ABSTRACTS

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

• Fats and Oils

STARCH-COMPLEXED LIPIDS: DIFFERENCES IN EXTRACTION WITH VARIOUS SOLVENTS. S. Rogols, J. E. Green and Mary A. Hilt (Res. and Dev. Lab., Keever Starch Co., Columbus, Ohio 43207). *Cereal Chem.* 46(2), 181–88 (1969). The yield and composition of various starch-complexed lipids depend on the choice of solvent used in the extraction. This was observed when the lipids present in starch were quantitated by two different extraction techniques, (1) carbon tetrachloride was used and (2) ether. Fractionation on silicic acid columns by the technique of Hirsch and Ahrens has shown additional differences in the components of the extracted lipids. These may be sufficient to account for the discrepancies that appear when starch-complexed lipids are quantitated. This is substantiated by silicic acid chromatography of both the phospholipid and the glyceride fractions. Marked differences in nature of the lipid material were observed, indicating possible dependence on the polarity of the extracting solvent.

SEMIMICRO METHOD FOR DETERMINING TOTAL LIPIDS IN FISH MEAL. Mary E. Ambrose, Barbara J. Roche, and G. M. Knobl, Jr. (Natl. Ctr. for Fish Protein Conc., College Park, Md. 20740). *J. Assoc. Offic. Anal. Chem.* 52(4), 688–92 (1969). A simple and rapid method has been developed for determining lipids in fish meal. Lipids are extracted with chloroform and methanol; the entire procedure requires no more than 10 minutes. An aliquot of the chloroform layer is dried at 50C under nitrogen and then equilibrated 90 minutes in a desiccator. Twelve samples can be completed in a single day, compared to the three days required to complete an analysis by AOAC method 22.037. Results of the extraction method average 99.0% of those obtained by method 22.037.

THIN LAYER AND GAS-LIQUID CHROMATOGRAPHY OF CHOLESTEROL IN FATS AND OILS. I. DEVELOPMENT OF METHOD. C. W. Thorpe, Linda Pohland, and D. Firestone (Div. of Food Chem. and Tech., FDA, Wash., D.C. 20204). *J. Assoc. Offic. Anal. Chem.* 52(4), 774–78 (1969). A method is described for analysis of sterols by thin layer chromatography-gas liquid chromatography (TLC-GLC). Sterols are isolated from other components of unsaponifiable matter by preparative TLC. The sterols are quantitatively removed from the TLC plate, extracted from the silica gel, and analyzed by GLC. This method has been used to detect low levels (2–3%) of animal fat in vegetable oil by measuring the cholesterol content of the animal fat-vegetable oil admixtures.

II. COLLABORATIVE STUDY. C. W. Thorpe. *Ibid.*, 778–90. A method employing TLC-GLC for detecting animal fats in vegetable fats was subjected to collaborative study. The method involves preparative TLC of unsaponifiable matter followed by GLC of the isolated sterols. The results of this study, based on GLC determination of cholesterol in the isolated sterols, indicate that low levels (2.5%) of animal fat can be detected. The possibility of obtaining false positive results is greatly reduced compared with direct GLC of unsaponifiable matter or column chromatographic fractionation of unsaponifiable matter followed by GLC analysis.

A RAPID METHOD FOR THE DETECTION OF RESIDUAL LIPASE ACTIVITY IN OAT PRODUCTS. T. Kazi and T. J. Cahill (Res. and Dev., Tea Div., J. Lyons & Co. Ltd., Greenford, Middlesex). *Analyst* 94, 417–18 (1969). A test that will give a quick indication of the presence of residual lipolytic enzymes in oat products has been developed and presented. It is more specific than the tyrosinase test which is a colorimetric test providing adequate results provided no color is produced. However, since 50% of the oats were found to contain tyrosinase, a more specific test was needed for lipase activity.

COLLABORATIVE STUDY OF THE SWEEP CO-DISTILLATION CLEANUP FOR CHLORINATED PESTICIDE RESIDUES IN EDIBLE FATS AND OILS. Bernadette Malone and A. Burke (Div. of Pest., FDA, Wash., D.C. 20204). *J. Assoc. Offic. Anal. Chem.* 52(4), 790–98 (1969). A collaborative study was made of the sweep co-distillation cleanup method for multiple residues of chlorinated pesticides in edible fats and oils with determination by electron capture GLC using a column of 15% QF-1/10% DC-200 on 80–100 Gas Chrom Q. Heptachlor epoxide, *p,p'*-DDE, dieldrin, *p,p'*-TDE, and *p,p'*-DDT were added at two levels to butterfat and soybean oil. Mean recoveries of pesticides ranged from 86.0 to 102.1% in soybean oil and 86.4 to 98.8% in butter.

NOTE ON THE SEPARATION AND BAKING PROPERTIES OF POLAR AND NONPOLAR WHEAT FLOUR LIPIDS. J. G. Ponte, Jr. and V. A. DeStefanis (Res. Labs., I II Continental Baking Co., Rye, N.Y.). *Cereal Chem.* 46(3), 325–30 (1969). A procedure is given for fractionating lipid mixtures into polar and nonpolar components which does not have the disadvantages of T.L.C., C.C.D. or column chromatography. It consists of adsorption of the lipid mixture onto activated silica gel followed with selective elution by appropriate solvents. It was found by applying this method, polar lipids increase loaf volumes, whereas nonpolar lipids have the opposite effect.

FATTY ACID COMPOSITION OF COCOA BUTTER OIL BY UREA FRACTIONATION AND PROGRAMMED TEMPERATURE GAS CHROMATOGRAPHY. J. L. Iverson, P. G. Harrill, and R. W. Weik (Div. of Food Chem. and Tech., FDA, Wash., D.C. 20204). *J. Assoc. Offic. Anal. Chem.* 52(4), 685–88 (1969). The proposed urea fractionation procedure concentrates esters with similar GLC retention times in separate fractions. GLC peaks of esters present in cocoa butter oil in trace amounts (0.001–0.1%), which are normally hidden under major peaks, can then be detected. By modified programmed temperature GLC techniques, it is possible to detect the short and long chain length fatty acids present in cocoa butter oil. The odd and even chain length saturated acids from C_{10} to C_{28}, mono-unsaturates C_{16} to C_{24}, branched acids C_{16} to C_{24}, and linoleic and linolenic acids were detected.

THE DETERMINATION OF COMPOUNDS BY USE OF CHROMATOGRAPHY ON THIN-LAYER CHROMATOSTRIPS. I. R. Shimi and G. M. Imam (Biochem. Dept., Faculty of Science, Ain Shams Univ., Cairo). *Analyst* 94, 62–7 (1969). A technique is described for the quantitative analysis of organic compounds by chromatography on narrow strips of glass plate bearing a thin layer of adsorbent. A relationship between the length, L, of the zone occupied by a compound, the weight, C, of compound applied and the distance, D, travelled by the developing solvent, namely, $L = K \log C \log D$ (where K is a constant), has been found to hold under specified conditions and can be used to determine organic compounds alone or in admixture. The compounds examined included carboxylic acids, amino acids, sugars, and the 2,4-dinitrophenylhydrazones of ketonic and aldehydic compounds.

GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF FREE LONG-CHAIN ALDEHYDES. R. Wood and R. D. Harlow (Med. Div., Oak Ridge Assoc. Univ., Inc., Oak Ridge, Tenn.). *J. Lipid Res.* 10, 463–464 (1969). Quantitative results are reported for gas-liquid chromatography of mixtures of free tetra-, hexa-, and octadecanals and *cis*-9-octadecenal on polar and nonpolar liquid phases. Stability of the fatty aldehydes during chromatographic analysis and up to 1 year of storage appears to be related to the solvent (carbon disulfide) used. Analysis of the free aldehydes by gas-liquid chromatography eliminates the disadvantages associated with the preparation and analysis of derivatives for this lipid class.

QUANTITATIVE ANALYSIS AND COMPARISON OF THE PHYSICAL PROPERTIES OF O-ALKYL AND S-ALKYL MONOETHERS OF GLYCEROL. R. Wood, C. Piantadosi and F. Snyder (Med. Div., Oak Ridge Assoc. Univ., Oak Ridge, Tenn.). *J. Lipid Res.* 10, 370–373 (1969). A homologous series (C_{10}, C_{12}, C_{14}, C_{16}, C_{18}) of synthetic O-alkyl and S-alkyl ethers of glycerol was analyzed by gas-liquid chromatography (GLC) and thin-layer chromatography (TLC), and examined by IR and n.m.r. spectroscopy; the physical properties of the O-alkyl and S-alkyl ethers were compared. Isopropylidene derivatives of the glycerol ethers and thioethers were quantitatively analyzed by GLC on polar and nonpolar liquid phases. On a medium polar liquid phase (ethylene glycol succinate), mixtures of the O-alkyl and S-alkyl ethers were completely resolved. Isopropylidene derivatives of glycerol ethers and of thioethers could be separated as classes (though not into individual homologues) by TLC. O-hexadecyl and S-hexadecyl ethers of glycerol are easily distinguished by IR and n.m.r. spectroscopy.

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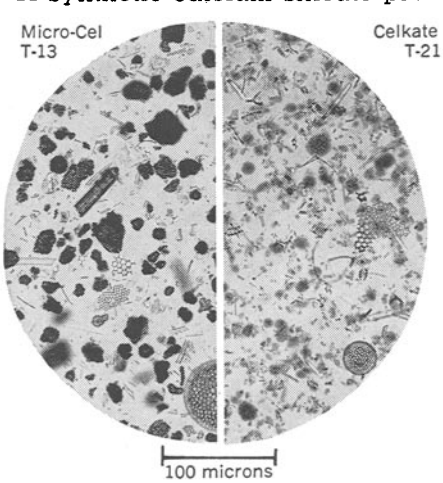

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Screen residue, 325 mesh, %	5.0	6.8	2.0
Surface area (B.E.T. method)	110 sq.m/gm	105	180
Color	Off-white	Off-white	Grey-white
Free moisture, %	5.0	4.2	3.0
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SPHINGOLIPIDS IN BEAN LEAVES. H. E. Carter and J. L. Koob (Div. of Biochem., Dept. of Chem. and Chem. Eng., U. of Illinois, Urbana, Ill.). *J. Lipid Res.* 10, 363–369 (1969). Phytoglycolipid has been isolated for the first time from plant leaves (*Phaseolus vulgaris*). The purified product (almost identical with the phytoglycolipid isolated from flax seed) was a ceramide attached through phosphate diester linkage to an oligosaccharide, which consisted of the usual trisaccharide unit (inositol, hexuronic acid, hexosamine) to which were attached mannose, galactose and arabinose. The major fatty acids were the saturated 2-hydroxy C_{22}, C_{24}, and C_{26} acids; the major long-chain bases were dehydrophytosphingosine (D-*ribo*-1,3,4-trihydroxy-2-amino-8-*trans*-octadecene) (53%) and phytosphingosine (D-ribo-1,3,4-trihydroxy-2-aminooctadecane) (32%). A ceramide and a cerebroside were also isolated. In the ceramide the major fatty acids and the major long-chain bases were the same as in the phytoglycolipid. In the cerebroside, the fatty acid composition was similar to that in the ceramide and phytoglycolipid, but the long-chain bases consisted of dehydrophytosphingosine and phytosphingosine (7:1) with a substantial amount of unidentified long-chain base. The sugar component was glucose.

COUNTERCURRENT DISTRIBUTION OF INOSITOL LIPIDS OF PLANT SEEDS. H. E. Carter and A. Kisic (Div. of Biochem., Dept. of Chem. and Chem. Eng., U. of Illinois, Urbana, Ill. 61801). *J. Lipid Res.* 10, 356–362 (1969). The inositol lipids of plant seeds consist of phosphatidyl inositol, the phytoglycolipids and a previously uncharacterized ceramide-phosphate-polysaccharide. These three species have been separated from each other and from the common glycerophosphatides by a series of simple countercurrent distributions, first as the naturally occurring Ca-Mg salts and subsequently in the Na salt form. The new ceramide-phosphate-polysaccharide is present in each of the four plant phosphatides examined (corn, soybean, flax, safflower). It is devoid of glucosamine but contains the other carbohydrate components commonly found in the phytoglycolipids. The basic structural unit of the new glycolipid consists of a ceramide-phosphate-inositol-hexuronic acid moiety to which the other sugars (galactose, mannose, arabinose) are attached. Flax ceramide-phosphate-polysaccharide has fucose in addition to the other sugars.

