ABSTRACTS

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

• Fats and Oils

Elaidic acid in crude olive oil. D. Buoncristiani and R. Salvadorini (Prov. Chem. Lab., Pisa, Italy). *Riv. Ital. Sostanze Grasse* **44**, 68–71 (1967). Analyses carried out on samples of olive oil extracted with three different solvents indicate complete absence of elaidic acid in the sample extracted with hexane, traces of the same acid present in the sample extracted with trieline and appreciable amounts (0.3–0.8%) in the sample extracted with carbon sulfide. The hypothesis is advanced that the latter two solvents can cause formation of elaidic acid during extraction.

On the formation of elaidic acid in olive oil. M. Vitagliano, A. M. Leone and V. Radogna. *Olearia* 20, 106–10 (1966). *Trans* oleic acid is not present in olives but can be formed by isomerization of the *cis* form during solvent extraction. A very important factor affecting the *cis-trans* transformation is the amount of iron present, especially if present as iron oxide. The degree of corrosiveness of the solvent employed is also important as it affects the amount of iron dissolved during the extraction process. Thus, carbon disulfide and trieline, which are both known to be more corrosive towards steel equipment than hexane, also cause formation of higher amounts of *trans* oleic acid in the solvent-extracted oil. Neither the free fatty acid content of the oil nor the extraction temperature are important factors in determining the *trans* oleic acid content.

Calculated and analyzed fatty acids in vegetarian diets. J. C. Gorman and M. E. Moore (Virginia Polytechnic Inst., Blacksburg). *J. Am. Dietetic Assoc.* **50**, 372–5 (1967). Calculated and analyzed values were compared for total fat and fatty acid content of two all-vegetable diets, each consisting of six menus. The daily means for the total fat and fatty acid content of the diets were in close agreement for analyzed and calculated values. However, the daily mean of the monounsaturated acid for one diet was statistically greater for the calculated value than for the analyzed value. Day-to-day variations between the calculated and analyzed values were large for the fat and fatty acids in the foods.

Fats and fatty acids in excess. M. L. Bierenbaum, A. B. Caldwell, P. Watson and V. Mollek (St. Vincent's Hospital, Montclair, N. J.). *J. Am. Dietetic Assoc.* **50**, 368–71 (1967). Recent results are reported on the complex interrelationship of saturated fat, dietary cholesterol and polyunsaturated fat in determining coronary heart ailments. Dietary recommendations based on these findings include: moderation in total intake of calories, fats and carbohydrates; limiting the fat intake to 30–35% of the total amount of calories; limiting the saturated fat intake, principally myristic acid, and supplementing the diet with polyunsaturated fat; maintaining the dietary cholesterol intake below 400 mg. daily. Some question is raised about the present level of fortification of vitamin D in foods. It may be that the fortification of vitamin D at present levels for the recently matured individual is contraindicated.

Diet and heart disease in the Cardiovascular Health Center. J. H. Browe, D. M. Morlley, V. M. Logrillo and J. T. Doyle (Albany Medical College, Albany, N. Y.). *J. Am. Dietetic Assoc.* **50**, 376–84 (1967). Nutritional data on 1514 male volunteers in the Cardiovascular Health Center are presented with special emphasis on fat intake, the intake of animal fat being on the average three times greater than that of vegetable fat. Under the conditions of this study, the extremes of fat intake were accompanied by the same average serum cholesterol values. Conversely, when grouped by extremes of serum cholesterol levels, no differences were found in nutrient and caloric intake, except for the percentage of calories from carbohydrates. There were no differences in age, height, weight and blood pressure. Data on physical activity are presented in terms of time and total energy expenditure. It would appear that it makes little difference whether estimates of summer activity are made during the summer or are either projected or antedated estimates. The same appears to be true of estimates of winter activity patterns. Estimated daily average caloric expenditure was 12% less than estimated intake.

The thin-layer chromatographic separation of fatty acid methyl esters and glycerides according to chain length and saturation. W. O. Ord and P. C. Bamford (Unilever Res. Lab., Welwyn, England). *Chem. Ind. (London)* **1967**, 277–8. A thin-layer chromatographic technique which has been successful in separating commonly occurring saturated and unsaturated fatty acid methyl esters on a dimethyldichlorosilane treated Kieselgel G chromatoplate is described. Some degree of success has also been achieved in extending this method to the separation of unsaturated glycerides.

Measuring the degree of bleaching of an edible oil by means of a new spectrophotometric index. C. Stella. *Olearia* **20**, 111–6 (1966). Two methods for measuring the color of an edible oil are proposed. One method consists in calculating the arithmetic mean of the various extinction coefficients at the characteristic wavelengths (in the visible region) for the oil in question; the second method consists in calculating the area under the extinction curve for the whole visible region. The numerical results from both methods can be used to evaluate the degree of decoloration of an oil subjected to a bleaching treatment.

On the gas chromatographic analysis of short chain fatty acids. II. G. Kaderavek and G. Volonterio (Univ. of Milan, Milan, Italy). *Riv. Ital. Sostanze Grasse* **44**, 75 (1967). A new technique for esterification and gas chromatographic separation is described which is useful in the analysis of volatile fatty acids.

Infrared spectra of triglycerides. L. Notarnicola (Univ. of Bari, Bari, Italy). *Riv. Ital. Sostanze Grasse* **44**, 72–4 (1967). The infrared absorption spectra of some vegetable oils (olive, soybean, peanut and corn) and the absorption values for the characteristic peaks at 6.8, 8.6 and 9.1 μm are reported. The validity of Beer's law for solutions of triglycerides in carbon tetrachloride has been confirmed at the characteristic wavelengths.

The infrared spectra of phospholipids. E. M. Pizzoli, O. DeMarco and L. Notarnicola (Univ. of Bari, Bari, Italy). *Riv. Ital. Sostanze Grasse* **44**, 62–7 (1967). The phospholipids of soy lecithin and of egg lipids have been separated and their infrared spectra have been obtained. The absorption values for the characteristic peaks (6.8, 8.6, 9.1 and 9.35 μm) are reported. The possibility of basing a quantitative determination of phospholipids in fats on IR spectrophotometric measurements is briefly examined.

Observations on the pigmentation of edible oils. A. Daghetta, A. Farini and D. Grieco (Inst. Agric. Chem., Milan, Italy). *Riv. Ital. Sostanze Grasse* **44**, 1–6 (1967). The spectral absorbance curves between 500 and 700 mμ have been determined for several vegetable oils (olive, soybean, peanut, rapeseed, corn, sunflower and sesame), both in the crude state and after refining, bleaching and deodorization. Absorption peaks at 670 and 655 mμ are attributed to the presence of feophytin A and B, two degradation products of chlorophyll. Refining does not eliminate these peaks, but bleaching does, provided sufficient amounts of earth are used.

