECT OF LOW TEMPERATURE ON FATTY ACID BIOSYNTHESIS IN SEEDS. P. Harris and A. T. James (Unilever Res. Lab., Colworth House, Sharnbrook, Bedfordshire, Great Britain). *Biochim. Biophys. Acta* 187, 13-18 (1969). By studying the effect of the incubation temperature on the formation of unsaturated fatty acids from acetate-2-¹⁴C in flax, sunflower

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and castor seeds, an increased formation of unsaturated fatty acids could be demonstrated as the temperature decreased. The magnitude of this effect increased in the order castor > sunflower > flax seeds. When the O₂ concentration was elevated at fixed temperatures, the formation of unsaturated fatty acids in castor and sunflower seeds increased with temperatures between 10C and 30C. The effect did not occur with flax. The failure of flax seeds to respond to changes in the concentration of O₂ was shown to be due to the presence of chloroplasts in the seed tissue. It is concluded that one of the major effects controlling an increase in the level of unsaturated fatty acids in seeds at low temperatures is the increase in available O₂ which is the rate-limiting factor for desaturation.

THE ROLE OF THE CYTOPLASMIC REDOX POTENTIAL IN THE CONTROL OF FATTY ACID SYNTHESIS FROM GLUCOSE, PYRUVATE AND LACTATE IN WHITE ADIPOSE TISSUE. M. L. Halperin and B. H. Robinson (Depts. of Biochem. and Med., Univ. of Toronto, Ont., Canada). *Biochem. J.* 116, 235-40 (1970). The metabolism of lactate, pyruvate and glucose was studied in epididymal adipose tissue of starved, normally fed and starved-re-fed rats. Lactate conversion into fatty acid occurred at an appreciable rate only in the adipocyte of starved-re-fed animals. *NN'N'*-Tetramethyl-*p*-phenylenediamine, an agent that transports reducing power from the cytoplasm to the mitochondria, caused large increments of fatty acid synthesis from lactate and a smaller one from glucose but a decrease in that from pyruvate. Glucose (1.0 mM) increased fatty acid synthesis from lactate 4.3-fold but only 1.67-fold from pyruvate in adipocytes from normally fed animals.

CHANGES IN LIPID PATTERN OF HELA CELLS EXPOSED TO IMMUNOGLOBULIN G AND COMPLEMENT. F. Guttler and J. Clausen (The Neurochem. Inst., Radmandsgade 58, 2200 Copenhagen N, Denmark). *Biochem. J.* 115, 959-68 (1969). Immunoglobulin G was isolated from sera of non-immunized rabbits or rabbits immunized with whole HeLa cell homogenate. The anti-HeLa immunoglobulin G and its Fab fragment precipitated the particulate 400000g-min. fraction of HeLa cell homogenate. Immunoglobulin G from immunized or non-immunized rabbits and fresh or inactivated complement were added to HeLa cell cultures. Changes in the cell count and cellular contents of DNA, RNA, protein, total and individual phospholipids, cholesterol (and esters) and ganglioside were followed. Addition of immunoglobulin G from non-immunized rabbits and guinea-pig serum (complement) caused a transient increase in DNA followed by a permanent increase in RNA, protein, dry weight and number of cells per culture. The changes in the lipid pattern of the HeLa cells were associated with the appearance of juxta-nuclear vacuoles in cells, but

were apparently not specifically related to the presence of active complement.

PLASMA AND TISSUE CHOLESTEROL AND LIPID LEVELS IN RABBITS ON L-HISTIDINE-SUPPLEMENTED DIETS. R. L. Geison and H. W. Waisman (J. P. Kennedy Jr. Lab., Dept. Pediatrics, Univ. Wisconsin Med. Center, Madison 53706). *Proc. Soc. Exp. Biol. Med.* 133, 234-37 (1970). Feeding 5 and 8% excess L-histidine to rabbits caused significantly elevated plasma cholesterol levels. Phospholipid levels were slightly but not significantly elevated. The 5% histidine-supplemented diet produced plasma levels of 20-50 mg/100 ml of histidine. After 17 weeks on diet, no effects on brain cerebrum and cerebellum or liver cholesterol concentrations were found. Brain and liver total lipid and phospholipid and cerebrum galactolipid concentrations were also normal. The effect of excess dietary histidine on lipid components is apparently localized in the circulatory system. The effects noted in rabbits are much less than those previously observed in monkeys.

SERUM CONCENTRATIONS OF LIPIDS IN RABBITS INFECTED WITH ESCHERICHIA COLI AND STAPHYLOCOCCUS AUREUS. J. I. Gallin, W. M. O'Leary and D. Kaye (Dept. Medicine, Woman's Med. College, Philadelphia 19129). *Proc. Soc. Exp. Biol. Med.* 133, 309-13 (1970). Rabbits infected subcutaneously with *E. coli* developed hyperlipemia related to increased serum levels of free fatty acids early in the infection and later to increased levels of triglycerides. Rabbits challenged subcutaneously with *S. aureus* had normal levels of serum lipids during the acute febrile period but after 24 hr developed hyperlipemia related to hypertriglyceridemia.

EFFECT OF AVITAMINOSIS E ON THE INCORPORATION OF ³⁵S-SULFATE BY RAT TISSUE COMPONENTS. Sara F. Fulton and J. T. Smith (Dept. Nutr., Univ. of Tenn., Knoxville, Tenn. 37916). *J. Nutr.* 100, 525-29 (1970). The effect of avitaminosis E upon the sulfation of cellular lipoprotein and its fractions was investigated by feeding diets low in inorganic sulfur and deficient in vitamin E or supplemented with α -tocopheryl acetate. The incorporation of ³⁵S-sulfate into tissue components after the subcutaneous injection of Na₂³⁵SO₄ in isotonic saline was used as an index of sulfate utilization. An avitaminosis E-associated decrease in ³⁵S-sulfate incorporation into cellular lipoprotein, and its lipid and mucopolysaccharide was obtained, whereas there was no effect on incorporation into the nucleotide, residual or sulfate protein fraction. Determination of the incorporation of ³⁵SO₄ by lipoprotein fraction versus time demonstrated that the sulfate protein fraction became maximally labeled 0.5 hour after the injection of a test dose of ³⁵SO₄ while the mucopolysaccharide fraction was not maximally labeled until 24 hours after injection of ³⁵SO₄. The sulfate uptake of the most active fraction was not affected by avitaminosis E but the sulfate uptake of the least active fraction was reduced; therefore, the effect of avitaminosis E on sulfate utilization is shown to have a specificity. Some of the physiological manifestations of avitaminosis E may be explained by the decreased fixation of sulfate by the sulfolipids.

TRIGLYCERIDE TRANSPORT IN PROTEIN-DEPLETED RATS. H. Flores, W. Sierralta and F. Monckeberg (Lab. de Investig. Ped., Fac. de Med., and Catedra de Nutr., Fac. de Quimica y Farm., Univ. de Chile, Casilla 5370, Santiago 3, Chile). *J. Nutr.* 100, 375-79 (1970). The hypothesis that fatty liver in protein malnutrition is produced mainly by a deficit in the availability of the protein moiety of low density lipoproteins was investigated in rats. The animals were protein-depleted by feeding a protein-free diet. They developed fatty livers as well as several other symptoms characteristic of infantile protein malnutrition. The injection of a plasma protein fraction containing the apoprotein of low density lipoproteins as compared to albumin-injected controls produced an increase of 80% in the fasting plasma triglyceride levels and a significantly higher incorporation of ¹³¹I-oleic acid into triglycerides of d < 1.020 plasma lipoprotein. These effects were not observed in normal, well-nourished animals. The results of these experiments strongly suggest that in protein malnutrition the protein moiety of low density lipoproteins is the limiting factor for their synthesis. The impaired rate of synthesis of the lipoprotein would cause triglycerides to accumulate in the liver.

AROMATIC RING HYDROXYLATION OF ESTRADIOL IN MAN. J. Fishman, H. Guzik and L. Hellman (Inst. Steroid Res., Montefiore Hosp., New York City 10467). *Biochemistry* 9, 1593-98 (1970). Estradiol specifically labeled with tritium

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L. I. Conrad Honored By Brooklyn College

L. I. Conrad ('63), Executive Vice President and Technical Director of American Cholesterol Products, Inc., Edison, N.J., has received the 1970 Distinguished Alumnus Award from Brooklyn College of the City University of New York. Mr. Conrad, a 1933 graduate, was presented his citation at the College's 45th Commencement exercises on June 4, 1970. American Cholesterol Products, world renowned for the versatility and functionality of the lanolin derivatives it has made available to cosmetic and allied industries, was founded by Mr. Conrad 30 years ago.

Mr. Conrad is a member of the American Oil Chemists' Society, and past president of the U.S. Society of Cosmetic Chemists and of the International Federation of Societies of Cosmetic Chemists. He has authored and co-authored numerous patents and publications on the chemistry of lanolin and its derivatives and on the utilization of these compounds in a wide variety of specialized products. In 1968 he received the Society of Cosmetic Chemists Medal Award, the Society's highest honor. Mr. Conrad is an officer and secretary of the Board of Trustees of the College of Pharmaceutical Sciences at Columbia University where he has been instrumental in introducing the newly proposed baccalaureate and graduate degree courses in cosmetic science.

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at C_ω2 was synthesized and administered to man together with estradiol-4-¹⁴C. Tritium displaced by metabolism at C-2 appeared in the body water and its rate and extent was compared with that following estradiol-17α-³H administration. The isotope content of urinary metabolites obtained after enzyme acid hydrolysis showed that 2-oxygenated compounds represented 22% of the dose.

THE CHARACTERIZATION AND OCCURRENCE OF AN S₁ 20 SERUM LIPOPROTEIN. W. R. Fisher (Dept. Medicine, Univ. Florida, Gainesville, Florida 32601). *J. Biol. Chem.* 245, 877-84 (1970). In the serum of patients with hyper-pre-β-lipoproteinemia, there frequently occurs in abundance an ultracentrifugally distinct low density lipoprotein component of the S₁ 20 class. This study concerns the characterization of this component, present in the serum of 14 to 15 patients. The lipoprotein has been isolated ultracentrifugally; it has the electrophoretic and immunological properties of a β-lipoprotein but is distinct from very low density lipoproteins. It has a buoyant density of 1.004 g per ml which is lighter than the major low density lipoproteins of normal serum, and this observation is consistent with its higher triglyceride content. This lipoprotein has a sedimentation coefficient corrected for concentration and viscosity of -68 S, measured in a solvent of density 1.20 g per ml, and a molecular weight of approximately 4.2 million. Electron microscopy of this larger low density lipoprotein shows spherical macromolecules with a diameter approximating 256 Å.