NEW SIALIC ACID-CONTAINING SULFOLIPID: "UNGULIC ACID." E. Leikola, E. Nieminen and Anna-Maija Teppo (Dept. of Pharmacy, Univ. of Helsinki, Helsinki, Finland). *J. Lipid Res.* 10, 440–4 (1969). Human epidermis, hair, nails and kidney as well as bovine and horses' hooves were found to contain a lipid fraction which on thin-layer chromatography migrated slightly ahead of the cerebroside sulfate esters and gave the color reaction specific for sialic acid. This fraction was isolated from horse hoof, in which it constituted nearly half of the total lipids. The purified fraction contained sulfur, but no phosphorus. The IR spectrum revealed the presence of a sulfate group, which was also determined by the benzidine method. Thin-layer and gas-liquid chromatography of the products of acid hydrolysis revealed the presence of sphingosine, galactose, galactosamine and sialic acid. Fatty acid analysis showed that stearic acid was the major component, with minor amount of palmitic and arachidic acids. The fraction isolated contained ceramide, sialic acid, galactose, galactosamine and sulfate in equimolar amounts. We conclude that the new lipid is a ganglioside sulfate, which we have called "ungulic acid" because it was first separated and identified from a horse's hoof (Latin, *ungula*).

DRY-COLUMN CHROMATOGRAPHIC ISOLATION OF FATTY ACID ESTERS OF PHORBOL FROM CROTON OIL. P. R. Ocken (Dept. of Biochem., New Jersey College of Med. & Dentistry, Jersey City, New Jersey). *J. Lipid Res.* 10, 460–2 (1969). The family of mixed fatty acid esters of 4,9,12,13,20-pentahydroxytiglia-1,6-dien-3-one (phorbol) has been isolated from croton oil by column chromatography on silica gel and preparative dry-column chromatography on silica gel HF/254 packed in a cellophane membrane. The tumor-promoting agents are obtained rapidly and with minimum difficulty.

SIMPLE SCRAPER FOR THIN-LAYER CHROMATOGRAMS. S. Bjorkerud (Depts. of Histology and Med. I, Univ. of Gothenburg, 400 33 Gothenburg, Sweden). *J. Lipid Res.* 10, 459–460 (1969). A simple scraper is described for rapid and quantitative transfer of zones on thin-layer chromatograms to liquid scintillation counting vials.

SEPARATION OF NEUTRAL LIPIDS OF SHARK LIVER BY "DRY-COLUMN" CHROMATOGRAPHY. Adria C. Casey (New England Inst. for Med. Res., Ridgefield, Conn.). *J. Lipid Res.* 10, 456–9 (1969). "Dry-column" chromatography in mixed solvents has been successfully used to separate gram quantities of neutral lipids from shark liver oil into simpler fractions.

EFFECT OF HEATING ON LONG-TERM PHYSIOLOGICAL RESPONSE OF DIFFERENT EDIBLE FATS. RESULTS WITH SECOND AND THIRD GENERATION ANIMALS. P. Ramel, M. Th. Lanteaume, A. M. LeClerc, P. Auliac and J. Rannaud (Lab. du Service central d'Etudes et Realisations des Subsistences, Paris). *Rev. Franc. Corps Gras* 16, 411–419 (1969). Groups of male and female Wistar rats were fed a standard diet, containing 5% lipid, supplemented with 20% of different oils—corn germ, grapeseed, peanut, and palm. Both fresh oil or oil heated in air for eight days at 200C were fed. Growth and reproduction were followed for three successive generations. After the animals were sacrificed, blood, liver and depot lipids were analyzed. Liver vitamin A content was also determined. Throughout the course of the study, no unusual mortality, organic lesions or metabolic troubles were observed. Some reproductive difficulties occurred in all animals, but these resulted from an increased vitamin requirement caused by prolonged feeding of the high fat diet.

NON-VOLATILE COMPOUNDS FORMED DURING FRYING. PART I. R. Guillaumin (Labs. de Paris—ITERG). *Rev. Franc. Corps Gras* 16, 119–124 (1969). Recent research work is reviewed on the non-volatile fraction in used frying fats. The subjects covered here include the nature and mechanisms of formation of thermal and oxidative polymers.

PART II. *Ibid.*, 189–204. The formation of cyclic monomers in oils subjected to high temperatures is considered first. Then the different physical and chemical methods used for fractionating and characterizing the non-volatile decomposition products are covered in detail. Although this review is very thorough, the author points out that knowledge of all the chemical reactions involved is still quite limited.

STUDY OF THE AUTOXIDATION OF LINOLENIC ACID AT 20 AND 40C. M. Loury and M. Forney (Inst. des Corps Gras, Paris). *Rev. Franc. Corps Gras* 16, 167–183 (1969). Linolenic acid was prepared in 85% purity from linseed oil. It was autoxidized at 20C for one month; then at 40C for 11 weeks. Both the volatile and non-volatile products of autoxidation were analyzed in order to determine the method of degradation of the linolenic acid chain. The volatile products were subdivided into gases (CO_2 and water), water soluble compounds (acids) and organic compounds. Characterization of the non-volatile products was subdivided into studies of the peroxides, changes in UV spectra, alterations of double bonds, free and combined carboxyl groups and formation of oxymonomers and oxypolymers. Formation of most of these compounds can be explained by Farmer's mechanism of autoxidation supplemented by the authors' hypothesis relating to the systematic degradation of fatty chains by a recurrent peroxidation reaction. Relatively little study of the formation of oxypolymers has been done, but it appears that the dienophile role played by oxygen is essential for their formation.

STUDY OF OILS FROM JATROPHA CURCAS. S. N. Kaley, D. Bhattacharyya and A. Saha (Dept. of Appl. Chem., Calcutta Univ., Calcutta 9, India). *Ind. Chim. Belge* 34(4), 301–302 (1969). Physical and chemical properties of the oil from the seeds of *Jatropha curcas* of the Euphorbiaceae family (also known as Chandrajati) were determined. Following petroleum ether extraction of the seeds, the fatty acid composition of the oil was determined by a combination of UV analysis following alkali isomerization, lead salt precipitation of saturated acids, iodine value and saponification equivalent techniques. Oleic acid concentration was calculated. Separation of triglycerides was carried out on thin layers of Kieselguhr and of silica gel-silver nitrate. Development and visualization of the plates was by standard techniques. This light yellow oil had a specific gravity (35C) of 0.9081 and a refractive index (40C) of 1.4655. Chemical properties were:

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acid value—9.4, sap. value—197.1, sap. equiv.—284.6, Wijs I.V.—95.8, unsap. matter—0.2%, Reichert-Meissel value—5.5, Reichert-Polenske value—0.1 and Kirschner value—0.3. The fatty acid composition follows: palmitic—11.9%, stearic—6.2%, oleic—50.9% and linoleic—31.0%. Triglyceride analysis indicated that one of the GU$_8$ types was triolein. Evidence for a total of five component glycerides was found.

DETERMINATIONS OF KINETIC MODELS AND PRECISE PARAMETER ESTIMATION IN HETEROGENEOUS CATALYSIS. G. F. Froment (Rijksuniversiteit Ghent, Ghent, Belgium). *Ind. Chim. Belge* 34(2), 93–101 (1969). The purpose of this theoretical discussion is to focus attention on the two fundamental steps involved in establishing a cogent rate equation for heterogeneous catalysis, namely: 1) the choice of the kinetic model itself, *i.e.*, the form of the rate equation, and 2) evaluation of the parameters of the model by fitting it to experimental data by some regression technique. Consideration is also given to the type of experimental design leading to an optimal evaluation of the parameters by a limited number of experiments. (In English)

DOUBLE IRRADIATIONS IN NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY. (PART *I*). E. G. Derouane (Inst. de Chimie, Liège, Belgium). *Ind. Chim. Belge* 34(2), 103–113 (1969). Different methods of double irradiation are presented from a semiquantitative point of view. Applications of the method are also examined. The bibliography is limited to the principal articles published on this subject, *i.e.*, to those which are the most representative of the theory and applications of the double resonance technique.

FORMATION OF FREE ACIDS IN CRUDE FATS AND OILS DURING STORAGE. M. Naudet and S. Biasini (Lab. Nat. des Matières Grasses, ITERG, Faculte des Sciences, Marseille). *Rev. Franc. Corps Gras* 16, 185–187 (1969). Crude peanut, rapeseed and coconut oils and tallow were stored in loosely covered containers at 20C. Some of the samples of vegetable oils were degummed, some were stored dry and some had 2.5% water added. Some of the tallow samples were stored dry, some had 2.5% water added, and some had 5% of cracklings or chopped adipose tissue added. The change in acidity with time was followed. Acids are formed only in the presence of water and organic matter, probably by enzymatic processes. The reaction occurs non-specifically, and considerable amounts of glycerol are formed.

1969 SYMPOSIUM ON MARGARINE SPONSORED BY ITERG. R. Francois (Director-General, Inst. des Corps Gras). *Rev. Franc Corps Gras* 16, 387–394 (1969). This review contains summaries of eighteen papers presented during the six sessions of the symposium. Discussed in detail are various problems of the industry relating to raw materials (oils, fats), technology, packaging, storage and distribution; and to the different methods used for quality control (physical, chemical, bacteriological and rheological tests). Dietary and nutritional aspects are discussed in terms of flavor and palatability and of the relation of chemical structure of the fats and other additives to physiological response. Special attention is given to margarines based on medium chain triglycerides. Legislation on margarine is reviewed.

DEVELOPMENT AND OUTLOOK FOR MARGARINE PRODUCTION IN FRANCE, IN THE E.E.C. AND IN THE WORLD. P. Carriere. *Rev. Franc. Corps Gras* 16, 395–401 (1969). In the period 1961 through 1968, margarine production increased 11% in developed countries, 25% in the U.S.S.R. and Eastern Europe, and 65% in underdeveloped countries. Similar increases are expected between 1968 and 1975. Various factors affecting the increases are discussed. In the E.E.C. particularly, political factors sometimes have great influence. Considering economic, commercial, nutritional and social factors, the future outlook for margarine is encouraging.

MARGARINE ADDITIVES: PRESERVATIVES, ANTIOXIDANTS, VITAMINS, FLAVORS, COLORS AND OTHER SUBSTANCES. J. P. Ostendorf (Centre Gustatif, Naarden, Holland). *Rev. Franc. Corps Gras* 16, 403–410 (1969). Additives, other than emulsifiers, which are used to improve the physical, nutritional or organoleptic properties of margarine are listed and discussed briefly. Margarine legislation in Europe and in the United States relating to additives is tabulated. New legislation in the E.E.C. is expected to liberalize the regulations considerably.

α-SPINASTEROL, α-SPINASTERYL ACETATE AND SOME HIGHER FATTY ACIDS FROM THE PETROLEUM ETHER EXTRACT OF THE ROOT OF HOMONOIA RIPARIA. S. P. Tandon, K. P. Tiwari and A. P. Gupta (Dept. of Chem., Univ. of Allahabad, Allahabad, India). *Indian Oil Soap J.* 34, 179–183 (1969). α-Spinasteryl acetate was isolated as the precipitate from the low temperature crystallization of the petroleum ether extract of the root of *Homonoia riparia*. The precipitate analyzed as follows: yield 3%, a yellow fat, saponification value 209.2, iodine value 27.8, acid value 5.1 and unsaponifiable matter 0.36%. The fatty acid composition of the fat was myristic 12.9%, palmitic 26.6%, stearic 23.5% and oleic 33.6%. The unsaponifiable matter contained α-spinasterol.

• Fatty Acid Derivatives

SYNTHESIS AND DESULFURIZATION—DECARBOXYLATION OF CYCLIC THIONOCARBONATES OF GLYCEROL 1-ETHERS. S. Ramachandran, R. V. Panganamala, & D. G. Cornwell (Dept. of Physiolog. Chem., The Ohio State Univ., Columbus, Ohio). *J. Lipid Res.* 10, 465–467 (1969). A method is described for the synthesis of cyclic thionocarbonates of 1-O-alkyl glycerols in quantitative yield. These derivatives of glycerol ethers can be quantitated by UV absorbance, analyzed by gas-liquid chromatography or quantitatively converted to allyl alkyl ethers for gas-chromatographic analysis.

RECENT ADVANCES IN SOME ASPECTS OF HIGH PRESSURE CHEMISTRY. S. K. Bhattacharyya (Dept. of Chem., Indian Inst. of Tech., Kharagpur, India). *J. Indian Chem. Soc.* 45, 115–79 (1968). This review deals with two aspects of high pressure chemistry. The first section deals with the catalytic syntheses of carboxylic acids and esters from carbon monoxide in the presence of nickel, cobalt and iron catalysts. The final portion includes the kinetics and mechanism of a few acid-catalyzed liquid phase hydration of unsaturated organic compounds and hydrolysis of lactones. Pressures involved range from 50–6000 atmospheres and temperature from 100–350C.

