ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: R. Aguilar B., J. G. Endres, Kazuo Fukuzumi, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

THIN LAYER CHROMATOGRAPHY OF UNSATURATED FATS. IMPROVEMENT WITH SILVER NITRATE ON THE SEPARATION TECHNIQUE. R. Perron and M. Auffret (Lab. of Lipochem. of the C.N.R.S., Bellevue (S. and O.), Fr.). *Oleagineux* 20, 379 (1965). The authors have described a method to prepare silver nitrate-TLC plates which are stable for long periods, even in the light. The TLC plates using Silica Gel G are prepared in the normal manner but without silver nitrate. After the plates are cool, they are immersed into a saturated solution of silver nitrate in methanol. The saturated solution of silver nitrate is prepared by boiling for 20 minutes, 3 g of silver nitrate in 100 ml of anhydrous methanol. This solution is then cooled to 30C before use. Plates prepared in the above manner have only a small amount of silver nitrate adsorbed and therefore are much more stable than conventionally prepared plates. With the above plates the authors are able to obtain better and more complete separations of unsaturated fatty acids including *cis-trans* and *cis-cis* isomers.

IDENTIFICATION OF DEC-1-YNE IN THE INITIAL AUTOXIDATION PRODUCTS OF SOME VEGETABLE OILS. T. H. Smouse, B. D. Mookherjee and S. S. Chang (Rutgers). *Chem. Ind. (London)* 1965, 1301–3. Dec-1-yne was identified as a component of the volatile flavor compounds of a reverted soybean oil with a peroxide number of 4.3 meq/kg. It was estimated that this oil contained 10 p.p.m. of volatile decomposition products, of which approximately 10 p.p.b. was dec-1-yne. An off-flavored cottonseed oil with a peroxide value of 2.09 meq/kg contained 1.0 p.p.m. of volatile decomposition products of which 0.75 p.p.m. was characterized as dec-1-yne. A mechanism for the formation of dec-1-yne is proposed.

ALIPHATIC DIETHER ANALOGS OF GLYCERIDE-DERIVED LIPIDS. M. Kates, B. Palameta and L. S. Yengoyan (Division of Biosciences, National Research Council, Ottawa, Canada). *Biochemistry* 4, 1595–99 (1965). L-2,3-Di-O-dihydrophytyl glycerol was synthesized. The dialkyl glycerol derived from the lipids of *Halobacterium cutirubrum* was shown to be identical with it.

STABILITIES OF METAL COMPLEXES OF PHOSPHOLIPIDS: Ca(II), Mg(II), AND Ni(II) COMPLEXES OF PHOSPHATIDYLSERINE AND TRIPHOSPHOINOSITIDE. H. S. Hendrickson and J. G. Fullington (Western Regional Res. Lab., Agricultural Res. Service, Albany, Calif.). *Biochemistry* 4, 1599–1605 (1965). Stability constants for Ca(II), Mg(II), and Ni(II) complexes of phosphatidylserine, triphosphoinositide, O-phosphoserine, O-phosphoethanolamine, and glycerylphosphorylinositol diphosphate were determined by a pH titration method. The lipids were studied in aqueous micellar dispersions. Apparent stability constants (K^M ML and K^M MHL) for the intact lipids were 10 to 100 times greater than those for the deacylated models.

ADVANCES IN RESEARCH ON THE FLAVOR STABILITY OF EDIBLE SOYBEAN OIL -A REVIEW. J. C. Cowan (No. Utilization Res. and Dev. Div., Agri. Res. Ser., Peoria, Ill.). *Food Technol.* 19, 107–10 (1965). Important advances and recent studies on the flavor stability of soybean oil at the Northern Utilization Research and Development Division are reviewed. Among the factors discussed are the importance of metal impurities and their inactivation, the identity of the precursors of undesirable flavors, the need for protection from air and light, hydrogenation, hydrogenated winterized oil, the lowering of the tocopherol, and other minor components and the omission the bleaching step.

INFLUENCE OF NITROGENOUS FERTILIZERS ON THE FATTY ACID COMPOSITION OF RAPE SEED OILS. F. Bachmann. *Schweiz. Landw. Forsch.* 3, 67–71 (1964). Various N fertilizers were used on field-grown rape. Fatty acids in the seed oil were detected by gas chromatography with polyethylene glycol adipate as stationary phase. Oil content and composition were unchanged by any treatment. (Rev. Current Lit. Paint Allied Ind., No. 277).

SPLITTING OF INDIAN VEGETABLE OILS. III. USE OF CATION EXCHANGE RESIN IN TWITCHELL PROCESS. S. D. Thirumula Rao and C. D. Prakasa Rao. *Chem. Age (Bombay)* 14, 476 (1963). The cation exchange resin, Duolite C–20 (bead form, 16–50 mesh), after acid-regeneration has been found to be an efficient catalyst for Twitchell splitting of coconut oil. Reaction with 2–3% of the acid-regenerated resin results in an 80–90% split in about 12 hr. The fatty acids obtained by using the resin are much lighter in color than those obtained when H_2SO_4 is used. Once-used resin can be recovered and reused after regeneration. (Rev. Current Lit. Paint Allied Ind., No. 277).

SUNFLOWER CULTIVATION AND INDUSTRY. I. Mizuno and A. H. Guerrero. *Informaciones Argentinas sobre Grasas y Aceites* 2, 18–31 (1965). First part of a detailed description of the origins of the sunflower industry in Argentina, the varieties cultivated, seed and oil production statistics, cultivation practice and manufacturing procedures.

ACTION OF ELECTRICITY IN FATS. F. Blasi. *Lipidos* 25, 6–8 (1965). Fat materials are characterized by a high dielectric constant which can be used as a measure of its purity. Experimentally it can be shown that, if an oil is subjected to the action of silent electrical discharges at high voltage (of several thousand volts), an increase in viscosity occurs. These and other actions are discussed.

SIMULTANEOUS DEACIDIFICATION AND DEODORIZATION OF FATS AND OILS. I. A. Millet M. *Lipidos* 25, 4–6 (1965). A quick distillation at adequate temperature and high vacuum and with live steam removes the undesirable acid substances as well as odorous and flavorful materials present in fats and oils. The height of the oil column must be considered since the oil at the bottom suffers an absolute pressure equal to the sum of the residual pressure plus the "oleostatic" pressure of the oil column, therefore, a distilling apparatus working on a thin layer of oil accelerates the elimination of the free fatty acids and odorous materials.

A STUDY OF THE CHEMICAL PROPERTIES OF LARD. A. V. Romero (Inst. de la Grasa y sus Derivados, Sevilla, Spain). *Grasas y Aceites* 16, 61–64 (1965). The physical and chemical characteristics of Iberian hog lard were determined by four different techniques. Results showed a lower iodine value but a higher melting point than American and other European lards. The presence of linoleic acid could not be positively established.

PHYSICAL-CHEMICAL STUDIES ON GROUND OLIVE PASTES XXII. THE INFLUENCE OF SURFACE-ACTIVE AGENTS ON THE PASTES. J. M. M. Moreno, C. G. Herrera, C. J. del Valle and L. Sant Pont (Inst. de la Grasa y sus Derivados, Sevilla, Spain). *Grasas y Aceites* 16, 55–60 (1965). The total oil yield from ground olive pastes is increased when surface active agents are added. The improvement in yield is caused by an increase in the filtration surface of the pastes during the pressing process and by the rupture of lipoproteic complexes. This improvement, however, can also be obtained by mechanical means (proper milling).

RECENT THEORIES OF THE MECHANISM OF FAT OXIDATION AND THE EFFECT OF THE ANTIOXIDANTS. St. Ivanov. *Baza za Tekh. Razvitiye pri dso, Tsent'r za Nauch.-Tekh. Informatsiya, Informatsionen Byull.* 1 (1), 3–9 (1965). A general review of the well-known concepts of fat oxidation is presented. Chemical equations are provided to show the formation of hydroperoxides. Graphs illustrate the effect of antioxidants on fat oxidation.

THE FATTY ACID COMPOSITION OF SOME HERRING AND WHITING OILS. A. Jart and V. Bitsch (The Technical Univ., Copenhagen, Denmark). *Oleagineux* 20, 447 (1965). The fatty acid composition of three samples of technical herring oil *(Clupea harengus)* and two samples of technical whiting oil *(Gadus merlangus)* have been determined by gas chromatography. Both polar and nonpolar stationary phases were used. Of the polar phases, poly(ethylene glycol succinate) was found especially satisfactory. Values for twenty components are given. The oleic acid content is greater in the whiting oils than in the herring oils, however, the docosenoic acid content is greater in

herring oils. The concentration of the other fatty acids are about the same for the two fish oils.