EFFECT OF DIET AND INSULIN ON THE MORPHOLOGY AND TPNH GENERATING ENZYME ACTIVITIES OF RAT ADIPOSE TISSUE. P. Fabry, R. Kleinfeld, H. M. Tepperman and J. Tepperman (Dept. of Pharm., State Univ. of New York, Upstate Med. Cen., Syracuse, N.Y. 13210). *Proc. Soc. Exp. Biol. Med.* 133, 577-81 (1970). The activities of TPNH malic enzyme and aggregate hexomonophosphate shunt dehydrogenases were determined in epididymal fat pads of rats subjected to the following treatment: (1) *ad libitum* chow fed; (2) fasted 72 hr; (3) refed sucrose diet 72 hr; (4) refed sucrose diet plus insulin; (5) refed high-fat diet; and (6) refed high-fat diet plus insulin. Refeeding the sucrose diet for 72 hr resulted in more than a six-fold increase in malic enzyme activity, and approximately a doubling of the activity of the shunt enzymes over the prefast levels. Refeeding the high-fat, carbohydrate-free diet resulted in restoration of enzyme activities to prefast levels. Administration of exogenous insulin resulted in no change beyond that produced by the respective diets alone. Fasting resulted in a decrease in nucleolar and cytoplasmic RNA staining and a reduction of

the mean cell size. Refeeding sucrose induced a marked enlargement of nucleoli and increased cytoplasmic basophilia with essentially no changes in mean cell size. Refeeding the high-fat diet produced a striking hypertrophy of fat cells, whereas the nucleolar and cytoplasmic RNA staining was comparable to the prefast state. Exogenous insulin did not produce marked differences in either of the two diet groups.

FATTY ACID SYNTHESIS IN THE CELL SAP AND MITOCHONDRIA OF RAT BROWN ADIPOSE TISSUE. Z. Drahot, P. Coratelli and C. Landriseina (Dept. of Biochem., Univ. of Bari, 70126 Bari, Italy). *FEBS Letters* 6, 241-44 (1970). The data presented in this paper indicate that cell sap and mitochondria from rat brown adipose tissue synthesize fatty acids by the same mechanism as corresponding subcellular fractions of rat liver. However mitochondria from brown fat exhibit a behavior different in respect to liver mitochondria in that they appear permeable to NADH, NADPH and acetyl-CoA.

A COMPARISON OF THE LYMPHOLYTIC EFFECTS OF CORTICOSTERONE AND TESTOSTERONE PROPIONATE IN IMMATURE COCKERELS. M. P. Dieter and R. P. Breitenbach (Zool. Dept., Univ. of Missouri, Columbia, Mo.). *Proc. Soc. Exp. Biol. Med.* 133, 357-64 (1970). Intact cockerels were injected with selected levels of corticosterone or testosterone propionate (TP) for 2 weeks. At 5 weeks of age (immediately after hormone treatment), and at 7 weeks (2 weeks after hormone withdrawal), the weights, histology, and tissue oxygen consumptions of the bursa Fabricii, thymi, and spleens were determined. TP caused a greater involution of lymphoid organs than corticosterone, but tissue sensitivity to corticosterone was greater. It is postulated that the effects of TP are one the differentiation and development of stem cells necessary to the propagation of bursal lymphocytes.

LIPOTROPIC EFFECT OF DEXTRIN VERSUS SUCROSE IN CHOLINE-DEFICIENT RATS. A. Chalvardjian and S. Stephens (Res. Inst., Hosp. for Sick Children, Toronto 101, Can.). *J. Nutr.* 100, 397-403 (1970). The effect of the type of dietary carbohydrate was determined on the amount of triglycerides accumulating in the livers of rats during the first 8 days of choline deficiency. Animals fed a choline-deficient diet with sucrose as the major carbohydrate accumulated about twice as much triglyceride in the liver as animals fed a diet in which dextrin replaced sucrose. This difference in lipid accumulation between the two groups was maintained even though one group was fed sucrose to which enough choline was added to simulate a small degree of contamination of dextrin with choline while another group of animals was fed dextrin from which most of the choline had been extracted by repeated washings with alcohol. In the choline-deficient rats fed dextrin, the ceca were larger and the color of the stools lighter than in the animals fed sucrose. We believe that the partially protective effect of dextrin against fatty livers of choline deficiency is mediated through a change in intestinal bacterial flora making choline, or some related lipotropes, available to the choline-deficient rat.

OBESITY: ABSENCE OF SATIETY AVERSION TO SUCROSE. M. Cabanac and R. Duclaux (Lab. de Physio. Fac. de Med., 69-Lyon 8, France). *Science* 168, 496-7 (1970). In obese subjects, injection of glucose did not cause the transformation of the gustative sucrose sensation from pleasant to unpleasant as in normal subjects. This result is consistent with the theory of a decreased sensitivity to internal signals on the control of food intake of obese people.

COMPARATIVE STUDIES OF BILE SALTS. I. G. Anderson and G. A. D. Haslewood (Guy's Hospital Med. School, London S.E.1). *Biochem. J.* 116, 581-87 (1970). GLC examination of bile alcohols prepared from the sucker *Catostomus commersoni* Lacépède (family Catostomidae) showed that although 5α-cyprinol (5α-cholestane-3α, 7α, 12α, 26, 27-pentol) was a minor constituent, the principal bile alcohol was an undescribed substance, probably present in the bile as the C-26 sulphate ester, whose i.r., n.m.r. and mass spectra agreed with the structure 5α-cholestane-3α, 7α, 12α, 24, 26-pentol. M_D studies suggest that this 5α-chimaerol is the 24(+),25S enantiomer and that 5β-chimaerol (chimaerol from *Chimaera monstrosa* bile) also has the 24(+),25S configuration. These findings imply that bile alcohol biosynthesis in suckers and chimaeras includes stereospecific oxidation of cholesterol at C-26. *C. commersoni* bile acids (present in minor amounts) probably consist largely of 3α, 7α, 12α-trihydroxy-5α-cholestan-24-oic acid (allocholic acid). 5α-Chimaerol sulphate and 5α-cyprinol sulphate are probably biochemically equivalent as bile salts, and can be considered as arising by parallel evolution.

• AOCS-ISF World Congress . . .

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Entertainment

A variety of entertainment has been arranged for the Congress registrants and their wives, beginning with a Reception Sunday evening, September 27th. Monday evening is left free, so that everyone may enjoy the lovely restaurants and varied entertainment offered by Chicago. On Tuesday evening, there will be a Cocktail Party at 6:00 PM, followed by a concert by an internationally known Swedish Choral Group. The traditional banquet will be held on Wednesday evening, followed by dancing until midnight. Jimmy Blade and his Orchestra will provide the music, and Don Rice, well-known comedian, who has appeared many times on the Dean Martin Television Show, will provide the entertainment.

Ladies

The Ladies' Hospitality Committee, under the direction of Miss Toni Trinchese, has some most interesting plans for the ladies during their visit to Chicago. These plans include tours of the Museum of Science and Industry, Museum of Contemporary Art, as well as both the University of Chicago and University of Illinois Campuses.

PROTEIN, LIPID, AND FATTY ACID OF MILK FROM PAKISTANI WOMEN DURING PROLONGED PERIODS OF LACTATION. Barbara A. Underwood (Inst. of Nutr. Sci., Columbia Univ., New York, N.Y. 10032), R. Hepner and H. Abdullah. *Am. J. Clin. Nutr.* 23, 400-7 (1970). Protein, fat and fatty acid levels are reported for milk collected from Pakistani women lactating up to 2 years. The concentration of total lipids varied extensively between individuals and no statistically significant changes were found. The patterns of fatty acids in milk lipids were intermediate between those of adipose tissue and dietary fat and seemed to reflect the high dietary intake of palmitic acid.

THE INTERACTION OF FETUIN WITH PHOSPHATIDYLCHOLINE MONOLAYERS. CHARACTERIZATION OF A LIPOPROTEIN MEMBRANE SYSTEM SUITABLE FOR THE ATTACHMENT OF MYXOVIRUSES. J. M. Tiffany and H. A. Blough (Dept. of Microbiol., School of Med., Univ. of Pennsylvania, Philadelphia, Pa. 19104). *Biochem J.* 117, 377-84 (1970). An artificial membrane system was formed by spreading at air/water and oil/water interfaces, using phosphatidylcholine and the glycoprotein fetuin (mol. wt. 48400). The plot of increase of interfacial pressure against amount of protein added beneath a monomolecular film of phosphatidylcholine showed two discontinuities, corresponding to the completion of two distinct layers of protein: (a) largely denatured and closely associated with the polar head groups of phosphatidylcholine, possibly with penetration of non-polar protein groups between the phosphatidylcholine molecules and (b) an additional adsorbed layer of substantially native fetuin in either a close-packed or open-lattice array. A more compactly organized membrane was apparently formed at pH 7.4 with 1 mM Mg^{2+} in the aqueous phase than without Mg^{2+} ; at 15 mM Mg^{2+} , more random adsorption of protein appeared to take place. Qualitatively similar results were obtained at pH 5.1 with 1 mM Mg^{2+} . Closer initial packing of the phosphatidylcholine layer decreased both the magnitude of the interfacial pressure change and the amounts of protein bound in the two layers. The amount of N-acetylneuraminic acid released by neuraminidase (EC 3.2.1.18) in the subphase was measured at pH 5.1; a mean distribution of 9.7×10^{13} residues/cm² was calculated for the completed second protein layer.

DIETARY PESTICIDES AND CONTAMINATION OF YOLKS AND ABDOMINAL FAT OF LAYING HENS. Sandra I. Smith, C. W. Weber and B. L. Reid (Poultry Sci. Dept., Univ. of Arizona, Tucson, Ariz. 85721). *Poultry Sci.* 49, 233-37 (1970). Two experiments were run to determine the effects of chlorinated hydrocarbon pesticide ingestion in hens. In experiment 1, lindane, dieldrin and DDT were fed in combination for three weeks at levels up to 5 p.p.m. In experiment 2, only DDT was fed at levels from 0 to 10 p.p.m. for two months. Dietary lindane and dieldrin were not retained to any great extent in either the abdominal fat or egg yolks analyzed in experiment 1. Dietary DDT was absorbed and concentrated in the fat and to a lesser extent in the egg yolks in both experiments. Ten p.p.m. DDT ingestion for two months resulted in 117.0 p.p.m. of both isomers of DDT plus its metabolite, DDE, in the fat, and 5.0 p.p.m. in the yolk. Egg shell thickness was significantly lowered by feeding 10 p.p.m. of DDT for two months.

DIETHYL OXALATE AS A NEW REAGENT FOR SPECTROPHOTOMETRIC DETERMINATION OF KETOSTEROIDS. S. Gorog (Che. Works G. Richter, Budapest X., Hungary). *Anal. Chem.* 42, 560-63 (1970). A new spectrophotometric method has been developed for determination of Δ^4 -3-ketol, 17-keto-, and 20-keto-steroids, which is based on the Claisen condensation of the active methylene groups of ketosteroids with diethyl oxalate leading to spectrophotometrically active glyoxalyl derivatives. The development of the chromophore was carried out at 0°C or at room temperature in a mixture of tertiary butanol and cyclohexane in the presence of sodium tertiary butoxide while the absorbance was measured in moderately acidic ethanol. The method is suitable for the characterization and quantitative determination of ketosteroids, particularly in the assay of mixtures and pharmaceutical ketosteroid formulations. The relative standard deviation of the method is ± 1.0 -1.9% for pure ketosteroids and 1.5-2.1% for formulated ones.

