

ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: J. G. Endres, J. Iavicoli,

K. Kitsuta, F. A. Kummerow, C. C. Litchfield, Gladys Macy, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

VOLATILE CARBONYL CONSTITUENTS OF DAIRY BUTTER. M. Winter, M. Stoll, E. W. Warmhoff, F. Greuter and G. Büchi (Res. Lab. Firmenich & Cie, Geneva, Switzerland, and Dept. of Chemistry, MIT, Cambridge, Mass.) *J. Food Sci.* **28**, 554-561 (1963). Volatile constituents of fresh butter were separated from fat and other components of high molecular weight by vacuum steam distillation. The carbonyl compounds in the aqueous distillate were converted to their 2,4-dinitrophenylhydrazones. Separation of these by column and paper chromatography gave the derivatives for formaldehyde, acetaldehyde, isobutyraldehyde, isovaleraldehyde, n-hexanal, n-nonanal, phenylacetaldehyde, acetone, 2-heptanone, 2-nonanone, diacetyl and (-)-acetoin, all identified by comparison with authentic samples. Possible biosyntheses of these flavor constituents are discussed.

INHIBITION OF AUTOXIDATION BY SUBSTITUTED PHENOLS. J. F. Hedenburg (Gulf Research & Development Co., Pittsburgh, Pa.) *I & EC Fundamentals* **2**, 265-267 (1963). The type and location of substituent groups on a phenol have a marked effect on its ability to inhibit autoxidation, but only qualitative predictions of the influence of a substituent can be made. A theory is presented which correlates the inhibitor factors of alkylphenols with Hammett's and Taft's substituent constants, as well as with Conant's "critical oxidation potentials." An equation is derived which permits calculation of the inhibitor factor when the substituent constants are known for alkyl groups in positions ortho and para to the hydroxyl group.

THE LIPIDS OF GREEN BEANS. A. C. Wagenknecht (New York State Ag. Expt. Sta., Cornell Univ., Geneva, N. Y.) *J. Food Sci.* **28**, 489-494 (1963). Raw green snapbeans (*Phaseolus vulgaris* var. Slendergreen) were cut, frozen, lyophilized, and extracted with chloroform-methanol 2:1. The crude extract amounted to 9.9% of the dry weight of the beans. The lipid material in the extract composed 2.6% of the dry weight of the bean. The crude lipids were fractionated with acetone, and the acetone-soluble portion was subjected to countercurrent distribution between n-heptane and 95% methanol. The major lipid fractions were treated with glacial acetic acid, followed by partition between benzene and 50% aqueous acetic acid to aid in removal of non-lipid contaminants. The composition of snapbean lipids was studied by measuring the nitrogen, phosphorus, sugar, and fatty acid content of the various fractions.

POLYGLYCEROL ESTERS—A NEW DEVELOPMENT IN THE FIELD OF FOOD EMULSIFIERS. N. H. Nash and V. K. Babayan (Drew Chemical Corp., Boonton, N. J.) *Bakers Digest* **37**(5), 72-75 (1963). Data are given on several mono- and di-glycerides which can be prepared to be uniform and of known characteristics which in turn result in polyglycerol ester derivatives of known constants and characteristics. Various applications have been found such as in margarine, peanut butter, cake mixes, confectionery, ice cream and others.

IONIZATION OF MONOLAYERS OF FATTY ACIDS FROM C₁₁ TO C₁₈. J. A. Spink (Div. of Tribophysics, Commonwealth Sci. and Ind. Res. Org., Univ. of Melbourne, Australia). *J. Colloid Sci.* **18**, 512-525 (1963). The force-area and potential-area characteristics of monolayers of the C₁₁-C₁₈ saturated fatty acids were studied in 0.01M NaCl as a function of pH. Contraction was observed for partly ionized films due to the increased head-group attraction rather than increased attraction between the

paraffin chains. Expansion occurring at high degrees of ionization was attributed to repulsion between the charged head groups.

OCCURRENCE OF trans-9-trans-12-OCTADECADIENOIC ACID AS A SEED OIL COMPONENT. Mary J. Chisholm and C. Y. Hopkins (Div. of Pure Chem., Nat. Res. Council, Ottawa, Canada). *Can. J. Chem.* **41**, 1888-1892 (1963). Trans-9-trans-12-octadecadienoic acid was found in the seeds of *Chilopsis linearis*. It was isolated by fractional crystallization and removal of conjugated acids as their maleic anhydride adducts. Identification was made by absorption spectra, derivatives, and degradative products. The acid was present to about 15% of the total fatty acids of the oil.

CRYSTALLIZATION OF EMULSIFIED TRIGLYCERIDES. W. Skoda and M. Van den Tempel (Unilever Res. Lab., Vlaardingen, The Netherlands). *J. Colloid Sci.* **18**, 568-584 (1963). The temperature at which crystallization starts in emulsified systems was found to be invariably lower than in the nonemulsified solutions and it depends upon the emulsifying agent used. Of 17 emulsifying agents used, three gave homogeneous nucleation while the rest promoted nucleation, the more strongly the more their molecular structure resembled the triglyceride. In the homogeneous nucleation emulsions, the frequency factor in the nucleation rate equation is much lower than predicted and is explained by taking into account the large entropy decrease connected with the incorporation of a triglyceride molecule in the crystal.

MONOLAYER PROPERTIES OF FATTY ACIDS. E. D. Goddard and J. A. Ackilli (Lever Brothers Co., Edgewater, N. J.). *J. Colloid Sci.* **18**, 585-595 (1963). The monolayer properties of stearic acid were examined upon subsolutions of pH from 2 to 11.1. A pH of 9 corresponds to the region where marked changes in the electrical characteristics and cohesion of the monolayer occur. Related changes in soap solutions occur at this pH and speculation concerning the monolayer structure is offered. The pronounced effect of Ca⁺⁺ and Mg⁺⁺ on the monolayers is utilized to estimate the dissociation constants of complexes of these metals with various sequestering agents.

LIQUID (OIL) SHORTENINGS IN WHITE BREAD. E. G. Bayfield, and W. E. Young (Florida State University, Tallahassee, Fla.). *Bakers Digest* **37**(5), 58-62 (1963). Using a sponge and dough procedure, it was found that liquid oils were comparable to plastic type shortenings in producing high quality white bread, provided hard fat or physically hard emulsifiers were added to the oil. Also with the liquid oils, bulk handling is possible provided some means of mildly agitating the oil is provided to keep the solid additive suspended throughout the mixture.

FLAVOR IMPROVEMENT OF CONTINUOUSLY MIXED BREAD WITH THE LIPOXIDASE OF SOY FLOUR. A. W. Kleinschmidt, K. Higashiuchi, R. Anderson, and C. G. Ferrari (Res. Labs., J. R. Short Milling Co., Chicago, Ill.). *Bakers Digest* **37**(5), 44-47 (1963). A procedure has been worked out for developing flavor in continuously mixed bread by the use of lipoxidase and a suitable substrate. The conditions for enzyme activity are a suitable substrate (unconjugated cis dienes), pH of 5.0-5.5, reaction time of 10-15 minutes at a temperature of 80-85F. Agitation must be sufficient for incorporating air which is necessary for the enzyme action.

CHANGES IN THE VOLATILE CARBONYLS OF POTATO CHIPS DURING STORAGE. T. P. Dornseifer and J. J. Powers (Food Technol. Dept., Univ. of Georgia, Athens, Georgia). *Food Technol.* **17**(10), 118-120 (1963). The steam distillate from 20 pounds of potato chips was treated with 2,4-dinitrophenylhydrazine. The hydrazones were regenerated by the α -ketoglutaric acid procedure and the carbonyls identified by comparing their retention times with those of known materials on a polar column. Diacetyl was positively identified and the C₂ to C₇ n-aldehydes, C₈ and C₉ 2-enals, and 2-propanone tentatively identified.