THE OCCURRENCE OF BRANCHED CHAIN METHYL ESTERS IN HUMAN BLOOD. G. Grimmer and J. Jacob (Inst. for Organic Chem., Univ. of Hamburg, Ger.). *Biochem. Z.* 341, 315 (1965). 15-Methyl hexadecanoic acid and 13-methyl tetradecanoic acid have been isolated from human blood. The isolated compounds have been compared with authentic products obtained by chemical synthesis. Some other homologous fatty acids with methyl substituents at the end (12-methyl tridecanoic acid and 14-methyl pentadecanoic acid) have been identified by gas-chromatographic comparison with authentic substances. A synthetic method is described for the preparation of 15-methyl hexadecanoic acid, 13-methyl tetradecanoic acid, 15-methyl *cis*-hexadec-12-enoic acid, and 15-methyl *trans*-hexadec-12-enoic acid.

THE GREY (ATLANTIC) SEAL; FATTY ACID COMPOSITION OF THE BLUBBER FROM A LACTATING FEMALE. R. G. Ackman and P. M. Jangaard (Fisheries Res. Board of Canada, Halifax, Nova Scotia). *Can. J. Biochem.* 43, 251 (1965). The fatty acid composition of the blubber from a lactating female seal has been examined in detail. Comparisons with the fatty acid composition of a milk sample and with generally observed blubber fatty acid compositions in other species suggest selective utilization of particular depot fat fatty acids during the nursing period.

FATTY ACIDS IN *Drosophila melanogaster*. I. THE QUANTITATIVE ANALYSIS OF UNSATURATED FATTY ACIDS IN *Drosophila melanogaster*. M. Kato (Zoological Inst., Kyoto Univ., Kyoto, Japan). *Can. J. Biochem.* 43, 485 (1965). The pupil lipids of *Drosophila melanogaster* were mercurated and the unsaturated fatty acids were separated by reverse-phase paper chromatography. Comparative quantitative analyses were made by means of densitometry and by comparison of extinction coefficients of absorption. In all the strains tested, the following acids were commonly found: oleic, palmitoleic, myristoleic, lauroleic, linolenic, linoleic, and arachidonic acids. Within a particular strain, the content of oleic and palmitoleic acids varied with that of linoleic and linolenic acids, respectively. Based on the contents of these unsaturated fatty acids, the strains can be sorted into three groups: group A, the wild types (*Tokyo, Oregon, Oregon-RS, Saikyo,* and *Canton-S*); group B, *vermilion* (v), *cinnabar* (cn), *scarlet* (st), *clot* (cl), *sepia* (se), and *brown* (bw); and group C, *white* (w), along with the compounds v;bw, cn;bw, and bw;st, all of which represent different genetic blocks to eye pigment formation.

ANALYSIS OF SOME ORGANIC ACIDS BY GAS-LIQUID CHROMATOGRAPHY. D. T. Canvin (Dept. Plant Sci., Univ. of Manitoba, Winnipeg, Manitoba, Canada). *Can. J. Biochem.* 43, 1281 (1965). Reoplex 400 coated Chromosorb W (10% w/w on Chromosorb W, 60–80 mesh) columns (15 inches x ¼ inch) were used with an Aerograph A-90-P2 gas chromatograph. Complete separations and symmetrical peaks of the methyl esters of lactic, glycollic, oxalic, malonic, succinic, malic, aconitic, tartaric, citric, isocitric and fumaric acids and isocitric acid lactone were obtained by programming the temperature at 4C/minute from 55C to 175C. Single acids could easily be assayed by isothermal operation. A linear relationship was obtained between the areas recorded and the quantities of acid injected. There was no consistent relationship between molecular species and response, so that the instrument was calibrated for each individual acid. The analyses of some plant materials for organic acids are presented.

EFFLUENT PROBLEMS IN AN EDIBLE OIL REFINERY AND MARGARINE FACTORY. R. J. Cunningham (Van denBerghs & Jurgens Ltd., Purfleet, Essex). *Chem. Ind. (London)* 1965, 1481–4. All of the effluents contain fat which separates fairly easily from the water during passage through the separators. The residual pollution is due to soluble organic matter, including fat, and fatty emulsions stabilized by the mucilage and protein matter. The effluent system treatment consists of (1) segregation of polluted effluents and the installation of improved fat separators adjacent to each source of effluent; (2) clarification of polluted effluents by sedimentation aided by flocculating agents; and (3) biological treatment through percolating filters. The clarification plant reduces the B.O.D. of the effluent by approximately 50% to an average of 400–500 p.p.m. The level of fatty matter is reduced by approximately 85% and suspended solids are now approximately 100 p.p.m. The B.O.D. of the non-polluted effluent is usually around 20–30 p.p.m.

PROCESS FOR RENDERING FATTY MATERIALS. J. E. Thompson. *U.S. 3,199,987.* A process for the simultaneous rendering of animal fat containing tissue and oil bearing seeds comprises: adding ground oil bearing seeds to unrendered fat and rendering the mixture by heat to yield easily separate dry rendered tankage and a mixed shortening stock containing from 1 to 8% oil, and separating the dry rendered tankage from the mixed shortening stock.

SELECTIVE HYDROGENATION OF FATTY OILS. M. Zajcew (Engelhard Industries, Inc.) *U.S. 3,198,816.* A method for hydrogenating unsaturated fatty oils comprises treating the oil with hydrogen at a temperature in the range of 40–200C and a pressure in the range of atmospheric to about 1000 p.s.i. in the presence of a catalyst. The catalyst consists of a solid support having deposited on it palladium metal and a modifying material selected from the group consisting of (a) bismuth subacetate, bismuth acetate, $BiCl_3$ and BiOCl, and (b) mixture of a compound of group (a) and silver, and (c) mixtures of a compound of group (a) and a silver compound consisting of silver acetate, sulfate, and nitrate. The palladium metal is present in the range of .001 to 10% by weight and the modifying material .005 to 10% by weight on the weight of the oil, being in the range of about 0.00005 to 0.1%.

SELECTIVE HYDROGENATION OF MALVALIC AND STERCULIC ACIDS IN COTTONSEED OIL. D. R. Merker and K. F. Mattil (Swift & Co.). *U.S. 3,201,431.* Cottonseed oil is hydrogenated between 200–300C in the presence of a minor amount of a hydrogenating catalyst by agitating in a hydrogen atmosphere at subatmospheric pressures. The reaction is stopped when the oil does not react to the Halphen test and before there is any appreciable saturation of the linoleic acid radicals in the oil. A catalyst regulator selected from the group consisting of ammonia and ammonium hydroxide may also be included.

• Biochemistry and Nutrition

ENDOGENOUS LIPID COMPOSITION OF THE INTESTINAL LYMPH OF RATS RAISED ON FAT-FREE, LARD OR CORN OIL DIETS. B. Verdino, M. L. Blank and O. S. Privett (The Hormel Inst., Univ. of Minnesota, Austin, Minn.). *J. Lipid Res.* 6, 356–62 (1965). Studies are reported on the structure of triglycerides from the intestinal lymph of fasted rats grown from weaning to 4 months of age on a fat-free diet or on diets containing lard or corn oil. Experiments are also reported on the incorporation of dietary palmitic-1-C^{14}, oleic-1-C^{14}, and linolenic acids and of tripentadecanoin into the triglycerides of the intestinal lymph of animals in the above groups. These studies show that the distribution of the fatty acids among the triglycerides synthesized in the intestinal mucosa does not conform to a random pattern. The composition of endogenous lipid (determined by the prolonged feeding period) was found to influence both the relative extent of incorporation of fatty acids into triglycerides or phospholipids, and also the resynthesis of different fatty acids into triglycerides. Linoleic acid was predominantly in the β-position of triglycerides of which it was a constituent, and palmitic acid was predominantly in the β-position in triglycerides containing fatty acids other than linoleic acid.

KINETICS OF LINOLEIC AND ARACHIDONIC ACID INCORPORATION AND EICOSATRIENOIC DEPLETION IN THE LIPIDS OF FAT-DEFICIENT RATS FED METHYL LINOLEATE AND ARACHIDONATE. R. R. Brener and A. M. Nervi (Catedra de Bioquimica, Instituto de Fisiologia, Facultad de Ciencias Medicas, Universidad Nacional de La Plata, La Plata, Argentina). *J. Lipid Res.* 6, 363–68 (1965). Changes induced by dietary methyl linoleate and arachidonate in the fatty acid composition of liver phosphatidyl choline, phosphatidyl ethanolamine, cholesterol esters, and triglycerides were investigated in essential fatty acid-deficient rats. The esters were fed for 0, 24, 50, 96, 192, and 360 hr. The lipids were fractionated by thin-layer chromatography and the fatty acid composition was estimated by gas-liquid chromatography. Acids bound to the α'- and β- carbons of phosphatides were separated by lipolysis with phospholipase A. From the compositions found it was deduced that both dietary linoleate and arachidonate inhibited eicosatrienoate synthesis from oleate but that only arachidonate replaced eicosatrienoate quantitatively in the β-position of lecithin and cephalin. Both dietary acids displaced some of the β-positioned oleate. Monoenoic: saturated acid ratios were also decreased by both esters both in triglycerides and in α'-bound acids in phosphatides. In triglycerides this change preceded any significant incorporation of linoleate or arachidonate. Arachidonate effects seemed to be more rapid and more marked than those of linoleate and although final compositions were similar, because of the conversion of linoleate into arachidonate, a different pattern of reactions led to these results.