THE INTERACTION OF IODINE WITH LECITHIN MICELLES. G. L. Jendrasiak (Radiation Lab., Univ. Notre Dame, Notre Dame, Ind. 46556). *Chem. Phys. Lipids* 4, 85-95 (1970). The concentration of I_3^- has been found to increase, upon the addition of lecithin to solutions of iodine in both polar and nonpolar solvents. This increase in concentration has been studied as a function of lecithin concentrations in the various solvents. The I_3^- concentrations, for given lecithin concentrations, vary

AOCS Past President Honored With Princeton Class Cup

A. S. Richardson ('21), of Cincinnati received from his Princeton University classmates the coveted 1913 Class Cup.

First used for a farewell toast to each classmate before 1913's graduation 57 years ago, today the Cup is the highest honor which the class can confer upon one of its members.



A. S. Richardson

Dr. Richardson, whose career was devoted largely to research on soaps, synthetic detergents, and edible oils and fats, is credited with organizing, expanding, and supervising a major research department of Procter & Gamble Co.

Joining the firm in 1921 after working a year for E. I. du Pont de Nemours & Co., he directed chemical research until 1946, when he was named Associate Director of the Chemical Division. Dr. Richardson is now retired.

Recipient of the A.B., A.M., and Ph.D. degrees from Princeton in 1913, 1915 and 1928, respectively, Dr. Richardson taught chemistry at Princeton for three years both before and after World War I service as a Field Artillery officer.

He holds some 30 U.S. patents, and is an author and speaker on topics related to science and technology. He has long encouraged development of more and better-trained science teachers.

President of the American Oil Chemists Society in 1931, Dr. Richardson served on the Governing Board, 1930-36; Referee Board, 1931-54; Editorial Advisory Board, 1932-48; and The Smalley Committee, 1946-52. He has been a Fellow of the Chemical Society of Great Britain, and also has been active with both the French and German Chemical Societies, with the American Association for the Advancement of Science, and with the American Chemical Society for whom he has served on publication boards.

In 1951 he was cited as Chemist of the Year in Cincinnati.

A native of Murfreesboro, Tenn., he was graduated Phi Beta Kappa from Princeton and was valedictorian of his 1913 class. A former resident of Wyoming, Ohio, he lives now at 43 Forest Ave., Cincinnati.

First awarded in 1933 to "that member of the class who shall be entitled to special recognition by his classmates for outstanding accomplishment in any field of endeavor," the award has been made in all but four years since that time.

for non-polar and polar solvents, and for lecithins having double bonds and no double bonds in the hydrocarbon chains. Break points in the plots of I_3^- concentrations (as measured spectrophotometrically) vs lecithin concentration were found. Where data from other experimental studies is available, these break points have been found to occur at the critical micelle concentration of the lecithin in the appropriate solvent; where other techniques reveal that lecithin has no critical micelle concentration in a particular solvent, no break points are observed. The results are discussed insofar as they might relate to the effect of iodine in increasing lipid electrical conductivity.

HYDROLYSIS OF PHOSPHOGLYCERIDES BY PURIFIED LIPASE PREPARATIONS. I. SUBSTRATE-, POSITIONAL- AND STEREO-SPECIFICITY. A. J. Slotboom, G. H. DeHaas, P. P. Bonsel, G. J. Burbach-Westerhuis and L. L. M. VanDeenen (Lab. of Biochem., State Univ. of Utrecht, Utrecht, The Netherlands). *Chem. Phys. Lipids* 4, 15-29 (1970). Purified lipase preparations (EC

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3.1.1.3) from porcine pancreas and from the mold *Rhizopus arrhizus* hydrolyze exclusively the fatty acid ester bond at 1-position of all common types of phosphoglycerides, regardless of the nature and distribution of the fatty acid constituents. Both enantiomeric forms of phosphatidylcholine are hydrolyzed at a similar rate by these enzymes, indicating that the latter lack stereo-specificity. The susceptibility of several synthetic analogues of choline phosphoglycerides, modified in the nature and type bond at the 1- and 2-positions, as well as of phosphotriester derivatives to lipase was compared to that of phosphatidylcholine. It could be tentatively concluded that the susceptibility of the 1-acyl ester bond to lipase is influenced by the type of bond present at the 2-position.

INTERACTIONS BETWEEN CHOLESTEROL AND LECITHINS IN MONOLAYERS AT THE AIR-WATER INTERFACE. J. Timoco and D. J. McIntocs (Dept. of Nutr. Sci., Univ. Calif., Berkeley, Calif. 94720). *Chem. Phys. Lipids* 4, 72-84 (1970). Liver lecithins were isolated from normal or essential fatty acid-deficient rats, and these were separated into fractions containing mainly 1, 2, 3, 4 or 6 double bonds. Pressure-area measurements were made with these fractions at the air-water interface. The linoleoyl-lecithin fraction and the arachidonoyl-lecithin fraction was measured in mixed monolayers with cholesterol, and condensation was observed. Palmitoyl-linoleoyl and stearoyl-linoleoyl lecithins were chemically synthesized and pressure-area curves of these, with and without cholesterol, were measured. Condensation also occurred with these nearly pure preparations.

THE SURFACE ORIENTATION AND ADSORPTION OF GLYCOCHOLIC ACID, THE EFFECT OF PH. P. Joos and R. Ruyssen (Lab. of Physical Biochem., State Univ., Ghent, Belgium). *Chem. Phys. Lipids* 3, 83-90 (1969). From the surface tension concentration curves of glycocholic acid at different pH, the molecular cross section, A_m , in the monolayer is calculated by means of the Gibbs equation. The results show that this cross section is dependent on pH. In the pH range 1-7 the glycocholic acid occurs as a "zwitterion." At higher pH values the ionization in the monolayer increases, resulting in a lower cross section. It is concluded that the "walking stick" or glycine group of the molecule in the pH range 1-7 is oriented coplanar to the surface, while at higher pH values this walking stick dips into the bulk solution.

IMMUNOCHEMICAL STUDIES OF PHOSPHOLIPIDS. IV. THE REACTIVITIES OF ANTISERA AGAINST NATURAL CARDIOLIPIN AND SYNTHETIC CARDIOLIPIN ANALOGUES-CONTAINING ANTIGENS. K. Inoue and S. Nojima (Faculty of Pharmaceutical Sci., Univ. of Tokyo, Hongo, Tokyo, Japan). *Chem. Phys. Lipids* 3, 70-77 (1969). Antibodies were produced against lipid antigens containing synthetic compounds as substitutes of cardiolipin. The reactivities of the sera against these cardiolipin analogues-containing antigens as well as cardiolipin antigen were examined by the VDRL microfloculation test. The results suggest that a free hydroxyl group and two phosphodiester bonds of cardiolipin are important in the immunological reaction of the cardiolipin antigen.

ESSENTIAL FATTY ACIDS AND IONIC PERMEABILITY OF LECITHIN MEMBRANES. J. L. Moore, T. Richardson and H. F. Deluca (Dept. Food Sci. and Indust., and Dept. Biochem., Univ. Wis., Madison). *Chem. Phys. Lipids* 3, 39-58 (1969). Lecithins were isolated from egg yolk, and from internal organs of fish, essential fatty acid (EFA)-deficient rats and control rats. From each, lecithin-dicetyl phosphate liquid-crystal vesicular particles were formed in 145 mM NaCl. Extraparticulate Na^+ was removed by dialysis, and the subsequent rate of Na^+ efflux within the particles was determined at various temperatures. The "membranes" of EFA-deficient lecithin permitted a faster rate of Na^+ efflux at 25C and a slower rate at 50C than those of egg, fish or control rat lecithins. At 37C the rate of Na^+ efflux from within "membranes" of EFA-deficient rat lecithins was greater than that for the "membranes" of control rat lecithins. Activation energies for Na^+ efflux as calculated from Arrhenius plots, were 15, 11.5, 9.5 and 4.5 kcal/mole Na^+ for control rat, fish, egg, and EFA-deficient rat lecithin "membranes," respectively.

BIOSYNTHESIS OF ODD OR BRANCHED CHAIN FATTY ACIDS IN THE YEAST *SCHIZOSACCHAROMYCES LIQUEFACIENS*. J. Baraud, S. Demassieux, and A. Maurice (Lab. de Biochimie, Fac. des Sciences, Bordeaux). *Rev. Franc. Corps Gras* 17, 155-63 (1970). Yeast cultures were grown in the presence of specific nutrients in order to determine the biochemical origin of certain fatty acids. The lipids were extracted from the cul-

ture, esterified with BF_3 -methanol and analyzed by GLC. Propionate induced the formation of odd chain acids. Valine, by its degradation through isobutyrate to propionate, led to the formation of iso-even and -odd chain acids. Leucine led to iso-odd chain acids through the intermediate 3-methyl butyrate. Isoleucine, after degradation to 2-methyl butyrate, led to odd chain ante-iso acids, while further catabolism to acetyl-CoA and propionyl-CoA engendered odd chain acids. Experiments with ^{14}C -labeled valine confirmed these results, but with labeled leucine, most of the radioactivity incorporated into the lipids was found in the unsaponifiable fraction. This result was explained by the degradation of leucine into β -hydroxy- β -methyl glutaryl CoA, which is a precursor of mevalonic acid and consequently of squalene, sterols, carotenoids and other polyisoprenoid compounds.

ACTIVATION OF LIPOPROTEIN LIPASE; COMPARATIVE STUDY OF MAN AND OTHER MAMMALS. T. F. Whyne, Jr. and J. M. Felts (The Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto 5, Ontario, Canada). *Circ. Res.*, 26, 545-51 (1970). Injection of heparin into a number of animal species releases lipoprotein lipase into the circulation. We have studied the effect of heparin added in vitro on the lipase activity in post-heparin serum from six mammalian species. With the exception of man, all animals were studied under anesthesia. Our results demonstrate that only post-heparin serum from the rat developed increasing lipoprotein activity when increasing concentrations of heparin were added to the assay system. Heparin decreased activity in the other species. These results prompted us to test the effect of adding rat serum to post-heparin serum from the other species in the presence of increasing concentrations of heparin. Rat serum stimulated lipoprotein lipase activity markedly. In guinea pigs, post-heparin serum activity increased 2,700% at a heparin concentration of 1.0 U/ml in the assay system. This effect may be related to the extremely low level of high-density lipoprotein in the guinea pig and the presence of a unique high-density lipoprotein in the rat.