Compositions with fatty oil and safflower phosphatide. J. Eichberg (American Lecithin Co.). *U.S. 3,318,704.* A fatty oil composition is claimed, containing as an additive between about 0.1% and about 5.0% by weight of the fatty oil of safflower phosphatide.

Taste improvement in margarine. A. J. Neilson and R. L. Hughes (Abbott Laboratories). *U.S. 3,314,799.* The process of adding cyclamic acid to margarine and uniformly blending the mixture is claimed, the cyclamic acid being added in an amount between 0.01% and 0.02% by wt. of the margarine.

Composition for preserving fatty materials. T. B. Tribble and E. L. Rondenet (Flavor Corp. of America). *U.S. 3,318,819.* A composition for preserving fatty materials consists essentially of butylated hydroxyanisole and a member selected from the group consisting of anthranilic acid, methyl anthranilate and ethyl anthranilate combined in the ratio of substantially 2:1.

Saturation in milk and meat fats. S. Patton and E. M. Kesler (Lipids Laboratory and Department of Dairy Science, Pennsylvania State University, University Park). *Science* **156**, 1365–6 (1967). Meat and milk products from ruminants (cows, goats, sheep and beef animals) contribute 35 to 40% of the fat in the average American diet. Such fat is highly saturated, containing less than about 4% polyunsaturated fatty acids. The unsaturated *plant* lipids (fats) ordinarily consumed by the ruminant are hydrogenated (saturated) in the rumen. Transport and incorporation of this hydrogenated fat into meat and milk follows. Rumen hydrogenation does not take place until the fat is broken down to free fatty acids, thus establishing the fact that lipolysis is an essential feature of the process. Circumvention of this lipolysis may lead to more-unsaturated meat and milk fat.

QUANTITATIVE PREPARATION OF METHYL ESTERS OF SHORT-CHAIN AND LONG-CHAIN FATTY ACIDS FOR GAS CHROMATOGRAPHIC ANALYSIS. S. A. Hyun, G. A. Vahouny and C. R. Treadwell. *Anal. Biochem,* 10, No. 2, 193–202 (1965). The sample of acids or esters (1 to 10 mg.) is dissolved in BF$_3$/methanol (1:7, w/w) (4 ml) and benzene (1 ml) in a screw-cap tube. The air above the solution is replaced by N$_2$ and the tube is heated at 68C to 70C for 16 hr (or 24 to 48 hr for branched-chain fatty acids). After cooling, 10 ml of water are added, and the methyl esters are extracted into light petroleum (4, 3 and 3 ml portions). The combined extracts are dried over Na$_2$SO$_4$/NaHCO$_3$ (4:1) (2 g) for 1 hr, then transferred to a sublimation tube, and the solvent is evaporated slowly in a stream of N$_2$ at 0–5C. The methyl esters are sublimed in two stages, the first at 125C ± 2 for 45 min with the cold finger cooled to −3C to 0 (this fraction contains the short-chain and small amounts of the long-chain fatty acid esters) and the second at 60C ± 2 for 1 hr at 0.2 ± 0.1 torr (this fraction contains the long-chain fatty acid esters). For known mixtures of triglycerides or cholesteryl esters, recoveries were between 93 and 100%. (Rev. Current Lit. Paint Allied Ind. No. 299).

PHOSPHOLIPIDS. D. Chapman. *Reports on Progress of Appl. Chem.* 50, 375–83 (1965).—A review with 123 refs. (Rev. Current Lit. Paint Allied Ind. No. 299).

AUTOXIDATION AND ANTIOXIDANTS. L. McGinley. *Reports on Progress of Appl. Chem.* 50, 359–67 (1965).—A review with about 150 refs. (Rev. Current Lit. Paint Allied Ind. No. 299).

OIL REFINING AND HYDROGENATION. C. B. Barrett. *Reports on Progress of Appl. Chem.* 50, 342–6 (1965).—A review with 35 refs. (Rev. Current Lit. Paint Allied Ind. No. 299).

A QUICK METHOD FOR THE EVALUATION OF THE OIL CONTENT OF OLIVES. M. Catalano (Univ. of Bari, Bari, Italy). *Olearia* 18, 116–9 (1964). A rapid, approximate method for determining the oil content of olives is described. The method, which employs the Roeder butyrrometer, is based on the hot solubilization of oil in isopropanol and its successive separation by dilution with water. The amount of oil thus determined is not equal to that determined by Soxhlet extraction but bears a linear relationship to it.

PROBABLE OCCURRENCE OF ACID ISOMERIZATION AS A SOURCE OF INTERPRETIVE ERRORS IN GAS CHROMATOGRAMS. E. G. Mondino (SAICA, Castelvetrano, Italy). *Olearia* 18, 101–7 (1964). Results of chromatographic studies suggest that certain isomeric forms of oleic acid may be formed during the preparation of methyl esters in acid environment. Such transformations would lead to the erroneous detection of the presence of eicosenoic acid in olive oil.

COMPOSITION OF UNREFINED OLIVE HUSK OIL. G. D'Arrigo and A. Giuffrida (Fats and Oils Exper. Stat., Catania, Italy). *Olearia* 18, 113 5 (1964). The fatty acid composition of the oil obtained from olive husks is reported. A difference in composition was found, especially in the stearic, palmitic and linoleic contents, between the fatty acid composition of the neutral oil and that of the free fatty acids from the same oil. This difference in composition becomes smaller as the acidity of the oil increases. The linoleic content of olive husk oil seems to be consistently higher than that of virgin olive oil, however the overall differences between the two oils are relatively minor.

MINOR FATTY ACIDS IN FATTY SUBSTANCES. CONTRIBUTION TO THE STUDY OF LARD ADULTERATION. E. Fedeli and A. Lanzani (Fats and Oil Exper. Stat., Milan, Italy). *Riv. Ital. Sostanze Grasse* 44, 127–31 (1967). The possibility of enriching a fat in some of its component fatty acids by means of low temperature crystallization of its methyl esters has been examined. It is possible in this manner to increase the sensitivity of subsequent gas chromatographic separations. The results of an investigation involving tallow, lard and their mixtures are reported.