EFFECTS OF α-P-CHLOROPHENOXYISOBUTYRYL ETHYL ESTER (CPIB) WITH AND WITHOUT ANDROSTERONE ON CHOLESTEROL BIOSYNTHESIS IN RAT LIVER. D. R. Avoy, E. A. Swyryd and R. G. Gould (Dept. of Med., Stanford Univ. School of Med., Palo Alto, Calif.). *J. Lipid Res.* 6, 369–76 (1965). α-p-Chlorophenoxyisobutyrate (CPIB) or a mixture of CPIB with a small amount of androsterone (Atromid) fed to rats at a level of 0.3% of the diet was found to increase the liver weight by about 25% and to decrease the cholesterol concentration in liver by about 10% and in plasma by about 30%. No change in rate of growth or of food consumption was observed. The rate of cholesterol biosynthesis per gram of liver, estimated from the incorporation of acetate-1-C^{14}, was decreased by about 70% in liver slices from rats fed CPIB or Atromid. Conversion of mevalonate-2-C^{14} into cholesterol was decreased only slightly. No decrease in the formation of ketone bodies from acetate-1-C^{14} in liver slices was found to result from CPIB, nor in the synthesis of triglyceride from acetate-1-C^{14}, indicating that the site of the inhibitory action of the drug is between acetyl CoA and mevalonate. CPIB is similar to dietary cholesterol in that it is not inhibitory when added to liver homogenates at concentrations up to about 10^{-3}M. In intact rats, both CPIB and Atromid significantly decreased the rate of cholesterol synthesis per gram of liver, as measured by the incorporation of acetate-1-C^{14} or of tritium water, but the effect was not as large as in liver slice studies. No decrease was noted in cholesterol synthesis in intestine. The decrease in acetate-C^{14} incorporation in liver cholesterol per 100g of rat body weight was estimated to be about 65% by the liver slice method and about 38% in intact animals; tritium water incorporation gave a mean decrease of 22%. The differences were significant for acetate incorporation but at the borderline for tritium water.

QUANTITATIVE ISOLATION AND GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF TOTAL FECAL BILE ACIDS. S. M. Grundy, E. H. Ahrens, Jr. and T. A. Miettinen (The Rockefeller Inst., New York, N.Y.). *J. Lipid Res.* 6, 397–410 (1965). A method for isolation and quantification of fecal bile acids is described which allows sterol balance studies to be made in man or in small laboratory animals without requiring the use of radioisotopes *in vivo*. Bile acids are purified by column and thin-layer chromatography, converted to the trimethylsilyl ethers of their methyl esters, and quantified by GLC with detection by hydrogen flame ionization. Recoveries are complete when internal standard corerctions are applied, with an error $< \pm 3\%$. The claim that the final fecal bile acid fraction accounts for all the bile acids and nothing but bile acids is validated in several ways. The sensitivity is such that fecal aliquots containing as little as 50μg of mixed bile acids can be analyzed accurately, but the procedure lends itself well to preparative scale work for more definitive study of individual bile acids. After oral administration of cholic-24-C^{14} and chenodeoxy-cholic-24C^{14} acids to one patient, 98% of the administered radioactivity was excreted in the bile acid fraction of the fecal extracts over a period of 38 days, and 2% in the urine. This experiment indicated the stability of bile acid structure during intestinal transit and provided additional evidence for the completeness of the described method of determining fecal bile acids.

QUANTITATIVE ISOLATION AND GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF TOTAL DIETARY AND FECAL NEUTRAL STEROIDS. T. A. Meittinen, E. H. Ahrens, Jr. and S. M. Grundy. *Ibid.*, 411–24. A method for isolation and quantification of fecal neutral steroids is described. The critical separations of cholesterol plant

sterols and their conversion products depend upon preliminary separations into three subfractions by thin-layer chromatography. Individual components in the three subfractions thus obtained are then quantitatively measured by gas-liquid chromatography of the unsubstituted 3-ketosteroids and of the trimethylsilyl ethers of the sterols. Extractions of cholesterol-7-α-H^3 added *in vitro* and of C^{14}-labeled neutral steroids synthesized *in vivo* were quantitative and highly reproducible. Several lines of evidence validate the determination of individual fecal neutral steroids by GLC. Examples are given of the application of this technique: a sterol balance study of 27 days' duration is described in a patient whose diet included plant sterols as well as cholesterol. Representative results in man and in rats are compared to others obtained by previously described methods. The sensitivity of the method is such that 1-g fecal aliquots containing as little as 25 μg of mixed neutral steroids can be analyzed accurately, but the procedure lends itself well to preparative scale work for more definitive study of individual neutral steroids.

TISSUE DISTRIBUTION AND METABOLISM OF NEWLY ABSORBED VITAMIN A IN THE RAT. D. S. Goodman, Helen Huang and T. Shiratori (Dept. of Med., Columbia Univ. College of Physicians and Surgeons, New York York, N.Y.). *J. Lipid Res.* 6, 390–96 (1965). Chylomicrons containing newly absorbed, labeled vitamin A were injected intravenously into normal intact rats, and the tissue distribution of radioactivity was observed for several days. Chylomicrons were used so that the vitamin could be administered physiologically, in the form in which it is normally absorbed. The total recovery of lipid-soluble radioactivity in the entire animal varied from 92% after 17 min to 63% after 24 hr to 56% after 6 days. At all times approximately two-thirds of the recovered radioactivity was found in the liver. Substantial amounts of radioactivity were also found in the kidneys and in the total depot fat, and small but significant amounts of labeled vitamin A were found in the plasma, small intestine, lungs and adrenals. After 8 hr, labeled retinyl esters predominated in all tissues except plasma, with small amounts of labeled retinol also being present. Quantitatively significant amounts of labeled retinal or retinoic acid were not observed. The composition of labeled retinyl esters was remarkable in showing a consistent predominance of saturated esters in all tissues. Marked differences were, however, seen in the relative amounts of labeled retinyl palmitate and stearate in different tissues. During the first 24 hr 3.7% of the injected radioactivity was excreted as expired CO_2, 3.5% was excreted as water-soluble compounds in the urine and 8.7% was excreted in the bile. The biliary metabolites apparently consisted of a heterogeneous mixture of polar compounds, some of which were present as glucuronic acid conjugates.

RADIOHOMOGENEITY OF H^3- AND C^{14}-LABELED LINOLEIC ACID IN VIVO. D. Sgoutas, M. J. Kim and F. A. Kummerow (The Burnsides Res. Lab., Univ. of Illinois, Urbana, Ill.). *J. Lipid Res.* 6, 383–89 (1965). A mixture of linoleic acid-1-C^{14} and linoleic acid labeled with H^3 in the chain was administered to rats, and the H^3/C^{14} ratio in the linoleic acid recovered from liver and adipose tissue of the rat was compared with that in the administered mixture. Agreement in the H^3/C^{14} ratios was taken as evidence that the H^3-labeled linoleic acid was biologically indistinguishable from the C^{14}-labeled. These findings establish the *in vivo* stability of the H^3 label in the fatty acid chain and the inability of the rat to discriminate between fatty acids labeled with H^3 in the side chain and with C^{14} in the carboxyl group.

INTRAMOLECULAR PATTERNS OF FATTY ACID INCORPORATION INTO TRIGLYCERIDES BY RAT INTESTINAL MUCOSA. I. A. Hansen (Univ. of Western Australia). *Arch. Biochem. Biophys.* 111, 238–9 (1965). Oleate is preferentially incorporated into the β position and stearate into the α position. Palmitate is approximately randomly distributed.

HEPATIC LIPIDS IN TUMOR-BEARING (GLIOMA) MICE. A. A. Stein, E. Opalka and I. Rosenblum (Dept. of Pathol., Albany Med. Col., Albany, N.Y.). *Cancer Res.* 25, 957–61 (1965). Tumor-bearing (glioma) mice have hepatomegaly. Although the neoplasm remains localized, it influences hepatic triglyceride metabolism. In glioma-bearing mice, there is a quantitative decrease in the rate of incorporation of the non-esterified fatty acids into triglycerides. The mechanism of tumor influence on host lipid metabolism is discussed.

TERPENE METABOLISM IN THE RAT TESTIS. R. A. Salokangas, H. C. Rilling, and L. T. Samuels (Utah College of Med., Salt Lake City, Utah). *Biochemistry* 4, 1606–11 (1965). Mevalonic acid has been found to be rapidly converted to 5-phosphomevalonic acid by 700 x g supernatants of rat testicular homogenates. No appreciable amounts of other metabolites of mevalonic acid are formed by this preparation. In contrast, a 110,000 x g supernatant from similar homogenates readily converts mevalonic acid to 5-pyrophosphomevalonic acid, isopentenyl pyrophosphate, and the allylpyrophosphates. If the 700 x g supernatant is then added the further conversion to squalene and sterols takes place. It is postulated that the rapid destruction of adenosine triphosphate by a microsomal adenosine triphosphatase is responsible for the inability of the 700 x g supernatant to further metabolize 5-phosphomevalonic acid. Intact testicular interstitial cells appear to be relatively impermeable to mevalonic acid.