APPLICATION OF THE ANTIOXIDANT COMPONENT EXTRACTED FROM ROSEMARY (ROSMARINUS OFFICINALIS) TO INCREASE THE STABILITY OF LARD AND MEAT. B. Ostric-Matyasevic (Inst. for Tech. of Meat, Belgrade, Yugoslavia). *Rev. Franc. Corps Gras* **10**, 443-52 (1963). The author has separated a strong antioxidant from rosemary. It is not a pure substance. This antioxidant, used at a level of 0.02%, has increased the stability of lard 5 to 6 times. Ascorbic acid is a synergistic for the antioxidant.

NEW PROCEDURE FOR THE REFINING OF SOYBEAN OIL USING A TOTAL DEGUMMING METHOD. R. Guillaumin and N. Drouhin

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(Lab. Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 10, 463-78 (1963). Various phases of the refining of soybean oil were studied especially methods for the elimination of phosphatides. It is possible to degum and refine soybean oil in one step using a nitric acid solution with a density of 1.33. Oils obtained by different means, i.e. solvent extraction, have no effect on the degumming and refining action of the nitric acid solution. The oil so treated can be easily bleached and deodorized.

MAIZE GERM MILLING. S. Kitumba Rao, C. Chandrasekharan Kartha, B. Appu Rao, S. D. Thirumala Rao and K. S. Murti (Oil Technology, Research Institute, Anantapur). *Food Science (India)* 12(3), 71-74 (1962). About 2,200 tons of crude corn oil are produced in India each year. Although the color is low (about 3R in a 1-inch tube), the free fatty acid content is high (average 8.9 per cent).

THE FATTY ACID COMPOSITION OF DEPOT FATS OF THE SOMALI SHEEP. W. W. C. Read and Z. Awdeh (American University of Beirut). *J. Sci. Food Agr.* 14, 770-2 (1963). The fatty acid composition of adipose tissues from different sites of the Somali sheep was examined by liquid-gas chromatography. The simplest fats were the perinephric and pericardial, in which 22 components acids were detected. The tail and chest fats were the most complex with 35 components. The acids identified ranged from those with 8 carbons to those containing 20, and included straight and branched chain saturated, and unsaturated. In all samples, however, 7 components (myristic, palmitic, heptadecanoic, 14-methyl-hexadecanoic, stearic, oleic and linoleic) accounted for at least 80% of the total acids. Approximately 5% of mixed isomers of oleic acid were present in all the samples.

A PRELIMINARY EXAMINATION OF THE FAT FROM PACHIRA AQUATICA. A. de Bruin, J. E. Heesterman, and M. R. Mills (Dept. of Tropical Products, Amsterdam). *J. Sci. Food Agr.* 14, 758-60 (1963). The kernels of *Pachira aquatica* Aubl. (Bombacaceae) contain from 40-50% of a pale yellow fat which is soft and greasy at ordinary temperatures. Many of the physical and chemical constants bear a close resemblance to those of palm oil. The fat from a Dutch Guiana sample had the following fatty acid composition: palmitic 56%, stearic 3%, arachidic 1%, oleic 7.5%, linoleic 5%, linolenic 1%, and cyclopropene acids 26.5%. The exact identity of the cyclopropene acids has not been determined.

PURIFICATION OF TRIACETIN. I. W. Trevoy and Derek Tegg (Canadian Chemical Co.). *U.S. 3,108,133*. Crude triacetin containing acetic acid is distilled to remove non-volatile impurities as residue. Water is added to the ester distillate and then distilled off to reduce the acidity of the ester. A water-containing forerun fraction of the ester is distilled from the bottoms from the last mentioned distillation, and the purified glyceryl ester is recovered as the bottoms from this fractional distillation.

PHYSICO-MECHANICAL PROCESS OF OBTAINING HIGH QUALITY COCONUT OIL. D. M. Birosel. *U. S. 3,106,571*. A method for obtaining by exclusively physical and mechanical steps a high quality coconut oil from coconut cream extracted from coconuts comprises beating the extracted cream while simultaneously controlling the temperature (the temperature rising from 10 to about 35°C) until the consistency of the cream begins to change and becomes a mass of broken solids.

• Biology and Nutrition

FATTY LIVERS INDUCED BY OROTIC ACID. II. CHANGES IN NUCLEOTIDE METABOLISM. L. H. von Euler, R. J. Rubin, and R. E. Handschumacher (Dept. of Pharmacology, Yale Univ. School of Med., New Haven, Conn.). *J. Biol. Chem.* 238, 2464-2469 (1963). When rats are fed a purified diet containing 1% orotic acid, which causes extensive infiltration of the livers with triglycerides, most of the absorbed orotate is first converted to uridine 5'-phosphate in the liver; subsequently, the pyrimidine ring is degraded, presumably by the enzymes in the liver that degrade uracil. This over-all catabolic reaction requires ribosylpyrophosphate 5-phosphate and is blocked by 5-azarotate and 6-azauridine 5'-phosphate. Although the primary excretion product in the urine was unchanged orotate, this compound could not be detected in the liver. Analysis of the acid-soluble nucleotides in the liver indicated, however, a 4-fold increase of uracil nucleotides associated with a 50% decrease in adenine nucleotides, including nicotinamide adenine dinucleotide phosphate and its reduced form. These changes were largely nullified if the diet also was supplemented with

0.25% adenine sulfate. Enzymatic studies indicated that adenine effectively competes with orotate for limiting amounts of ribosylpyrophosphate 5-phosphate in cell-free extracts, and that the apparent decrease in the rate of catabolism of radioactive orotate by slices or extracts of livers from animals fed orotic acid is caused by dilution of the radioactivity in the large pools of uracil nucleotides.

THE BIOSYNTHESIS OF PHOSPHATIDYLGLYCEROL. J. Y. Kiyasu, R. A. Pieringer, H. Paulus, and E. P. Kennedy (Dept. of Biol. Chem., Harvard Med. School, Boston 15, Mass.). *J. Biol. Chem.* 238, 2293-2298 (1963). Enzymes present in cell-free extracts of liver and other animal tissues catalyze the synthesis of phosphatidylglycerol according to the following equations. CDP-diglyceride + L- α -glycerophosphate \rightarrow phosphatidylglycerophosphate + CMP; Phosphatidylglycerophosphate \rightarrow phosphatidylglycerol + orthophosphate (2). The enzymes catalyzing these reactions appear to be principally localized in the mitochondrial fraction of chicken liver. The phosphatase catalyzing Reaction 2 can be preferentially inhibited with sulfhydryl poisons; under these conditions the accumulation of phosphatidylglycerophosphate can be observed. Some properties of the enzymes are described.

THE EXTRACTION AND PURIFICATION OF LIPOGENIN. G. N. Catravas (Dept. of Biochem., Univ. of Chicago, Chicago, Ill.). *Biochim. Biophys. Acta* 70, 331-335 (1963). A method for the extraction and purification of lipogenin has been described. By means of alcohol fractionation, chromatography, electrophoresis, and mannanase treatment 1000-fold purification was achieved. The purified material contained some 30% carbohydrate, mainly mannan, and 70% of a peptide.

EDIBLE SOYBEAN PROTEINS AND NEW USES. Yoshiro Muchida (Sugiyama Ind. Chem. Research, Tokyo). *Yukagaku* 12, 461-7 (1963). The Nutrition Committee in Japan proposed the food requirements (g.) per cap.ta/day in 1965 as follows: grains 400, tubers 65, sugars 50, fats and oils 17, soybeans 25, other beans 5, fishes 85, meat 25, eggs 35, milk 140, green vegetables 100, other vegetables 150, and fruits 200. Preparation and suggested use of soybean protein given.