REDUCED TRIPHOSPHOPYRIDINE NUCLEOTIDE OXIDASE-CATALYZED ALTERATIONS OF MEMBRANE PHOSPHOLIPIDS. B. K. Tam and P. B. McCay (Biochem. Section of the Oklahoma Med. Res. Found., Univ. of Oklahoma School of Med., Oklahoma City, Ok. 73104). *J. Biol. Chem.* 245, 2295-2300 (1970). Transient formation of phospholipid peroxides was observed during the TPNH-dependent cleavage of phospholipid-bound polyunsaturated fatty acids in liver microsomes. The peroxide functions are associated with the β position polyunsaturated fatty acids and appear to be intermediates in the chain cleavage process. The data support the conclusion that microsomes contain an enzyme system which promotes multiple peroxidative cleavage of endogenous membrane-bound polyunsaturated fatty acids, producing a variety of carbonyl-containing residues. Concomitant with the alteration of the membrane-bound phospholipids, there is evidence for major structural changes in the membrane itself. The reaction may represent an explicit metabolic function for unsaturated phospholipids during electron transport in the endoplasmic reticulum, as well as a possible alternative pathway for polyunsaturated fatty acid oxidation. On the other hand, the changes observed may be the result of chemical damage to the microsomal membrane as a consequence of TPNH-linked electron transport.

ADRENOCORTICOTROPIN STIMULATION OF 2-KETOGLUTARATE OXIDATION BY ISOLATED RAT EPIDIDYMAL ADIPOSE TISSUE. J. L. Skosey (Dept. of Med. and the Argonne Cancer Res. Hospital, Univ. of Chicago, Chicago, Ill. 60637). *J. Biol. Chem.* 245, 510-18 (1970). Adrenocorticotropin (ACTH) stimulated the oxidation of 2-ketoglutarate- $1-^{14}C$ to $^{14}CO_2$ by isolated rat epididymal adipose tissue. The results of further studies indicated that this effect of ACTH was mediated by an increase in adipose tissue cycle 3',5'-adenosine monophosphate which is known to result from an action of the hormone. The relationship between ACTH effects upon 2-ketoglutarate oxidation and lipid metabolism was also studied. ACTH stimulated the incorporation of 3H from glucose- $1-^3H$ into total lipid, presumably reflecting enhanced fatty acid esterification known to result from ACTH action.

THE DISTRIBUTION OF RADIO-IODINATED SERUM ALBUMIN AND LOW-DENSITY LIPOPROTEIN IN TISSUES AND THE ARTERIAL WALL. P. J. Scott and P. J. Hurley (Med. Unit, Auckland Hosp., Auckland, New Zealand). *Atheroscl.* 11, 77-103 (1970). Plasma low-density lipoprotein labelled in the peptide component with radioiodine (RI-LDL) was injected into 11 patients in coma, in whom death was considered inevitable. Injected material was primarily S_2 0-9 LDL. The serum turnover of RI-LDL was followed until death of the patient. Parallel studies were

carried out in another 11 subjects using radioiodinated human serum albumin (RI-HSA). The various tissues were recovered at necropsy and their radioactivity measured. The temporal pattern of radioactivity distribution in tissues was studied by comparing results from the individual patients in ascending order of the time elapsing between administration of labelled proteins and recovery of tissue. Results for RI-LDL and RI-HSA tissue to plasma radioactivity ratios were qualitatively similar. Equilibration between plasma and tissue was most rapid in liver and spleen. Intima and inner media of aorta and coronary arteries showed rising ratios of tissue to plasma radioactivity over the 14-16 day maximum duration of these studies, and higher levels of radioactivity were reached in the arch and abdominal segments than in the thoracic aorta. Outer medial tissue/plasma ratios were lower and appeared to reach equilibrium earlier. The results show that plasma LDL peptide does enter the inner arterial wall, presumably across the intima, and that the intima may be the site of a slowly exchanging LDL pool.

DEGRADATION AND REASSEMBLY OF A HUMAN SERUM HIGH-DENSITY LIPOPROTEIN. EVIDENCE FOR DIFFERENCES IN LIPID AFFINITY AMONG THREE CLASSES OF POLYPEPTIDE CHAINS. A. Seanu, E. Cump, J. Toth, S. Koga, E. Stiller and L. Albers (Dept. of Med. and Biochem., Univ. of Chicago Pritzker School of Med., Chicago, Ill. 60637). *Biochemistry* 9, 1327-35 (1970). Turbid aqueous suspensions of lipid extracts from human serum high-density lipoprotein of d 1.063-1.125 (HDL₂) were converted into clear solutions when sonicated in the presence of the lipid-free protein moiety (apo HDL₂). This was due to the formation of a major lipoprotein complex isolated in the density range of 1.063-1.21 g/cm³. Incorporation of the nonpolar lipids (cholesterol esters and triglycerides) into this water-soluble complex required the presence of both protein and phospholipids and energy. The reconstituted lipoprotein proved very similar to, although not identical with, native HDL₂ on the basis of chemical, immunological, ultracentrifugal, circular dichroic and electron microscopic studies.

RELATIONSHIP BETWEEN FATTY-ACID COMPOSITION OF PLATELETS AND PLATELET AGGREGATION IN RAT AND MAN: RELATION TO THROMBOSIS. S. Renaud, K. Kuba, C. Goulet, Y. Lemire and C. Allard (Res. Dept., Montreal Heart Inst., Montreal, Quebec, Canada). *Circ. Res.* 26, 553-64 (1970). Male rats fed a diet rich in butter or stearic acid presented a marked predisposition to endotoxin-initiated thrombosis. This was preceded by hypercholesterolemia, hypercoagulability and an increase susceptibility of platelets to thrombin-induced aggregation. In contrast to this, feeding of corn oil or linoleic or oleic acids did not result in such changes in the blood or in severe thrombosis. Gas-liquid chromatographic analysis of total lipids of platelet and plasma indicated that the thrombogenic fat or fatty acid resulted in a highly significant increase, mostly in the platelets, of the ratio saturated + monosaturated to polyunsaturated fatty acids (S+M)/P. In patients who had suffered a myocardial infarction as compared with men without risk factors for coronary heart disease, an increase in the (S+M)/P in plasma and platelets was also observed.

STUDIES ON THE MECHANISM OF FATTY ACID SYNTHESIS. XXIV. THE ACETYL- AND MALONYLTRANSACYLASE ACTIVITIES OF THE PIGEON LIVER FATTY ACID SYNTHETASE. C. A. Plate, V. C. Jashi and S. J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, N. C. 27706). *J. Biol. Chem.* 245, 2868-75 (1970). Evidence is presented to show that the transacylase components of the pigeon liver fatty acid synthetase complex catalyze the transacylations of acetyl and malonyl groups from their CoA thioesters to the thioesters of *Escherichia coli* acyl carrier protein (ACP). The acetyl- and malonyl-transacylase activities are inhibited by N-ethylmaleimide, although it appears that a sulfhydryl groups is not directly involved in the transacylations of acetyl and malonyl groups to ACP. Protection of both transacylase activities against N-ethylmaleimide inhibition can be achieved by previously incubating the synthetase with either acetyl-CoA or malonyl-CoA. Indoacetamide, while totally inhibiting triacetic acid lactone formation and fatty acid synthesis, has no effect on the acetyl- and malonyltransacylase activities.

EFFECT OF LITHOCHOLIC ACID AND ANTIBIOTICS ON TISSUE BILE ACIDS IN THE RAT. P. Nair, C. Garcia-Lilis, and A. I. Mendeloff (Biochem. Res. Div., Dept. of Med., Sinai Hosp. of Baltimore, Inc., Baltimore, Md. 21215). *J. Nutr.* 100, 698-704 (1970). The early changes in composition of major tissue bile acids in rats maintained on supplements of lithocholic acid (50 mg/day/rat) with and without antibiotics (Terramycin hydro-

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NRA Participates in Far East Festival, Exhibition



NRA booth at Japan Poultry Assn. National Exhibition.

Through their Far East Office in Tokyo, the National Renderers Association has participated recently in the Tokyo Food Festival and the Japan Poultry Association Exhibition. At the USDA Food Festival promotion program, sponsored by the Takashimaya Department Store Chain in Tamagawa, Tokyo, NRA participated with a dog food promotion booth. Dog food—one of many animal feeds which are improved and enriched by the addition of animal fat—was introduced to Japan a few years ago. It has been gaining significant marketing momentum in volume sales, and sales have doubled in the last year. Sales in 1969 totaled 20,000 tons. NRA, acting jointly with Japan's dog food manufacturers and importers of U.S. dog food, has been conducting extensive consumer promotion programs. At the Takashimaya show in Tokyo, 25,000 samples and promotional pamphlets were distributed.

Participation of NRA in the recent Japan Poultry Association National Exhibition proved highly successful, with a feed fat and animal protein booth staffed by members of the NRA Far East office in Tokyo. The show was patronized by over 20,000 poultrymen from all areas of Japan. Employing literature and an educational slide movie, the NRA promotion was directed towards educating end users in the poultry field on the advantages of fat and animal proteins in terms of economic production and Yen profits.

U.S. Tallow Exports Down Slightly In 1969; Anticipate Gain in 1970

The National Renderers Association anticipates that the slight upward trend in world tallow production will continue into 1970, with the gain over 1969 expected to approach two percent.

Tallow exports from the United States—although the 1969 total was somewhat less than that for 1968—are also expected to increase slightly in the coming year. Production of U.S. tallow is seen at well over 5 billion pounds. As in past years, one half or more of the American tallow production will be exported.

The greatest share of American tallow exports will continue to go to Japan. Other leading import areas receiving the American product include Italy, Spain, The Netherlands and India.

Looking toward future market possibilities for U.S. tallow, The National Renderers Association maintains overseas offices and marketing staffs in Rome and Tokyo, and cooperates with other U.S. trade groups in participating in foreign trade fairs and exhibits as well as other events and activities for the promotion of American tallow in worldwide markets.

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chloride, 50 mg/day/rat and succinylsulfathiazole, 20 mg/day/rat) were studied. Lithocholic acid induces a specific depression of tissue cholic acid accompanied by an elevation in hepatic cholesterol levels. The concurrent administration of antibiotics prevented these changes only partially, suggesting that lithocholic acid, instead of its bacterial metabolites, controls cholic acid biogenesis probably by inhibiting the enzyme, 12 α -hydroxylase. In addition, lithocholic acid could partially block the uptake of cholic acid in the small bowel, another site at which regulation of bile acid homeostasis could occur. These effects are considered primary attributes of lithocholic acid since antibiotics administered concurrently failed to restore normal metabolic profiles.

BINDING OF BILIRUBIN WITH LIPID. M. G. Mustafa and T. E. King (Dept. of Chem., State Univ. of New York at Albany, Albany, N.Y. 12203). *J. Biol. Chem.* 245, 1084-89 (1970). Binding of bilirubin with mitochondria, mitochondrial membranes, various cells and cellular fragments resulted in a hypochromicity with a red shift of the absorption spectrum of bilirubin. It was found that the mitochondrial lipids rather than the proteins were involved in the binding. These findings suggest that the binding of bilirubin with lipid alters the characteristics of mitochondrial membranes so that membrane-linked functions are impaired. In view of the lipophilic nature of bilirubin, this explanation might be considered as a mechanism of toxicity of bilirubin for cells in general.