GAS CHROMATOGRAPHIC SEPARATION OF OLEIC AND ELAIDIC ACID. A STUDY OF OPERATING CONDITIONS. G. P. Cartoni and A. Liberti (Univ. Naples, Naples, Italy). *Riv. Ital. Sostanze Grasse* 44, 178-83 (1967). The use of glass capillary columns coated with Apiezon L grease is described and the operating conditions required for the separation of oleic and elaidic acid are evaluated. The criteria adopted to establish the optimum working parameters (such as column temperature, carrier gas flow rate, etc.) in order to obtain the maximum separation in minimum analytical time, are discussed on the basis of theoretical considerations.

THE USE OF A FLAME IONIZATION DETECTOR TO DETERMINE THE PURITY OF LARD. P. Armandola (Prov. Chem. Lab., Novara, Italy). *Riv. Ital. Sostanze Grasse* **44**, 123–6 (1967). Gas chromatographic analysis of lards known to be free from adulteration has never revealed the presence of any peaks between myristic and palmitic acid. It is therefore suggested that the presence of such peaks, in amounts higher than 0.1%, can be considered as proof that the lard had been adulterated with tallow. The use of a flame ionization detector, with its high sensitivity, would allow the determination to be carried out rapidly and precisely.

THE FATTY ACID COMPOSITION OF OLIVE OILS FROM THE ITALIAN REGION OF PUGLIA. A. Cucurachi (Agric. Exper. Stat., Bari, Italy). *Olearia* **18**, 108–12 (1964). The fatty acid composition of two varieties of olive oil from the Italian region of Puglia has been determined on 82 samples. Significant differences have been found between the two varieties. In all of the samples analyzed the content of fatty acids lower than C_{16} has been zero.

PHYSICO-CHEMICAL CHARACTERISTICS AND ACID COMPOSITION OF OLIVE OIL FROM CALABRIA. A. Cucurachi (Agric. Exper. Stat., Bari, Italy). *Riv. Ital. Sostanze Grasse* **44**, 172–7 (1967). Physico-chemical characteristics of 168 samples of olive oil produced in the Italian region of Calabria over 8 years are reported. The relatively low I.V. of these oils (ave. 81.4) was noteworthy. Gas chromatographic analysis of the same samples gave the following mean values: C-14:0 sometimes in traces; C-16:0 13.08%; C-16:1 1.22%; C-17:0 0.21%; C-17:1 0.30%; C-18:0 2.71%; C-18:1 72.87%; C-18:2 8.22%; C-18:3 0.62%; C-20:0 0.44%; C-20:1 0.28%. Total unsaturated was 83.53% with 16.46% saturated.

IMPROVEMENT OF THE QUALITY OF RAPESEED. II. DETERMINATION OF SULPHUR RAPESEED THIOGLYCOSIDES. J. Fiby and I. Zeman (Fat Res. Inst., Usti). *J. Inst. Chem. Tech. Prague* **8**, 205–13 (1964). A new method for the determination of sulphur in the thioglycosides of rapeseed is described. The procedure consists in hydrolizing the thioglycosides in alkaline solution, thereby producing sulfides which can be determined in the same solution by means of oscillopolarography. The method has the advantage of eliminating the preliminary isolation by distillation of sulphur aglucones. The alkaline hydrolysis solution is also the basic electrolyte for polarography. The possibility of determining thioxazolidones by an analogous process currently under study. It was confirmed that thioaminoacids and sulfates do not interfere with the determination, but a separate calibration curve proved to be necessary for each botanic genus.

EFFECT OF AUTOXIDATION ON THE DETERMINATION OF FATTY ACID COMPOSITION OF MICROSAMPLES. H. Grynberg and M. Belodiwicz (Inst. Gen. Chem., Warsaw, Poland). *J. Inst. Chem. Tech. Prague* **8**, 199–204 (1964). The presence of low molecular weight oxidation products detected in chromatograms of methyl ester mixtures obtained from rapeseed glycerides after previous paper chromatographic separation has been investigated. It was concluded that erucic acid can become partially oxidized during the treatment with formation of low molecular weight products. An apparent increase in the percentage of oleic acid (from 12 to 25%) may be attributed to the formation of C_{12} dicarboxylic acid. Linoleic and linolenic acids yield azelaic acid upon oxidation and their content therefore decreases, while the apparent amount of palmitic acid increases from 4 to 13% as azelaic acid has approximately the same retention volume as palmitic acid. These findings suggest that autoxidation should be inhibited as much as possible, by carrying out the preliminary separation under inert gas and in the presence of oxidation inhibitors.

GROWTH OF FUSARIUM DIVERSISPORUM SHERB. ON LONG-CHAIN N-FATTY ALCOHOLS OR CHOLESTEROL AS THE SOLE CARBON SOURCE. R. G. Strobel, H. Quinn and W. Lange (The Procter and Gamble Co., Miami Valley Labs., Cincinnati, Ohio). *Can. J. Microbiol.* **13**, 121–136 (1967). *Fusarium diversisporum* Sherb. in aerated submerged cultures trans-locates *n*-hexadecanol and *n*-heptadecanol unchanged through the cell wall faster than these compounds can be metabolized. These alkanols may comprise up to one-half of the cell total lipid. The alkanols are initially oxidized at the hydroxylated carbon to fatty acids which are subsequently further degraded. Triglycerides are present as a major reserve material. Saturated fatty acids predominate on positions 1 and 3 and unsaturated fatty acids on position 2 of these triglycerides. A difference in sterol ester and phospho-glycolipid contents was shown in mycelia grown on sucrose, hexadecanol or heptadecanol.

FATTY ACIDS IN THE GENUS BACILLUS I. ISO- AND ANTEISO-FATTY ACIDS AS CHARACTERISTIC CONSTITUENTS OF LIPID IN 10 SPECIES. T. Kaneda (Res. Council of Alberta, Edmonton, Alberta, Canada). *J. Bacteriol.* **93**, 894–903 (1967). All 10 species of *Bacillus* studied produced eight fatty acids (anteiso-C15, anteiso-C17, iso-C14, iso-C15, iso-C16, iso-C17, n-C14 and n-C16). The six branched-chain fatty acids made up over 60% of the total. *B. cereus* was found to produce the additional fatty acids anteiso-C13, iso-C12, iso-C13 and monoenoic C16. Distinct differences in relative amounts of fatty acids produced between *B. cereus* and the other nine species were observed.