IONENE: A THERMAL DEGRADATION PRODUCT OF β -CAROTENE. W. C. Day and J. G. Erdman (Mellon Inst., Pittsburgh, Pa.). *Science*, 141, 808 (1963). Ionene has been identified as a thermal degradation product of β -carotene. The 5-percent yield of ionene represents the largest amount of any compound thus far identified from the degradation. Experimental evidence has been obtained indicating the presence of ionene in a marine sediment subjected to the same temperature used to degrade β -carotene.

CAROTENOIDS IN SEDIMENTS AS A FUNCTION OF ENVIRONMENT. R. B. Schwendinger and J. G. Erdman (Mellon Inst., Pittsburgh, Pa.). *Science* 141, 808-809 (1963). The carotenoid content and xanthophyll/carotene ratio were determined for the surface horizons of each of nine recent aquatic environments. In general, the concentrations of carotenoids, expressed as a function of organic carbon, were higher in marine than in fresh-water sediments. Xanthophyll/carotene ratios were all above unity.

PARTIAL RESOLUTION OF THE ENZYMES CATALYZING OXIDATIVE PHOSPHORYLATION. III. A NEW COUPLING FACTOR REQUIRED BY SUBMITOCHONDRIAL PARTICLES EXTRACTED WITH PHOSPHATIDES. T. E. Conover, R. L. Prairie, and E. Racker (Dept. of Biochem., The Public Health Res. Inst. of The City of New York, Inc., New York 9). *J. Biol. Chem.* 238, 2831-2837 (1963). Submitochondrial particles were prepared from mitochondria that were sonically disrupted in the presence of phosphatides. These particles oxidized DPNH and succinate, but esterification of phosphate took place unless both coupling Factor 1 (ATPase) and a new coupling factor (Factor 4) were added. Both factors were also required for the P_i^{32} ATP exchange reaction, which was stimulated further by coupling Factor 3. Reconstruction of the particles with the soluble factors and isolation of active new particles were demonstrated. Coupling Factors 1 and 4 were also required for the ATP-linked reversal of electrons from succinate to DPN. Coupling Factor 3 further stimulated this reaction. Coupling Factor 4 was soluble in

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alkaline solution but rather insoluble at neutral pH. It is not identical with a previously described mitochondrial structural protein, which did not replace Factor 4 in the phosphorylation process. The requirement for multiple factors in oxidative phosphorylation and the possible role of coupling Factor 4 are discussed.

FATTY ACID SYNTHESIS IN CELL-FREE PREPARATIONS OF HUMAN ADIPOSE TISSUE. M. I. Jacob (Dept. of Biochem., Columbia Univ., College of Physicians and Surgeons, N. Y., N. Y.). *Biochim. Biophys. Acta* 70, 231-241 (1963). Comparison of normal human omental adipose tissue with the lipoma has shown that both contain the same fatty acids. The soluble enzymes of both require the same cofactors for fatty acid synthesis and incorporate radioactive acetate mainly into myristic and palmitic acids. Avidin inhibits the synthesis of fatty acids by both tissues and this inhibition is reversed by biotin. However, the lipoma synthesizes more fatty acids per gram of protein than adjacent normal subcutaneous fat. It is concluded that the lipoma and normal adipose tissue synthesize fatty acids by a pathway similar to that found in liver and yeast involving the formation of malonyl-CoA. In both normal adipose tissue and the lipoma, only the mitochondrial fraction was found to be capable of incorporating (1-C^{14}) acetate into a fatty acid which had the retention time on gas-liquid chromatographic analysis of an octadecatrienoic acid.

THE INCORPORATION OF CITRATE CARBON INTO FATTY ACIDS. A. Bhaduri and P. A. Srere (Dept. of Biochem., The University of Michigan, Ann Arbor). *Biochim. Biophys. Acta* 70, 221-230 (1963). Long-chain fatty acids are synthesized from citrate in an undialyzed soluble enzyme system from pigeon liver at a rate comparable to that observed when acetate is used as a precursor. The first enzymic step for citrate incorporation is probably its breakdown to acetyl-CoA and oxaloacetate catalyzed by the citrate-cleavage enzyme. Experiments with variously labeled citrate show good incorporation of the acetyl portion of citrate into fatty acids, and a poor incorporation of the oxaloacetyl portion into fatty acids. The incorporation of the oxaloacetyl portion of citrate as well as the acetyl portion has been shown to be avidin sensitive. The enzymic sequence from the oxaloacetyl portion remains uncertain.

STUDIES ON THE NATURE AND FORMATION OF α -GLYCERYL ETHER LIPIDS IN BOVINE BONE MARROW. G. A. Thompson, Jr., and D. J. Hanahan (Dept. of Biochem., Univ. of Washington, Seattle 5). *Biochemistry* 2, 641-646 (1963). The distribution and biosynthesis of α -glyceryl ether phospholipids in bovine hematopoietic bone marrow have been studied. The two major phospholipid fractions, phosphatidyl ethanolamine and phosphatidyl choline, contain, in addition to the diacyl compounds, significant levels of vinyl ether derivatives (plasmalogens) and of glyceryl ether (chimy, batyl, and selachyl alcohols) derivatives. In incubation experiments, radioactivity from glucose- 6-C^{14} , sodium palmitate- 1-C^{14} , and tritiated water were incorporated into glyceryl ether phospholipids by extracts of bone marrow. At the end of the incubation times studied, radioactivity of the glyceryl ether phospholipids was less than that of the nonglyceryl ether phospholipids. Possible relationships with plasmalogens are discussed.

INFLUENCE OF LINOLEIC ACID ON EGG WEIGHT. J. V. Shutze and L. S. Jensen (Dept. of Poultry Sci., Washington State Univ., Pullman). *Poultry Sci.* 42, 921-924 (1963). Three experiments were conducted to determine if the linoleic acid content of corn oil could account for its positive effect on the weight of eggs laid by hens fed a semi-purified low fat diet. Corn oil, tall oil and safflower oil all significantly improved egg weight when included at levels of 5%. Methyl linoleate and a purified linoleic acid supplement (95%) also significantly improved egg weight when added on an equivalent linoleic acid basis to 5% corn oil. Stilbestrol (1 mg./lb.) had no effect.

THE INFLUENCE OF PROTEIN SOURCE ON THE RESPONSE OF CHICKS TO CORN OIL. J. E. Marion and H. M. Edwards, Jr.

(Poultry Dept., Univ. of Georgia, Athens). *Poultry Sci.* 42, 825-828 (1963). The marked growth response of chicks to dietary corn oil did not appear to be greatly influenced by small differences in residual fatty acids that were supplied by protein sources used in the purified diets. However, the levels of linoleic and eicosatrienoic acids in the liver appeared to be sensitive measures of the linoleic acid supplied by the protein sources when these levels are in a critical range. The data indicate that factors other than residual fatty acids present in protein sources are responsible for marked differences in the growth response of chicks to unsaturated oils that have been noted by other researchers.

ESSENTIAL FATTY ACID DEFICIENCY IN THE LAYING HEN. L. S. Jensen and J. V. Shutze (Dept. of Poultry Sci., Washington State Univ., Pullman). *Poultry Sci.* 42, 1014-1019 (1963). Chicks were reared from one day of age to maturity on a low fat diet containing a very low level of linoleic acid, and carried through ten months of egg production. A second generation hatched from eggs low in or free of essential fatty acids were reared again to maturity and kept for several months on the low fat diet. Rate of egg production of the first generation was not improved by supplementing the diet with linoleic acid (5% safflower oil), but was slightly improved with the second generation. A marked increase in egg weight was obtained with linoleic acid. Hatchability of fertile eggs, but not fertility, was depressed by the low fat diet. This may have been associated with egg weight, as the depression gradually disappeared during the laying year. No essential fatty acids or trienoic acids were detected in eggs or carcasses from second generation hens, but lipids from specific tissues, not diluted with depot fat, were not analyzed.