THE LIPIDS OF RUVETTUS PRETIOSUS MUSCLE AND LIVER. J. C. Nevenzel, W. Rodegker and J. F. Mead (Lab. of Nuclear Med. and Radiation Biology, Dept. of Biophysics and Nuclear Med., School of Med., Center for the Health Sciences, Univ. of Calif., Los Angeles, Calif.). *Biochemistry* 4, 1589–95 (1965). The muscle of the gempylid fish, *Ruvettus pretiosus*, contains 14.7% (wet wt.) of lipid, which is predominantly wax esters of 34 and 36 carbon atoms with one and two double bonds. The liver lipids contain only about 2% wax esters. Contrary to a previous report, the muscle lipid does not contain hydroxy fatty acids. Gas-liquid chromatographic analyses are reported for the fatty acids of several lipid fractions, including the muscle wax esters, for the long-chain alcohols of the muscle wax esters, and for the unhydrolyzed wax esters.

INCREASED NUTRITIVE REQUIREMENTS FOR CHICKS TO PREVENT EXUDATION AND DYSTROPHY DUE TO DIETARY LONG-CHAIN POLYUNSATURATES. D. Miller, K. C. Leong, G. M. Knobl, Jr. and E. H. Gruger, Jr. (Bur. of Com. Fisheries Tech. Lab., College Park, Md.). *Poultry Sci.* 44, 1072–79 (1965). A concentrate of molecularly distilled ethyl esters of polyunsaturated fatty acids (two-thirds of which had 20 or 22 carbons and four, five, or six double bonds) was studied for nutritional stress in chicks at dietary levels of 0, 1, 2, 4, and 5%. The basal diet contained 0.9% sulfur amino acids, 44 ppm dl-α-tocopherol acetate, 167 ppm ethoxyquin, and approximately 0.3 ppm Se from soybean meal in the diet. In addition to these protectants, various levels of dl-α-tocopherol acetate, Se, and ethoxyquin were fed to determine efficacy of each in preventing the stress induced as indicated by the abnormalities of exudative diathesis, muscular dystrophy, and growth depression. Two-thirds of the chicks fed the 4% level of polyunsaturates developed exudative diathesis but not severely enough to affect growth. The stress was completely overcome by increasing the Se content approximately to 0.4 ppm or the dl-α-tocopherol acetate to 220 ppm in the diet in the presence of other protectants. Ethoxyquin at 1500 ppm almost completely prevented the symptoms.

THE EFFECT OF ESTRADIOL AND HYDROCORTISONE ON ATHEROSCLEROSIS IN COCKERELS. M. R. Malinow, R. Depaoli, C. A. Maruffo, J. Stevens, I. Szijan and S. J. Kaplan (Inst. of Cardiology, Fundacion Hermenegilda Pombo de Rodriguez, National Academy of Med., Buenos Aires, Argentina). *J. Atheroscler. Res.* 5, 403–06 (1965). The effects of the implantation of pellets of estradiol or hydrocortisone were studied in 3–4 month-old New Hampshire Red cockerels maintained on regular mash for 11 months. Minimal sudanophilia and moderate fibrosis were present in the aorta and some degree of coronary atherosclerosis was also observed. Estradiol increased sudanophilia in the aorta but was without effect on aortic fibrosis or on the spontaneous coronary lesions. Hydrocortisone did not modify aortic fibrosis or coronary atherosclerosis; sudanophilia in the abdominal aorta was increased. The possible significance of these findings is discussed.

METABOLISM OF 9-KETODEC-2-ENOIC ACID BY WORKER HONEYBEES *(Apis mellifera L.)*. Norah Johnston, J. H. Law and N. Weaver (James B. Conant Lab. of Chem., Harvard Univ., Cambridge, Mass.). *Biochemistry* 4, 1615–20 (1965). 9-Keto-*trans*-dec-2-enoic acid, a compound which has a specific physiological role in the inhibition of queen-rearing behavior in worker honeybees, was prepared in radioactive form and fed to worker bees. The

major metabolites were found in the gut or whole abdomen. These were identified as 9-ketodecanoic acid, 9-hydroxydecanoic acid, and 9-hydroxydec-2-enoic acid. The conversion into these compounds was sufficiently rapid to account for the manifestation of queenless behavior in worker bees which have been separated from the queen for short periods of time.

FACTORS INFLUENCING MILK FAT DEPRESSION ON RATIONS HIGH IN CONCENTRATES. N. A. Jorgensen, L. H. Schultz and G. R. Barr (Dept. of Dairy Sci., Univ. of Wisc., Madison). *J. Dairy Sci.* **48**, 1031–39 (1965). Three continuous feeding trials involving a total of 36 cows were used to study milk fat depression on high-concentrate diets composed primarily of pelleted corn. Physiological changes that consistently accompanied a depression in milk fat percentage included: 1) a reduction in rumen acetic acid; 2) increases in rumen propionic and valeric acids; 3) a decrease in blood lipids; 4) a decrease in blood ketone bodies; 5) an increase in blood glucose levels; 6) increased body weight gains; 7) reduced milk production; 8) decreases in the short-chain as well as the palmitic and stearic acid components of the milk fat. The following alterations in the pelleted corn ration resulted in some degree of improvement in milk fat percentage: 1) substitution of pelleted oats or herd mix; 2) feeding thyroprotein; 3) adding 3% urea; 4) administration of butyric acid. Unsuccessful alterations included: 1) addition of 25% soybean oil meal; 2) feeding five times daily; 3) addition of 5% lard; 4) administration of sodium acetate. The results support the concept that the major factors depressing milk fat test on high-concentrate diets involve a high level of glucogenic metabolites that reduce blood ketone and lipid levels and tend to stimulate a fattening type of metabolism at the expense of milk fat synthesis.

BIOSYNTHESIS OF WAX IN BRASSICA OLERACEA. P. E. Kolattukudy (Conn. Agr. Experiment Station, New Haven, Conn.). *Biochemistry* **4**, 1844–55 (1965). The waxes deposited on the surface of leaves of several varieties of *Brassica oleracea* (cabbage, broccoli, and cauliflower) were found to be similar in chemical composition. Leaves that were rapidly growing assimilated acetate-C-14 into the wax most rapidly. Both carbons of acetate were incorporated into the various components of the wax at equal rates. Chemical degradation of the 15-nonacosanone of the surface wax showed that the carbonyl carbon originated predominantly from the methyl carbon of acetate and not from the carboxyl carbon. Other short-chain fatty acids such as pentanoate and hexanoate contributed carbon to the wax almost as efficiently as acetate.

BIOSYNTHESIS OF VITAMIN A WITH RAT INTESTINAL ENZYMES. D. S. Goodman and Helen Huang (Columbia Univ., College of Physicians and Surgeons, New York, N.Y.). *Science* **149**, 879–80 (1965). Vitamin A is synthesized from β-carotene in cell-free homogenates of rat intestinal mucosa, the biosynthetic enzymatic activity being present in the soluble protein fraction of the homogenate. Also required are a heat-stable factor in the particulate fraction, molecular oxygen, and bile salts. The reaction is stimulated by glutathione. The product, obtained in yields of up to 50%, has been identified as vitamin A aldehyde (retinal) by way of its semicarbazone derivative. The reaction mechanism involves the central cleavage of β-carotene into two molecules of retinal.

SPECIFIC GROWTH OF A SOIL MICROORGANISM ON THE NATURAL ISOMER OF α TOCOPHEROL. C. T. Goodhue (Eastman Kodak Co., Rochester, N.Y.). *Biochemistry* **4**, 1822–24 (1965). A microorganism with the ability to metabolize d-α-tocopheryl acetate has been isolated from soil. This organism grows selectively on d-α-tocopheryl acetate in the presence of various other optical isomers of d-α-tocopheryl acetate. A growth test based on this property was developed in which the following mean responses were observed: d-α-tocopheryl acetate, 100%; 2d-α-tocopheryl acetate, 48%; racemic α-tocopheryl acetate, 28%; l-α-tocopheryl acetate 3.0%.

EFFECT OF UNSATURATED FATS UPON LIPEMIA AND CONJUCTIVAL CIRCULATION. M. Friedman, S. O. Byers and R. H. Rosenman (Harold Brunn Inst., Mt. Zion Hosp. and Med. Center, San Fran., Calif.). *J. Am. Med. Assoc.* **193**, 882–86 (1965). Preprandial and postprandial serum lipids after meals of saturated or unsaturated fat were measured in 44 men, and blood sludging in 20 men, half of whom showed a behavior pattern (A) associated with proneness to clinical coronary artery disease. The average plasma cholesterol and both fasting and postprandial triglyceride values were higher ($P < 0.001$) in men showing pattern A, regardless of whether a saturated or unsaturated fat was given. Seven of ten men with pattern A showed severe sludging after a meal of saturated fat, five of these seven also showed sludging after a meal of unsaturated fat. Sludging was virtually absent in the noncoronary-prone group. It was concluded that substitution of an unsaturated fat for a saturated fat carries no benefit under the circumstances tested.