A COMPARATIVE STUDY OF THE ABILITY OF METHIONINE OR LINOLENIC ACID TO ACT AS PRECURSORS OF ETHYLENE IN PLANT TISSUES. L. W. Mapson, J. F. March, M. J. C. Rhodes and L. S. C. Wooltorton (Agr. Res. Council Food Res. Inst., Colney Lane, Norwich NOR70F, U.K.). *Biochem. J.* 117, 473-9 (1970). A comparative study has been made of the ability of three plant tissues to incorporate ¹⁴C into ethylene from ¹⁴C-labelled methionine and derivatives and from ¹⁴C-labelled linolenic acid. Incorporation of label occurs readily from methionine and its derivative 4-methylmercapto-2-oxybutyric acid with apple, tomato or cauliflower floret tissue. No incorporation of label occurred, however, from uniformly ¹⁴C-labelled linolenate.

ARGUMENTS FOR A REGULATION OF PANCREATIC GLUCAGON SECRETION BY CIRCULATING PLASMA FREE FATTY ACIDS. A. S. Luyckx and P. J. Lefebvre (Secteur Diabetologie, Inst. de Med., Dept. de Clinique et de Pathologie Medicales, Univ. de Liege, Belgium). *Proc. Soc. Exp. Biol. Med.* 133, 524-28 (1970). Artificial changes in plasma FFA concentrations were induced in dogs by infusion of nicotinic acid and of triglycerides with added heparin. In all experiments, the fall in plasma FFA observed during the nicotinic acid infusion or after terminating the TG-heparin infusion was accompanied by an increase in pancreaticoduodenal venous plasma glucagon concentrations corresponding to a true increase in pancreatic glucagon production. These results support the concept of an important role of plasma FFA in controlling the pancreatic glucagon production, at least in dogs.

ON THE STRUCTURE ARISING FROM THE INTERACTION OF PHOSPHOLIPID MICELLES WITH HEADPIECE-STALK SECTORS DETACHED FROM THE MITOCHONDRIAL CRISTAL MEMBRANE. E. F. Korman, G. dePury, J. Asai, D. W. Allmann, K. Kopaczkyk and D. E. Green (Inst. of Enzyme Res., Univ. of Wis., Madison, Wis. 53706). *Biochemistry* 9, 1318-26 (1970). Electron microscopic evidence is presented indicating that phospholipid micelles in water have two structurally different regions, the peripheral edges and the interiors. A model at the molecular level is proposed which describes the two structurally different regions. This model is based on the two possible orientations of phospholipid molecules in a bilayer. In addition, evidence is presented that the detachable headpiece-stalk of the repeating units of the mitochondria cristal membrane can interact with bilayers having phospholipid molecules in only one of the two possible orientations. The nature of this proposed interaction is correlated with the interaction of headpiece-stalk sectors with base pieces in the mitochondrial cristal membrane.

PERIODICITY OF FOOD INTAKE AND LIPOGENESIS IN RATS SUBJECTED TO TWO DIFFERENT FEEDING PLANS. T. Kimura, T. Maji and K. Ashida (Lab. of Nutritional Biochem., Dept. of Agr. Chem., Nagoya U., Chikusa, Nagoya, Japan). *J. Nutr.* 100, 691-97 (1970). The periodicity of food intake, apparently occurring in a 24-hour rhythm, was measured using rats fed ad libitum for 11 weeks. Rats ate mostly at night, and hardly at all during the day. The periodic pattern of lipogenesis in both liver and carcass tissues was essentially similar to that of food intake. The effect of two feeding plans, ad libitum and meal-fed, on the lipogenesis in rats was investigated by measuring the incorporation of the intraperitoneally injected acetate-1-¹⁴C into a) respiratory CO₂, b) liver lipids and c) carcass lipids. Regardless of the feeding conditions, lipogenesis in both liver and carcass during the food intake period was found to be appreciably higher than that measured before the intake period. The rate of lipogenesis in carcass tissue of rats subjected to the meal-fed plans was greater than that in rats fed ad libitum. The pattern of liver cholesterogenesis in rats fed under the two different feeding conditions was found to be analogous to that of liver lipogenesis.

PHOSPHOLIPID SYNTHESIS AND EXCHANGE IN ISOLATED LIVER CELLS. F. B. Jungalwala and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council Inst. of Animal Physiol., Babraham, Cambridge, U.K.). *Biochem. J.* 117, 481-90 (1970). The ³²P-phosphate incorporated into the phospholipids of isolated rat hepatic cells is present in phosphatidic acid and to a smaller extent in phosphatidylinositol. The ability to synthesize nitrogen-containing phospholipids is restored by adding a liver supernatant fraction, and it is suggested that the metabolic deficiency is caused by the leakage of cytoplasmic enzymes of the synthetase system from the cells. Fortified cell preparations were pulse-labelled with ³²P-phosphate Me-¹⁴C-choline, 2-¹⁴C-ethanolamine and U-¹⁴C-inositol and the subsequent fate of the labelled microsomal and mitochondrial phospholipids followed. A fall in the specific radioactivity of microsomal phospholipids and a rise in that of mitochondrial phospholipids is interpreted as providing evidence of a transfer of labelled phospholipid molecules from the synthetic site (endoplasmic reticulum) to the mitochondrial membranes in intact cells. The formation of the phospholipids of mitochondrial membranes is discussed.

IDENTIFICATION OF 7 α -HYDROXYLATED ANDROGENS AS THE METABOLITES OF ANDROSTENEDIONE BY TESTICULAR MICROSOMAL FRACTION OF RATS. H. Inano, K. Tsuno and B. Tamaoki (Nat. Inst. of Radiological Sci., Anagawa-4-chome, Chiba-shi, 280, Japan). *Biochemistry* 9, 2253-59 (1970). After incubation of androstenedione with testicular microsomal fraction (10,000-105,000 g percipitate) of rats on the presence of reduced nicotinamide-adenine dinucleotide phosphate and in the atmosphere of O₂-CO₂ mixture (95:5, v/v), one of the major metabolites which was designated as I was identified as 7 α -hydroxyandrostenedione by the following biochemical and physicochemical procedures. (1) By double-isotope dilution method, I was proved as being directly derived from androstenedione. (2) Under anaerobic conditions, the formation of I was severely reduced, suggesting that a mixed-function oxidase or a monooxygenase was involved in the transformation of androstenedione to I. (3) Through the chemical behavior of I against the several reagents, it was considered as a hydroxylated androstenedione.

PLASMA TURNOVER OF S_t 0-9 LOW-DENSITY LIPOPROTEIN IN NORMAL MEN AND WOMEN. P. J. Hurley and P. J. Scott (Med.

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Unit, Auckland Hosp., Auckland, New Zealand). *Atheroscl.* 11, 51-76 (1970). Experiments were performed to investigate the lower plasma low-density lipoprotein concentrations seen in premenopausal female populations compared with men or older women. Turnover studies were performed on normal subjects, using their low-density lipoprotein radioiodinated in the peptide component. Most studies could not be prolonged past 17 days, but it appeared that equilibration of plasma and extravascular compartments was generally incomplete at this stage. In two studies maintained for 6 weeks, equilibration appeared to require more than 3 weeks; turnover rates were slower than had previously been suspected, and the extravascular pool contained about half the total body radioactivity. The 17-day studies appeared to provide quantitatively accurate parameters of lipoprotein fractional catabolic rates (obtained from urinary measurements) but not of plasma half-lives. Ten young women as a group showed significantly faster fractional turnover rates than these 10 men or 3 older women. In men and young women, serum low-density lipoprotein levels had no correlation with fractional catabolic rates, but did correlate with absolute catabolic rates, suggesting that a fixed proportion of the plasma pool may be catabolized daily (although at different rates between the sexes). Results from the 3 older women suggested that a simple relationship between serum low-density lipoprotein levels and absolute catabolic rate may not apply to all age groups. Possible mechanisms of lipoprotein metabolism are discussed in the light of these results.

IN VITRO SYNTHESIS OF CHOLESTEROL AND TESTOSTERONE FROM ACETATE BY RAT EPIDIDYMIUM AND VAS DEFERENS. D. W. Hamilton and D. W. Fawcett (Dept. of Anatomy and Labs. of Human Reproduction and Reproductive Biol., Harvard Med. School, Boston, Mass. 02115). *Proc. Soc. Exp. Bio. Med.* 133, 693-95 (1970). The epididymis and vas deferens from the rat are capable of synthesizing cholesterol and testosterone from acetate. The significance of androgen synthesis by the epididymis is discussed.

EFFECTS OF NUTRITIONAL STATUS ON RAT BRAIN MATURATION AS MEASURED BY LIPID COMPOSITION. R. L. Geison and H. A. Waisman (J. P. Kennedy Jr. Lab., Dept. of Pediatrics, Univ. of Wis. Med. Center, Madison, Wis. 53706). *J. Nutr.* 100, 315-24 (1970). Alteration of the rate of growth of suckling rats produces changes in the concentrations of several brain lipid components (galactolipid, cholesterol, plasmalogens) and chloroform-methanol extractable protein (proteolipid protein). The results suggest that the rates of lipid accumulation in suckling rats are related to the body and brain growth. A reduced rate of growth causes a delay in the accumulation of lipids with the concentrations of the various lipids being maintained proportional to younger, faster growing rats. After a recovery period, depressions in levels of lipid components may exist, depending on the final body weights attained. Greater depressions in the concentration of myelin-related lipids are found in rats of smaller body weight suggesting that a deficit in myelin still exists and that the accumulation of lipids is related to the previous overall rate of maturation and development.

EMBRYO MORTALITY IN QUAIL INDUCED BY CYCLOPROPENE FATTY ACIDS: REDUCTION BY MATERNAL DIETS HIGH IN UNSATURATED FATTY ACIDS. W. E. Donaldson and B. L. Fites (Dept. of Poultry Sci., North Carolina State Univ., Raleigh, N.C. 27607). *J. Nutr.* 100, 605-10 (1970). Quail (*Coturnix coturnix japonica*) hens were dosed orally with 30 mg/day of *Sterculia foetida* oil. The dosing resulted in increased embryo mortality, increased ratios of saturated to unsaturated fatty acids in yolk, decreased desaturation of stearic-1-¹⁴C acid by hen liver homogenates and high levels of cyclopropene fatty acids in yolk. Injection of up to 25 mg of *S. foetida* oil/egg into eggs from nondosed quail did not affect embryo mortality as compared with corn oil-injected controls. Addition of 5 or 10% of crude oleic acid to the diets of hens treated with 60 mg/day of *S. foetida* oil reduced embryo mortality and the ratios of saturated to unsaturated fatty acids in egg yolk as compared to control. Oleic acid feeding had no effect on cyclopropene content of eggs. The results suggest that the embryo mortality associated with maternal ingestion of cyclopropene fatty acids is due to the increased ratio of saturated to unsaturated fatty acids in egg yolk and not to direct cyclopropene effects on the embryo.