STUDIES ON THE STRUCTURE OF GLYCERYL ETHERS AND THE GLYCERYL ETHER PHOSPHOLIPIDS OF BOVINE ERYTHROCYTES. D. J. Hanahan, J. Ekholm, and C. M. Jackson (Dept. of Biochem., Univ. of Washington, Seattle 5). *Biochemistry* 2, 630-641 (1963). The "phosphatidyl ethanolamine" present in bovine erythrocytes has been shown to be a mixture of diacyl glycerylphosphorylethanolamine and monoalkyl, monoacyl glycerylphosphorylethanolamine. The ether-containing phospholipid, which represented nearly 75% of this fraction, was subjected to chemical degradation and was shown to be an L-1-glyceryl ether derivative. The glyceryl ether phospholipid was freed of accompanying diacyl phospholipid by a selective deacylation procedure. Although not conclusively proven, the fatty acyl group is most probably on the 2-position of the glyceryl residue. Only unsaturated fatty acids were found in this highly purified ether phospholipid. A new procedure was developed for the identification of the glyceryl ethers, wherein these ethers were converted in 95% yield to their isopropylidene derivatives by a rapid, room temperature acetonation in the presence of $10^{-2} M HClO_4$. The 2,3-O-isopropylidene glyceryl ethers could be separated and identified by gas-liquid chromatography. In addition, the free glyceryl ethers, which were isolated from the phospholipid by acetolysis, were converted into their isopropylidene derivatives, and separated into saturates and unsaturates through formation of the acetoxymercurimethoxy derivatives and subsequent chromatography on aluminum oxide.

THE BIOCHEMISTRY OF PLASMALOGENS. III. CONCENTRATIONS IN TISSUES OF THE RATS AS A FUNCTION OF AGE. E. L. Gottfried and M. M. Rapport (Depts. of Biochem. and Med. and the Unit for Research in Aging, Albert Einstein College of Medicine, Yeshiva Univ., New York). *Biochemistry* 2, 646-648 (1963). The plasmalogen concentrations of heart, lung, liver, spleen, and skeletal muscle were determined by two independent methods in rats 1, 2, 3, 4, and 8 weeks of age. In contrast to the marked increase noted in brain during this period of rapid growth, no consistent change in plasmalogen concentration with age was observed in any of these tissues when comparisons were made on the basis of fresh weight of tissue, total lipid content, or total phosphatide content. A simple ultramicro spectrophotometric method for specific iodination has been found to be satisfactory for determination of the plasmalogen content of total lipid extracts.

INTERFERENCE IN FATTY ACID METABOLISM OF LAYING HENS CAUSED BY COTTONSEED OIL FEEDING. R. J. Evans, J. A. Davidson, J. N. LaRue and S. L. Bandemer (Dept. of Biochem. and Poultry Science, Michigan State Univ., East Lansing). *Poultry Sci.* 42, 875-881 (1963). Crude cottonseed oil included in the ration of laying hens caused the hens to lay eggs which contained a larger proportion of stearic acid and a smaller proportion of oleic acid in the total fatty acids than contained in eggs laid by hens fed the ration without crude cottonseed oil. This was the case whether the basal ration containing 4.1%

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ether extractable material or the basal ration plus 10% corn oil or 10% olive oil was fed. Something in crude cottonseed oil appears to upset the fatty acid metabolism of the hen so that an equilibrium between oleic acid and stearic acid in the mobile lipides is shifted to give more stearic acid. Addition of 10% corn oil to the basal ration increased the linoleic acid content of fatty acids in eggs produced and slightly increased the stearic acid content. A similar level of cottonseed oil increased stearic and linoleic acid contents of eggs more than corn oil did and decreased oleic acid. Ten percent olive oil increased oleic acid and decreased linoleic and stearic acids in the eggs.

EFFECT OF ESTROGENS ON INTERLIPID RELATIONS IN MEN WITH MYOCARDIAL INFARCTION. J. Marmorston, F. J. Moore, O. T. Kuzma, O. Magidson and J. M. Weiner (Dept. of Med. and Public Health, Univ. of So. Calif. School of Med., Los Angeles County Hosp. and Cedars of Lebanon Hosp., Los Angeles).

Proc. Soc. Exp. Biol. Med. 113, 357-361 (1963). A total of 223 men recovered from myocardial infarction were allocated to treatment groups and serum cholesterol and phospholipids determined (I) before and (II) following 6 months of uninterrupted treatment with No estrogen, Premarin, Lynoral or Anvene. The abnormality in interlipid relationships characteristic of men with clinical atherosclerosis was unaltered in the subjects receiving Premarin, but this abnormality was abolished by treatment with Lynoral. There is no necessary correlation between the feminizing, lipid-altering effects and survival rate in estrogen therapy of men with myocardial infarction.

TRANSMETHYLATION REACTIONS IN BACTERIAL LIPIDS. J. H. Law, H. Zalkin and T. Kaneshiro (Dept. of Chem., Harvard Univ., Cambridge, Mass.). *Biochim. Biophys. Acta* 70, 143-151 (1963). Lipids of *Escherichia coli*, *Serratia marcescens* and *Argrobacterium tumefaciens* grown in the presence of methyl-labeled methionine have been examined. *A. tumefaciens* produces lipids containing N-methylethanolamine, N,N dimethylethanolamine and choline with labeled methyl groups as well as labeled cyclopropane acids. The rate of formation of methylated bases parallels growth, while the rate of cyclopropane acid formation does not. In all three organisms, cyclopropane acid formation takes place mainly in late logarithmic growth and in the stationary phase. Hydrogen as well as carbon of methionine methyl groups is incorporated into cyclopropane rings. A mutant organism blocked in methionine synthesis forms cyclopropane acids from methionine methyl groups, the extent of incorporation being undiluted by a number of known one-carbon donors.

STUDIES ON PHOSPHOLIPIDS. 9. THE COMPOSITION OF RAT LIVER LECITHINS. F. D. Collins (Univ. of Melbourne). *Biochem. J.* 88, 319-24 (1963). Lecithin was isolated from dinitrophenylated rat liver lipids by chromatography on diethylaminoethylcellulose with cold acetone as solvent, purified by counter-current distribution in $\text{CCl}_4\text{-MeOH-H}_2\text{O}$, and analyzed for phosphorus and fatty acid. Stearoyl arachidonoyl lecithin was the major component. After exchange of inorganic P^{32} phosphate for 1 hour, the stearoyl lecithins were calculated to have an average specific radioactivity of 81 ± 32 counts/min./ μg atom of phosphorus as compared with 756 ± 24 for the palmitoyl lecithins.

CHEMICAL STUDIES ON THE LIPID AND CONNECTIVE TISSUE COMPONENTS OF EARLY ATHEROMATOUS LESIONS. Elspeth B. Smith (Middlesex Hospital Medical School). *Biochem. J.* 88, 49P-50P (1963). To compensate for individual variation and the chemical changes which occur with age, normal intima and different types of lesion have been compared in the same aorta. In fatty streaks the cholesterol ester may increase tenfold, and its fatty acid composition changes dramatically. In adults linoleic acid falls from 30 to 40% in normal tissue to about 15% in the adjacent fatty streak, while eicosatrienoic acid which characteristically increases in essential fatty acid deficiency rises from under 1% to 6-7%. The concentration of lipid in larger intimal fatty plaques is much greater than in fatty streaks, but the cholesterol ester fatty acid distribution is less abnormal, with about 20% linoleic acid. In mature fibrous plaques the pattern is often still closer to normal, but invariably there is some fall in linoleic acid and rise in eicosatrienoic acid.