ISOLATION AND CHARACTERIZATION OF GLYCOLIPIDS FROM SOME PHOTOSYNTHETIC BACTERIA. G. Constantopoulos and K. Bloch (Nat. Inst. of Neurological Dis. and Blindness, Nat. Inst. of Health, Bethesda, Maryland). *J. Bacteriol.* **93**, 1788–1793 (1967). Glycosyl glycerides were found in substantial amounts in *Chloropseudomonas ethylicum* but not two strains of *Rhodopseudomonas polustris*. *R. molischianum* contained small amounts of monoglycosyl diglyceride. The glycolipids of *C. ethylicum* consisted of a monogalactosyl diglyceride and a glycolipid yielding galactose, rhamnose and an unidentified sugar on hydrolysis. All glycolipids and total lipids of photosynthetic bacteria examined contained saturated or monounsaturated but no highly unsaturated fatty acids.

HYDROGENATION OF SUNFLOWER OIL FOR MARGARINE USING A DISCONTINUOUS SYSTEM WITH RECIRCULATION OF THE OIL AND HYDROGEN. B. Freier, Henriette Antoni, M. Cotutui, Ana-Maria Ille, Ani Paboran, O. Papescu, C. Ille, P. Mihai and E. Dordea (Inst. of Nutr. Res., Bucharest, Romania). *Rev. Franc. Corps. Gras* **14**(4), 295–304 (1967). Refined sunflower seed oil was hydrogenated on a discontinuous basis but with recirculation of the oil and hydrogen. Selectivity was not influenced by temperature in the 160–200C range nor by pressure in the 1–2 atmosphere range; only the rate of hydrogenation was increased. The linoleic acid content of the hydrogenated oil decreased in a selective manner until the 0.5% level and without an appreciable increase in the saturated fatty acid content. Addition of fresh catalyst, at a ratio of 0.0001 lbs. Ni per pound of oil, retains the proper hydrogenation characteristics of the catalyst system. The *trans* content of the finished oils varied from 30 to 40%, while the saturated acid level varies from 28 to 30% depending upon the exact conditions of hydrogenation.

APPLICATION OF THE ZENITH METHOD FOR THE DEACIDIFICATION OF OILS HIGH IN FREE FATTY ACIDS. H. Niewiadiowski *et al.* *Przem. Spoz.* **21**(1), 11–13 (1967). A laboratory test was performed comparing the Zenith process to conventional alkali refining. The laboratory model was rapeseed oil acidified with synthetic fatty acids to an acid value of 220. With the Zenith process, it is possible to reduce the acid value from 220 to about 1 in a single step, while conventional alkali refining required three stages. (Rev. Franc. Corps Gras).

IMPROVED REAGENT FOR TRIMETHYLSILYLATION OF SPHINGOLIPID BASES. H. E. Carter and R. C. Gaver (Div. of Biochem., Noyes Lab. of Chem., Univ. of Ill., Urbana, Ill. 61801). *J. Lipid Res.* **8**, 391–5 (1967). This paper describes the trimethylsilylation of sphingolipid bases under conditions that give derivatives of improved stability. The retention times of the common C18 and C20 long-chain bases, including the anhydro bases, obtained on a commercially available gas-liquid chromatographic column with a nonpolar stationary phase are given. Data are also presented on the separation of the erythro and threo isomers of sphingosine and dihydrosphingosine, as the trimethylsilyl ethers of the N-acetyl derivatives.

DIRECT GAS CHROMATOGRAPHIC EXAMINATION OF TOTAL LIPID EXTRACTS. A. Kuksis, L. Marai and D. A. Gornall (Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Canada). *J. Lipid Res.* **8**, 352–8 (1967). The conditions for gas-liquid chromatography for the improved separation of natural triglycerides have been established to permit direct examination of total lipid extracts. For this purpose the range of temperature programming has been extended to 100–350C. Under optimum conditions, complete separations and quantitative estimates are obtained for free fatty acids, free sterols diglycerides, steryl esters and triglycerides. The separations are based on differences in molecular weights. Glycerophosphatides present in the sample seem to be pyrolyzed to compounds with retention times similar to those of diglycerides. The accuracy of the method is examined for standard mixtures of neutral lipids and fatty acids, and applications are illustrated with samples of the total plasma lipids of man. The lipid compositions obtained are compared with those data derived by conventional analyses. Although the method is rapid, its successful application to quantitative analysis requires extreme care.

Changes in fatty acid composition of sulfolipid and phospholipids during maturation of alfalfa. W. E. Klopfenstein and J. W. Shigley (Dept. of Biochem., The Pennsylvania State Univ., Univ. Park, Penna. 16802). *J. Lipid Res.* **8**, 350 1 (1967). Lipids were extracted from alfalfa samples collected at intervals over the growing season and were fractionated to yield pure sulfolipid. In the sulfolipid and in a phospholipid fraction the major fatty acids were palmitic, linolenic and linoleic, of which the palmitic acid increased in proportion during the season while the proportion of linolenic acid dropped. The sulfolipid contained more linolenic acid and less palmitic and linoleic acids than the phospholipids, and had a greater rate of change of fatty acid composition.

Separation of neutral glycosphingolipids and sulfatides by thin-layer chromatography. V. P. Skipski, A. F. Smolowe and Marion Barclay (Div. of Expt. Chemotherapy, Sloan-Kettering Inst. for Cancer Res., New York 10021). *J. Lipid Res.* **8**, 295–9 (1967). Two one-dimensional systems for separation of glycolipids from total lipid extracts of tissues by thin-layer chromatography are described. System I used, as adsorbent, an alkaline mixture of silica gel without CaSO$_4$ binder (75%) and magnesium silicate (25%), and the lipids were "developed" with three successive solvent mixtures. The separated compounds (from the fastest to the slowest moving) were: ceramide, ceramide monohexosides, sulfatides, ceramide dihexosides, psychosine, ceramide trihexosides, and ceramide N-acetyl-hexosamine trihexosides. In system II a two step development was used on an adsorbent consisting of silica gel without CaSO$_4$ binder (80%) and magnesium silicate (20%). The separated compounds were: ceramides, ceramide monohexosides, and ceramide dihexosides. Psychosine and sulfatides as well as ceramide trihexosides and ceramide N-acetylhexosamine trihexosides were not separated. In both systems all neutral lipids moved to the very top of the chromatogram and phospholipids stayed at the origin. Application of systems I and II for separation of glycolipids was demonstrated on total lipid extracts from animal tissues.