EFFECT OF GROWTH HORMONE AND DEXAMETHASONE ON LIPOLYSIS AND METABOLISM IN ISOLATED FAT CELLS OF THE RAT. J. N. Fain, V. P. Kovacev and R. O. Scow (Nat. Inst. of Arthritis and Metabolic Diseases, N.I.H., U.S. Public Health Service, Bethesda, Md.). *J. Biol. Chem.* **240**, 3522–29 (1965). The effect of hormones on fatty acid release was studied in fat cells isolated from adipose tissue of fasted normal rats. Bovine growth hormone and dexamethasone, added separately, had very little effect on fatty acid release in fat cells from fasted normal rats. The hormones added together, however, markedly increased fatty acid release. In the presence of dexamethasone, 0.016 μg per ml, the concentration of bovine growth hormone needed to accelerate fatty acid release was 0.001 to 0.01 μg per ml; a maximal effect was seen with growth hormone at 0.1 μg per ml. Similar effects were obtained when either human, simian, or porcine growth hormone was used in place of bovine growth hormone. The evidence presented suggests that the lipolytic action of growth hormone and dexamethasone is secondary to an effect of the hormones on ribonucleic acid synthesis.

FAILURE OF EPOXY AND HYDROXY FATTY ACIDS TO CAUSE EGG DISCOLORATION WHEN FED TO LAYING HENS. R. J. Evans, Selma Bandemer and J. A. Davidson (Dept. of Biochem. and Poultry Sci., Mich. State Univ., E. Lansing, Mich.). *Poultry Sci.* **44**, 1097–99 (1965). The fraction of crude cottonseed oil fatty acids that did not form a urea adduct was prepared as described by Evans *et al.* (1962). This fraction contained hydroxy and epoxy fatty acids, identified by thin-layer chromatography, and 20% of a fatty acid with a gas-liquid chromatographic peak between vernolic acid and hydroxyoleic acid. Eggs from hens fed *Vernonia anthelmintica* seeds (vernolic acid), castor oil (ricinoleic acid), hydroxyoleic acid, hydroxystearic acid, or dihydroxystearic acid did not discolor on storage, but eggs from hens fed crude cottonseed oil (malvalic acid) or *Sterculia foetida* seeds (sterculic acid) developed pink-whites on storage. Therefore, epoxy fatty acids as represented by vernolic acid or hydroxy acids represented by hydroxystearic, dihydroxystearic, hydroxyoleic, and ricinoleic acids are not the fatty acids of the Halphen-negative, urea soluble fraction of cottonseed fatty acids that cause pink-white discoloration in stored shell eggs produced by hens fed the fraction.

THE MACROPHAGE SYSTEM, LIPID METABOLISM AND ATHEROSCLEROSIS. A. J. Day (Dept. of Human Physiology and Pharmacology, Univ. of Adelaide, Australia). *J. Atheroscler. Res.* **4**, 117–30 (1964). The deposition of lipid in the arterial wall in atherosclerosis may occur as a result of infiltration from the blood with deposition of serum lipid in the subintimal space. There is now evidence, however, that such filtered lipid can be metabolized in the arterial wall and that some lipid arises by synthesis in the wall itself. The possible part played by arterial macrophages in each of these processes has been considered and the evidence indicating that macrophages may play some role in each of these mechanisms has been reviewed. Macrophages can be shown to take up various forms of lipid and metabolic changes can be brought about following the uptake of lipid by macrophages. These cells have also been shown to synthesise lipid. Macrophages may also affect lipid deposition by transporting it through the endothelial wall after taking it up at some distant site.

SERUM LIPIDS OF MEN FED DIETS DIFFERING IN PROTEIN QUALITY AND LINOLEIC ACID CONTENT. Ada Campbell, Marian Swendseid, W. H. Griffith and S. G. Tuttle (School of Public Health, Univ. of Calif. and the Veterans Administration Center, Los Angeles, Calif.). *Am. J. Clin. Nutr.* **17**, 83–7 (1965). When wheat gluten was substituted for a casein-lactalbumin mixture as the chief source of nitrogen in an experimental diet, less nitrogen was retained in four of five subjects tested. With six subjects studied and under the experimental conditions em-

ployed, this treatment had no significant effect on the serum content of total lipids, sterol esters, glycerides, phospholipids or unesterified fatty acids. This situation pertained whether the diet contained 12% linoleic acid or 40% linoleate as fat. However, serum cholesterol levels were lower and the per cent of linoleate in the sterol ester, glyceride and phospholipid serum fractions was increased when the subjects were fed diets containing the larger amount of the polyunsaturated fatty acid with either type of protein.

MYOCARDIAL INFARCTION IN RABBITS INDUCED SOLELY BY A HYFERCHOLESTEROLEMIC DIET. H. Buchwald (Dept. of Surgery, Univ. of Minnesota, Minneapolis, Minn.). *J. Atheroscler. Res.* **5**, 407–19 (1965). The induction of true myocardial infarctions in rabbits by means of a 2% cholesterol diet maintained for four months is described. Forty per cent of the 30 animals that were started on the diet and 50% of the 22 animals that survived the full four months had myocardial infarcts. The lesions were caused by atheromatous plaques narrowing and occluding the coronary arteries; coronary thrombosis was not seen. The predominant rise in the whole blood cholesterol occurred prior to two months on the hypercholesterolemic diet. A correlation between the occurrence of myocardial infarcts and the final blood cholesterol level of the individual hypercholesterolemic rabbits was not demonstrated.

FATTY-TISSUE CHANGES IN RATS WITH ACCLIMATIZATION TO ALTITUDE. C. M. Blatteis and L. O. Lutherer (Div. of Med. Sciences, Army Res. Inst. of Environmental Med., Natick, Mass.). *Science* **149**, 1383–85 (1965). Adipose tissue in the adult white rat changes in both quantity and histologic characteristics during a 5-week period of acclimatization to a stimulated altitude of 4350 meters at 26C. These findings are descriptive and do not at present permit conclusions as to the mechanisms involved.

SYNTHESIS OF BUTYRIC AND OTHER SHORT-CHAIN ACIDS BY A PARTIALLY PURIFIED ENZYME PREPARATION. M. E. Becker and Soma Kumar (Marymount Manhattan College, N.Y., N.Y.). *Biochemistry* **4**, 1839–43 (1965). The fatty acid synthetase from lactating goat mammary supernatant was partially purified. Fatty acid synthesis by this enzyme preparation, in contrast to cruder preparations, was totally dependent upon the presence of malonyl coenzyme A and reduced nicotinamide-adenine dinucleotide phosphate. In the spectrophotometric assay the requirement for acetyl-CoA could not be observed, although tracer experiments showed the incorporation of acetyl-CoA and malonyl-CoA into butyric, hexanoic, octanoic, and longer-chain acids by a pathway similar to the one described for the synthesis of palmitic acid in other systems.

BIOSYNTHESIS OF PROSTAGLANDINS FROM ARACHIDONIC ACID IN GUINEA PIG LUNG. E. Anggard and B. Samuelsson (Dept. of Chem., Karolinska Inst. Stockholm 60, Sweden). *J. Biol. Chem.* **240**, 3518 21 (1965). Homogenates of guinea pig lung transformed tritium-labeled arachidonic acid into prostaglandin F_2, prostaglandin $E_{2\alpha}$, 11α,15-dihydroxy-9-ketoprost-5-enoic acid and 11α-hydroxy-9,15-diketoprost-5-enoic acid.

EFFECT OF CHOLESTEROL FEEDING ON ATHEROMATOSIS IN THE RABBIT, PART I. W. Albrecht and W. Schuler (CIBA Ltd., Basle, Switzerland). *J. Atheroscler. Res.* **5**, 353–68 (1965). Female rabbits were fed for 5, 11, 21, 50, and 80 days an atherogenic diet of low-protein content, containing cholesterol and fat. The lipids in the serum, aorta, liver, and adrenals were measured at the end of each of these feeding periods. In the blood serum and in the liver, the cholesterol levels, including particularly that of the esterified fraction, show a rapid and sharp initial rise. As time goes on, however, the rate of increase slows down and the level finally reached is somewhat lower than the maximum recorded on or around the 35th day of feeding. Following withdrawal of the cholesterol diet the cholesterol levels in the blood serum and in the liver decline at first rapidly and then more slowly. In the aorta there is a slow and steady increase in the cholesterol content following withdrawal of cholesterol feeding.

DECENOIC, DODECENOIC, AND TETRADECENOIC ACIDS IN THE LACTOBACTERIACEAE. W. M. O'Leary (Cornell Univ. Med. College, New York, N.Y.). *Biochemistry* **4**, 1621–27 (1965). Gas-chromatographic analyses of the fatty acids of several species of the *Lactobacteriaceae* demonstrated the presence of C-10, C-12 and C-14 monoenoic acids. Further chemical studies of such compounds recovered by preparative scale gas chromatography indicated that they were, respectively, *cis*-3-decenoic, *cis*-5-dodecenoic, and *cis*-7-tetradecenoic acids, members of the *cis*-11-octadecenoic acid series. There were also evidences of small amounts of Δ^3-dodecenoic and Δ^5-tetradecenoic acids in two species of streptococcus.