PREPARATION OF ACETOGLYCERIDES AND TRIGLYCERIDES—SIMPLE AND MIXED—WITH TWO RADICALS OF THE SAME ACID. I. G. De Kuck, R. A. Macchi and F. Crespo. *Rev. Argent. Grasas Aceites* 10 27–31 (1968). The acetoglycerides are prepared by reaction of 1,2-acetone-glycerol with methyl esters of fatty acids and acetylation of this intermediate with acetic acid and anhydride in presence of a mineral or sulphonic acid catalyst. The triglycerides are similarly prepared using fatty acids in place of the acetylation mixture. Products are purified by washing, vacuum distillation, decolorisation, etc. (World Surface Coatings Abs. No. 324)

THERMAL POLYMERS OF MONOGLYCERIDES AND THEIR ACETONISED AND ACETYLATED DERIVATIVES. R. Macchi, I. G. De Kuck and F. Crespo. *Rev. Argent. Grasas Aceites* 10, 32–36 (1968). Esters of 1,2-acetoneglycerol with α-elaeostearic acid have been polymerised in an inert atmosphere at 250C. The polymers were then hydrolysed at 50C to give the monoglyceride polymers. Alternatively they were acetylated with acetic acid and anhydride (H_3PO_4 catalyst) to form acetylated monoglyceride polymers. The monoglyceride polymers have possible application as emulsifiers and the acetylated polymers as plasticisers. (World Surface Coatings Abs. No. 324)

NEW ACTIVE SOLVENTS. I. R. Morosov *et al. Lakokras. Mat. 1968*, No. 5, 8–9. The reaction of isobutanol with various fractions of synthetic fatty acids provided active solvents whose performance and physico-chemical characteristics have been elucidated. (World Surface Coatings Abs. No. 324)

• Biochemistry and Nutrition

PHOSPHORUS DETERMINATION IN PHOSPHOGLYCERIDES FROM THIN-LAYER CHROMATOGRAMS. A. F. Rosenthal and S. C.-H. Han (Dept. of Laboratories, The Long Island Jewish Hosp. New Hyde Park, N.Y., N.Y. 11040). *J. Lipid Res.* 10,

243–5 (1969). Phosphoglyceride phosphorus is readily determined directly on silica gel removed from thin-layer chromatograms, without elution, by a nondigestive procedure with a sulfuric-periodic acid reagent. The method is specific for hydrolyzable phosphoglyceride containing two acid-hydrolyzable groups. Cardiolipin reacts only partially, while sphingomyelin, diether lecithin and phosphonate cephalin fail completely to react.

INFLUENCE OF pH OF THE MEDIUM ON FREE FATTY ACID UTILIZATION BY ISOLATED MAMMALIAN CELLS. A. A. Spector (Depts. of Med. and Biochem., College of Med., Univ. of Iowa, Iowa City, Iowa 52240). *J. Lipid Res.* 10, 207–15 (1969). Studies with Ehrlich ascites tumor cells showed that small decreases in the pH of the incubation medium from 7.4 increase the magnitude of incorporation of free fatty acid (FFA) into the cells from an albumin solution. A similar effect occurred when rabbit erythrocytes, rat heart slices or rat liver slices were incubated with FFA-bovine albumin solutions and when tumor cells were incubated with FFA in media containing human albumin, β-lactoglobulin or rat plasma. The effect was not seen when the medium contained no protein. When the pH of the albumin-containing medium was lowered from 7.4 to 6.6, oxidation of FFA to CO_2 by the tumor cells increased, esterification of the FFA (mostly into phospholipids and triglycerides) increased, and less esterified radioactive fatty acid was depleted from the cells. Hence, more fatty acid accumulated in the cells in more acid media. These findings suggest that small changes in intracellular pH might regulate FFA utilization and lipid accumulation in mammalian tissues.

ABSORPTION AND LYMPHATIC TRANSPORT OF CHOLESTEROL AND SITOSTEROL IN THE RAT. C. Sylven and B. Borgstrom (Div. of Physiol. Chem., Chem. Center, Univ. of Lund, Lund, Sweden). *J. Lipid Res.* 10, 179–182 (1969). Sitosterol-22,23-^{3}H in different combinations with cholesterol-4-^{14}C, dissolved in 0.8 ml of triolein, was fed to rats with lymph fistulae. Feeding 1.5, 50, or 100 μmoles of sitosterol resulted in a transfer to the lymph in 24 hr of 3–6% of the sitosterol, largely independent of the dose fed. The total amount of sitosterol transferred to the lymph was therefore almost linearly related to the dose fed. About 30% of a tracer dose of cholesterol 4-^{14}C fed together with the sitosterol was transferred to the lymph in 24 hr. When a total of 50 μmoles of sterol, containing cholesterol-^{14}C and sitosterol-^{3}H in the proportions 1:3, 1:1, and 3:1, was similarly fed, we found that sitosterol had no significant effect on the lymphatic transport of the simultaneously fed cholesterol. The ratio of ^{3}H to ^{14}C in the lymph was between 0.1 and 0.2 (the ratio in each fed mixture being taken as 1.0). The ratio was constant during the absorption period and independent of the ratio of sterols in the fed sterol mixture. Thus the same percentage of each sterol was always absorbed, and the sterols exerted no mutual interference in each others' absorption.

PHOSPHOLIPID METABOLISM DURING BACTERIAL GROWTH. D. C. White and A. N. Tucker (Dept. of Biochem., Univ. of Kentucky Med. Center, Lexington, Ky. 40506). *J. Lipid Res.* 10, 220–233 (1969). *Haemophilus parainfluenzae* incorporates glycerol and phosphate into the membrane phospholipids without lag during logarithmic growth. In phosphatidyl glycerol (PG), the phosphate and unacylated glycerol moieties turn over and incorporate radioactivity much more rapidly than does the diacylated glycerol. At least half the radioactivity is lost from the phosphate and unacylated glycerol in about one doubling. The total fatty acids turn over slightly faster than the diacyl glycerol. In phosphatidyl ethanolamine (PE), which is the major lipid of the bacterium, ethanolamine and phosphate turn over and incorporate radioactivity at least half as fast as the phosphate in PG. The glycerol of PE did not turn over in 4 bacterial doublings. In phosphatidic acid the glycerol turns over at one-third the rate of phosphate turnover. By means of a modified method for the quantitative recovery of 1,3-glycerol diphosphate from cardiolipin, the phosphates and middle glycerol of cardiolipin were shown to turn over more rapidly than the acylated glycerols during bacterial growth. There is no randomization of the radioactivity in the 1- and 3-positions of the glycerol in the course of one doubling.

THE INTERACTION OF CHOLESTEROL ABSORPTION AND CHOLESTEROL SYNTHESIS IN MAN. S. M. Grundy, E. H. Ahrens, Jr. and Jean Davignon (Rockefeller Univ., New York 10021). *J. Lipid Res.* 10, 304–315 (1969). Feeding large amounts of cholesterol to the normocholesteremic patient caused an expansion of body pools by as much as 20 g before the amount of cholesterol re-excreted as fecal neutral steroids each day came into balance with the cholesterol absorbed from the diet. There was no detectable decrease in total body synthesis of cholesterol nor any increase in conversion of cholesterol into bile acids. However, feedback control of cholesterol synthesis was demonstrable when large quantities of plant sterols were fed: in the hypercholesteremic patients thus studied, the absorption of both endogenous and exogenous cholesterol was then greatly reduced, and a compensatory increase in synthesis occurred. Thus, the plant sterol experiments, but not the cholesterol feeding experiment, demonstrated that feedback control by dietary cholesterol does occur in man. That feedback control by dietary cholesterol is relatively unimportant in man seems to be due to the fact that in the metabolic "steady state" the absorption mechanism is essentially saturated by the large amounts of endogenous cholesterol available for reabsorption.

FATTY LIVER PRODUCED BY DIETARY DEFICIENCIES: ITS PATHOGENESIS AND POTENTIATION BY ETHANOL. C. S. Lieber, N. Spritz and Leonore DeCarli (Cornell Medical Div., Bellevue Hosp., New York, N.Y. 10016). *J. Lipid Res.* 10, 283–287 (1969). In a study of the pathogenesis of hepatic fat accumulation under experimental conditions mimicking chronic alcoholism, rats were fed a low-fat diet, deficient in amino acids and choline, containing either ethanol or isocaloric amounts of carbohydrate. Dietary deficiencies alone produced a moderately fatty liver after 24 days. The combination of ethanol and dietary deficiencies resulted in enhanced lipid accumulation, which was apparent after only 11 days. In an investigation of the origin of hepatic triglyceride fatty acids, the experiment was repeated after the adipose lipids had been marked by the feeding of oils containing characteristic fatty acids (linseed oil, containing linolenate, or coconut oil, containing laurate and myristate). In all animals, the fatty acid composition of the hepatic triglycerides differed markedly from that of adipose tissue; it had a larger percentage of endogenously synthesized fatty acids and a five times smaller percentage of the marker fatty acids. In addition, ethanol feeding resulted in a greater retention of the marker fatty acids in the adipose tissue.

NEGLIGIBLE RELEASE OF CARDIOLIPIN DURING MILK SECRETION BY THE RUMINANT. S. Patton, L. F. Hood and J. S. Patton (Div. of Food Science, Penn. State Univ., University Park, Pa. 16802). *J. Lipid Res.* 10, 260–266 (1969). The presence of cardiolipin (diphosphatidyl glycerol) in lactating mammary tissue (cow and goat) was investigated. The tissue was separated into subcellular fractions by sedimentation; the identities of the fractions were confirmed by electron microscopy. Polar lipids recovered from the fractions, the whole tissues and milks were analyzed by two dimensional thin-layer chromatography and the percentages of cardiolipin were determined. The phospholipids of whole mammary tissue from the cow and goat contain 3–5% cardiolipin which is concentrated largely, if not exclusively, in the mitochondria. Although milk may on occasion have up to 1% cardiolipin in its phospholipids, some normal milks contain less than 0.15%. Since tissue contains 20–30 times the amount (mg/g) of phospholipids in milk, the quantitative ratio of tissue to milk cardiolipin is several hundred to one.

THE SYNTHESIS OF TRANS-β-CAROTENE FROM RETINYL PHOSPHONATE BY THE MICHAELIS-ARBUZOV REACTION. J. Surmatis and R. Thommen (Tech. Dev. Dept., Hoffmann-LaRoche Inc., Nutley, New Jersey). *J. Organic Chem.* 34, 559–60 (1969). Retinyl phosphonate, which was synthesized for the first time, was condensed with vitamin A aldehyde to afford β-carotene in good yield.

RELATION OF FLAVOR DEVELOPMENT IN CHEDDAR CHEESE TO CHEMICAL CHANGES IN THE FAT OF THE CHEESE. J. A. Ohren and S. L. Tuckey (Dept. of Food Sci., Univ. of Ill., Urbana 61801). *J. Dairy Sci.* 52, 598–607 (1969). Typical Cheddar cheese flavor was found to be related to a balance of free fatty acids and acetate. Experimental lots of cheese, which had the finest flavor and highest score, had a concentration of free fatty acids plus acetate of 12 to 28 μmoles per gram of cheese solids after 180 days of aging or a ratio of free fatty acids to acetic acid between 0.55 and 1.0. Gas-liquid chromatography analysis showed that identical fatty acids were liberated in each lot of cheese. All even-numbered carbon fatty acids from C_4 to C_{18} were found in each lot from the first day of manufacture. Cheese criticized as having rancid, fruity, and fermented flavors had two to three times the concentration of C_{10}, C_{12} and C_{14} fatty acids as did cheese of fine flavor. Cheese made from skimmilk did not acquire ether

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Cheddar flavor or body characteristics during ripening of six or 12 months. Only Cheddar cheese containing 50% fat or more in the dry matter developed a typical flavor, whereas cheese with less than 50% fat did not. As fat in the cheese decreased, the concentration of fatty acids decreased, but the acetate increased so the ratio of free fatty acids to acetate became undesirable. Typical flavor developed in cheese made either from raw or from pasteurized whole milk, provided the bacterial count of the milk was not abnormally high or low. Greater concentration of free fatty acids developed during ripening in cheese made from pasteurized milk, when the total plate count was high in the raw milk, >10,000,000/ml, than in cheese made from raw milk with a low bacterial count, 1,000 to 5,000/ml.

STRUCTURE OF CELL WALL LIPOPOLYSACCHARIDE FROM SALMONELLA TYPHIMURIUM. I. LINKAGE BETWEEN O SIDE CHAINS AND R CORE. H. Nikaido (Biochem. Res. Lab., Mass. General Hosp., Boston, Mass. 02114). *J. Biol. Chem.* 244, 2835–2845 (1969). Lipopolysaccharide of wild type *Salmonella typhimurium* is believed to contain O side chains, whose reducing terminal sugar, galactose, is linked to the R core. Two oligosaccharides were isolated by periodate oxidation, $NaBH_4$ reduction, and mild acid hydrolysis of such a lipopolysaccharide. They were also isolated from the lipopolysaccharide of a mutant synthesizing very short O side chains each containing only one "repeat unit," but not from that of a mutant totally lacking O side chains. The degradation of a lipopolysaccharide, which was synthesized partially *in vitro* and contained ^{14}C only in the reducing terminal galactose residue of the O side chain, also resulted in the isolation of these two oligosaccharides, labeled with ^{14}C. These results indicate that the oligosaccharides were derived from the linkage region between the O side chain and R core. Moreover, one of the oligosaccharides was identified as O-D-galactosyl-O-D-glucosyl-(1→2)-glyceraldehyde; the other appeared to be a cyclic acetal formed from the former oligosaccharide and glycerol. These and other results show that the reducing terminal galactose of O side chains is not linked to the nonreducing terminal sugar of the R core, i.e., N-acetyl-D-glucosamine, but to a glucose residue within the R core through a 1→4 linkage if the sugars are in pyranose forms. This glucose in turn is linked through a 1→2 linkage to a galactose residue in the R core.