METABOLISM AND SUBCELLULAR LOCATION OF 25-HYDROXYCHOLECALCIFEROL IN INTESTINAL MUCOSA. R. J. Cousins, H. F. DeLuca, T. Suda, T. Chen and Y. Tanaka (Dept. Biochem.,

Univ. of Wis., Madison, Wis. 53706). *Biochemistry* 9, 1453-59 (1970). The metabolism and subcellular distribution of 25-hydroxycholecalciferol, a biologically active metabolite of cholecalciferol (vitamin D₃) was investigated in the intestinal mucosa of vitamin D deficient rats. The mucosal nuclear fraction accumulates approximately 50 and 25% of the total cellular ³H after administration of 0.025 and 0.25 μg of (26,27-³H)-25-hydroxycholecalciferol, respectively. Both 1,2-³H- and 26,27-³H-labeled 25-hydroxycholecalciferol are converted in vivo by the intestinal mucosa into polar metabolites, referred to as peak V and peak VI. Within 30 min after a 0.025 μg dose of (26,27-³H)-25-hydroxycholecalciferol, 72% of the nuclear radioactivity is in peak VI, the more polar of the two metabolites. Two hours after the dose the relative amount of peak VI steadily decreases and after 8 hr peak V had decreased to 58% of the total tritium-containing metabolites on the nuclear fraction. The time course of appearance of these metabolites indicates peak VI is the probable precursor of peak V. The paucity of these polar metabolites in the cytoplasmic fractions suggest they are of nuclear origin and hence may be of significance in understanding at the nuclear level the mode of action of vitamin D on the calcium transport mechanism in the small intestine.

IN VITRO SYNTHESIS OF LIGNOCERIC AND NERVONIC ACIDS ON MAMMALIAN LIVER AND BRAIN. S. C. Boone and S. J. Wakil (Dept. of Biochem., Duke Univ. Med. Center, Durham, N. Carolina 27706). *Biochem.*, 9, 1470-79 (1970). A fatty acid elongation system has been identified in 21-day-old rat liver and brain mitochondria. This fatty acid system will elongate a multitude of saturated and unsaturated acyl coenzymes (acyl-CoAs) ranging in chain length from C₁₂ to C₂₂. The components necessary for this elongation have been found to be a precursor acyl-CoA, acetyl coenzyme A reduced nicotinamide-adenine dinucleotide and reduced nicotinamide-adenine dinucleotide phosphate. Acetyl-CoA and not malonyl CoA has been found to be the immediate precursor of the two-carbon addition unit. It was this mitochondrial system which was found to elongate behenyl-CoA to lignoceric acid and erucyl-CoA to nervonic acid. The synthesized lignoceric and nervonic acids were identified by thin-layer and gas chromatography. Their response to hydrogenation was further proof of their identity. Decarboxylation of the ¹⁴C-lignoceric and nervonic acids revealed they had both been synthesized by an elongation process.

IN VITRO HEMOLYSIS AS RELATED TO RAT ERYTHROCYTE CONTENT OF α-TOCOPHEROL AND POLYUNSATURATED FATTY ACIDS. J. G. Bieri and R. K. H. Poukka (Lab. of Nutr. and Endocrinology, Nat. Inst. of Health, Bethesda, Md. 20014). *J. Nutr.* 100, 557-64 (1970). The purpose of this study was to relate the amount of α-tocopherol required in rat erythrocytes for prevention of hemolysis in vitro to their polyunsaturated fatty acid (PUFA) composition. Red cells of varying PUFA and α-tocopherol contents were produced in rats and their hemolysis by dialuric acid determined. The erythrocyte concentration of α-tocopherol required to prevent significant hemolysis ranged from 122 μg/100 ml packed cells when the peroxidizable index (PI) of the PUFA was lowest (linoleic acid-free diet) to 196 μg/100 ml when the PI was highest (5% corn oil in the diet). The average ratio μmoles α-tocopherol/μmole PUFA to prevent 10% hemolysis was 0.00089, or one molecule of α-tocopherol per 1100 molecules of PUFA. Over a wide range of blood α-tocopherol concentrations, the erythrocyte content was about 0.45 of that in plasma.

OBSERVATIONS ON RUMEN FLUID, BLOOD SERUM AND MILK LIPIDS OF COWS FED METHIONINE ANALOG. R. A. Patton, R. D. McCarthy and L. C. Griel, Jr. (Lipids Lab., Dept. of Dairy Sci., The Penn. State Univ., University Park, Pa. 16802). *J. Dairy Sci.* 53, 776-80 (1970). Twelve dairy cows were assigned to each of three groups which received either 0, 40 or 80 g of methionine hydroxy analog per day in their grain. Milk and fat yields were increased by supplementation. Milk fat of supplemented cows compared to that of the controls contained more of the 18-carbon fatty acids and less of the short-chain fatty acids. Cows receiving methionine hydroxy analog had more blood serum lipids (P < 0.01); but there were only minor differences in the composition of these lipids between the three groups. Feeding of methionine hydroxy analog decreased the free fatty acids in rumen fluid and apparently promoted the formation of an unidentified polar lipid. The relative proportion of stearic acid was lower in the rumen fluid of those cows fed methionine hydroxy analog (P < 0.05).

REMOVAL OF THE 4,4-DIMETHYL CARBONS IN THE ENZYMIC CONVERSION OF LANOSTEROL TO CHOLESTEROL. R. Rahman, K. B.

Vitamin Fortification of Foods Aim of Eastman IFT Exhibit

Wider use of the concept of enriching the nutritive values of foods by addition of vitamins E and A was one of the primary goals of the IFT Show exhibit of the DPI Division, Eastman Chemical Products, Inc., a subsidiary of Eastman Kodak Company, Kingsport, Tenn. The 30th Annual Show, sponsored by the Institute of Food Technologists, was held May 24 to 27 in San Francisco, California.

The exhibit also explained how Eastman combines essential food products to provide better customer service. Vitamin E is offered in many different forms and potencies, including pure vitamin E acetate having a potency of 1360 I.U./g, the highest biological potency of any commercial form of vitamin E. Vitamin A is offered in oil form with a potency of 1,000,000 USP units/g, in dry edible bead form with a potency of 500,000 USP units/g, and in blends with carotene, vitamins D and E, and food colorants. Special formulations of both vitamin E and vitamin A can be tailored to specific product requirements.

Beta carotene, used for fortification of margarine, popcorn and other foods, is made by Eastman in two concentrations, one with 400,000 USP units of vitamin A per gram, the other with 500,000 USP units of vitamin A per gram. Vitamins E, A and beta carotene help provide fabricated and substitute foods with nutritive value equal to the natural foods they replace.

Eastman's line of additives, for food protection, including antioxidants and the food industry's most complete line of distilled monoesters, was also emphasized, at the show exhibit. To stabilize foods against oxidative rancidity, Eastman suggests three basic grades of Tenox food-grade antioxidants for fats and oils, as well as several Tenox proprietary mixtures of antioxidants, citric acid and various solvents. The basic antioxidants are Tenox BHA butylated hydroxyanisole; Tenox BHT butylated hydroxytoluene and Tenox PG propyl gallate.

Included in Eastman's line of food chemicals are Myverol distilled monoglycerides, Myverol distilled propylene glycol monoester, Myvacet distilled acetylated monoglycerides, Myvatex food emulsifiers and Myvaplex food-grade concentrated glyceryl monostearates.

terial separated from thrice-washed fat globules, was ultracentrifugally classified into three fractions, of 7,500 S (>7,500), 230 S (230 to 7,500), and 35 S (35 to 230) sedimentation characteristics. Their composition was from 82.5% protein and 17.5% lipid for the 7,500 S fraction to 44.7% protein and 55.3% lipid on the 35 S fraction. The proportion of polar lipids in the lipid moieties decreased with increasing lipid content. The protein moieties contained approximately 14% nitrogen and varying amounts of hexose (2.82 to 4.15%), hexosamine (2.48 to 4.17%), and sialic acid (1.29 to 1.77%). These data indicate an increasing proportion of glycoproteins in successively lighter membrane fractions. No appreciable differences in amino acid composition were noted for the protein moieties. Electron micrographs of the membrane fractions revealed differences in the size and structure of the particulate material. A proposed model for the fat globule membrane, as it exists in milk, provides for a protein or lipid-protein matrix to which lipoprotein micelles are adsorbed.

EFFECT OF IN VIVO INJECTION OF ANTIOXIDANTS ON TURKEY FAT STABILITY. W. C. Micelberry (Food Sci. and Biochem. Dept., Clemson U., Clemson, S.C. 29631). *Poultry Sci.* 49, 355-60 (1970). Market age male turkeys were injected with several types of antioxidant substances at either 24 hours or 5 minutes prior to slaughter. Fats extracted from samples of skin and dark muscle were subjected to an accelerated oxidation method. The rate of oxidation was evaluated by the peroxide value and comparisons were made with the uninjected control samples to determine the relative storage stability of the treatments. Since none of the treatments resulted in a marked increase in storage stability, it was concluded that a pre-slaughter injection time of 24 hours was inadequate to assure distribution of the antioxidants into the fatty tissues in a quantity necessary to retard oxidation. Observations were

Sharpless, T. A. Spencer and R. B. Clayton (Dept. of Psychiatry, Stanford Univ. School of Medicine, Stanford, Calif. 94305). *J. Biol. Chem.* 245, 2667-71 (1970). The sequence of removal of methyl substituents at C-4 of 4,14a-trimethyl-5a-cholesta-8,24-dien-3 β -ol (lanosterol) in the course of its conversion to cholesterol has been re-examined. From a homogenate of rat liver incubated with DL-mevalonic acid-2-¹⁴C-5-³H, squalene, lanosterol, 4,14a-trimethyl-5a-cholest-8-en-3 β -ol, 4a-methyl-5a-cholest-7-en-3 β -ol and cholesterol have been isolated. It is concluded from measurements of the ³H:¹⁴C ratios found in these various compounds that the 4a-methyl group of lanosterol is removed before the 4 β -methyl group and that the 4a-methyl group of 4a-methyl-5a-cholest-7-en-3 β -ol originates as the 4 β -methyl group of lanosterol.

TUMOR LIPIDS. R. Wood and Kathleen Healy (Medical Div., Oak Ridge Assoc. Univ., Oak Ridge, Tennessee 37830). *J. Biol. Chem.* 245, 2640-48 (1970). Labeled long chain acyl-CoA, aldehyde and alcohol (16:0) were incubated in the peritoneal cavity of mice bearing Ehrlich ascites cells and the distribution of radioactivity in the acyl, alkyl and alk-1-enyl moieties of various neutral lipid and phospholipid classes was compared. The results suggested the following metabolic relations. 1) Alkyl glyceryl ethers are precursors of alk-1-enyl glyceryl ethers. Alk-1-enyl phosphoglycerides (plasmalogens) appear to be derived from intact alkyl acyl phosphoglycerides by biodehydrogenation. 2) Fatty acids are precursors of long chain alcohols that serve as precursors of alkyl glyceryl ethers. 3) Aldehydes are less effective precursors of plasmalogens than alcohols. They are oxidized primarily to acids and to a lesser extent are reduced to alcohols. 4) Fatty acids are elongated but the saturated acids are not desaturated to the corresponding monoenoic acids in this neoplasm. 5) Comparison of the data from the three labeled substrates suggests an interrelation that explains how each substrate was incorporated into glyceryl ethers.