CUTANEOUS LIPIDS. V. R. Wheatley (New York University Medical Center). *Drug Cosmetic Ind.* 93, 161-2, 250, 252-3 (1963). The author reviews (20 references) surface film lipids, epidermal lipids, sebaceous lipids, lipids of the horny layer, lipogenesis in the skin, and possible roles of cutaneous lipids.

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THE ISOLATION OF LEAF COMPONENTS. II. D. Thirkell and G. R. Tristram (The University, St. Andrews, Fife). *J. Sci. Food Agr.* 14, 488-95 (1963). A method is described for the fractionation of the complex lipid-pigment mixture from lucerne which involves chromatography on a silicic acid column and elution with light petroleum containing increasing amounts of ethyl ether and finally methanol. A good degree of initial separation is achieved. The method is also suitable for the quantitative preparation of the various lipid classes from which further investigation into the members of each class can be carried out. The use of thin layer chromatography has shown that each of the fractions separated contains from 1 to 10 compounds.

VARIATIONS IN THE PROPORTIONS AND IODINE VALUES OF FATS AT DIFFERENT LOCATIONS IN THE ENDOSPERM OR EMBRYO. A. R. S. Kartha (Indian Agricultural Research Institute). *J. Sci. Food Agr.* 14, 515-19 (1963). Variations in the proportions and iodine values of fats at different locations in the endosperm or embryo were studied for several different types of seed (hazelnut, apricot, almond, cashew, sapota, pistachio, groundnut, Brazil nut, coconut, arecanut). The variations in oil content and iodine value occur in systematic patterns with reference to the center of the seed or in some cases the center of each cotyledon. The patterns differ with different varieties of seed, in some from the center to the periphery, in others along the vertical axis. There appears to be no connection between the patterns of iodine value and variation in oil content.

THE COMPOSITION OF PACHYRRHIZUS FROSUS (YAM BEAN) SEED OIL. J. H. Broadbent and G. Shone (Tropical Products Institute). *J. Sci. Food Agr.* 14, 524-7 (1963). The fatty acid composition of the oil has been examined by gas-liquid chromatography and found to contain 26.7% palmitic, 5.7% stearic, 33.4% oleic and 34.2% linoleic. The unsaponifiable matter of the oil, which contains 55% digitonide-forming sterols, has been separated by thin-layer chromatography into 6 components, 2 of which give positive Liebermann-Burchard tests and 1 of which gives a positive Emmerie-Engel test. The tubers of *P. erosus* are used for edible purposes; the seeds could possibly be used to give an edible grade oil and also insecticidal concentrates.

IDENTIFICATION AND DETERMINATION OF PLASTICIZERS IN LACQUERS BY PROGRAMMED TEMPERATURE GAS CHROMATOGRAPHY. G. G. Esposito (Coating and Chemical Lab, Aberdeen Proving Ground, Md.). *Anal. Chem.* 35, 1439-1441 (1963). The physical characteristics of lacquers are greatly influenced by their plasticizer content. A procedure is described for the identification and determination of seven plasticizers in nitrocellulose, vinyl, and acrylic-type lacquers by programmed temperature gas liquid chromatography. The analysis is conducted on lacquer samples after treatment to remove the resins; the plasticizers are identified from their relative retention times and determined by the internal standard technique. The method is simple, rapid, and accurate.

THE BIOSYNTHESIS OF LONG-CHAIN FATTY ACIDS BY LETTUCE CHLOROPLAST PREPARATIONS. P. K. Stumpf and A. T. James (National Institute for Medical Research, London (Great Britain)). *Biochim. Biophys. Acta* 70, 20-32 (1963). It is demonstrated that the major site of biosynthesis of saturated fatty acids from C_{10} to C_{18} and of oleic acid in leaves is the chloroplast. The co-factors required in the presence of light are ATP, CoA, Mg^{2+} , CO_2 and inorganic phosphate. In the dark greatly diminished synthesis occurs despite the presence of a full complement of cofactors. As in photosynthetic phosphorylation the synthesis of fatty acids is inhibited by NH_3 and 3-(p-chlorophenyl)1,1-dimethyl urea but not by dinitrophenol. Under anaerobic conditions the biosynthesis of oleic acid drops markedly but that of the saturated acids is relatively unaffected. Isolated chloroplasts are less effective in utilizing the C_8 , C_{10} , C_{12} and C_{14} saturated fatty acids for the biosynthesis of oleic acid than is the intact leaf. Both malonic and acetic acids are, however, readily utilised.

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ENZYMIC PATHWAYS OF GLYCERIDE AND PHOSPHOLIPID SYNTHESIS IN AORTIC HOMOGENATES. Y. Stein, O. Stein, and B. Shapiro (Hadassah Univ. Hosp., Hebrew Univ., Hadassah Medical School, Jerusalem, Israel). *Biochim. Biophys. Acta* 70, 33-42 (1963). Homogenates were prepared from rabbit and dog aortas and were shown to catalyze the incorporation of C¹⁴ linoleic acid into neutral lipids and phospholipids. α -Glycerophosphate, CoA and ATP are required for this process. Triglycerides and diglycerides were the major radioactive components in the neutral lipid fraction. Lecithin, lysolecithin and phosphatidyl ethanolamine made up most of the radioactivity in the phospholipid fraction. An alternative pathway of lecithin synthesis was found in which lysolecithin served as immediate precursor. This reaction is also ATP and CoA dependent. With lysolecithin, as precursor, C¹⁴ linoleic acid was confined to the β -position of the lecithin synthesized; with α -glycerophosphate, both the α - and β -positions were labeled. Purified lecithin also promoted incorporation of linoleic acid into phospholipids. This is probably due to its transformation into lysolecithin, which then serves as (14C) fatty acid acceptor.

THE INCORPORATION OF AMINO ACIDS INTO SOLUBLE LIPOPROTEINS BY CELL-FREE PREPARATION FROM RAT LIVER. J. B. Marsh (Dept. of Biochem., School of Med. and Grad. School of Med., Univ. of Penna., Philadelphia 4). *J. Biol. Chem.* 238, 1752-1756 (1963). Homogenates of rat liver, isolated microsomes, and, to a lesser extent, washed mitochondria have been shown to incorporate labeled amino acids into plasma lipoproteins. Upon the addition of carrier rat plasma, the proteins labeled in the microsomes have the ultracentrifugal and immunochemical characteristics of the plasma low and high density lipoproteins. The labeled high density lipoprotein made in the microsomal system was further characterized by comparing its peptide labeling pattern with that made in liver slices, and a high degree of correlation between the two patterns was found. In contrast to the results with intact liver cells, the high density lipoproteins showed a higher specific activity than the low density lipoproteins. Microsomes from rats with experimental nephrosis were more than twice as active in synthesizing plasma lipoprotein than those from normal controls.

EFFECT OF INTRAVENOUSLY INJECTED TOCOPHEROL ON OXIDIZED FLAVOR IN MILK. D. R. Erickson, W. L. Dunkley, and M. Ranning (Depts. of Food Sci. and Techn., Univ. of Calif., Davis). *J. Dairy Sci.* 46, 911-915 (1963). In investigating the role of tocopherol as an antioxidant in milk, intravenous injection of tocopherol was used as an approach that would give more complete control of variables than can be obtained in feeding trials. Injection of 7 g of DL- α -tocopherol acetate in unemulsified form gave negligible increases in tocopherol and oxidative stability of milk, but as little as 1.5 g of either tocopherol or tocopherol acetate injected in emulsified form caused marked increases in milk tocopherol and oxidative stability. When injected as emulsions, tocopherol acetate gave greater response than tocopherol. For individual cows, correlations between milk tocopherol and oxidative stability were highly significant. In comparing milks from different cows, however, the tocopherol level did not provide a reliable indication of susceptibility to oxidized flavor. In an experiment in which the milk lipids were fractionated by a churning procedure, changes in oxidative stability of the milk after tocopherol acetate injections correlated with tocopherol in the membrane lipids (from buttermilk) more closely than with that inside the fat globules (butteroil).