BIOSYNTHESIS AND STRUCTURE OF A NEW INTERMEDIATE BETWEEN FARNESYL PYROPHOSPHATE AND SQUALENE. G. Popjak, J. Edmond, K. Clifford and V. Williams (Shell Res. Ltd., Milstead Lab. of Chem. Enzymol. Sittingvourne, Kent, Eng.). *J. Biol. Chem.* 244, 1897–1918 (1969). The intermediate between farnesyl pyrophosphate and squalene was synthesized in milligram quantities with yeast subcellular particles from farnesyl-^{14}C-pyrophosphate and from farnesyl-1-$^{3}H_2$-^{14}C-pyrophosphate. The ^{3}H:^{14}C ratio in the new squalene precursor was found to be identical with that in the farnesyl pyrophosphate, whereas the ratio in squalene was close to the expected value of 0.75 relative to the ratio either in farnesyl pyrophosphate or in the precursor. The squalene precursor is optically active and gives a normal optical (dextro)rotatory dispersion curve. From nuclear magnetic resonance and mass spectrometric studies, and from chemical degradation, it is concluded that this squalene precursor is the cyclic pyrophosphoryl ester of squalene-10,11-glycol. The metabolism of farnesyl pyrophosphate by the yeast subcellular particles yields, in addition to the squalene precursor, free farnesol, some nerolidol, farnesene, and also the cyclic monophosphate (phosphodiester) of squalene-10,11-glycol. The latter is not converted into squalene with liver microsomes and NADPH. The synthesis of the squalene precursor from farnesyl pyrophosphate with liver microsomes could not be shown. In the absence of NADPH, liver microsomes converted farnesyl pyrophosphate quantitatively into farnesol, nerolidol and the phosphodiester of squalene-10,11-glycol, which is though to arise by enzymic hydrolysis of the precursor. A new method for the preparation of crystalline farnesyl pyrophosphate and for the purification of the squalene precursor is described.

EVIDENCE OF A δ-OXIDATION PATHWAY FOR SATURATED FATTY ACIDS. P. S. Dimick, N. J. Walker and S. Patton (Lipids Lab., Penn. State Univ., University Park, Pa. 16802). *Biochem. J.* 111, 395–399 (1969). Specific radioactivities of milk triglyceride fatty acids and γ- and δ-hydroxy fatty acids were measured after the intramammary infusion of acetate-1-^{14}C δ-hydroxy-laurate-1-^{14}C and laurate-1-^{14}C as their sodium salts into fed lactating goats. Net incorporations of the radioactive tracer into the total milk lipids were comparable, being 16, 17 and 21% of the label infused, respectively. The specific radioactivities of the C_4–C_8 fatty acids after acetate-1-^{14}C infusion were lower than those of the C_{10} to C_{14} fatty acids. After δ-hydroxy laurate-1-^{14}C administration the milk triglyceride fatty acids were labelled and their specific radioactivities were characterized by decreasing values with increasing chain length of the fatty acids, implicating C_4 unit incorporation. The γ- and δ-hydroxy fatty acids isolated after laurate-1-^{14}C infusion were highly labelled and the milk triglyceride fatty acids, other than laurate, exhibited a labelling pattern similar to that of the fatty acids derived from the radioactive δ-hydroxy fatty acid. Evidence is presented for the existence of saturated fatty acid δ-oxidation in the mammary gland, in which the γ- and δ-hydroxy fatty acids are active intermediates.

STUDIES ON THE α-OXIDATION OF PHYTANIC ACID BY RAT LIVER MITOCHONDRIA. Su-Chen Tsai, J. Avigan and D. Steinberg (Mol. Disease Branch, National Heart Inst., Nat. Inst. of Health, Bethesda, Md. 20014). *J. Biol. Chem.* 244, 2682–2692 (1969). Phytanic acid (3,7,11,15-tetramethylhexadecanoic acid) is oxidized to CO_2 in rat liver whole cell homogenates or washed mitochondria supplemented with ATP, NAD^+ and NADPH. In the course of this degradation, α-hydroxyphytanic, pristanic, A^2-pristenic, and 4,8,12-trimethyltridecanoic acids are formed as intermediates; they have been identified by gas-liquid chromatography or mass spectrometry. The proposed mechanism of mammalian catabolism of phytanic acid involves initial α-oxidation leading through α-hydroxyphytanic acid to pristanic acid, and subsequent β-oxidations. The α-oxidative process requires NADPH and O_2, the addition of Fe^{+++} ions greatly stimulates this reaction. Fe^{++} and a number of other heavy metal ions, as well as dipyridyl, lipoic acid, CoA–SH and H_2O_2 generated *in situ* strongly inhibit it, whereas ascorbic acid, imidazole, aminopterin and folic acid have little or no effect. The properties of the mammalian phytanic acid-α-oxidizing enzyme are discussed and compared with those of straight chain fatty acid-α-oxidizing systems in plants and animals.

CONGENITAL LIPOPROTEIN LIPASE DEFICIENCY AND HYPERLIPEMIA IN THE YOUNG PUPPY. D. Baum, A. I. Schweid, D. Porte, Jr. and E. L. Bierman (Depts. of Ped., Pathol. and Med., Univ. of Wash. School of Med., and Veterans Admin. Hosp., Seattle, Wash. 98105). *Proc. Soc. Exptl. Biol. Med.* 131, 183–5 (1969). A young puppy with hyperlipemia presumably associated with lipoprotein lipase deficiency is reported. It appears that this rare abnormality of lipid metabolism may occur in mammals other than man.

HEPATIC ATP AND TRIGLYCERIDE LEVELS IN CHOLINE-DEFICIENT RATS WITH AND WITHOUT DIETARY OROTIC ACID SUPPLEMENTATION. J. B. Simon, R. Scheig and G. Klatskin (Dept. of Internal Med., Yale Univ. School of Medicine, New Haven, Conn.). *J. Nutr.* 98, 188–192 (1969). Hepatic ATP depletion is probably important in the pathogenesis of the experimental fatty livers produced by orotic acid and several other agents that inhibit hepatic lipoprotein production. Because choline deficiency also impairs lipoprotein production, we have investigated the role of ATP depletion in this condition. Rats fed a choline-deficient diet for 5 days had no change in hepatic ATP despite a 30-fold increase in triglycerides. Furthermore, adenine sulfate, an ATP precursor, failed to influence the degree of lipid accumulation when added to the diet. In contrast, adding 1% orotic acid to a choline-supplemented diet for 5 days produced a 50% fall in ATP along with a sevenfold increase in hepatic triglycerides, and 0.25% dietary adenine sulfate completely prevented both these effects. A previously reported protective effect of orotic acid in choline deficiency was confirmed by the fact that choline-deficient rats fed orotic acid had about 50% lower hepatic triglyceride levels than those not given this agent. Despite this, orotic acid lowered ATP in choline-deficient animals equally as well as in choline-supplemented animals. These results indicate that unlike the lipid accumulation induced by orotic acid, the fatty liver of choline deficiency is not related to hepatic ATP depletion. The paradoxical protective effect of orotic acid in choline deficiency appears to be independent of its influence on ATP.

FATTY ACID SYNTHESIS IN HUMAN ADIPOSE TISSUE. E. Shrago, T. Spennetta and E. Gordon. (Dept. of Med., Univ. of Wisc. Med. School., Madison, Wisconsin 53706). *J. Biol. Chem.* 244, 2761–6 (1969). The concentration of enzymes required for fatty acid synthesis was considerably less in extracts prepared from human omental adipose tissue than from rat epididymal fat. Overall rates of synthesis as measured by the incorporation of radioactive precursors into fatty acids

were also much lower in human adipose tissue. The most striking difference was found with citrate-1,5-^{14}C, human adipose tissue incorporating the compound at a rate less than one-tenth that of rat epididymal fat. This finding was consistent with the virtual absence of the citrate cleavage enzyme in human adipose tissue. By contrast, the activities of pyruvate carboxylase and phosphoenolpyruvate carboxykinase, two enzymes necessary for the synthesis of glyceride glycerol from pyruvate, and the long chain fatty acid activating enzyme (or enzymes) were essentially similar in both human and rat adipose tissues. The results are consistent with the hypothesis that synthesis *de novo* of fatty acids is not an important physiological function of human adipose tissue.

THE STRUCTURE OF AN ACYLATED INOSITOL MANNOSIDE IN THE LIPIDS OF PROPIONIC ACID BACTERIA. N. Shaw and F. Dinglinger (Microbiol. Chem. Res. Lab., Dept. of Organic Chem., Univ. of Newcastle upon Tyne, NE1 7RU). *Biochem. J.* 112, 769–75 (1969). Lipids were extracted from five strains of *Propionibacterium* with chloroform-methanol mixtures and fractionated by chromatography on silicic acid. All five extracts contained a glycolipid composed of fatty acids, inositol and mannose in the molar proportions 2:1:1. Hydrolysis of the glycolipid with alkali gave a mixture of fatty acids and O-α-D-mannopyranosyl-(1→2)-myoinositol. Analysis of the fatty acids by G.L.C. showed that they were predominantly straight- and branched-chain isomers of pentadecanoic acid and heptadecanoic acid. The location and distribution of the fatty acid residues in the molecule was established by periodate oxidation studies and mass spectrometry. The structure of the major glycolipid is 1-O-pentadecanoyl-2-O-(6-O-heptadecanoyl-α-D-mannopyranosyl) myoinositol. The glycolipids are located in the membrane; the cell walls are devoid of lipid. Possible functions of the glycolipid are discussed.

A SHIFT IN THE OPTIMUM pH OF PHOSPHOLIPASE D PRODUCED BY ACTIVATING LONG-CHAIN ANIONS. R. H. Quarles and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council Inst. of Animal Physiol., Babraham, Cambridge). *Biochem. J.* 112, 795–9 (1969). The activity of phospholipase D (phosphatidylcholine phosphatidohydrolase, EC 3.1.4.4) towards ultrasonically treated phosphatidylcholine or large phosphatidylcholine particles activated with ether was maximal near pH 5, and there was little activity above pH 6. When the enzyme was activated by the addition of phosphatidic acid to large phosphatidylcholine particles, the pH optimum was shifted to pH 6.5 irrespective of the amount of activator added. When the enzyme was activated with low concentrations of dodecyl sulphate the pH optimum was 5.5 with little activity above pH 6. With higher concentrations of dodecyl sulphate the pH-activity profile was shifted upwards towards a pH optimum of 6.5–6.6, the magnitude of the shift depending on the extent of the hydrolysis. The shifts in the pH-activity profiles cannot be correlated with changes in the "surface pH" of the substrate particles calculated from the measurement of their ζ-potentials (electrophoretic mobilities).

PROTECTION OF NEONATES AGAINST WHOLE-BODY RADIATION BY THE ADMINISTRATION OF A SINGLE EMULSIFIED INJECTION OF A LIPOPOLYSACCHARIDE DURING PREGNANCY. S. Prigal (Dept. of Med., New York Medical College, Flower-Fifth Ave. Hospital, N.Y.). *Proc. Soc. Exptl. Biol. Med.* 131, 159–63 (1969). A lipopolysaccharide (LPS) derived from *E. coli* was administered to mice during gestation yielding neonates that were highly resistant to lethal whole-body radiation. The LPS was given as an emulsion in mineral oil: the slow release from the emulsion eliminated the abortive and toxic effect of the LPS and prolonged its effective action.

EFFECT OF INHIBITORS OF CHOLESTEROL SYNTHESIS ON RAT LIVER UBIQUINONE. W. E. J. Phillips and R. L. Brien (Res. Lab., Food and Drug Directorate, Dept. of National Health, Ottawa, Ont.). *J. Atheroscler. Res.* 9, 113–119 (1969). Three hypocholesterolemic agents that act *in vivo* by inhibition of cholesterol synthesis were studied in regard to their effect on liver ubiquinone and vitamin A levels. Benzmalacene, SK and F No. 525A and AY9944 although modifying isoprenoid synthesis did not lower liver ubiquinones of the rat. None of the inhibitors studied adversely affected vitamin A metabolism as indicated by liver stores of the vitamin.

PRENATAL AND POSTNATAL MORTALITY OF OFFSPRING OF CYCLOPROPENOID FATTY ACID-FED RATS. A. Miller, E. Sheehan, and M. Vavich (Depts. of Agricultural Biochem. and Food and Nutr., Univ. of Ariz., Tucson, 85721). *Proc. Soc. Exptl. Biol. Med.* 131, 61–6 (1969). Cyclopropenoid fatty acids fed to

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female rats in the form of *Sterculia foetida* oil caused a decrease in mating behavior, fertility and fetal and newborn viability. At the 3% level in the diet, *S. foetida* oil completely prevented reproduction. At the 2 and 1% levels, it caused pre- and postpartum death of offspring. No teratological effects were observed, but degenerative changes and necrosis inconsistent with survival were seen in fetal and newborn livers and kidneys. Hemorrhages into the lung alveoli resulting in anoxia appeared to be the immediate cause of postpartum death.