EFFECT OF PHENAZINE METHOSULFATE ON LIPOGENESIS. J. Katz and P. A. Wals (Med. Res. Inst., Cedars-Sinai Med. Center, Los Angeles, Calif. 90029). *J. Biol. Chem.* 245, 2546-48 (1970). The effect of phenazine methosulfate (PMS) on lipogenesis of rat epididymal fat pad tissue was studied. PMS at concentrations of 10⁻⁶ to 10⁻⁵M stimulates L-lactate oxidation and, most markedly, fatty acid synthesis, without affecting glycerol synthesis. Maximal stimulation of lipogenesis occurs at about 10⁻⁵M. With tissue of rats fed "ad libitum," the increase in fatty acid ranged from 300 to 1800%. There was no stimulation of synthesis from pyruvate or glucose. Similar effects of PMS on lipogenesis were also seen with mammary gland slices of lactating rats. It is concluded that there is limited capability for the transfer of cytoplasmic reducing equivalents into mitochondria. The effect of PMS is the result of oxidation of excess cytoplasmic reducing equivalents and regeneration of DPN.

INCREASED ERYTHROCYTE FRAGILITY WITH HYDROGEN PEROXIDE IN VITAMIN E-DEFICIENT CHICKENS. V. Fischer, J. S. Nelson and P. Young (St. Louis U. School of Med., St. Louis, Mo. 63104). *Poultry Sci.* 49, 443-46 (1970). A modified hydrogen peroxide method is utilized to determine differences in susceptibility to lysis of red cells from chickens on normal or vitamin E-deficient diets. Results indicate that erythrocytes from young chicks on a vitamin E-deficient diet are more prone to lysis in dilute hydrogen peroxide solutions than red cells from chicks on a balanced diet. Reversal of exposure to a normal or vitamin E-deficient diet results in an inverse relationship of hemolysis levels. These data support the view that plasma tocopherol is a major factor in the determination of erythrocyte susceptibility to peroxide lysis.

EFFECT OF DESMETHYLMIPRAMINE OF HORMONE, THEOPHYLLINE, AND DIBUTYRYL CYCLIC AMP-INDUCED LIPOLYSIS IN ISOLATED RAT FAT CELLS. J. Nakano and T. Ishii (Depts. of Pharmacol. and Med., Uni. of Oklahoma School of Med., Oklahoma City, Okla. 73104). *Proc. Soc. Exp. Biol. Med.* 134, 210-12 (1970). The effect of desmethylmipramine (DMI) on lipolysis was studied in isolated rat fat cells. It was found that DMI interferes with the lipolytic action of NE, ACTH, theophylline and dibutyryl cyclic AMP. It is suggested that DMI inhibits the activation of hormone-sensitive lipase at biochemical site(s) subsequent to the production of cyclic AMP, which is increased by NE, ACTH and theophylline in rat adipose tissue.

CHARACTERISTICS OF THE FAT GLOBULE MEMBRANE OF COW'S MILK. F. C. Swope and J. R. Brunner (Dept. of Food Sci., Mich. State Univ., East Lansing, Mich. 48823). *J. Dairy Sci.* 53, 691-99 (1970). Fragmented fat globule membrane ma-

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made on differences in color of the skin and dark muscle fat upon prolonged heating and aeration. The possibility of this being due to differences in the tocopherol content was discussed.

FAT METABOLISM IN HIGHER PLANTS. XXXIX. EFFECT OF ADENOSINE TRIPHOSPHATE AND TRITON X-100 ON LIPID SYNTHESIS BY ISOLATED SPINACH CHLOROPLASTS. P. K. Stumpf and N. K. Boardman (Div. of Plant Ind., CSIRO, Canberra, Australia). *J. Biol. Chem.* 24, 2579-87 (1970). Spinach chloroplasts with intact outer envelopes (Class I) rapidly synthesize oleic and palmitic acids from ^{14}C -acetate in the presence of coenzyme A, sodium bicarbonate, magnesium ion and light. Light intensity studies reveal a 2-fold stimulation at 10 foot-candles and 10-fold stimulation at 3000 foot-candles. Very low concentrations of detergents (Triton X-100 at 130 mM concentration) greatly stimulate ^{14}C -acetate incorporation and markedly increase the oleic to palmitic ratio (from 1 to 1.5 to over 11). Low concentrations of ATP (2mM) return the oleic to palmitic ratio to values of 1 to 1.5. Other nucleoside triphosphates are ineffective. Cyanide (0.1 mM) is only partially inhibitory for oleic acid synthesis. Action spectra studies indicate that ^{14}C -acetate incorporation into fatty acids follows the absorption spectrum of chloroplasts.

BY-PRODUCTS OF THE REFINING OF SOYBEAN OILS AS PIGMENT SOURCES FOR POULTRY. 2) EGG YOLK PIGMENTATION. B. Lipstein and P. Budowski (The Volcani Inst. of Agr. Res., Bet Dagan, Israel) and S. Bornstein (Hebrew U. of Jerusalem, Fac. of Agr., Rehovot, Israel). *Poultry Sci.* 49, 449-58 (1970). Two by-products of the refining of soybean oil, crude unbleached soy lecithin (CSL) and acidulated soybean soapstock (ASS) were tested for their efficiency as yolk pigments in three trials. In addition, the effect of pigment-free soy phospholipids on the pigmentation ability of ASS and alfalfa lipids was examined, and an attempt was made to evaluate the role of lutein in yolk pigmentation. CSL was found to be equivalent to yellow corn in xanthophyll utilization (i.e. 20%), whereas ASS was much less efficient for yolk coloration. The lower efficiency of ASS as yolk pigmenter appeared to be due to the lower proportion of lutein among the xanthophylls and also to the generally low utilization (about 6%) of ASS-derived xanthophylls. Xanthophyll-free soybean phospholipids did not increase the pigmenting effect of other xanthophyll-containing feedstuffs. Non-lutein pigments produced by acid treatment of alfalfa lipids were found to be effective yolk pigmenters.

THE BINDING OF REDUCED NICOTINAMIDE ADENINE DINUCLEOTIDE PHOSPHATE TO MAMMALIAN AND AVIAN FATTY ACID SYNTHETASES. R. E. Dugan and J. W. Porter (Lipid Metabolism Lab., Vets. Adm. Hosp., Univ. of Wis., Madison, Wis. 53706). *J. Biol. Chem.* 245, 2051-59 (1970). The binding of NADPH to pigeon and rat liver fatty acid synthetases has been examined by the techniques of fluorescence enhancement, fluorescence polarization and equilibrium dialysis. Pigeon and rat liver fatty acid synthetases increase the fluorescent yield from NADPH 4.6- and 3.8-fold, respectively. Fluorescent yield appears to be independent of the buffer concentration and the amount of coenzyme bound to enzyme. The number of binding sites on each synthetase is independent of the protein concentration.

THE EFFECT OF ESTROGEN PRIMING ON THE UPTAKE OF RADIOACTIVE ESTRADIOL. R. J. Kraay and L. J. Black (Lilly Res. Labs., Eli Lilly and Co., Indianapolis, Ind. 46206). *Proc. Soc. Exp. Biol. Med.* 133, 376-79 (1970). Many investigators have turned to the use of titrated estradiol with high specific activity as a tool for studying mechanisms of estrogen action. The effect of estrogen pretreatment on the uptake of radioactive estradiol has been studied in several laboratories with variable results. This report defines the conditions under which various estrogens stimulate the uptake of tracer estradiol by the mouse uterus.

FATTY ACID COMPOSITION OF THE FATS OF THE RUMEN AND ABOMASUM OF SHEEP. F. B. Shorland and M. D. Earle (Massey Univ., Palmerston North, New Zealand). *J. Sci. Food Agr.* 20, 682-4 (1969). The fatty acid composition of the abomasum and rumen tissues of 16-week old and 80-week old Romney ewes fed on pasture has been determined. For 16-wk. old lambs it was comparable to that of the longissimus dorsi of 26-wk. old lambs. At 80 weeks the rumen lipids showed a highly significant decrease in total saturated acids with a corresponding increase in total unsaturated and octadecenoic (oleic) acids. The abomasum lipids showed similar changes. The reduced contents of myristic, lauric and decanoic acids in the lipids of the older animals were consistent with

the removal of these acids from the diet. Whereas before weaning the dietary fatty acids are rich in saturated acids, the fatty acids of sheep at pasture comprise mainly linolenic and palmitic acids. Consideration of the results of other investigations suggest that the changes in fatty acid composition of the lipids of grazing sheep with age observed for the rumen and abomasum tissues may apply to muscle and fatty tissues generally.

FATTY ACID COMPOSITION OF TISSUE LIPIDS FROM MINIATURE SWINE: INFLUENCE OF DIETARY SUCROSE AND STARCH. R. W. St. Clair (Dept. of Pathology, The Bowman Gray School of Med. of Wake Forest Univ., Winston-Salem, N.C. 27103). *Lipids* 5, 359-62 (1970). The fatty acid composition of serum, liver and adipose tissue from Pitman-Moore miniature swine was determined following their consumption of starch- or sucrose-containing diets for a period of one year. Among the tissues studied there were no significant differences in the fatty acid composition due to the type of dietary carbohydrate (starch or sucrose). The cholesterol ester fatty acid composition of all samples studied remained quite constant. There were minor fluctuations in fatty acid composition of phospholipids and triglycerides from serum collected at different intervals following initiation of the diets.

THE COMPARATIVE OXIDATION OF PALMITIC, OLEIC AND SUCCINIC ACIDS BY RAT AND BAT BROWN ADIPOSE TISSUE HOMOGENATES AS A FUNCTION OF TEMPERATURE. R. L. Dryer, J. R. Paulsrud, D. J. Brown and Karol Mavis (Dept. of Biochem., Univ. of Iowa, Iowa City, Ia. 52240). *Lipids* 5, 15-22 (1970). The oxidation of $1\text{-}^{14}\text{C}$ -palmitic, $1\text{-}^{14}\text{C}$ -oleic and $2\text{-}^{14}\text{C}$ -succinic acids to $^{14}\text{CO}_2$ by homogenates of brown adipose tissue (BAT) from rats and bats was studied as a function of temperature. In all cases bat BAT gave a greater conversion of added fatty acids to $^{14}\text{CO}_2$ than did rat BAT. The conversion of labeled succinate to $^{14}\text{CO}_2$ is greater in the bat than in the rat only at low temperatures. In all paired observations below 30°C the energy of activation of the bat preparations are lower than the rat. This indicates a greater thermal efficiency for the oxidation of the indicated substrates. The bat BAT homogenates show a greater efficiency than rat homogenates in the amount of succinic oxidation associated with the oxidation of long chain fatty acids to CO_2 . The significance of these findings to thermogenesis by BAT in hibernation and cold adaptation is discussed.