FAILURE OF CORN OIL AND TRIPARANOL TO PREVENT HYPERCHOLESTEROLEMIA AND ATHEROSCLEROSIS. M. L. Armstrong, W. E. Connor, and R. S. Melville (Vet. Admin. Hosp., Dept. of Internal Med., Univ. of Iowa, Iowa City). *Proc. Soc. Exp. Biol. Med.* 113, 960-963 (1963). A diet high in polyunsaturated fat derived from corn oil did not prevent the development of hypercholesterolemia and atherosclerosis in rabbits fed cholesterol at the 1% and 0.25% levels. Aortic and hepatic sterol content increased greatly. When triparanol, a potent inhibitor of cholesterol biosynthesis, was added to the corn oil-cholesterol

feeding, it had no effect on the resulting hypercholesterolemia and atherosclerosis at the 0.05% level. Triparanol did appear to reduce aortic atherosclerosis slightly at a dose of 0.10% and under conditions of a lessened intake of dietary cholesterol. The evidence to date is poor that atherosclerosis can be controlled by the use of either polyunsaturated oils in the diet or pharmacologic agents to inhibit cholesterol synthesis as long as significant amounts of cholesterol are absorbed in the body.

TRANSPORT OF GLYCEROL IN HUMAN BLOOD. C. F. Borchgrevink and R. J. Havel (Cardiovascular Research Inst., Univ. of California, San Francisco). *Proc. Soc. Exp. Biol. Med.* 113, 946-949 (1963). Glycerol is released from the area drained by the saphenous vein in man and taken up in the splanchnic region and kidneys. The arterial concentrations of glycerol and FFA are positively correlated. In resting subjects, net splanchnic uptake of glycerol was calculated to be .052 to .11 mmoles per minute and renal uptake .011 to .022 mmoles per minute. It seems likely that more than 3 moles of FFA is released from adipose tissue for each mole of glycerol.

LIPID METABOLISM OF YOUNG FEMALE RATS FED DIETS VARYING IN FAT AND CALORIES. J. Dupont and H. Lewis (Dept. of Food and Nutr., Florida State Univ., Tallahassee, Fla.). *J. Nutr.* 80, 397-402 (1963). The effect of diet on rate of synthesis of several lipids was studied using young female rats. Dietary variations were 1 or 20% cottonseed oil and 20% animal fat (lard and butter in equal amounts). Young adult and weaning animals were fed these diets for 4, 7 or 12 weeks, at which time each was given Na-1-C¹⁴acetate. Amounts of serum and liver lipids in isotope incorporation were determined. Cholesterol synthesis was enhanced, whereas non-cholesterol lipids were depressed by the higher amounts of fat. At 10 weeks the animals fed the higher level of fat had very high cholesterol activities with only slightly larger concentrations of cholesterol in the livers and serum. When food intake was restricted, the rate of cholesterol metabolism was related to the amount of dietary or stored fat utilized for energy.

INFLUENCE OF DIETARY MENHADEN OIL ON GROWTH RATE AND TISSUE FATTY ACIDS OF THE CHICK. H. M. Edwards, Jr. and J. E. Maron (Poultry Dept., Univ. of Georgia, Athens). *J. Nutr.* 81, 123-130 (1963). Using purified diets containing 2 sources of protein, an essential fatty acid deficiency was produced in chicks that was characterized by poor growth and a high quantity of eicosatrienoic acid in the liver lipid. The feeding of corn oil caused an increase in the eicosatetraenoic acid and a decrease in the eicosatrienoic acid content of the liver. The feeding of menhaden oil did not change the eicosatetraenoic acid content of the liver lipid, but caused a complete disappearance of eicosatrienoic acid. Eicosapentaenoic acid, docosapentaenoic acid and docosahexaenoic acid were present in the liver only when menhaden oil was fed. The data indicate that the feeding of fish oil with its high content of long-chain polyunsaturated fatty acids inhibits the synthesis of eicosatrienoic acid in the chicken. When menhaden oil was fed with corn oil, the level of arachidonic acid present in the liver and heart fat was decreased from levels resulting when corn oil is fed alone. Some interpretations of these observations are discussed.

TYPE AND QUANTITY OF 3 β -HYDROXYSTEROLS EXCRETED BY SUBJECTS SUBSISTING ON FORMULA RATIONS HIGH IN CORN OIL. H. L. Haust and J. M. R. Beveridge (Dept. of Biochem., Queen's Univ., Kingston, Ontario). *J. Nutr.* 81, 13-16 (1963). A normal and a diabetic subject were given a fat-free formula diet for 8 days and then continued for a similar period of time with a ration providing corn oil at a level of 60% of calories in place of an equicaloric amount of carbohydrate. By a differential-spectrophotometric system of analysis, 3 β -hydroxysterols excreted in the feces during the last 4 days of each regimen were determined. During the corn oil regimen, total 3 β -hydroxysterols in feces increased 11- and 17-fold, respectively; β - plus γ -sitosterol accounted for about 80% of the sitosterol intake and comprised about 60% of the 3 β -hydroxysterol output. Cholesterol excretion increased four- and five-fold. In the case of the diabetic subject, this was accompanied by a tenfold increase in the elimination of coprostanol. These data demonstrate that endogenously derived sterols contribute to the well-known increase in fecal unsaponifiable matter observed during the consumption of vegetable fats of high plant sterol content. This observation, considered in the light of the decrease in plasma cholesterol observed when corn oil is added to a fat-free diet, suggests a cause and effect relationship between the 2 observations.

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CHANGES IN SUCCINIC DEHYDROGENASE ACTIVITY AND FATTY ACID COMPOSITION OF RAT LIVER MITOCHONDRIA IN ESSENTIAL FATTY ACID DEFICIENCY. T. Hayashida and O. W. Portman (Dept. of Nutr., Harvard Sch. of Public Health, Boston, Mass.). *J. Nutr.* 81, 103-109 (1963). The effects of feeding diets containing corn oil, coconut oil, tuna oil, or no fat on the sequence of development of growth inhibition and altered mitochondrial fatty acid compositions and succinic dehydrogenase activities were studied. The mitochondrial succinic dehydrogenase activities of rats fed tuna oil were higher than those of the control (corn oil) rats, but lower than those of the other EFA-deficient rats throughout the experiment. Suggestive differences between control and deficient mitochondria were noted after one week of the experiment and were marked after 2 weeks. The exposure to water, the addition of calcium ion, or the addition of snake venom elevated the mitochondrial succinic dehydrogenase activities, and eliminated or reduced the differences between the control and EFA-deficient rats. The appearance of eicosatrienoic acid and a reduction of arachidonic and linoleic acids in mitochondrial lipids from the fat-free and coconut oil groups occurred within one week after initiating the experiment. The feeding of tuna oil resulted in significant amounts of a highly polyunsaturated fatty acid of calculated carbon number 23.4, which was, perhaps, eicosapentaenoic acid, but not of eicosatrienoic acid in mitochondrial lipid. The alterations of mitochondrial fatty acid composition in EFA deficiency preceded slightly the appearance of elevated succinic dehydrogenase activity.

PROTECTION BY DIETARY FAT AFFORDED SERUM γ_1 -GLOBULIN OF X-IRRADIATED RATS. E. Jameson, R. J. Martinez and R. M.