BRAIN LIPOYL DEHYDROGENASE. PURIFICATION, PROPERTIES AND INHIBITORS. Sara A. Millard, Adrienne Kubose, and E. M. Gal (Div. of Neurobiochem., Dept. of Psychiatry, College of Med., Univ. of Iowa, Iowa City, Iowa 52240). *J. Biol. Chem.* **244,** 2511–5 (1969). Lipoyl dehydrogenase (NADH: lipoamide oxidoreductase, EC 1.6.4.3), highly purified from pig brain, is similar in physical and kinetic properties to the enzyme from other mammalian sources. Lipoyl dehydrogenase is markedly inhibited by pteridines, but its transhydrogenase and diaphorase activities are unaffected. Mitochondrial keto acid oxidation is also inhibited by pteridines, although the inhibition is only significant at 10^{-3} M pteridine.

TURNOVER RATES OF KETONE BODIES IN NORMAL, STARVED AND ALLOXAN-DIABETIC RATS. Margaret W. Bates, H. A. Krebs and D. H. Williamson (Med. Res. Council Unit for Res. in Cell Metabolism, Dept. of Biochem., Univ. of Oxford). *Biochem. J.* 110, 655–61 (1968). Rates of appearance and disappearance of total ketone bodies were determined in normal, starved and alloxan-diabetic rats by measuring specific radioactivities and concentrations of blood acetoacetate and 3-hydroxybutyrate at different times after injection of 3-hydroxyl butyrate-^{14}C. The mean rates of appearance were 1.7, 4.2 and 10.9 μmoles/min./100 g. body wt. respectively for normal, starved and alloxan-diabetic rats. The rates of disappearance were of the same order of magnitude as the rates of appearance. There was a direct correlation between the rates of appearance and disappearance and the blood concentrations of the ketone bodies. The results indicate that in the rat increased ketone-body production is paralleled by increased ketone-body utilization and that the raised ketone-body concentration in the blood in starvation and alloxan-diabetes is due to a slight imbalance between the rates of production and utilization. The findings are discussed in relation to the concept that ketone bodies can serve as fuels of respiration when the supply of carbohydrate is limited.

STUDIES ON THE STEROLS AND STEROL ESTERS OF THE INTRACELLULAR ORGANELLES OF MAIZE SHOOTS. R. J. Kemp and E. I. Mercer (Dept. of Biochem. and Agr. Biochem., Univ. College of Wales, Aberystwyth). *Biochem. J.* 110, 119–25 (1968). The composition of the esterified and unesterified sterols of the nuclear, chloroplastidic, mitochondrial and microsomal fractions of 21-day-old maize shoots was examined. The microsomal and mitochondrial fractions contain the bulk of the sterols of the tissue. Only 1% of the sterol isolated from all the organelles is esterified. The nuclear fraction has the greatest proportion of esterified sterol and the microsomal fraction the least. 4-Demethyl sterols constitute the bulk of both esterified and unesterified sterols in all organelle fractions. Cholesterol is the major esterified 4-demethyl sterol of the nuclear and chloroplastidic fractions, but only the nuclear fraction has an appreciable proportion of unesterified cholesterol. Sterol esters of linolenic acid are more abundant in the mitochondrial and microsomal fractions than in the other two fractions.

BIOCHEMICAL EFFECTS OF THE HYPOGLYCAEMIC COMPOUND PENT-4-ENOIC ACID AND RELATED NONHYPOGLYCAEMIC FATTY ACIDS. FATTY ACID OXIDATION. A. E. Senior, B. Robson and H. S. A. Sherratt (Dept. of Physiol., Med. School, Univ. of Newcastle upon Tyne, NE1 7RU). *Biochem. J.* 110, 511–9 (1968). The effects of the hypoglycaemic compound, pent-4-enoic acid, and of four structurally related non-hypoglycaemic compounds (pentanoic acid pent-2-enoic acid, cyclopropanecarboxylic acid and cyclobutanecarboxylic acid), on the oxidation of saturated fatty acids by rat liver mitochondria were determined. The formation of $^{14}CO_2$ from palmitate-1-^{14}C was strongly inhibited by 0.01 mM pent-4-enoic acid. The inhibition of oxygen uptake was less than that of $^{14}CO_2$ formation, presumably because fumarate was used as a sparker. The oxidation of butyrate-1-^{14}C, octanoate-1-^{14}C, or laurate-1-^{14}C was not strongly inhibited by 0.01 mM pent-4-enoic acid. The other four non-hypoglycaemic compounds did not inhibit the oxidation of any saturated fatty acid when tested at 0.01 mM concentration, though they all inhibited strongly at 10 mM. The oxidation of myristate-1-^{14}C and stearate-1-^{14}C but not of (1-^{14}C) palmitate-1-^{14}C was about 50% carnitine-dependent under the experimental conditions used. There was a correlation between the ability to inhibit long-chain fatty acid oxidation and hypoglycaemic activity in this series of compounds.

THE MEMBRANE LIPIDS OF HALOBACTERIUM HALOBIUM. Carolyn L. Marshall and A. D. Brown (Dept. of Microbiol., Univ. of New South Wales, Kensington, Sydney, N. S. W. 2033, Australia). *Biochem. J.* 110, 441–8 (1968). The lipid content of the cell membrane of *Halobacterium halobium* increased from about 15% to 21% during exponential growth cycle. The mixture of membrane lipids from stationary-phase organisms was similar to lipid mixtures from whole cells of other halobacteria inasmuch as 80% of the lipid phosphorus occurred in a diether analogue of phosphatidylglycerophosphate and an additional 7.5% occurred in the ether analogue of phosphatidylglycerol. The lipid mixture was more complex than those reported for other halophils, however, 12 components being recognized in the acetone-insoluble fraction and 17 in the acetone-soluble fraction.

THE CONTROL OF FATTY ACID AND TRIGLYCERIDE SYNTHESIS IN RAT EPIDIDYMAL ADIPOSE TISSUE. ROLES OF COENZYME A DERIVATIVES, CITRATE AND L-GLYCEROL 3-PHOSPHATE. R. M. Denton and M. L. Halperin (Dept. of Biochem., Univ. of Bristol). *Biochem. J.* 110, 27–38 (1968). An investigation was made of some postulated mechanisms of control of fatty acid and triglyceride synthesis in rat epididymal fat pads incubated *in vitro*. The rate of triglyceride synthesis could not be correlated with the concentrations of either L-glycerol 3-phosphate or long-chain fatty acyl-CoA (measured as total acid-insoluble CoA). Factor(s) other than the whole-tissue concentrations of these recognized precursors appear to be involved in the determination of the rate of triglyceride synthesis. No relationship was found between the rate of fatty acid synthesis and the whole-tissue concentrations of the intermediates, citrate or acetyl-CoA, or with the two proposed effectors of acetyl-CoA carboxylase, citrate (as activator) or

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long-chain fatty acyl-CoA (as inhibitor). The control of fatty acid synthesis appears to reside in additional or alternative factors.

LECITHIN AEROSOLS GENERATED ULTRASONICALLY ABOVE 25C. E. Merrill, D. Graves, K. Smith (Dept. of Chem. Engineering, Mass. Institute of Technology, Cambridge), D. Shannon and H. Kazemi. *Science* 164, 1167–8 (1969). DL-Dipalmitoyl-α-lecithin, suspended in 0.15-molar sodium chloride solution by sonic cavitation at 20 kilohertz, can be aerosolized by an 800-kilohertz ultrasonic generator only at temperatures above 25C. The aerosol thus produced is exceptionally stable against evaporation even at particle radii of 0.1 to 0.6 micron; this suggests applicability to the therapy of pulmonary disorders.

GLYCOSPHINGOLIPIDS WITH LEWIS BLOOD GROUP ACTIVITY: UPTAKE BY HUMAN ERYTHROCYTES. D. M. Marcus and L. E. Cass (Dept. of Medicine, Albert Einstein College of Medicine, Bronx 10461). *Science* 164, 553–554 (1969). The Lewis blood group antigens of the human erythrocyte are acquired from plasma and not synthesized *in situ*. Although assumed previously to be glycoproteins, the Lewis antigens in plasma are glycosphingolipids which are taken up by the erythrocyte membrane from lipoproteins or from aqueous dispersions.

EFFECT OF PHOSPHOLIPIDS ON PLATELET ELECTROPHORETIC MOBILITY. J. R. Hampton and C. H. Bolton (Dept. of Regius Professor of Medicine, Radcliffe Infirmary, Oxford, G.B.). *J. Atheroscler. Res.* 9, 131–139 (1969). The effects of natural and synthetic phospholipids on platelet electrophoretic mobility have been studied. The only phospholipids to have consistent effects were lecithin and lysolecithin. Lecithin decreased and lysolecithin increased postcontact mobility. Platelet sensitivity to adenosine diphosphate was increased by lecithin only in the presence of fresh plasma, whilst lysolecithin caused a similar increase whether or not fresh plasma was present. It was noted that the amounts of added phospholipid that caused these changes were lower than those present in plasma. The possible mechanism and significance of these changes, and their relevance to the problem of arterial disease, are discussed.

THE EFFECT OF LOW TEMPERATURES ON FATTY ACID BIOSYNTHESIS IN PLANTS. P. Harris and A. T. James (Unilever Res. Lab., Colworth House, Sharnbrook, Bedford). *Biochem. J.* 112, 325–30 (1969). Of three systems, bulb tissue, plant leaf tissue and intact green algal (*Chlorella vulgaris*) cells, only the former shows an increase in rate of formation of unsaturated fatty acids with decrease in temperature. In bulb tissue the oxygen concentration is rate-limiting for synthesis of unsaturated fatty acids at temperatures down to 10C. At elevated oxygen concentrations the formation of unsaturated fatty acids in bulb tissue increases with temperature. The failure of photosynthetic tissues to respond to either lower temperatures or increased oxygen concentrations in the presence of light is attributed to photosynthetic production of excess of oxygen. This is supported by the fact that in the dark a potentiating oxygen effect on the formation of unsaturated fatty acids can be demonstrated. The HCO_3^- ion concentration has a small effect on the formation of unsaturated fatty acids. Elevated content of unsaturated acids at lower temperatures in plants is attributed to increases in oxygen concentration in solution.

ABOLITION OF MILIEU-INDUCED HYPERLIPEMIA IN THE RAT BY ELECTROLYTIC LESION IN THE ANTERIOR HYPOTHALAMUS. M. Friedman, S. Elek and S. Byers (Harold Brunn Inst., Mount Zion Hospital and Medical Center, San Francisco, Calif.). *Proc. Soc. Exptl. Biol. Med.* 131, 288–93 (1969). An electrolytic lesion placed in the anterior hypothalamus of rats fed 3 ml of cottonseed oil prevented the milieu-induced postprandial hyperlipemia usually observed in these animals. Thus the average 6-hr postprandial plasma triglycerides of the lesioned rats was 40 mg/100 ml and that of the controls was 91 mg/100 ml. A similar lesion placed in the tuberal area of the hypothalamus was not similarly effective.

EVIDENCE FOR THE PRESENCE OF SEVERAL LIPASES IN COW'S MILK. W. K. Downey and P. Andrews (Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9 AT, Berks). *Biochem. J.* 112, 559–62 (1969). Skim milks containing sodium chloride (0.75 M) were centrifuged at 80,000 g for 2 hr. and portions of the supernatants were submitted to gel filtration on columns of Sephadex G-200. Enzymes in the effluent fractions were assayed titrimetrically for their hydrolytic activities towards tributyrin, triolein and milk-fat emulsions, and triacetin solution. Summation of the measurements gave ratios of activities towards the various substrates similar to those of the original skim milks. Although only partial separation was obtained, five enzymes appeared to be present. They showed some differences in substrate specificity, but all appeared to be lipases in that they hydrolysed the emulsified substrates more rapidly than the dissolved triacetin.

IN VITRO INCORPORATION OF ^{14}C LABELLED OLEIC ACID INTO COMBINED LIPID BY FOAM CELLS ISOLATED FROM RABBIT ATHEROMATOUS LESIONS. A. J. Day and R. K. Tume (Dept. of Physiol., Univ. of Melbourne, Parkville, Victoria). *J. Atheroscler. Res.* 9, 141–149 (1969). Foam cells obtained from rabbit atherosclerotic lesions were incubated *in vitro* with sodium oleate-^{14}C; the uptake of the fatty acid and its subsequent incorporation into other lipid fractions was determined. Most of the fatty acid taken up by the cells was incorporated into phospholipid (predominantly phosphatidylcholine) and into cholesterol ester with lesser amounts into triglyceride. The specific activity of the phospholipid-oleic acid was greater than that of the cholesterol ester-oleic acid indicating that the phospholipid had the greater fractional turnover rate. The possible pathways for the synthesis of phospholipid and cholesterol ester by these cells and the significance of such synthesis in the pathogenesis of the atherosclerotic lesion is discussed.