NUTRITIVE STUDIES OF HEATED COTTON SEED OIL AND FRIED BROAD BEAN CAKES (taamiah). M. S. Mameesh, M. H. Chahine and N. M. El-Hawwary (Nat. Res. Center, Dokki, Cairo, Egypt). *Grasas y Aceites* **16**, 65–68 (1965). Cottonseed oil which had been used to deep fry taamiah (a popular Egyptian food item) was fed to rats at 10% of the diet. A 25% decrease in growth resulted. Food consumption also decreased but food efficiency, fat digestibility and liver weights were not changed. Frying did not affect the protein efficiency ratio of taamiah proteins which is about 35% of that of a whole egg. The composition of the taamiah cake is given.

LIPOPROTEINS OF THE HUMAN BRAIN. L. I. Komnatnaya (Dept. of Biochem., Lugansk Medical Inst.). *Ukr. Biokhim. Zhur.* **37** (2), 243–49 (1965). The lipid part of the lipoproteins includes cholesterol, phospholipid and cerebroside, with the total quantity of lipids varying from 9.03 to 12.95% in neuroglobulins and from 28.73 to 43.06% in neurostromins. Phospholipids in human brain include those both soluble in and precipitated by acetone. Most of the cholesterol enters the composition of brain lipoproteins in the free, unesterified state. No correlations between composition of brain lipoproteins and age and sex were found.

DETERMINATION OF GLYCERIDE STRUCTURE OF NATURAL FATS. A REVIEW. G. Laksminarayana (Reg. Res. Lab., Hyderabad-9, India). *Indian Oil Soap J.* **30**, 246 (1965). A very comprehensive review of glyceride structure.

ESTERIFICATION OF INTRA- AND EXTRACELLULAR FREE FATTY ACIDS BY RAT ADIPOSE TISSUE. D. Rubinstein, A. M. Daniel, L. Lechter and J. C. Beck (McGill Univ., Montreal, Quebec, Canada). *Can. J. Biochem.* **43**, 271 (1965). The esterification of intracellular and extracellular FFA by rat adipose tissue *in vitro* was investigated. The rate of incorporation of FFA into neutral lipids was proportional to the FFA concentration in the incubation medium. Both in the presence and absence of a lipolytic agent (epinephrine), heptadecanoate-1-C^{14}, which is not specifically diluted by tissue fatty acids, was esterified in the same manner as palmitate-9,10-H^3. Stearate, palmitate, and oleate were esterified at similar rates by adipose tissue taken from fed animals and incubated with glucose. The rate of esterification of one fatty acid was not significantly affected by the presence of another. Similar results were obtained when tissues were taken from fasted animals and incubated in the absence of glucose, except that the overall rate of esterification was diminished and FFA accumulated in the tissue. It is concluded that long-chain fatty acids do not compete for esterification or entry into the adipose tissue cell. In some experiments tissue FFA esterification was studied by measuring the incorporation of glucose-U-C^{14} carbons into glyceride-glycerol. Esterification, assayed in this manner, increased when albumin was present in the incubation medium and allowed FFA to diffuse from the tissue. However, pre-incubation of adipose tissue in *medium* containing labelled FFA indicates that much of the intracellular FFA may be esterified without its mixing with the extracellular FFA pool.

THE ENZYMATIC ESTERIFICATION OF ETHANOL WITH FATTY ACIDS. W. H. Newsome and J. B. M. Rattray (Dept. of Biochem., Queen's Univ., Kingston, Ontario, Canada). *Can. J. Biochem.* **43**, 1223 (1965). Some characteristics of the system present in pancreatin responsible for the enzymatic esterification of ethanol with fatty acids were examined. Definite pH optima were found for different fatty acids in the pH range 5.5–6.1. At a relatively high ethanol level and with a low fixed fatty acid concentration at pH 6.1, the degree of esterification was oleic = linolenic > linoleic > arachidonic > myristic > palmitic > stearic. At various acid concentrations the same general order of specificity was observed but to differing extents. The physical state of dispersion of the fatty acid in the incubation medium appeared to be a major factor governing the fatty acid specificity for esterification of ethanol. Evidence for the possible occurrence of more than one enzyme activity functioning on fatty acid substrate in different dispersion states was obtained and discussed.

THE OCCURRENCE AND QUANTITATIVE DETERMINATION OF PHOSPHATIDIC ACIDS IN PLANT AND ANIMAL TISSUES. J. Holzl (Inst. for Pharmacology, Univ. Munchen, Ger.). *Biochem. Z.* **341**, 168 (1965). A chromatographic procedure is described for the qualitative and quantitative determination of phosphatidic acids in plant and animal tissues. Besides this, a method is given for the enzymatic determination of phosphatidic acid by means of glycerophosphate dehydrogenase. Various tissues have been analyzed. Phosphatidic acid could be demonstrated only in plant materials, whereas polyphosphatidic acid and diglycerophosphatide could be found in plant as well as in

animal tissues. A method is described for the preparation of authentic phosphatidic acid, which is obtained by an enzymatic cleavage of egg lecithin and a subsequent chromatographic isolation.

IMPAIRMENT OF TRIGLYCERIDE TRANSPORT FROM THE LIVER IN CHOLINE DEFICIENCY. D. S. M. Haines and S. Mookerjea (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Ontario, Canada). *Can. J. Biochem.* **43**, 507 (1965). The changes in liver and plasma lipids in choline deficiency were studied *in vivo* and *in vitro*. In choline deficiency, after a lag period of several days, total liver lipids rose rapidly and a relatively small decrease of plasma triglycerides was noted at about the same time. In the recovery experiments, a significant increase of plasma phospholipids occurred within 24 hours after choline had been restored to the diet of the deficient animals. When livers from normal rats (choline-supplemented) were perfused with blood diluted with buffer, triglyceride was released to the perfusate. Livers from choline-deficient rats (perfused with blood from similarly deficient rats) failed to make a net contribution of triglyceride to the perfusate. A moderate recovery of transport of triglyceride from liver to plasma occurred within 4 to 7 days after choline had been restored to the diet of rats that had been fed the deficient diet for 3 weeks. These studies provided firm support for the hypothesis that, in choline deficiency, transport of triglyceride from the liver is impaired.

FATTY ACID AND GLYCERIDE GLYCEROL SYNTHESIS FROM GLUCOSE DURING HIGH RATES OF GLUCOSE UPTAKE IN THE INTACT RAT. A. S. W de Freitas and F. Depocas (N.R.C.C., Ottawa, Canada). *Can. J. Biochem.* **43**, 437 (1965). The extent of incorporation of glucose carbon into total lipids and component fatty acid, neutral glyceride glycerol, and phosphoglyceride glycerol moieties of carcass, liver, and epididymal tissue has been measured in 20 rats under conditions of constant plasma glucose concentration and specific activity. Fifty per cent of the C^{14} found in total lipids of carcass and liver was in the fatty acid fraction. Corresponding glyceride glycerol moieties contained approximately 40% of the total activity. The low level of incorporation of glucose carbon into fatty acids and glyceride glycerol indicates that lipogenesis from glucose can only account for a small proportion of the total glucose taken up by the tissues, even at high rates of glucose uptake. Rates of synthesis from glucose of carcass and liver fatty acids were estimated as 1.5 and 0.11 mmoles fatty acid per tissue per day respectively, with corresponding half-lives of 57 and 7.6 days. Absolute rates of fatty acid synthesis were estimated as 2.6 and 0.55 mmoles fatty acid per day for carcass and liver tissue respectively, with corresponding half-lives of 34 and 4.6 days.

THE EFFECT OF HOMOGENIZATION ON FREE AND ESTERIFIED FATTY ACID POOLS IN ADIPOSE TISSUE. D. Rubenstein, A. M. Daniel, S. Chiu and J. C. Beck (McGill Univ., Montreal, Quebec, Canada). *Can. J. Biochem.* **43**, 271 (1965). The effect of homogenization of adipose tissue on fatty acid pools was studied with palmitate-1-C^{14} in the presence and absence of epinephrine. Addition of epinephrine to intact tissue in an incubation medium high in FFA increases the specific activity of the tissue FFA. When the tissue is incubated in a medium low in FFA, epinephrine induces an increase in the concentration and radioactivity of the tissue FFA. Epinephrine decreases the esterification of palmitate-1-C^{14} by intact tissue, regardless of the FFA concentration in the medium. This decrease is unrelated to the specific activities of either the medium or the tissue FFA. In homogenates, the decrease in incorporation of palmitate-1-C^{14} is proportional to the decrease in the specific activity of the FFA induced by epinephrine. Under the influence of epinephrine, FFA released from adipose tissue that was previously charged with palmitate-1-C^{14} have a specific activity about six times at great as the glyceride fatty acids. This difference is abolished by homogenization of the tissue. These results suggest that the newly synthesized triglycerides exist as a separate pool and are more readily hydrolyzed, thereby contributing FFA to an intracellular FFA pool. The existence of multiple pools of glycerides and FFA in the adipose tissue cell is dependent on the architecture of the cell.