Ryan (Dept. of Med., Univ. of Southern Calif., Los Angeles, Calif.). *J. Nutr.* 80, 370-374 (1963). A study was made to determine the influence of dietary fat or methyl linoleate on the response of the serum proteins of the rat to X-irradiation. Electrophoretic studies showed that X-irradiation caused a substantial decrease in the concentration of γ_1 -globulin in the serum of rats fed a fat-deficient diet. This change did not occur in rats that had been fed the fat-free diet plus a daily supplement of methyl linoleate or a diet containing 15% cottonseed oil. The similar body weights of the linoleate-supplemented rats and the fat-deficient rats demonstrated that the protective effect of dietary fat was not due simply to a mechanical shielding of the blood-forming organs by a fatty layer. It is suggested that the protection against X-ray afforded by dietary linoleate or fat may be due to protection of the antibody-forming system.

LIPOLYSIS OF LAURATE GLYCERIDES BY PANCREATIC AND MILK LIPASE. R. G. Jensen, J. Sampugna, and R. M. Parry, Jr. (Dept. of Animal Industries, Univ. of Conn., Storrs) and K. M. Shahani (Dept. of Dairy Husbandry, Univ. of Nebraska, Lincoln). *J. Dairy Sci.* 46, 907-910 (1963). Trilaurin, 1,3-dilaurin, and 1- and 2-monolaurins were lipolyzed by pancreatic and purified milk lipases. Rates of digestion of the substrates decreased in the order listed above. Acyl migration was noted when 2-monolaurin was the substrate. The crude pancreatic lipase preparation may have contained other lipases as both 1- and 2-monolaurins were hydrolyzed. Significance of the findings with regard to the study of triglyceride structure is discussed.

A STUDY OF THE HYPOCHOLESTEROLEMIC ACTIVITY OF THE ETHYL ESTERS OF THE POLYUNSATURATED FATTY ACIDS OF COD LIVER OIL IN THE CHICKEN. I. EFFECT ON TOTAL SERUM CHOLESTEROL. S. G. Kahn, J. Vandeputte, S. Wind and H. Yacowitz (Squibb Inst. for Med. Res., New Brunswick, N.J.). *J. Nutr.* 80, 403-413 (1963). This report is concerned with the polyunsaturated fatty esters of cod liver oil and their effect on total serum cholesterol in hypercholesteremic chickens. An ethyl ester fraction of cod liver oil (I no. 315) was found 4 times as effective as natural cod liver oil (I no. 160) in lowering total serum cholesterol in the hypercholesteremic chicken. Increasing the iodine number of the ethyl ester preparation to 374 increased the hypocholesteremic activity approximately twofold. An ethyl ester fraction of menhaden oil was found equal in hypocholesteremic activity to an equivalent ethyl ester fraction of cod liver oil. The hypocholesteremic effect of the polyunsaturated fatty esters is related to the degree of unsaturation of the fatty esters fed. This hypocholesteremic effect of the fish oils was obtained only during the period that they were fed. When the oils were withdrawn from the ration, hypercholesterolemia returned. Dietary hypercholesterolemia diminished with age.

II. EFFECT ON SERUM AND TISSUE CHOLESTEROL AND AORTIC AND CORONARY ATHEROSCLEROSIS. S. G. Kahn, S. Wind, A. Slocum, D. Pfeffer and H. Yacowitz. *Ibid.*, 414-424. The polyunsaturated fatty acid esters of cod liver oil or menhaden oil were fed to both hypercholesteremic and normocholesteremic chickens. Serum phospholipid and serum, adrenal, abdominal aorta, and intestinal wall cholesterol concentrations were lowered in the hypercholesteremic chicks. Serum glutamic-oxaloacetic transaminase and liver, spleen, brain, and thoracic aorta cholesterol concentrations did not differ from the values obtained in birds fed the basal diet. Only serum phospholipid and cholesterol were reduced in normocholesteremic birds fed the fatty esters. The incidence of atherosclerosis in the aortic and coronary vessels of birds fed the polyunsaturated fatty acid esters, did not differ from their respective controls. The hypocholesteremic effect of the polyunsaturated fatty esters was observed in 90-day-old chicks; however, after 400 days the effect was not seen.

PHOSPHOINOSITIDES. 5. THE INOSITOL LIPIDS OF OX BRAIN. R. B. Ellis, T. Galliard, and J. N. Hawthorne (Medical School, Birmingham). *Biochem. J.* 88, 125-31 (1963). The major hydrolysis product of the diphosphoinositide fraction of ox brain was glycerylphosphorylinositol diphosphate. Glycerylphosphorylinositol monophosphate and glycerylphosphorylinositol were also present. It was concluded that ox brain contains 3 phosphoinositides: phosphatidylinositol, diphosphoinositide [1-phosphatidyl(inositol 4-phosphate)] and triphosphoinositide [1-phosphatidyl(inositol 4,5-diphosphate)]. Inositol di- and tri-phosphate were also found in the hydrolysates. The free diphosphates occur in ox brain; the triphosphate may come from a new type of phosphoinositide.

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4. STUDIES ON THE MODE OF ABSORPTION OF VITAMIN A BY RAT INTESTINE IN VITRO. *Ibid.* 534-9. After incubation of everted intestinal sacs prepared from normal male rats, in media containing aqueous dispersions of vitamin A alcohol or its various esters, the particulate and supernatant fractions of the mucosal-cell homogenates were analyzed. Although there was no significant esterification of vitamin A alcohol, considerable hydrolysis of all the esters occurred in the medium. In all cases the particulate materials contained the bulk of the vitamin A as alcohol; the ester predominated in the supernatant where it was mostly in the form of vitamin A palmitate. The effect of inhibitors and activators of the enzymes hydrolyzing and synthesizing vitamin A esters (taurocholate, Tween 20, tetra-ethyl phosphate, di-isopropyl fluorophosphate) has been studied.

• Drying Oils and Paints

THE STRUCTURE OF A CYCLIC C₁₈ ACID FROM HEATED LINSEED OIL. R. B. Hutchison and J. C. Alexander (The Procter and Gamble Co., Miami Valley Labs., Cincinnati, Ohio). *J. Org. Chem.* 28, 2522-2526 (1963). One of the cyclic fatty acids formed by heating linseed oil in the absence of air was isolated in pure form and was shown to be ethyl 11-(2-methyl-cyclohex-2-en-1-yl) undec-trans-9-enoate. A combination of chemical degradation, synthesis, and physical measurements was used to determine the structure.

VALVE PACKING COMPOSITION. G. A. Puttroff (ACF Industries, Inc.). *U.S. 3,109,744*. A valve packing composition has the following composition: chemically polymerized castor oil, 30-60% by weight; triethanolamine, 3-7%; stiffener (carnauba wax, NN' ethylene bis-stearamide, aluminum ricinoleate, or dimethyl dioctadecyl ammonium bentonite) 5-20%; and filler, 30-60%.

BIVALENT METAL HYDROXIDE TREATMENT OF DRYING OIL MODIFIED ALKYL RESINS. L. W. Friedsam (Sherwin-Williams Co.). *U.S. 3,110,690*. A method of improving the quality of a drying oil modified alkyl resin containing a stoichiometric excess of hydroxyl groups over carboxyl groups, an acid value between 10 and 50, and a cure value in excess of zero in a volatile organic solvent is described. The resinous solution is treated with a quantity of an inorganic hydroxide-forming basically-reactive bivalent metal ion source in the solution sufficient to neutralize at least in part the acid value. The combination is then heated at a temperature of from 125-350°F until the acid value and the cure value have been reduced to form a stable liquid product.

• Detergents

THE TENSIONS OF ISOLATED DETERGENT FILMS. R. J. Grabenstetter and J. M. Corkill (Miami Valley Labs., The Procter and Gamble Co., Cincinnati, Ohio). *J. Colloid Sci.* 18, 401-408 (1963). A strain gauge attached to continuous recording equipment was used to study the tensions of isolated detergent films as they were extended and retracted. Dodecanol addition to aqueous sodium dodecyl sulfate solutions has a pronounced effect upon extension and retraction. The results that were obtained indicate films become more rigid as the surface concentration of dodecanol is increased and may approach the plastic solid state in behavior.