APPLICATION OF A NEW INTRAVENOUS FAT TOLERANCE TEST IN THE STUDY OF HYPERTRIGLYCERIDAEMIA IN MAN. J. Boberg, L. A. Carlson and D. Hallberg (Dept. of Geriatrics, Uppsala Univ., Uppsala, Sweden). *J. Atheroscler. Res.* 9, 159–169 (1969). A new intravenous fat tolerance test was performed in a group of younger and a group of older male normolipidemic subjects, as well as in a group of male patients with hyperlipoproteinaemia. In this tolerance test the disappearance of an injected fat emulsion from blood was characterized by 2 rate constants: K_1 that describes the maximal removal rate and K_2 that measures the fractional removal rate of the injected triglycerides. K_1 did not vary with age or correlate with either K_2 or the plasma triglyceride level. K_2 was lower in the older than in the younger control subjects. The older subjects also had higher plasma triglyceride values. K_2 was furthermore significantly lower in the hyperlipidaemic patients than in the old control subjects; all the former patients had K_2 values below the mean value for the older control group. When all values for K_2 and plasma triglycerides were plotted against each other, K_2 was found to decrease with increasing concentration of triglycerides in a hyperbolic fashion. The clinical use of the intravenous fat tolerance test, the possible physiological basis of K_1 and K_2, as well as the clinical implications of reduced fat tolerance were briefly discussed.

GLYCERYLPHOSPHORYLCHOLINE DIESTERASE: INHIBITION BY NUCLEOTIDES. J. Baldwin and W. Cornatzer (Guy and Bertha Ireland Res. Lab., Dept. of Biochem., Univ. of North Dak., School of Med., Grand Forks, N. Dak.). *Proc. Soc. Exptl. Biol. Med.* 121, 271–5 (1969). Glycerylphosphorylcholine diesterase (glycerolphosphorylcholine glycero-phosphohydrolase, EC 3.1.4.2) from rat kidney was inhibited selectively by purine triphosphate nucleotides and inorganic pyrophosphate. Classical competitive inhibition for all compounds tested was observed. Of the purine nucleotides ATP, GTP and ITP showed the greatest amount of inhibition, producing K_I values of approximately 1.5 mM. The purine diphosphates showed a lesser degree of inhibition, producing K_I values of approximately 20 mM and the corresponding purine monophosphates gave very little inhibition, producing K_I values of approximately 125 mM. In the case of the pyrimidine nucleotides, both the cytidine and uridine triphosphates were not as effective as the purine triphosphates. The K_I values obtained with the pyrimidine triphosphates were approximately seven times greater than for the purine triphosphates. Inhibition by ATP was found to be pH dependent in the range studied, (pH 7.0–10.2) with the greatest amount of inhibition observed at pH 8.6. Michaelis-Menton kinetics were observed with all of the nucleotides studied. However, when considering inorganic pyrophosphate, sigmodial type kinetics were observed. Inorganic phosphate was without effect on the diesterase; 5′-AMP and cyclic AMP did not reverse ATP inhibition; $MgCl_2$ alleviated the inhibition produced by ATP.

LYSOSOMAL ENZYMES IN REGENERATING RAT LIVER. M. Klockars and O. Wegelius (Univ. of Helsinki, Helsinki, Finland). *Proc. Soc. Exptl. Biol. Med.* 131, 218–22 (1969). The concentration of the lysosomal enzymes, acid phosphatase, arylsulfatase B

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and β-glucuronidase, was determined in regenerating liver 1, 2, 3 and 10 days after partial hepatectomy. An obvious increase in enzymatic activity was observed 2–3 days after the operation, but the reactions of the different enzymes were not parallel. It is concluded that the lysosomal organelle as such does not participate in the initiation of the process of cell division. The enzymatic activities seem to be at their maximum at a point of time subsequent to mitotic division. The present results argue in favor of the view that the lysosomes play a part in a postmitotic autophagocytosis. It is suggested that the lysosomal enzymes are involved in the inhibition of the regeneration of the liver.

STUDIES ON THE EFFECT OF VITAMIN D ON CALCIUM ABSORPTION AND TRANSPORT. G. Hashim and I. Clark (Inst. of Nutrition Sciences and Departments of Biochem. and Orthopaedic Surgery, Columbia Univ., New York, N.Y. 10032). *Biochem. J.* 112, 275–83 (1969). Mucosal cells of the small intestine obtained from rats deprived of vitamin D or given excessive amounts of the vitamin accumulated significantly more calcium than did cells from control animals. Mucosal cells from vitamin D-deficient rats released less calcium than did cells from normal or hypervitaminotic D animals. Studies *in vivo* showed that the transfer of ^{45}Ca from the intestine to the blood was delayed in vitamin D deficiency, but was accelerated in hypervitaminosis D. The findings support the thesis that vitamin D is involved in the release of calcium rather than in its uptake by mucosal cells. Further evidence is presented suggesting that uptake of calcium by intestinal mucosal cells at 0C is primarily passive, whereas at 38C uptake and release are effected by an active process that depends on energy derived from glycolytic activity.

PHOSPHOLIPID EXCHANGE REACTIONS WITHIN THE LIVER CELL. W. C. McMurray and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council, Inst. of Animal Physiol., Babraham, Cambridge). *Biochem. J.* 112, 91–108 (1969). Isolated rat liver mitochondria do not synthesize labelled phosphatidylcholine from CDP-(^{14}C)choline or any phospholipid other than phosphatidic acid from phosphate-^{32}P. The minimal labelling of phosphatidylcholine and other phosphoglycerides can be attributed to microsomal contamination. However, when mitochondria and microsomes are incubated together with phosphate-^{32}P, the phosphatidylcholine, phosphatidylinositol and phosphatidylethanolamine of the reisolated mitochondria become labelled, suggesting a transfer of phospholipids between the two fraction.

INCORPORATION OF ORTHOPHOSPHATE-^{32}P INTO BRAIN-SLICE PHOSPHOLIPIDS AND THEIR PRECURSORS. EFFECTS OF ELECTRICAL STIMULATION. A. M. Pumphrey (Dept. of Biochem., Inst. of Psych., De Crespigny Park, London S. E. 5). *Biochem. J.* 112, 61–70 (1969). The incorporation of phosphate-^{32}P into phospholipids was measured in slices cut from the pial surface of guinea-pig cerebral cortex; incorporation into the phosphorus of some water-soluble precursors of phospholipid was measured under similar conditions. Slices subjected to overall electrical stimulation at a frequency of 5 pulses/sec. differed from control slices in their pattern of phospholipid labelling. After 1 hr. of stimulation, incorporation of phosphate-^{32}P into phosphatidylcholine, ethanolamine phospholipid and cardiolipin was respectively 54, 55 and 58% of the control value, and that into phosphatidylinositol was 186% of control. Phosphatidic acid labelling tended to increase with electrical stimulation, but the statistical significance of this change was marginal. Labelling of phosphatidylglycerol and di- and triphosphoinositides was not affected significantly by electrical stimulation. Electrical stimulation of the tissue altered the specific radioactivities of water-soluble precursors of phospholipid. The turnover rates of the phosphate groups of phospholipids were estimated approximately from the specific radioactivities of phospholipids and their precursors. Phosphatidylinositol (and its lipid-soluble precursors) showed the largest change in turnover rate in response to electrical stimulation of the tissue; the turnover rates of other lipids were also affected. Changes in the specific radioactivity of phospholipids did not correspond to changes in turnover in these experiments.

CLEARING-FACTOR LIPASE IN ADIPOSE TISSUE. DISTINCTION OF DIFFERENT STATES OF THE ENZYME AND THE POSSIBLE ROLE OF THE FAT CELL IN THE MAINTENANCE OF TISSUE ACTIVITY. V. J. Cunningham and D. S. Robinson (Dept. of Biochem., Univ. Oxford, Gr. Br.). *Biochem. J.* 112, 203–9 (1969). Incubation of intact epididymal adipose tissue from fed rats at 37C in an albumin solution at pH 7.4 *in vitro* results in a rapid loss of clearing-factor lipase activity until a low activity, stable to prolonged incubation, is attained. The clearing-factor lipase activity of intact tissue from starved rats, which is initially much less than that of tissue from fed rats, is mainly stable to incubation at 37C. Much of the clearing-factor lipase activity of intact epididymal adipose tissue from fed rats is inactivated by collagenase. The enzyme activity of intact tissue from starved rats is not inactivated by collagenase. The clearing-factor lipase activity of fat cells isolated from the epididymal adipose tissue of fed rats is stable to prolonged incubation at 37C. It represents only a small proportion of the total activity of the intact tissue. In starved rats, the isolated fat cells contain a much higher proportion of the activity of the intact tissue. Their activity is also stable at 37C. Incubation of isolated fat cells in a serum-based medium leads to a progressive rise in clearing-factor lipase activity. Actinomycin increases the extent of this rise in activity. No rise in clearing-factor activity occurs when stromal-vascular cells isolated from epididymal adipose tissue are incubated in the medium. The findings indicate that less than 20% of the activity of intact adipose tissue from fed rats is retained when fat cells are isolated from the tissue by collagenase treatment. The activity that is lost could be that which normally functions in the uptake of triglyceride fatty acids by the tissue.

REACTIONS OF VITAMIN A WITH ACCEPTORS OF ELECTRONS. FORMATION OF RADICAL ANIONS FROM 7,7,8,8-TETRACYANOQUINODIMETHANE AND TETRACHLORO-1,4-BENZOQUINONE. F. U. Lichti and J. A. Lucy (Molecular Biol. Lab., Univ. of Wis., Madison, Wisc. 53706). *Biochem. J.* 112, 221–9 (1969). The interactions of retinol and retinoic acid with two electron acceptors, 7,7,8,8-tetracyanoquinodimethane (TCNQ) and tetrachloro-1,4-benzoquinone (chloranil), were studied in an investigation on the ability of vitamin A to behave as a donor of electrons. Retinol reacts with TCNQ in polar organic solvents with the formation, as judged by spectral studies, of the radical anion of TCNQ. Addition of the products of this reaction to water is accompanied by a rapid consumption of OH^- ions. Consumption of OH^- ions is also a feature of the reactions between retinol and chloranil, but the spectrum of the radical anion of chloranil is observed only when

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retinol and chloranil are suspended in aqueous salt solutions. Retinoic acid behaves similarly to retinol in its reactions with TCNQ and chloranil, but it appears to be a weaker electron donor than retinol. The reaction products that may be formed from retinol in its reactions with TCNQ and chloranil are discussed. It is suggested that the ability of vitamin A to behave as a donor of electrons may be an important aspect of its biochemical mode of action.

REACTIONS OF VITAMIN A WITH ACCEPTORS OF ELECTRONS. INTERACTIONS WITH IODINE AND THE FORMATION OF IODIDE. J. A. Lucy and F. U. Lichti. *Ibid.*, 231–41. The reactions of retinol and retinoic acid with iodine were investigated since knowledge of the chemical reactions of vitamin A with acceptors of electrons may shed light on its biochemical mode of action. Colloidal retinol, but not retinoic acid, reacts with iodine to yield a blue-green complex that rapidly decomposes, giving iodide and an unknown species with λ_{max} at 870 mμ. In addition, both retinol and retinoic acid reduce iodine to iodide by a reaction that does not involve an intermediate coloured complex. this reaction appears to yield unstable carbonium ion derivatives of the vitamin. The presence of water greatly facilitates the production of iodide from vitamin A and iodine. Possible chemical pathways involved in these reactions are discussed. It is suggested that the chemical properties of retinol and retinoic acid that underlie their biochemical behaviour might be apparent only when the molecules are at a lipid—water interface, and that vitamin A might be expected to react with a number of different electron acceptors *in vivo*.

THE METABOLISM OF D-GLYCERALDEHYDE BY THE LENS. R. van Heyningen (Nuffield Lab. of Ophthalmology, Univ. of Oxford, Gr. Br.). *Biochem. J.* 112, 211–20 (1969). The metabolism of D-glyceraldehyde by the lens was examined. When low concentrations of D-(U-^{14}C)glyceraldehyde were incubated with lens extracts, there was no incorporation of the label into protein; more than two-thirds of the labelled metabolites consisted of glyceridic acid and glycerol, their relative proportions depending on the species. Lactic acid, a phosphate, glutathione-glyceradehyde compounds and a neutral compound were also formed. When high concentrations of D-(U-^{14}C) glyceraldehyde were incubated with lens, extensive incorporation of the label into protein occurred and the protein became yellow-brown. This coloured protein did not exhibit the fluorescent properties shown by the brown proteins of human cataractous senile lens, or of naphthaquinone-treated lens. Evidence that D-glyceraldehyde is formed by the lens was sought but not found.