PHOSPHONOLIPIDS. IV. SYNTHESIS OF PHOSPHONIC ACID ANALOGUES OF L-α-CEPHALINS. E. Baer and G. R. Sarma (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Ontario, Canada). *Can. J. Biochem.* **43**, 1353 (1965). The synthesis of phosphonic acid analogues of L-α-(distearoyl)cephalin and L-α-(dimyristoyl)cephalin is described. They were obtained by phosphonylating D-α,β-distearin and D-α,β-dimyristin

with 2-phthalimidoethylphosphonic acid monochloride and triethylamine, and removing the protective phthaloyl group of distearoyl and dimyristoyl L-α-glyceryl-(2-phthalimidoethyl) phosphonate by hydrazinolysis.

PROPERTIES OF ANIMAL DEPOT FAT IN RELATION TO DIETARY FAT. O. Dahl and K-Å. Persson (Scan's Centrallaboratorium, Malmö, Sweden). *J. Sci. Food Agr.* **16**, 452–5 (1965). The quality of the depot fat in ruminants is only slightly affected by the dietary fat owing to the biohydrogenating mechanism in these animals. Some seasonal variation in composition does occur. In rapidly formed fat, like milk fat, more of the character of the dietary fat is reflected. Calves, before entering the stage of rumination, do not hydrogenate unsaturated dietary fat and consequently lay down fat like non-ruminants. Non-ruminants like pigs deposit ingested unsaturated fatty acids selectively. This may give rise to a depot fat with a higher iodine value than the dietary fat.

EFFECT OF PROTEIN ON PLASMA LIPIDS OF YOUNG WOMEN. Elizabeth S. Prather (Auburn University). *J. Am. Dietet. Assoc.* **47**, 187–91 (1965). Plasma cholesterol, phospholipids, and total lipids were determined in 6 young women on 2 controlled diets providing 55 and 91 gm. protein. The diets contained 82 and 83 gm. of fat which was derived approximately equally from animal and vegetable sources. P:S ratios of the diets were 0.45 and 0.44. The subjects had higher plasma cholesterol levels after 4 weeks on the high protein intake than on the low protein diet. The differences were significant at the 0.05 level of confidence. No statistically significant differences for the plasma phospholipid or total lipid levels were found.

PROCESS FOR TREATING HYPERCHOLESTEROLEMIA. J. P. Dailey (Armour Pharmaceutical Co.). *U.S. 3,197,371.* The described treatment consists of administering to a mammal a daily dose of at least 200 mg of an isolated phospholipid containing at least 10% by weight of arachidonic acid and being free from proteinaceous substances.

NUTRIENT COMPOSITIONS AND PROCESSES FOR PREPARING SAME. P. C. Anderson (Feed Service Corp.). *U.S. 3,198,635.* Described is a stable, weather-resistant, palatable, animal saliva soluble nutrient composition in block form for supplying a single metal nutritive element to an animal. It consists of an intimate mixture of an edible, waxy substance which is solid at ambient temperatures and which is a member selected from the group consisting of a saturated fatty acid having from 14–20 carbon atoms, an ester of at least one saturated fatty acid having from 1–20 carbons, and at least one alcohol corresponding to a saturated fatty acid having from 14–20 carbons and a member selected from the group consisting of: (1) a saliva-soluble chelate of citric acid and the nutritive element, and (2) a saliva-soluble mixture which consists of at least one water-soluble citric acid compound and the nutritive element in the form of a metal oxide, hydroxide or carbonate. The process comprises bringing the waxy substance and the nutritive element in finely divided form into intimate contact with each other by pressing them together under a pressure of 2000 to 3000 pounds per square inch so as to form an integral, homogeneous mass.

ORAL ANTI-HYPERCHOLESTEROL COMPOSITION. J. H. Jones. *U.S. 3,203,862.* An anhydrous pharmaceutical composition for oral administration consists of 9 parts of anhydrous unsaturated, edible vegetable oil and 1 part of anhydrous phosphatides dissolved in the composition. The phosphatides cannot be removed by filtration.

WATER DISPERSIBLE CAROTENOID PREPARATIONS AND PROCESSES THEREOF. H. Riehen (Hoffmann-La Roche, Inc.). *U.S. 3,206,316.* The described carotenoid preparation consists of a carotenoid coloring agent and a salt of a higher fatty acid ester of ascorbic acid. The fatty acid has from 12 to 20 carbon atoms, and the salt is selected from the group consisting of alkali metal and amino acid salts. A solution of the carotenoid coloring agent is formed in an organic solvent together with a salt of a higher fatty acid ester of ascorbic acid and the solvent is removed.

• Drying Oils and Paints

STUDIES ON POLYESTER RESIN PAINTS. IX—POLYESTER RESIN MODIFIED WITH TETRAHYDROPHTHALIC ANHYDRIDE. K. Noma and R. Yosomiya. *J. Jap. Soc. Col. Mai.* **37**, 165–8 (1964). In order to obtain polyester paints of excellent air-curing properties the authors investigated modification of the base resin by addition of tetrahydrophthalic anhydride. The effect on air-curing properties of compositions of base resin, the catalyst and the promoter were studied by using these modified polyester. Fast air-curing rate was obtained for the tetrahydrophthalic anhydride modified polyester when the content of unsaturated acid in base resin was nearly 60% mol. and maximum value in the heat of reaction was found at that composition. Excellent air-curing properties and surface hardness were obtained when trimethylolpropane and glycerol were used as a part of the base resin. Air-curing effect of the catalyst as promoter was remarkable for methyl ethyl ketone peroxide used with Co naphthenate. The air-curing mechanism was discussed, on the basis of comparisons of the absorption at 3400 cm^{-1} of the infrared spectra. (Rev. Current Lit. Paint Allied Ind.).

USE OF SELF-EMULSIFYING OILS IN THE PREPARATION OF VARIOUS COATINGS. M. Fauve and Caraes. *Peint Pig. Vernis* **40**, (9), 561–9 (1964). The authors give an account of the test procedures for combining ethylene oxide with castor oil and with glycerol/phthalate resins, and this is the principal basis for the manufacture of self-emulsifying oils. These oils possess excellent anti-flaking qualities, remove the need for solvents and permit the cleaning of the material with water. Employed in the manufacture of anticorrosive paints containing red lead, they permit application on wet sheet iron in foggy weather and in light rain. Application properties of the paints are good, there is no odour and none of the risks associated with the use of solvents (*e.g.*, inflammability, toxicity, *etc.*). When added to latex emulsion paints, they improve adhesion properties, increase coating thickness, improve resistance to atmospheric agents, and reduce the chalking on formulation with ZnO. (Rev. Current Lit. Paint Allied Ind., No. 277).

PAINT OILS FROM FISH OILS. I. O. Notevarp. *Färg och Lack* **10**, (6), 150–8 (1964). The unsaturated liver and whole fish oils have too high a content of monoene and saturated fatty acids for ideal drying oils. Fractionation of the fatty acids and monoesters of fish oils enables more suitable unsaturated fractions to be separated and the composition of such fractions has been determined. These fractions may be esterified and polymerised to give paint media suitable for various purposes. (Rev. Current Lit. Paint Allied Ind., No. 277).

PROBABLE REDUCTION OF LINSEED AND LINSEED OIL CARRY OVER IN THE MAIN EXPORTING COUNTRIES. J. J. Hinrichsen. *Informaciones Argentinas sobre Grasas y Aceites.* **2**, 39–41 (1965). The estimated increase in North American exports of linseed and linseed oil combined is about 80,000 tons, oil basis, for the period July 1964 to June 1965. The combined carry overs of Canada and the U.S.A. will probably be the lowest in several years, this will be not so for the Argentinian stocks. A statistical analysis of the situation follows.

THE EUROPEAN PAINT AND VARNISH INDUSTRY, EVOLUTION AND PERSPECTIVES. Anon. *Informaciones Argentinas sobre Grasas y Aceites* **2**, 37–38 (1965). A brief analysis.

PIGMENT COLORS AND SURFACTANT SELECTION. R. H. Pascal and F. L. Reig (E. I. du Pont de Nemours and Co., Wilmington, Del.). *Paintindia* **15**, 89 (1965). Good dispersions of pigment colors in paints often requires use of surface active agents. Choice of the best surfactants for addition to dry colors, use in aqueous dispersions, or making "universal colorants" has been difficult because of the innumerable pigments, surfactants and vehicles available. This paper describes a method to select simply, the proper surfactant to disperse any pigment color in any paint vehicle. The method is based on, and is an expansion of, the HLB (hydrophilic-lipophilic balance) system of surfactant classification developed by Atlas Chemical Industries, Inc. In the Atlas system, surfactants are assigned HLB values according to their relative solubility in oil and water. It was determined that (1) every pigment color has a required HLB for optimum dispersion. Best results are obtained when a surfactant blend with an HLB matching the required HLB of the pigment used; (2) the required HLB of any pigment color can be established by relatively few tests; (3) the required HLB of a given pigment is constant. Changes in extender, vehicle, etc. in the paint may require changing to a surfactant of different chemical type, but of

the same HLB as the original surfactant used. The required HLB's of several pigment colors are given, as are the HLB values of numerous surfactants.