CHEMICAL AND PHYSICAL CONSTANTS OF CATIONIC AND NON-IONIC SURFACTANTS CONTAINING NITROGEN. D. E. Herring (E. R. Howard, Ltd., Stowmarket, Suffolk, Eng.). *Soap, Perfumery, Cosmetics*, 36, 889-92 (1963). The data given are average values for commercial products and have been abstracted or calculated from trade and technical literature. Data are included for quaternary ammonium salts, water insoluble simple amines, water soluble ethoxylated amines, betaines, amine oxides, amino acids, amides and complex amines.

THE ANALYSIS OF SYNTHETIC DETERGENTS. W. B. Smith (Machen Prod. Ltd., Whitehaven, Cumberland, Eng.). *J. Soc. Cosmetic Chemists* 14, 513-25 (1963). Surface active agents are classified, the older qualitative tests are reviewed and then a new paper chromatographic procedure outlined. Quantitative analysis, confined to the determination of the active constituents, is described under headings of solvent extraction, colorimetric determinations, anionic-cationic titration, and miscellaneous methods.

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DETERGENT COMPONENT ANALYSIS. E. F. Kaelble (Monsanto Chemical Co.). *Soap Chem. Specialties* 39(10), 56-9, 121, 123 (1963). Gas chromatography has been found to yield accurate, full data on the nature of detergent raw materials, and their behavior during formation, polymerization and biodegradation. Techniques are described for the analysis of alpha-olefin mixtures and for the separation and analysis of straight chain alkylbenzenes.

SURFACTANT ANALYSIS. T. E. Bruelle and S. B. Crecelius (Economics Laboratory, Inc.). *Soap Chem. Specialties* 39(10), 63-6, 121 (1963). A rapid and versatile method is described for the determination of hydroxyl numbers by infrared analysis. The method uses an independent standard reference graph derived from trityl alcohol (triphenyl methanol), and thus there is no dependence on a chemical reaction to give a standard reference. Determinations can be made on alcohols of varied structures and molecular weights using the same standard reference graph. No amino alcohol or mixture of an alcohol and amine can be analyzed because of interference by the amine function in the region of the spectrum where the measurement is being taken. The same instrument and equipment must be used for analysis as was used to obtain data for the standard curve, and it is best if the same operator does the work.

PROCESS FOR PREPARING ALPHA SULFO FATTY ACIDS AND SALTS THEREOF. G. Gavlin, W. M. Boyer, and D. R. Berger (The Richardson Co.). *U. S. 3,104,247*. Fatty acid is dissolved in a saturated hydrocarbon solvent in which the hydrocarbon is characterized by the absence of branching. Sulfur trioxide is introduced into the solution at a maximum temperature of 35°C, and the reaction mass is subsequently heated to a temperature above 35 but not exceeding about 100°C.

SOAP. R. E. Farrar and A. L. Schulerud (Colgate-Palmolive Co.). *U. S. 3,105,051*. A milled and plodded toilet soap bar particularly suitable for cleansing oily skin consists essentially of 75-87% sodium salt of higher fatty acids of 8 to 20 carbon atoms, 15-45% of them being saturated fatty acids of 8 to 14 carbon atoms. Distributed homogeneously throughout the soap is 1 to 1.75% of finely divided grit free water insoluble sodium metaphosphate of particle diameter size of from 1 to 40 microns. This perceptibly decreases the slip of the soap bar when it is wet without scratching human skin or exerting an abrasive effect.

INHIBITED ALKALINE DETERGENT SOLUTION. J. V. Karabinos and E. J. Quinn (Olin Mathieson Chemical Corp.). *U. S. 3,105,322*. A washing solution comprises water, caustic soda as a detergent, and from 0.5-10% (based on the caustic soda) of the mixture of heptonic acids resulting from the cyanide carboxylation of invert sugar.

PROCESS OF ACIDIZING OIL-BEARING STRATA AND COMPOSITION THEREFOR. C. Cooper (Petrolite Corp.). *U. S. 3,106,531*. The described composition consists essentially of an acid solution of an imidazoline derived from a detergent-forming acid and a polyethylene polyamine having up to 5 nitrogen atoms and an acylated amino-ethanol derived from a detergent-forming acid in weight ratios of 9-1 to 1-9 of imidazoline to acylated aminoethanol.

OXIDIZING SCOURING CLEANSER AND PROCESS OF PREPARING SAME. H. E. Wixon (Colgate-Palmolive Co.). *U.S. 3,108,077*. The described product consists of at least 50% of a water insoluble siliceous abrasive, 0.5-15% by weight of a water soluble anionic organic foaming detergent, and 0.1-10% dichlorocyanuric acid stabilized against decomposition by an odorless olefin having a double bond containing a tertiary carbon atom. The olefin is present in an amount sufficient to stabilize the dichlorocyanuric acid (up to 40% by weight).

WATER SOLUBLE TEXTILE BLEACHING AND DETERGENT COMPOSITION. H. E. Wixon (Colgate-Palmolive Co.). *U.S. 3,108,079*. The described product consists of from 0.1-20% of solid particulate dichlorocyanuric acid stabilized against decomposition by an olefin having a double bond containing a tertiary carbon atom, 2-50% of a water soluble anionic organic detergent salt stable in the presence of dichlorocyanuric acid, and a balance of a water soluble inorganic salt.

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• Local Section News

North Central Section

The North Central Section held their second meeting of the year in the Builders' Club, Chicago, Nov. 20, 1963, preceded by a social hour and dinner. Featured speaker was J. H. Guill, Jr., District Director of the Food and Drug Administration.



J. H. Guill, Jr.

His topic, "The Work of the Food and Drug Administration," could fill many libraries. Mr. Guill broke this down into: a) The Role of the Inspector; b) Seizure; c) Inspection; d) Labelling; and e) Diet Study. The questions elicited proved a fine tribute to the speaker.

E. E. Rice will report on the National Diet-Heart Study which is currently in progress at the January 22, 1964 meeting. March 4, 1964 will be annual Bailey Award Night. Members are requested to review their choice of possible candidates for the award and submit their names to Award Committee Chairman, A. V. Graci, Jr., Wurster & Sanger, Inc., 164 W. 144th St., Chicago 27, Ill.

SDA Voluntary Changeover Proceeding on Schedule

Congress was told last month that by the end of 1965 it will be virtually impossible to purchase household detergents containing the so-called "hard" material (ABS) which has caused foaming on some lakes and streams in various parts of the country.

This and other assurances given the House Committee on Public Works by soap and detergent industry spokesmen confirmed that its voluntary program to completely replace so-called "hard" detergents with newly-developed "soft" materials is proceeding on schedule.

Suppliers to the industry went on record that they will be producing only the new highly degradable material on or before December 1965, target date for completion of the voluntary changeover. They also confirmed that the new materials will be sold to detergent manufacturers at costs which will make it prohibitive for foreign suppliers to consider export of "hard" detergent materials to the U.S.

The soap and detergent industry's success in carrying out its own voluntary program and timetable so as to clean up its share of the nation's water pollution program eliminates any need for legislation specifically directed at "hard" detergents. D. C. Melnicoff, President, Fels & Co. and President of SDA, warned that regulating legislation would only add unnecessary costs for all concerned and discourage other groups from embarking on voluntary programs to solve their share of the water pollution problem.

In reporting on substantial progress already made by the soap and detergent industry in voluntarily meeting its responsibility to the public, Melnicoff pointed out that the industry is cooperating closely with the Dept. of Health, Education and Welfare in developing a test method on which to base standards of degradability.

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