THE DISTRIBUTION OF PHOSPHOLIPASE D IN DEVELOPING AND MATURE PLANTS. R. H. Quarles and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council Inst. of Animal Physiol., Babraham, Cambridge). *Biochem. J.* 112, 787–94 (1969). The distribution of phospholipase D (phosphatidyl choline phosphatidohydrolase, EC 3.1.4.4) was examined in the tissues of a number of plants and seeds. The highest activities were found in various swollen storage tissues of certain plants: cabbage, central stalk; cauliflower, flower; celery, swollen leaf stalk; Kohl rabi, swollen stem; carrot, root; pea and marrow, seed. It is concluded that phospholipase D in plant storage tissues and seeds may be related to the rapid growth involved in their formation rather than being necessary for the utilization of their food reserve substances.

FATTY ACID DESATURASE MUTANTS OF SACCHAROMYCES CEREVISIAE. A. D. Keith, M. R. Resnick and A. B. Haley (Dept. Genetics, Univ. of Calif., Berkeley 94720). *J. Bacteriol.* 98, 415–420 (1969). Genetic and biochemical analyses were conducted on fatty acid mutants of yeast deficient for Δ^9 desaturase activity in the production of palmitoleate and oleate. Two genetic loci were observed and two others are inferred: three of these were represented by respiratory-deficient strains. All strains were incapable of converting palmitate to palmitoleate and stearate to oleate whether the direct precursor or acetate was present. All strains were capable of acylating both denovo-produced fatty acids and oleate taken up from the medium into phospho- and neutral lipids.

PHOSPHATIDIC ACID SYNTHESIS IN ESCHERICHIA COLI. M. Kito and L. I. Pizer (Dept. Microbiol., School of Medicine, Univ. of Penna., Philadelphia, Penna. 19104). *J. Bacteriol* 97, 1321–1327 (1969). The kinetic properties of acyl-coenzyme A: L-α-glycerol-phosphate transacylase was studied. At 10C the enzyme had an apparent Km of 60 μM for L-α-glycerol-phosphate. A Km of 11 μM was calculated for palmitoyl-CoA. ATP specifically inhibited the reaction. Inhibition by palmitoyl-CoA occurred only at high concentrations, maximal inhibition being 60%.

BIOCHEMICAL STUDIES OF BACTERIAL SPORULATION AND GERMINATION XIV. PHOSPHOLIPIDS OF BACILLUS MEGATERIUM. L. L. Bertsch, P. P. M. Bonsen and A. Kornberg (Dept. Biochem., Stanford Univ. School Medicine, Stanford, Calif. 94305). *J. Bacteriol* 98, 75–81 (1969). The principal phospholipids of *B. megaterium* throughout the cycle of growth and sporulation were phosphatidylglycerol (PG), diphosphatidylglycerol (DPG), phosphatidylethanolamine and glycosaminylphosphatidylglycerol. PG predominated during vegetative growth and declined as spores developed, whereas DPG became more prominent during spore maturation.

BIOCHEMICAL STUDIES ON THE LIPIDS OF TURBO CORNUTUS. I. CONJUGATED LIPIDS OF VISCERA (1). Akira Hayashi, Toshiko Matsubara and Fumio Matsuura (Kinki Univ., Osaka). *Yukagaku* 18, 118–23 (1969). The phospholipid fractions were composed of phosphatidyl ethanolamine and phosphatidyl choline, and two sphingophosphonolipids which consisted of C_{14}-sphingosine, C–P bonding nitrogen base (2-N-methylaminoethylphosphoric acid), and fatty acid (palmitic acid and unidentified acid). The glycolipid was a glucoside-type mucolipid which contained sphingosine bases, fatty acids and sugars (glucose, galctose, fructose and glucosamine).

BILE ACIDS AND LIPID METABOLISM. C. Entenman, R. J. Holloway, M. L. Albright and G. F. Leong (Inst. for Lipid Res., Berkeley, Cal.). *Arch. Biochem. Biophys.* 130, 253–6 (1969). The isolated rat liver perfusion system has been used to study the release of bile phospholipid P^{32} following the injection of inorganic P^{32} into the perfusate. It was demonstrated that in the absence of added bile salt very little PLP^{32} was excreted into bile, but when bile salt was added to the perfusate the PLP^{32} excretion increased markedly. At the start of bile salt infusion, the specific activity of the bile phospholipids was lower than that of the liver, but at later times it was greater than liver PL specific activity. It is suggested that bile acids play an essential role in the transport of phospholipid from liver to bile.

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EFFECT OF LIPIDS, IN PARTICULAR CHOLESTERYL 14-METHYLHEXADECANOATE, ON THE INCORPORATION OF LABELLED AMINO ACIDS INTO TRANSFER RIBONUCLEIC ACID IN VITRO. J. Hradec and Z. Dusek (Oncological Inst., Prague, Czechoslovakia). *Biochem. J.* 110, 1–8 (1968). Rat liver pH 5 enzymes and cell sap extracted with various organic solvents showed a decreased incorporation of labelled amino acids into a s-RNA *in vitro*. The original enzymic activity could be fully restored, though at different rates, by the addition of lipid extracts in quantities corresponding to those originally present. Of the main lipid groups separated from the extract, only free cholesterol and cholesteryl esters were able to reactivate the extracted pH 5 enzymes in the same way as the whole lipid extract. Addition of pure cholesteryl 14-methylhexadecanoate also fully restored the enzymic activity. It is concluded that lipids play an important role in the synthesis of aminoacyl-s-RNA complexes and that cholesteryl 14-methylhexadecanoate may be the active lipid in this respect.

SYNTHESIS OF UNSATURATED FATTY ACIDS BY PENICILLIUM CHRYSOGENUM. A. S. Bennett and F. W. Quackenbush (Dept. of Biochem., Purdue Univ., Lafayette, Ind.). *Arch. Biochem. Biophys.* 130, 567–72 (1969). Actively growing mycelia of *Penicillium chrysogenum* produced linoleate and linolenate from 1-^{14}C-labelled capric, lauric and oleic acids (50% conversion), palmitic and stearic acids (20% conversion), and, slightly, from myristic acids (5%). Absence of substantial label in shorter chain products and location of label in oxidation products indicate that the polyunsaturated acids resulted from direct elongation and desaturation of the substrates. When acetate-1-^{14}C was the substrate, the label was found in the 1-position of all unsaturated as well as saturated fatty acids in 1.5 min. Thereafter, label accumulation was mainly in the alkyl portions of the fatty acids. The data suggest that endogenous fatty acids were elongated to C_{18} with acetate and desaturated in a sequential pattern: stearate, oleate, linoleate, linolenate.

COMPOSITION OF ADIPOSE TISSUE TRIGLYCERIDES OF NEONATAL AND YEAR-OLD LAMBS. G. A. Garton and W. R. H. Duncan (Rowett Res. Inst., Aberdeen). *J. Sci. Food Agr.* 20, 39–42 (1969). Triglycerides were isolated from perinephric (internal) and subcutaneous (external) adipose tissue obtained from neonatal lambs and from one-year old lambs which had been fed on a semi-synthetic ration or on a diet of grass cubes. The triglycerides were analyzed for fatty acid composition (including *trans* acids) and for the intramolecular distribution of these acids on the glycerol molecule. Whereas in the year-old lambs the triglycerides of internal adipose tissue had more stearic and *trans* acid than those of external tissues, no such difference was found in the case of the neonatal lambs. Palmitic acid and $C_{18:1}$ acid together constitute more than 80% of the total acids. This composition resembles that of the subcutaneous triglycerides of the grown animal and suggests that, at all stages of growth, the triglycerides of external tissues are largely the result of endogenous synthesis. Neonatal animals did not contain any of the acids (e.g. *trans* acids) which characterize the glycerides of growing and mature animals, particularly those of the internal depots. Nevertheless, the intramolecular disposition of fatty acids in the triglycerides formed *in utero* was similar to that previously observed in triglycerides from both the internal and external depots of the adult sheep. Saturated acid predominated among those esterified in the 1- and 3-positions of the glycerol moiety and unsaturated acids were the major components esterified in the 2-position. While triglycerides from corresponding body sites in the two groups of year-old lambs were generally quite similar with respect to their content of palmitic, stearic and $C_{18:1}$ acids, the contribution of *trans* isomer to the total $C_{18:1}$ acid was considerably greater in the tissues (particularly internal) of the animals fed on grass cubes than in the tissues of those given the semi-synthetic ration. This difference between the two groups of lambs was associated with a corresponding difference in the proportions of C_{18} *trans* unsaturated acid in the lipids of the rumen contents of the animals.

EFFECT OF DIETARY PROTEIN ON HEPATIC LIPOGENESIS IN THE GROWING CHICK. Y. Y. Yeh and G. A. Leveille (Div. of Nutr. Biochem., Dept. of Animal Sci., Univ. of Ill. Urbana, Ill.). *J. Nutr.* 98, 356–366 (1969). The influence of dietary protein on hepatic lipogenesis in growing chicks has been investigated. Both *in vitro* and *in vivo* studies demonstrated that the incorporation of glucose-U-^{14}C, pyruvate-2-^{14}C and acetate-1-^{14}C into liver fatty acids was depressed by elevating the dietary protein level. Liver cholesterol content, however, as well as synthesis, was increased as the dietary protein increased. The data suggest that hepatic lipogenesis and cholesterogenesis are altered by dietary protein per se regardless of its quality or its growth-stimulation effect. The plasma free fatty acid level was decreased by increasing dietary protein and was positively related to the rate of hepatic lipogenesis. Incorporation of DL-lactate-2-^{14}C and pyruvate-2-^{14}C into blood glucose appeared to be increased as the dietary protein level increased. The activity of malic enzyme was positively correlated with the rate of lipogenesis. Increasing dietary protein from 15 to 35% depressed both *in vitro* fatty acid synthesis and malic enzyme activity by about 75%. The possible regulatory mechanisms responsible for the depression of hepatic lipogenesis in chicks fed a high protein diet are discussed. It is suggested that a limitation in the availability of cytoplasmic reducing equivalents may initiate the reduction in hepatic fatty acid synthesis of chicks fed a high protein diet.

ISOLATION OF RAT LIVER MITOCHONDRIAL MEMBRANE FRACTIONS AND LOCALIZATION OF THE PHOSPHOLIPASE A. M. Waite (Dept. of Biochem., Bowman Gray School of Med., Wake Forest Univ., Winston-Salem, N.C. 27103). *Biochemistry* 8, 2536–2542 (1969). Mitochondria were isolated by sucrose density gradient centrifugation from livers of rats previously injected with ethanolamine-^{14}C, which was incorporated into the membrane phosphatidylethanolamine. Mitochondrial phospholipase A catalyzed chiefly the hydrolysis of the outer membrane phosphatidylethanolamine. The specific activity (disintegrations per minute per micromole of phosphorus) of the phosphatidylethanolamine only changed in the inner membrane during incubation which suggests that not all of the inner membrane phospholipid was hydrolyzed at the same rate.

RELATION OF SERUM LIPIDS AND LIPOPROTEINS TO FATTY LIVER IN KWASHIORKOR. A. S. Truswell, J. D. L. Hansen, C. E. Watson and P. Wannenburg (Univ. of Cape Town Med. School, Observatory, Cape Town, South Africa). *Am. J. Clin. Nutr.* 22, 568–575 (1969). In 19 children with kwashiorkor, before and during treatment with high protein, very low fat diets, measurements were made of serum lipoproteins (by paper electrophoresis), phospholipid fractions (by thin-layer chromatography), and total cholesterol, triglyceride and phospholipid. During treatment, serum lipids rose above normal levels, triglyceride appeared before cholesterol, and pre-beta-lipoprotein. Our results are consistent with the hypothesis that reduced synthesis of low density lipoproteins is a major cause of the fatty liver in kwashiorkor. No evidence was found to implicate lipotropic factor deficiency.

DDT EFFECT ON RATS RAISED ON ALPHA-PROTEIN RATIONS: GROWTH AND STORAGE OF LIVER VITAMIN A. I. J. Tinsley (Dept. of Agr. Chem., Oregon State Univ., Corvallis, Oregon). *J. Nutr.* 98, 319–323 (1969). Rats have been raised on rations containing alpha-protein as the sole source of nitrogen, and growth and liver vitamin A levels have been observed as a function of the rate of methionine supplement in the presence and absence of *DDT*. Increasing the level of methionine supplement in increments from zero to 4g/kg produced a progressive increase in the growth of male rats. Females showed maximum growth when the methionine level was 1.0g/kg. In the absence of added methionine DDT depressed growth, but at levels greater than 1.0g/kg DDT stimulated growth. The level of vitamin A stored in the liver was depressed by feeding DDT, with the response being dependent on the level of methionine in the diet. The most pronounced reduction was observed with the unsupplemented ration, and the DDT effect was virtually eliminated when methionine was added at a level of 4g/kg. A mechanism has been proposed for this interaction based on the action of DDT and methionine on the processes responsible for the absorption and transport of vitamin A.