• Detergents

TESTING DETERGENT BIODEGRADABILITY. P. J. Weaver (Procter & Gamble Co.). *Soap Chem. Specialities* 41 (7), 45–9, 95–7 (1965). Laboratory and field tests (the tests are described) show that linear alkylate sulfonate (LAS) are as biodegradable as soluble organic matter normally in sewage. However, effective and complete waste treatment facilities must be provided where not available. Cesspools and primary plants are no more adequate for the removal of LAS than they are for overall sewage treatment.

MODERN TECHNIQUES FOR THE ANALYSIS OF DETERGENTS. P. M. Plans (Dept. Textil des Patronato J. de la Cierva, Barcelona, Spain). *Grasas y Aceites* 16, 73–83 (1965). The author describes the ion exchange resins method for the quantitative determination of surfactant mixtures and the infrared spectroscopic method for determining the ethylene oxide content of nonionic detergents.

LIQUID DETERGENT COMPOSITION. N. R. Smith (Procter & Gamble Co.). *U.S. 3,192,166.* An opaque viscous liquid detergent composition consists of: (a) 4–10% of an alkali metal borate such as sodium tetraborate decahydrate or potassium pentaborate; (b) 3–10% of an aliphatic tertiary amine oxide having the general formula $R_1R_2R_3N \rightarrow O$, where R_1 is an alkyl radical containing 10–16 carbon atoms and R_2 and R_3 are each selected from the group consisting of methyl and ethyl radicals, at least 50% of the amine oxide having an R_1 alkyl radical containing 12 carbon atoms; (c) 3–15% of non-soap detergent selected from the water soluble salts of the group of detergent anions consisting of RSO_4^-, $R(OC_2H_4)_xSO_4^-$ where x is an integer from 1 to 5, $RC_6H_4SO_4^-$, R being an alkyl radical containing 9 to 6 carbon atoms, and mixtures of the detergents; (d) 3–10% of a salt of a hydrotrope anion of the group consisting of toluene–, benzene–, and xylene sulfonate; (e) 3.5–6% silicate solids having an SiO_2/M_2O ratio of from 16:1 to 2.6:1 and M is sodium or potassium; (f) 10–30% of a salt of pyrophosphate anion; and (g) water. The cations of the salts of the detergent anions, of the salts of the hydrotrope anions, and of the salts of the pyrophosphate anion are selected from the group consisting of potassium, sodium, ethanolammonium, diethanolammonium, and triethanolammonium, the mole ratio of the total of potassium and alkanolammonium cations to sodium cations being greater than 3:1.

DETERGENT COMPOSITION, NON-CORROSIVE TO METAL SURFACES. L. A. Joo (Pure Oil Co.). *U.S. 3,193,506.* The described composition consists of a major portion of an aqueous solution of mixed alkylaryl sulfonates, sodium tripolyphosphate, and sodium sulfate and as the corrosion-inhibiting component, about 0.01 g/100 ml of a halo, polynuclear carboxylic acid prepared by reacting solvent extracts obtained in the solvent refining of mineral lubricating oils with a solvent selective for aromatic compounds with an alkali metal to form the alkali metal adduct, carbonating the adduct to form the alkali metal salt of the acid and acidizing the resulting salt to form the free carboxylic acid. The corrosion inhibitor is characterized by a complex polynuclear aryl, alkaryl nuclei having an average molecular weight of above 300 with about 1.7 to 3.5 aromatic rings per mean aromatic molecule and containing 1–5 halogen atoms and 1 to 5 carboxyl groups per molecule.

SUDSING DETERGENT COMPOSITION. J. S. Berry (Procter & Gamble Co.). *U.S. 3,194,767.* A detergent composition consists of a relativeing low sudsing detergent compound and as a suds builder an effective amount of a member of the class of compounds having the following formula: $R_fCH_2NR'R'' \rightarrow O$ in which R_f represents a perfluorinated straight chain alkyl radical ranging from C_3F_7 to $C_{11}F_{23}$ and R' and R'' represent lower alkyl radicals selected from the group consisting of methyl, ethyl and n-propyl. The ratio of the suds builder to the detergent compound is from 1:1 to 1:6 by weight.

DETERGENT COMPOSITION NON-CORROSIVE TO METAL SURFACES. J. B. Braunwarth, R. C. Kimble and L. A. Joo (Pure Oil Co.). *U.S. 3,200,078.* A detergent composition normally tending in aerated aqueous solution to corrode metals consists essentially of a water soluble mixed aryl sulfonate detergent, a water soluble metal polyphosphate, and, as the sole corrosion inhibiting agent, about 0.01 to 10% by weight of nitrogen-containing mixed mono-, di-, and polycarboxylic acids derived from solvent extracts obtained in the solvent extraction of mineral lubricating oils using a solvent selective for aromatic compounds. The acids are prepared by reaction of the solvent extracts with nitrogen dioxide at a weight ratio of nitrogen dioxide to solvent extracts of 0.4:1 to 0.8:1 and a temperature of 100–200C for at least 2 hours. The acids are characterized by having a molecular weight of 346 to 728 and an average of 1.7 to 3.5 aromatic rings per mean aromatic molecule.

DETERGENT COMPOSITION NON-CORROSIVE TO METAL SURFACES. L. A. Joo, W. E. Kramer and R. C. Kimble (Pure Oil Co.). *U.S. 3,200,079.* A detergent composition, non-corrosive to metal surfaces in contact therewith in the presence of air, consists of a major portion of a water soluble detergent and emulsifying compound and, as the sole corrosion-inhibiting component, a minor but corrosion-inhibiting amount of a compound of the formula $R(COOA)_n$. R represents the complex, polynuclear, aromatic and heterocyclic nucleus derived from solvent extracts obtained in the solvent extraction of mineral lubricating oils, characterized by having a molecular weight of about 300 to 750, containing about 0.5 to 4.5 weight % of combined sulfur and having an average of 1.7 to 3.5 aromatic rings per mean aromatic molecule, A is at least one substituent of the group consisting of hydrogen and a hydrogen equivalent of a metal, and n has a value of 1 to 5.

MANUFACTURE OF SULPHATED FATTY ALCOHOLS AND SULPHONATED ALKYL PHENYLS. A. E. Sowerby (Marchon Products Ltd.). *U.S. 3,200,140.* A method of sulphating and sulphonating, respectively, a detergent raw material selected from the group consisting of saturated fatty alcohols and mononuclear alkaryl hydrocarbons comprises continuously flowing a liquid mass containing the material through a reaction vessel partitioned to have at least 2 interconnecting reaction zones established in the flow path of the liquid; introducing into each of the zones a gaseous mixture of sulphur trioxide and a diluent which is inert and gaseous at the conditions of the reaction, the zones being controlled at a temperature just above the melting point of the reactants in the respective zones whereby the liquid flows freely through the zones; intimately mixing the gas mixture with the mixture to react the sulphur trioxide and the material, the gas mixture being introduced into the liquid so that the molecular ratio of sulphur trioxide to the material is substantially less than 1 in the first of the zones and greater than 1 in the latter of the zones, the volume of the gas mixture being at least 400 times the volume of the liquid in the reactor, the mean gas-liquid residence time in the latter zone being less than about 1 second; then terminating the reaction.

OPAQUE LIQUID DETERGENT COMPOSITIONS. F. E. Carroll and R. R. Sepulveda (Lever Bros. Co.). *U.S. 3,203,900.* The described composition consists of: (a) a water-soluble soap selected from the group consisting of sodium, potassium, and ammonium salts of fatty acids having from 16 to 18 carbon atoms; (b) 5–20% by weight of a complex inorganic polyphosphate such as tetrapotassium pyrophosphate or pentapotassium tripolyphosphate; and (c) a synthetic nonionic detergent selected from the group consisting of lauric diethanolamide, lauric isopropanolamide, oleic diethanolamide and lauric monoethanolamide. The amount of soap and nonionic detergent together is from 3.5–14% by weight of the total composition, and the weight ratio of nonionic detergent to soap is from 90:10 to 20:80.

AQUEOUS SHAMPOO COMPOSITION. E. A. Vitalis and F. L. Andrew (American Cyanamid Co.). *U.S. 3,206,408.* A composition suitable for use in the shampooing of pile fabric contains a high-foaming synthetic organic anionic sulfonated detergent which is capable of drying to an easily removable powdery form, and an inorganic siliceous clay characterized by from 45–75% by weight of silica and 10–40% of alumina and by a brightness as measured by a G.E. Reflectometer at 458 mu of a minimum value of about 90 and an ultimate particle size of from .01 to .1 micron. The detergent and siliceous material are present in relative weight ratios of 1:2 to 3:1, respectively.