• Fatty Acid Derivatives

Infrared analysis of methyl stearates containing deuterium. W. K. Rohwedder, C. R. Scholfield, H. Rakoff, Janina Nowakowska and H. J. Dutton (Northern Reg. Res. Lab., Peoria, Ill. 61604). *Anal. Chem.* **39**, 820–3 (1967). Infrared spectra of methyl stearates specifically labeled with deuterium at or near the 9-10 carbon atoms were measured to provide a basis for quantitative determination of deuterium content and to determine the relative amounts of CHD and CD$_2$ on unknown stearates. Methyl stearates containing deuterium as follows: 9- or 10-d$_1$; erythro-9,10-d$_2$; threo-9,10-d$_2$; 6,7-d$_2$; 9,9,10- or 9,10,10-d$_3$; 9,10,11,12-d$_4$; 9,10,12,13-d$_4$; 9,9,10,10-d$_4$; and 9,10,12,13,15,16-d$_6$ were prepared for making band assignments. Methyl stearate prepared by the catalytic deuteration of unsaturated methyl esters had two shoulders on the 2148 cm^{-1} C-D peak, whereas the same esters reduced with hydrazine hydrate-d$_4$ had only a single peak without shoulders. The peak at 2148 cm^{-1} results from the C-D stretching vibration of the CHD group while the shoulders come from symmetric and asymmetric stretching of C-D in the CD$_2$ group. Integrated linear absorbance gave good quantitative correlations with deuterium content determined mass spectrometrically. The infrared spectrum is given of methyl esters of a mixture of perdeutero fatty acids extracted from the algae *Scenedesmus obliques* grown in 99.7% D$_2$O.

Catalysis of ester hydrolysis by mixed micelles containing N-α-myristoyl-L-histidine. A. Ochoa-Solano, G. Romero and C. Gitler (Centro de Investigation, Estudios Avanzados del Instituto, Politecnico Nacional, Mexico, D.F.). *Science* **156**, 1243-4 (1967). Model compounds are described for the study of the properties of amino acid side chains in the surface of micelles. Mixed micelles of N-α-myristoyl-L-histidine and cetyltrimethylammonium bromide catalyze the hydrolyses of p-nitrophenyl acetate and p-nitrophenyl caprylate at much higher rates than imidazole or histidine do. The reaction shows a kinetic behavior similar to that of surface-catalyzed reactions.

Performance of odd- and even-chain pure alcohol monolayers in water evaporation retardation. E. R. Noe and R. G. Dressler (Chem. Dept., Trinity Univ., San Antonio, Tex.). *Ind. Eng. Chem. Prod. Res. Dev.* **6**, 132–6 (1967). Specially purified samples of odd and even saturated fatty alcohols, C$_{12}$ to C$_{20}$, were prepared and analyzed. Evaporation rate tests were performed systematically on water surfaces protected with monomolecular films of the purified alcohols, using specially designed laboratory apparatus which indicated performance expected in monomolecular film application on outdoor reservoirs. Detailed results are given for nine alcohols. A search of the technical literature disclosed no appreciable studies of odd-carbon-chain alcohols as reservoir evaporation retardants. When the evaporation retardation properties of the alcohols tested are expressed in terms of per cent water savings, a linear relationship with increasing carbon chain length is observed, from 18% for C$_{12}$ to 65% for C$_{20}$. A correlation between evaporation rates, expressed in terms of specific evaporation resistance from the present study and those of others, shows agreement, even though the methods were widely different.

Brassylic acid from ozonolysis of erucic acid. N. J. Nieschlag and I. A. Wolff (Northern Reg. Res. Lab., U.S. Dept. Agr., Peoria, Ill., 61604) T. C. Manley and R. J. Holland. *Ind. Eng. Chem. Prod. Res. Dev.* **6**, 120–3 (1967). In bench-scale experiments, brassylic acid of 98% purity was isolated in 70% of theoretical yield by ozonolysis of erucic acid. Alternatively, dimethyl brassylate of 95% purity was obtained in 88% yield. Brassylic acid of 95% purity was produced in a continuous 7-day pilot-plant process, but the achievable yield demonstrated in the laboratory was not realized in this preliminary scale-up.

Synthesis and properties of hydroxy-14-oxa-4-tetradecanoic and methyl-2-hydroxy-13-oxa-3-tridecanoic acid isomers. C. Paquot, A. Hochapfel and B. Agoh (Lab. of Lipochemie of C.N.R.S., Thiais-(Val-de-Marne), Fr.). *Rev. Franc. Corps Gras* 14 (3), 167–173 (1967). Methyl-2-bromo-13-oxa-4-ethyl tridecanoate was synthesized by reacting dibromo-1-10-decane with sodium ethyl lactate. Saponification of the brominated compound yields both the D and D′ derivative. The D derivative had a very pleasant, musky smell after lactonization.

Properties, composition and structure of stearic acid-stearate monolayers on alkaline earth solutions. D. W. Deamer, D. W. Meek and D. G. Cornwell (Depts. of Physiolog. Chem. and Chem., The Ohio State Univ., Columbus, Ohio 43210). *J. Lipid Res.* 8, 255–63 (1967). Interactions between alkaline earth ions and the carboxylate ligand in a stearic acid surface film have been investigated by IR spectrophotometry and surface chemical procedures. The frequency and shape of the carboxylate absorption band and the effect of hydration and pH on band characteristics suggest that berylium, magnesium, and calcium ions form calcium-type complexes and more ionic barium-type complexes, which have lower carboxylate band maxima.

Progress in the analysis of 1- and 2-fatty acid monoglycerides. H. W. Wachs (Univ. of Berlin-Charlottenburg, Germany). *Tenside* **4**, 40–2 (1967). Methods used for the determination of 1- and 2-fatty acid monoglycerides are reviewed. These include thin-layer chromatography, infra-red and near infra-red spectroscopy and proton resonance spectroscopy. It is concluded that 1- and 2-monoglycerides can be determined by near-infrared spectroscopic methods following their separation by thin-layer chromatography.

Process for the production of lithium soaps of epoxidized fatty acids. A. Szczepanek (Chem. Fabrik Hoesch K. G., Duren, Germany). *U.S. 3,313,828.* A process is claimed for the production of solid lithium soaps of epoxidized fatty acids. Solid epoxidized fatty acids having about 12-24 C atoms, or esters of the same epoxidized fatty acids, are slurried in water and an aqueous solution of lithium hydroxide is slowly added to this slurry, until a slurry of lithium soap is formed, having a solid concentration of 30-90%. The slurry is subsequently dried, while destruction of the epoxy groups under the conditions of the reaction is suppressed.

Process for the manufacture of fatty acid esters. R. R. Allen and R. L. Campbell, Jr. (Anderson, Clayton & Co.). *U.S. 3,313,834.* A process for the manufacture of fatty acid esters comprises continuously introducting fat, polyhydric alcohol and alkaline ester-interchange catalyst into a reaction vessel containing the same materials in equilibrium with the monoester resulting from their reaction, at a temperature above about 350F. A portion of the mixture at equilibrium is continuously withdrawn from the reaction vessel, at the same rate at which the feed is introduced, then the alcohol is vacuum film distilled at a pressure of 3–50 mm Hg and at a temperature above the boiling point of the alcohol and below the boiling point of the esters in the mixture. The distillation residue is cooled to below 350F within about 10 minutes from the time the mixture is withdrawn from the reaction vessel and sufficient acid is added to neutralize the esterification catalyst. Finally, the salt formed during neutralization of the catalyst is separated by filtration.