EFFECT OF AMBIENT TEMPERATURE AND DIETARY AMINO ACIDS ON CARCASS FAT DEPOSITION IN RATS. M. Sugahara, D. H. Baker, B. G. Harmon and A. H. Jensen (Dept. of Animal Sci., Univ. of Ill., Urbana, Ill.). *J. Nutr.* 98, 344–350 (1969). Sixty-three rats of the Sprague-Dawley strain were used in each of two experiments to study the effects of ambient temperature (7, 23 and 33C) on diet utilization. In experiment 1, dietary protein levels and protein-amino acid sources were: A) 31.7%, casein; B) 15.85%, casein; and C) 31.7%, diet B plus casein-simulating crystalline amino acid mixture. The rats, average initial weight 122 g, were confined to individual metabolism cages and fed *ad libitum* for 20 days, then killed for carcass analysis. Diet intake increased signif-

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icantly with decrease in temperature. Gain was highest at 23C, lowest at 7C. Gain-to-feed ratio results were similar at 23 and 33C, with both significantly higher than at 7C. Carcass fat decreased significantly as temperature decreased. For experiment 2, diet C of experiment 1 served as the control and the effects of deletions of certain of the crystalline amino acids were studied. With isonitrogenous diets, omission of the crystalline essential amino acids or of only the basic amino acids increased fat deposition; however, carcass fat deposition responded more to ambient temperature than to amino acid imbalance.

OXIDATION OF FREE FATTY ACIDS BY SKELETAL MUSCLE DURING REST AND ELECTRICAL STIMULATION IN CONTROL AND DIABETIC DOGS. J. J. Spitzer and Sadaaki Hori (Dept. of Physiol. and Biophys., Hahnemann Med. College, Phil., Pa. 19102). *Proc. Soc. Exp. Biol. Med.* 131, 555–9 (1969). The uptake and oxidation of FFA by skeletal muscle were studied in anesthetized, control dogs during rest, electrical stimulation, recovery and DNP administration. Similar studies were also conducted in diabetic animals during rest, stimulation and recovery. During rest, skeletal muscle removed about 40% of the labeled FFA and oxidized 36% of the removed amount. During skeletal muscle stimulation, the oxidation of FFA increased. During the recovery period, FFA oxidation was very low and accounted for about 12% of the uptake. The DNP also increased FFA oxidation. Both the uptake and oxidation of FFA by skeletal muscle were elevated in diabetic dogs and a significant uptake of β-hydroxybutyrate was also noted. A further increase of FFA oxidation occurred during stimulation. During recovery, only 7% of the removed FFA was oxidized and glucose uptake was high.

LIPOPROTEIN LIPASE CONTENT AND TRIGLYCERIDE FATTY ACID UPTAKE IN ADIPOSE TISSUE OF RATS OF DIFFERING BODY WEIGHTS. P. J. Nestel, W. Austin and Carole Foxman (Dept. of Clin. Sci., the John Curtin School of Med. Res., the Australian Nat. Univ., Canberra, A.C.T. Australia). *J. Lipid Res.* 10, 383–7 (1969). Increasing body weight appears to alter lipid metabolism in adipose tissue. Highly significant correlations were found between fat pad weight and both the number and the volume of the individual adipocytes. In rats weighing from 140 to 350 g, the increase in the size of fat pads was attributable almost equally to increases in cell size and in cell number. Lipoprotein lipase activity was measured in acetone powders of whole fat pads and of isolated fat cell preparations. With both, lipoprotein lipase activity per cell diminished significantly as the weight of fat tissue increased, i.e., larger fat cells contained less enzyme per cell than smaller cells.

INTESTINAL ABSORPTION AND LYMPHATIC TRANSPORT OF CHOLESTEROL IN THE RAT: INFLUENCE OF THE FATTY ACID CHAIN LENGTH OF THE CARRIER TRIGLYCERIDE. C. Sylven and B. Borgstrom (Div. of Physiol. Chem., Chem. Center, Univ. of Lund, Lund, Sweden). *J. Lipid Res.* 10, 351–355 (1969). Feeding rats medium- or short-chain triglycerides (C_{12} to C_2) did not affect the lymphatic transport of endogenous cholesterol from the intestine compared to the fasting state. When cholesterol was fed in octadecane, negligible amounts were transported to the thoracic duct lymph.

• Drying Oils and Paints

THE THEORY OF FUNCTIONALITY: PART 1. A. R. H. Tawn (Cray Valley Prod, St. Mary Cray, Kent). *J. Oil Colour Chem. Assoc.* 52, 250–53 (1969). The functionality of a system is qualitatively critical in determining the nature of the polymerization product. This theory is treated with particular reference to condensation reactions, although it is equally applicable to addition polymerizations. The behaviors of monofunctional and linear bifunctional reactants are discussed. Examples using specific alcohols and carboxylic acids are given.

ESTERIFICATION RATES IN PREPARING UNSATURATED POLYESTERS. Fu-Yong Tsao (Union Indust. Res. Inst., Ministry of Economic Affairs, Taipei, Taiwan, China). *Chemistry-Chinese Chem. Soc.* 3, 124–27 (1968). The factors affecting the rates of polyesterification, such as temperature, glycols employed, flow rate of inert gas, agitation speed and catalysts were investigated. In polyesterification of maleic anhydride, reaction temperatures should be higher than 180C, and the reaction rate with ethylene glycol was the fastest. The space velocity of the inert gas should be below 1 volume gas per 1 volume liquid reactant per minute. The agitation showed no effect on the reaction rate at the beginning, but later became important. Vigorous agitation would increase the reaction rate quickly. In preparing unsaturated polyester containing isophthalic acid, the most effective catalysts were butyl titanate or the combination of stannous oxalate, zinc acetate, and sodium acetate. The polyesterification of terephthalic acid was the most difficult among all the acids studied.

ANALYSIS AND TESTING. Anon. *Paint Manuf.* 39 No. 4, 32–4 (1969). A review with 91 refs. covers subjects such as weathering, the analysis of oils, fats and waxes, the determination of mol. wt. and the use of chromatography and spectroscopy in analysis. (World Surface Coatings Abs. No. 324)

ANALYSIS OF MALEINISED OILS. L. P. Krylova *et al. Lakokras. Mat.* 1968, No. 5, 46–8. The amount of bound maleic anhydride present in maleinised oils was determined rapidly and accurately by direct titration with Na methoxide. The method was extended to the determination of the anhydride and carboxylic groups in such oils. (World Surface Coatings Abs. No. 324)

MONOGLYCERIDES OF α-ELAEOSTEARIC ACID/MALEIC ANHYDRIDE ADDUCTS AND THEIR ACETYLATED DERIVATIVES. I. G. DeKuck and R. A. Macchi. *Rev. Argent. Grasas Aceites* 10, 37–40 (1968). Maleic anhydride adducts of tung oil fatty acids and α-elaeostearic acid were prepared by maleinisation in absence of solvent at 78–85C and converted to the tributyl esters by esterification with *n*-butanol using conc. H_2SO_4 catalyst in toluene soln. The 1,2-isopropylidene-glycerol esters were obtained by interesterification with 1,2-isopropylideneglycerol (Na catalyst) and the acetone then split off by hydrolysis with 80% aa. acetic acid at 100C. The products were dimonoglyceride monobutyl esters (4 OH groups per mol.), reddish brown viscous liquids with emulsifying properties. Acetyl derivatives were less viscous, with possible value as plasticisers. (World Surface Coatings Abs. No. 324)

RHEOLOGY OF COATINGS. P. E. Pierce (Glidden-Durkee Division, SCM Corporation, Res. Center, PO Box 8827, Strongsville, Ohio 44136). *Paint Tech.* 41, No. 533, 383–395 (1969). The rheology of coatings is reviewed from three aspects—the rheological behavior of typical coating raw materials and

products, the correlation of coating rheology and performance, and the measurement of the rheology of coatings with practical and research viscometers and the comparison of viscosity units. Theory is briefly discussed. The correlation of coating rheology with the processing behavior and the application behavior of organic coatings is also briefly discussed. A rather broad description of instrumentation is presented.

THE EXTENT OF SUBSTITUTION OF LINSEED OIL BY DEHYDRATED CASTOR OIL AND THE PROBLEM OF LOST ACIDITY IN THE MALEINISATION REACTION. N. A. Ghanem and A. M. M. Nasser (Lab. of Polymers and Pigments, Nat. Res. Center, Dakki, Cairo, Egypt). *Farbe Lack* 75, 419–430 (1969). The extent to which dehydrated castor oil (D.C.O.), produced by a new dehydration method, can be introduced in a reaction mixture of linseed oil and maleic anhydride is examined. By careful control of the reaction temperature and duration, a mixture of linseed oil and DCO containing up to 50% by volume of the latter gives fairly viscous water-soluble product when reacted with 20% of the total weight of maleic anhydride and neutralized with ammonia. Any further elevation of the DCO ratio causes gel formation. The material has considerably better properties than the straight linseed maleinised product regarding the color, stability of the adduct, drying time and the water resistance. Its use in surface coatings of various types is satisfactory. Viscosity reduction curves using ethyl alcohol show optimum solid contents and consistency at 15–25% alcohol content. The maleinisation reaction is followed by the determination of the product's acid value and the amount of CO_2 evolved, and the sum of the two values in mg KOH is compared with the theoretical acid value. A loss in acidity is noted. The work was then conducted on model compounds; pure fatty acids of different unsaturations and their simple exters. The theoretical acidity of the reaction product is equal to the experimental acidity plus twice the amount of CO_2 evolved. This finding is explained in terms of the different reactivities of the fatty chains.

• Detergents

AN EQUATION FOR THE SURFACE PRESSURE OF LONG CHAIN ELECTROLYTES TAKING INTERIONIC AND VAN DER WALLS ATTRACTIONS INTO CONSIDERATION. B. N. Ghosh (Univ. College of Science, 92 Acharya Prafulla Chandra Road, Calcutta, 9, India). *J. Indian Chem. Soc.* 45, 1120–26 (1968). From an equation similar to that of Volmer and Frumkin, an equation has been derived for the surface pressure of long chain electrolytes at the oil/water interface using electrostatic repulsion and interionic attraction values. It is also shown that at the oil/water interface, the absence of cohesive pressure due to the attraction of the CH_2 groups within the chain is not always correct. At low substrate concentration, many of the CH_2 groups of the long chains lie in the aqueous part of the oil/water interface and attract one another producing cohesive pressure. The existence of cohesive pressure at the oil/water interface also creates conditions favorable for the Langmuir isotherm for adsorption of long chain electrolytes.

CHEMICAL DERIVATIVES OF TALLOW WITH SURFACE-ACTIVE PROPERTIES USED IN THE SOAP AND DETERGENT INDUSTRY. A. Uzzan (Service de Documentation, ITERG, Paris). *Rev. Franc. Corps Gras* 16, 205–213 (1969). This article is a review of the uses of various tallow derivatives in the soap and detergent industry. These compounds are subdivided into anionics, sulfonated acids and their salts; cationics, mainly amines and quaternary ammonium salts; and nonionics, including mixed partial glycerides and polyethoxylated esters. The final section includes discussion of some representative detergent formulations, including detergents in bar form, utilizing different derivatives.

APPLICATION OF SURFACTANTS FOR FLOATATION. Taro Yamasaki (Tohoku Univ., Sendai). *Yukagaku* 18, 417–26 (1969). A review with 34 references.

APPLICATION OF SURFACTANT IN THE MANUFACTURING OF AGRICULTURAL AND ANIMAL PRODUCTS. Konoshin Onodera (Kyoto Univ.). *Yukagaku* 18, 399–405 (169). A review with 24 references.

APPLICATION OF SURFACTANTS IN TEXTILE INDUSTRIES. Yutaka Orimo (Daiichi Kogyoseiyaku Co., Kyoto). *Yukagaku* 18, 379–90 (1969). A review.

SHAMPOO. Tomoo Ito and Shizuo Hayashi (Kao Soap Co., Tokyo). *Yukagaku* 18, 364–73 (1969). A review with 87 references.

ENVIRONMENTAL SANITATION AND DETERGENTS. Shinichi Tomiyama (Lion Fat & Co., Tokyo). *Yukagaku* 18, 427–42 (1969). A review with 244 references.

METAL CLEANING. Fujio Mamiya (Japan Cee-Bee Chem. Co., Tokyo). *Yukagaku* 18, 406–16 (1969). A review with 55 references.

APPLICATION OF SURFACTANTS IN THE PULP AND PAPER INDUSTRY. Tatsumi Okada (Nippon Pulp Industry Co., Tokyo). *Yukagaku* 18, 391–8 (1969). A review with 48 references.

DENTIFRICE AND SURFACE ACTIVE AGENT. Teruo Matsumura (Lion Dentifrice Co., Tokyo). *Yukagaku* 18, 374–8 (1969). A review.

HEAVY-DUTY DETERGENTS. Iwao Maruta (Kao Soap Co., Tokyo). *Yukagaku* 18, 340–52 (1969). A review with 80 references.

LIGHT-DUTY DETERGENTS. Tetsuya Fujiii (Lion Fat & Oil Co., Tokyo). *Yukagaku* 18, 354–63 (1969). A review with 104 references.