REACTIONS OF BIOLOGICAL ANTIOXIDANTS: I. Fe(III)-CATALYZED REACTIONS OF LIPID HYDROPEROXIDES WITH ALPHA-TOCOPHEROL. E. H. Gruger, Jr. (Food Sci. Pioneer Res. Lab., Bureau of Commercial Fisheries, Seattle, Wash. 98102) and A. L. Tappel. *Lipids* 5, 326-31 (1970). Rates of alpha-tocopherol oxidation were measured for free-radical reactions produced by Fe(III)-catalyzed dissociations of hydroperoxides. The kinetics were treated as first-order in alpha-tocopherol. The hydroperoxides were preformed from methyl linoleate, methyl linolenate, ethyl arachidonate, methyl eicosapentaenoate and a fraction of polyunsaturated fatty esters of menhaden oil. The degree of unsaturation of the lipid hydroperoxides had little effect on the rates of alpha-tocopherol oxidation. The rates of oxidation decrease with the concentration of water and increase with the acidity of the media. The pH data suggest a transition from one predominant mechanism to another, which may involve principally acid catalysts. A mechanism for alpha-tocopherol oxidation is suggested.

REACTIONS OF BIOLOGICAL ANTIOXIDANTS: II. Fe(III)-CATALYZED REACTIONS OF METHYL LINOLEATE HYDROPEROXIDES WITH DERIVATIVES OF COENZYME Q AND VITAMIN E. E. H. Gruger, Jr. (Food Sci. Pioneer Res. Lab., Bureau of Commercial Fisheries, Seattle, Wash. 98102) and A. L. Tappel. *Lipids* 5, 332-36 (1970). Lipid free-radical oxidations of ubiquinol-6, ubichromenol-6, ubichromenol-10, and alpha-tocopherol hydroquinone were kinetically examined in the presence of Fe(III)-catalyzed dissociations of preformed methyl linoleate hydroperoxides. The rates of oxidation of the chromenols increased more than those of the hydroquinones as reaction acidity was increased. Differences in thermal effects upon rates were influenced by the levels of water in the reactions. The hydroquinones exhibited faster rates relative to alpha-tocopherol than the ubichromenols, while the rates for the latter varied markedly depending on the nature of the solvent.

AN INVESTIGATION OF THE LIPID METABOLISM OF DOG KIDNEY MEDULLA AND CORTEX. M. Gold (Gerontological Res. Inst., Philadelphia Geriatric Center, Phil., Pa. 19141). *Lipids* 5, 293-8 (1970). The kidneys were removed from dogs treated with radioactive palmitate and oleate. Lipids were extracted from the medullae and cortices with chloroform-methanol (2:1)

and the lipid classes were analyzed for radioactivity content and fatty acid composition. Most of the radioactivity was found in the phospholipid fraction and a large portion of the remainder was in triglyceride. Cortical phospholipids contained 80% of the radioactivity versus a value around 60% in the medulla, whereas triglyceride, in the medulla, was about 26% compared to the cortical content of 15%. The cortex possessed a higher specific activity for oleate and palmitate in both triglyceride and phospholipid. The total kidney retained 0.25% of the infused palmitate and 0.08% of the infused oleate.

CHANGES IN THE STRUCTURE OF SOYBEAN TRIGLYCERIDES DURING MATURATION. J. N. Roehm and O. S. Privett (The Hormel Inst., Univ. of Minn., Austin, Minn. 55912). *Lipids* 5, 353-58 (1970). Soybeans of the Hawkeye variety were picked at eleven periods from 30 to 111 days after flowering and extracted with chloroform-methanol. The triglyceride fraction of 5 pickings was isolated and found to increase from 6.5% of the total lipid at 30 days to 85% in the mature bean (111 days). During the first 52 days after flowering, linolenic acid decreased from 35.2% to 11.7% in the triglycerides. While the percentages of linoleic and oleic acids increased, stearic remained fairly constant and palmitic decreased slightly. However, the positional distribution of fatty acids remained virtually unchanged throughout maturation indicating that the mode of glyceride synthesis was established very early and molecular species composition was controlled by the fatty acids available for synthesis.

LONG-CHAIN ALCOHOLS IN MAMMALIAN TISSUES. T. Takahashi and H. H. O. Schmid (Univ. of Minnesota, The Hormel Inst., Austin, Minn. 55912). *Chem. Phys. Lipids* 4, 243-46 (1970). Long-chain alcohols have been detected in lipid extracts of bovine and porcine brain and heart muscle. They were found to occur at levels of approximately 0.002% (w/w) of the total lipids. Hexadecanol, octadecanol, octadecenol and, in the bovine tissues, docosanol were identified as major constituents.

PHYSICAL PROPERTIES OF A POLYOXYETHYLENE SORBITAN MONOLEATE MICELLE. B. Love and G. Cornick (Dept. of Biochem. Univ. of Rochester School of Med. and Dentistry, Rochester, N.Y. 14620). *Chem. Phys. Lipids* 4, 191-6 (1970). The non-ionic surfactant, Emasol 4130, forms micelles of molecular weight equal to 68,900. Data from light scattering, viscosity and diffusion studies indicate that the micelle is rod-like rather than spherical, and that the equivalent prolate ellipsoid would have an axial ratio of 12. The physical constants are found to be $D_{20} = 6.0 \times 10^{-7}$, $[\eta] = 0.064 \text{ dl g}^{-1}$, and $\beta = 2.61 \times 10^{-6}$.

A NEW GLYCOLIPID FROM STREPTOMYCES. L. Bergelson, S. Batrakov and T. Pilipenko (Inst. for Chem. of Natural Compounds, Acad. of Science of USSR, Moscow, USSR). *Chem. Phys. Lipids* 4, 181-90 (1970). In the cell lipids of *Streptomyces* LA 7017 two unusual glycolipids were detected. One of them was isolated in a pure state and shown to be 1-0-(4-0-(α -D-glycopyranosyl)- α -D-(2- or 3-0-acyl)galacturonosyl)-2,3-diglyceride.

THE MOBILIZATION OF FREE FATTY ACIDS IN RELATION TO ADIPOSE TISSUE TRIGLYCERIDE FATTY ACIDS IN THE RAT. J. Hunter, H. Buchanan and E. Nye (Dept. of Med., Univ. of Otago Medical School, Dunedin, New Zealand). *J. Lipid Res.* 11, 259-65 (1970). Three diets, consisting respectively of formulations high in oleic and stearic acid, linolenic acid and lauric acid, were fed to rats until the adipose tissue TGFA largely reflected the dietary pattern of fatty acids. The composition of the serum FFA under basal conditions and following noradrenaline-stimulated lipolysis, were examined in relation to the respective adipose tissue TGFA. It was found in both in vivo and in vitro studies that lauric acid appeared to be less easily mobilized than longer chain acids. The in vitro studies indicated that this could not be explained either by positional preference of the shorter chain acids for the α -position of esterification or by increased reesterification of the shorter chain acids. The possibility remains that the difference is due to some specificity of tissue lipases for certain ester linkages.

• Drying Oils and Paints

ALCOHOLYSIS REACTION OF FATTY OILS WITH PENTAERYTHRITOL. Seigo Iwase, Morio Kimura, Tadashi Watanabe and Hiroyuki Nakayama (Kansai Paint Co., Hiratsuka, Kanagawa-ken, Japan). *Yukagaku* 18, 812-19 (1969). Thin-layer chromatography was applied to separate and identify the products of reaction of triglyceride and pentaerythritol. Silica gel

and ethyl ether were used in the chromatography as the adsorbent and the solvent, respectively. Quantitative determination was made by using densitometer on each spot on the chromatogram. In the system soybean oil-pentaerythritol, the apparent activation energy of the reaction was 27 kcal/mole. The reaction rate constants for various oils were in the order of linseed (highest), olive, coconut, dehydrated castor and soybean oil. The apparent activation energies were in the opposite order. Lead oleate was the most active catalyst followed by PbO. The catalytic activity was in the order of Pb (highest), Ca, Zn, Mn, Li, K and Fe oleates. This reaction was of the 2nd order. Alkoxy anions formed by the reaction of pentaerythritol with catalysts were presumed to attack CO group of fatty oils. The composition of reaction products was almost independent of reaction conditions and was consistent with the calculated values by assuming the random distribution of fatty acid groups.

INDIAN TUNG CHARACTERISTICS AND PROCESSING. T. Lakshminarayana, R. Yousuf Alikhan, R. K. Viswanadham and S. D. Thirumala Rao (Oil Tech. Res. Inst., Anantapur, India). *Tropical Sci.* 6, 319-23 (1969). Crushing of tung kernels containing 15-20% of hulls, gives an oil yield of about 17% on the weight of fruit. Storage of fruit has decisive effect on oil yield. Up to 100 days, there was no adverse effect. After 160 days, the oil yield dropped to 12.4% and after 250 days, to 4.8%. Storage studies show that the fruit cannot be stored beyond 100 days and the cake for more than one month without appreciably reducing their oil contents. Tung cake also has a tendency towards spontaneous combustion under certain conditions. As storage progresses, white kernels begin to turn brown. While the characteristics of tung oils from fresh fruit are normal, the iodine values of oils obtained by crushing kernels of stored tung fruit are considerably lower.

ATOMIC ABSORPTION SPECTROPHOTOMETRIC DETERMINATION OF CALCIUM IN MODIFIED VEGETABLE OILS AND CALCIUM DRIERS. R. A. Foss and D. M. Houston. *Atomic Absorption Newsletter* 3(4), 82-4 (1969). A method is described for the determination of Ca in modified vegetable oils and in Ca driers by atomic absorption spectrophotometry using a standard air/acetylene burner. A 5% lanthanum soln. is added to the sample to reduce chemical interferences and the method of additions is employed to determine the Ca percentage. This method is reliable and reproducible for the determination of Ca in the range 25-40,000 p.p.m. (World Surface Coat. Abs. No. 334)

LINSEED OIL FOR THE PREVENTIVE MAINTENANCE OF CONCRETE. W. L. Kubie, L. E. Gast and J. C. Cowan. *Highway Research Record* 254, 61-7 (1968). Information is presented on the use of boiled linseed oil solutions and emulsions as anticaking compounds for concrete. When subjected to freeze-thaw cycles in the presence of salt, air-entrained concrete highways coated with linseed oil showed increased durability. Laboratory freeze-thaw tests in water and 2% brine were conducted on concrete beams coated with oil emulsions. Coated beams showed no loss in 42-day flexural strength over moist-cured controls, and when subjected to 300 freeze-thaw cycles in the presence of water and brine were from 4 to 6 times as durable as uncoated beams. Preliminary data indicate that linseed oil emulsions may serve as both curing and anticaking compounds. (World Surface Coat. Abs. No. 334)

• Detergents

STUDIES ON POLYGLYCEROL ESTERS. I. PREPARATION OF POLYGLYCEROL AND ITS ESTERS. M. R. Baichwal and J. K. Lalla. *Indian J. Tech.* 7, 161-3 (1969). The polymerization of glycerol in a non-oxidizing atmosphere (CO₂) using NaOH as catalyst, and the subsequent esterification of polyglycerol with

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