PREPARATION OF UNSATURATED CARBOXYLIC ACIDS. L. Schmerling (Universal Oil Products Co.). *U.S. 3,317,590.* A method of preparing an unsaturated carboxylic acid consists of heating a haloalkane to a temperature of 100–300C in contact with a carboxylic acid salt such as alkali metal and alkaline earth metal salts of alkanoic, cycloalkylalkanoic and arylalkanoic acids, and acidifying the resultant reaction product. The haloalkane must contain at least two halogen atoms (either chlorine or bromine) attached to the same C atom and the carboxylic acid must contain at least two hydrogen atoms attached to the same alpha carbon atom.

REACTION PRODUCTS OF POLYMERIZED POLYENE HIGHER FATTY ACIDS AND POLY-1,2-ALKYLENAMIDES. P. Fram and G. H. Smith (Minnesota Mining & Mfg. Co.). *U.S.3,318,930.* A 100% solids-forming liquid comprises a mixture of a polymerized polyene higher fatty acid contining from about 14 to 22 C atoms, and a poly-1,2-alkylenamide.

FATTY ACIDS AND THEIR NATURAL AND SYNTHETIC DERIVATIVES. F. D. Gunstone. *Reports on Progress of Appl. Chem.* **50,** 346–55 (1965).—A review with numerous refs. (Rev. Current Lit. Paint Allied Ind. No. 299).

SYNTHESIS OF FATTY ALDEHYDES AND THEIR CYCLIC ACETALS (NEW DERIVATIVES FOR THE ANALYSIS OF PLASMALOGENS). P. Venkata Rao, S. Ramachandran and D. G. Cornwell (Dept. of Physiological Chem., The Ohio State Univ., Columbus, Ohio 43210). *J. Lipid Res.* **8,** 380–91 (1967). Saturated and unsaturated fatty aldehydes were prepared in good yield by the reduction of acid chlorides with lithium aluminum tri-t-butoxy hydride. Saturated odd and even numbered aldehydes were prepared by the ozonolysis, then reduction of 1-alkenes. Ozonides were hydrogenated with a Lindlar catalyst or reduced with dimethyl sulfide. Several diols, including 1,3-propanediol and ethylene glycol, were used to synthesize cyclic acetals from aldehydes and plasmalogens in quantitative yield. Cyclic acetals were synthesized from 2,4-dinitrophenyl hydrazones when an exchanger such as acetone or acetylacetone was included in the reaction mixture.

VINYL CHLORIDE POLYMERS CONTAINING FATTY ACID AND FATTY ACID SALTS. K. L. Blau, A. Herr, J. Lintner and O. Wilhelm (Vinypal S. A.). *U.S. 3,321,425.* Granules of synthetic resin which are readily dispersible in water comprise particles of vinyl chloride polymer and copolymers with a monoethylenically unsaturated comonomer, less than 1 micron in size, admixed with 1–5% by wt. of a free fatty acid having 12–20 C atoms and an alkali metal salt of a fatty acid, with a ratio of salt to acid between 1:9 and 1:1. The free acid bonds the mixture together in the form of granules which are readily dispersed in water.

EPOXIDATION. S. Beesley and J. B. Powner (British Celanese Ltd.). *U.S. 3,321,493.* An improvement is claimed in the process for the production of epoxidized unsaturated oils by reacting the oil with peracetic acid. Oxygen and acetaldehyde are reacted in the vapor phase to produce a gaseous mixture consisting essentially of peracetic acid, acetic acid and acetaldehyde. This mixture is passed, as it is produced, through a column into which are also introduced the unsaturated oil and a solvent such as acetone, methyl acetate or ethyl acetate. A solution of the epoxidized oil in a mixture of acetic acid and solvent is withdrawn from the base of the column.

PROCESS FOR THE PRODUCTION OF CARBOXYLIC ESTERS. S. Togashi and H. Yamada (Tokyo, Japan). *U.S. 3,322,772.* An improvement is claimed in the process for the production of carboxylic acid esters by esterification of aliphatic, aromatic or heterocyclic carboxylic acids with an alcohol by heating the carboxylic acid in the presence of an inorganic, organic or cation-exchange resin catalyst. The improvement consists in adding peroxide to the reaction system in a mole ratio of peroxide to carboxylic acid of from 0.01 to 0.5:1.

PROCESS FOR OBTAINING PURE METHYL AZELAALDEHYDATE FROM OZONOLYSIS OF COMMERCIAL METHYL OLEATE. W. R. Miller and D. J. Moore (U.S. Sec'y Agric.). *U.S. 3,322,798.* An improvement is claimed in the process for obtaining methyl azelaaldehydate from the heterogeneous product formed by ozonization of commercial methyl oleate followed by reductive decomposition of the ozonized intermediates. The improvement comprises a distillation step to remove a first fraction boiling at 28–94C/3 mm. and to isolate a fraction boiling at 65–118C/0.5 mm., treating the latter fraction with a saturated aqueous-methanolic solution of sodium bisulfite, isolating the resulting crystals of bisulfite addition compound, dissolving them in 10% NaOH solution, extracting the methyl azelaaldehydate regenerated therein with successive additions of ether, washing the pooled ether fractions with water to remove residual alkali, stripping off the ether solvent and distilling at 85–86C/0.2 mm. to obtain methyl azelaaldehydate having a purity of about 99.8 percent.

PURIFICATION OF ESTERS. H. J. Elder and N. W. Franke (Gulk Res. & Dev. Co.). *U.S. 3,324,156.* A process for reducing the acidity and improving the color of an ester of an aliphatic acid with an aliphatic alcohol comprises contacting the ester with ammonia impregnated carbon. The carbon material should have a pore volume of at least 0.3 cc per gram and a surface area of at least 500 square meters per gram, with at least 5% of its pore volume being in pores having a diameter in the range of about 10 to about 50 angstroms.

PRODUCTION OF CARBOXYLIC AMIDES. H. Scholz, M. Strohmeyer and E. Haarer (BASF A. G.). *U.S. 3,324,179.* A process is claimed for the continuous production of a carboxylic acid amide which comprises introducing as initial materials a carboxylic acid ester of a fatty acid with 1–4 C atoms and an alkanol with 1–4 C atoms, and a hydrocarbon primary or secondary amine with 1–12 C atoms. The reaction zone is arranged in a reaction column so as to provide a countercurrent flow of vapor and liquid both above and below the point of raw material feed, with temperatures of up to 200C at the bottom and at least 20C at the top of the column. The top product consisting mainly of alcohol is partly refluxed at a minimum reflux ratio of 2:1 and the carboxylic acid amide obtained as product is withdrawn at a point below the feed point.

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EFFECT OF METHIONINE SUPPLEMENTATION ON EXPERIMENTAL ATHEROSCLEROSIS IN RABBITS. W. J. Poole, Jr., S. R. Shimer, W. R. Dunlop and W. E. Urban, Jr. (Univ. of New Hampshire, Durham). *J. Nutr.* **91,** 441–6 (1967). A study was made to determine the effect of methionine on hypercholesteremia and atherosclerosis. Forty-eight New Zealand white rabbits were divided into 4 dietary groups of 12 rabbits each. Groups 1 and 2 received daily supplements of 0.5 g cholesterol and 0.25 g methionine, respectively. Group 3 received 0.5 g cholesterol and 0.25 g methionine daily. Group 4, the control group received no supplement. Two animals from each group were killed and autopsied after 7, 21, 42, 63, 84 and 105 days of supplementation. Aortic tissue was examined both grossly and histologically for signs of atherosclerosis, and the cholesterol content of aortas, hearts, livers, kidneys and serum was determined. At 21 days and at each subsequent autopsy interval, all rabbits fed cholesterol and cholesterol plus methionine demonstrated grossly apparent atherosclerosis. Medial involvement occurred quite early in the formation of the plaque. The addition of cholesterol to the ration had no observable biochemical effect on the kidney or aorta, but did affect the cholesterol level of the serum, liver and heart. Total feed intake was related negatively to liver cholesterol. There was no evidence of an inhibiting effect of methionine. It was observed that atherosclerosis was not, in all cases, accompanied by elevated serum cholesterol levels.

FAT METABOLISM IN HIGHER PLANTS, XXXII. CONTROL OF PLANT ACETYL-COA CARBOXYLASE ACTIVITY. D. Burton and P. K. Stumpf (Univ. of California, Davis, Calif.). *Arch. Biochem. Biophys.* **117,** 604–14 (1966). Intact lettuce cloroplasts readily utilize acetate-^{14}C for incorporation into long chain fatty acids in the presence of HCO_3^-, ATP, Mg^{++}, and light. However, disrupted chloroplasts no longer utilize either acetate-^{14}C or acetyl-CoA-^{14}C at a substrate. An almost complete absence of acetyl-CoA carboxylase activity was found in preparations of disrupted chloroplasts. Attempts to stimulate this activity by employing the allosteric effectors of mammalian and yeast acetyl-CoA carboxylase gave negative results. Further study showed the presence of an inhibitor in preparations of disrupted chloroplasts which markedly depressed the activity of wheat germ acetyl-CoA carboxylase. Its general properties are described. In addition, wheat germ acetyl-CoA carboxylase, unlike its counterparts in other tissues, is not stimulated by phosphorylated sugars, dicarboxylic and tricarboxylic acids.

Synthesis of long-chain fatty acids by microsomes of pigeon liver. R. B. Guchhait, G. R. Putz and J. W. Porter (Univ. of Wisconsin, Madison, Wis.). *Arch. Biochem. Biophys.* **117**, 541–9 (1966). Pigeon liver microsomes contain an enzyme system capable of synthesizing saturated and unsaturated C_{18} and C_{20} fatty acids by the addition of malonyl-CoA to shorter chain fatty acids. Since no malonyl-CoA was incorporated into the first five "two-carbon" units of synthesized oleic acid (pelargonic acid), it is concluded that the shortest chain fatty acid elongated by this system is decanoic acid. This conclusion is supported by the relatively high specific radioactivity of the carboxyl group in stearic and oleic acids synthesized from 1,3-^{14}C-malonyl-CoA and by the failure of octanoyl-CoA to stimulate the incorporation of malonyl-CoA into fatty acids. Requirements for ATP and a reduced nucleotide for microsomal fatty acid synthesis are also reported. The role of ATP in this system is discussed, and it is concluded that ATP probably functions in the activation of primer fatty acid units and in the synthesis of phospholipids. The latter are major end products of microsomal fatty acid synthesis.

Studies in lipogenesis in vivo. Fatty acid and cholesterol synthesis during starvation and re-feeding. G. R. Jansen, M. E. Zanetti and C. F. Hutchison (Merck Inst., Rahway, N.J.). *Biochem. J.* **101**, 811–8 (1966). Lipogenesis *in vivo* has been studied in mice given a 250 mg meal of U-^{14}C-glucose or given an intraperitoneal injection of 25 µg of U-^{14}C-glucose. The ability to convert a U-^{14}C-glucose meal into fatty acid was not significantly depressed by 6–7 hrs of starvation. By contrast, incorporation of ^{14}C into fatty acid in the liver after the intraperitoneal dose of ^{14}C-glucose was depressed by 80% and by over 90% by 1 and 2 hrs of starvation respectively. Carcass fatty acid synthesis from the U-^{14}C-glucose meal was not depressed by 12 hrs of starvation, whereas from the tracer dose of U-^{14}C-glucose the depression in incorporation was 80% after 6 hrs of starvation. Re-feeding for 3 days, after 3 days' starvation, raised fatty acid synthesis and cholesterol synthesis in the liver fivefold and tenfold respectively above the levels in non-starved control mice. These increases were associated with an increased amount of both fatty acid and cholesterol in the liver. After 18 hrs of starvation incorporation of a U-^{14}C-glucose meal into carcass and liver glycogen were both increased threefold.

Isolation and identification of carotenoids produced by a green alga in submerged culture. F. Dentice, O. Gribanovski-Sassu, A. Romagnoli and L. Tuttobello (Istituto di Sanita', Rome, Italy). *Biochem. J.* **101**, 735–40 (1966). Six carotenoid pigments were produced by and isolated from the green alga *Dictyococcus cinnabarinus* grown in submerged culture in the presence of glucose. The first, second, and fourth pigments were identified respectively as beta carotene, echinenone and canthaxanthin; the physicochemical properties of the other three are described and their similarity to other oxo-carotenoids is shown. Culture techniques, isolation and identification procedures are described.

By-products of the refining of soybean oil as pigment sources for poultry. I. Pigmentation studies with broilers. B. Lipstein, S. Bornstein and P. Budowski (National and Univ., Inst. of Agr., Rehovot, Israel). *Poultry Sci.* **46**, 626–36 (1967). By-products of the refining of soybean oil were tested as sources of pigments in practical broiler rations in four trials. Results obtained indicate that acidulated soybean soapstock, containing 168–260 mcg/gm xanthophylls, may serve as a pigmentor for broilers. On the other hand, soya lecithin contained only 32–45 mcg/gm xanthophylls, and hence cannot serve as a pigmenter for chicks.

Influence of water binders on the activity and thermal inactivation of lipase. E. J. Guardia and G. J. Haas (Corporate Res. Dept., Tech. Center, General Foods Corp., Tarrytown, N.Y.). *J. Agr. Food Chem.* **15**, 412–6 (1967). When water binders (sucrose, glycerol or propylene glycol) were added to liquid olive oil emulsions at pH 9.0, the activity of hog pancreatic lipase was inhibited. At pH 7.0, however, addition of these water binders significantly accelerated lipolytic activity. Acceleration was also found when propylene glycol was used at pH 6.0. In contrast, a lipase of fungal origin was completely inhibited by propylene glycol at concentrations which yielded maximum activation of pancreatic lipase. Sucrose and glycerol significantly protected pancreatic lipase against thermal inactivation, while propylene glycol increased its thermolability. Pancreatic lipase was active at moisture levels as low as 0.06% under the conditions tested.

Detection and determination by ultraviolet reflectance spectrometry of vitamins resolved on thin-layer plates. M. M. Frodyma and V. T. Lieu (Dept. of Chem., Univ. of Hawaii, Honolulu, Hawaii). *Anal. Chem.* 39, 814–19 (1967). A procedure has been developed whereby five vitamins of the B-group—thiamine hydrochloride, pyridoxine hydrochloride, nicotinic acid, nicotinamide, and *p*-aminobenzoic acid—were resolved on thin-layer plates and can be analyzed by means of ultraviolet reflectance spectrometry. Two methods were employed to locate the resolved vitamins prior to analysis. One involved the observation under ultraviolet light of chromatoplates prepared with adsorbent to which fluorescent material had been added; the other involved scanning of the plates by means of a spectrometer set at an appropriate wavelength. All but two of the vitamins could be identified unequivocally by means of their reflectance spectra, with the two having similar spectra being distinguished with the aid of their R_f values. The procedure also makes it possible to measure the concentration of the adsorbed vitamins with a precision of 2–3%.

Synthesis of 2-multiprenylphenols and 2-multiprenyl-6-methoxyphenols, biosynthetic precursors of the ubiquinones. G. D. Daves, Jr., H. W. Moore, D. E. Schwab, R. K. Olsen, J. J. Wilczynski and K. Folkers (Stanford Res. Inst., Menlo Park, Calif.). *J. Org. Chem.* **32**, 1414–17 (1967). The synthesis of 2-multiprenylphenols by three routes has been accomplished. Acid-catalyzed condensation of methyl *p*-hydroxybenzoate with phytol followed by ester hydrolysis and thermal decarboxylation yielded 2-phytylphenol. Isoprenylation of phenol under either acidic or basic conditions yielded 2-geranyl-, 2-farnesyl-, 2-phytyl-, 2-nonaprenyl-(2-solanesyl-), and 2 decaprenylphenol. Isoprenylation of 2-methoxyphenol (guaiacol) produced 2-geranyl-, 2-farnesyl-, 2-phytyl-, 2-nonaprenyl-(2-solanesyl-), and 2-decaprenyl-6-methoxyphenol. Among these compounds achieved synthetically, 2-decaprenylphenol, 2-nonaprenylphenol, and 2-decaprenyl-6-methoxyphenol have previously been isolated from cultures of *R. rubrum* and shown to be biosynthetic precursors of ubiquinone.

Lipid mobilizer hormone in Triton hyperlipemia. C. J. D. Zarafonetis, G. L. Brody and L. Dabich (Simpson Memorial Inst. for Med. Res., Univ. of Michigan, Ann Arbor). *Proc. Soc. Exp. Biol. Med.* **125**, 321–4 (1967). Tests were performed on baseline and periodic blood samples obtained from rabbits treated with intramuscular injections of Triton WR-1339. The ensuing hyperlipemia was characterized by marked elevation in total fatty acids, triglycerides, cholesterol, lipid phosphorus and total lipids. Paper electrophoresis revealed a concomitant increase in β-lipoproteins. Lipid mobilizer (LM) also increased strikingly, as was determined indirectly by testing plasma aliquots for inhibition of heparin activated clearing lipase. On the basis of these and related studies, it is suggested that Triton hyperlipemia is produced, at least in part, through sustained release of increased amount of LM which mobilize triglycerides to the portal circulation. Furthermore, Triton modifies metabolic activity of the liver so that post-hepatic hyperphospholipidemia and hypercholesteremia ensue.

Toxicity of topically applied fats and oils. W. D. Woods, E. L. McCune and B. L. O'Dell (Depts. of Agr. Chem. and Vet. Microbiol., Univ. of Missouri, Columbia). *Proc. Soc. Exp. Biol. Med.* **125**, 124–7 (1967). A potentially lethal dermatitis observed in chicks fed a high fat (20% vegetable oil) diet can be attributed to the external application of the oil. Topical application of both vegetable and mineral oils to young chicks produced a severe hyperkeratosis and high mortality within a few days. Mortality was largely prevented and skin damage substantially alleviated by including antibiotics in the oil and minimizing the number of environmental microbes. At least part of the topical fat toxicity syndrome can be attributed to secondary microbial infection.

Total inhibition of hepatic β-lipoprotein production in the rat by orotic acid. H. G. Windmueller and R. I. Levy (Lab. of Nutr. and Endocrinol., Nat. Inst. of Arthritis and Metabolic Diseases, Nat. Institutes of Health, Bethesda, Md. 20014). *J. Biol. Chem.* **242**, 2246–54 (1967). Lipoproteins of rat plasma have been characterized by lipid analysis, preparative ultracentrifugation, electrophoresis on paper, and immunoelectrophoresis with specific antisera to β-lipoprotein, and whole rat plasma. Similar techniques were used to characterize the lipoproteins released by livers perfused in situ with a suspension of erythrocytes in a medium initially free of rat plasma proteins. Normal rat livers released α-lipoprotein, β-lipoprotein, albumin and other plasma proteins during the perfusion. When

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rats were fed orotic acid as 1% of their diet, the plasma β-lipoprotein concentration fell within 7 days to less than 1% of normal. It rebounded to normal within 48 hours following withdrawal of orotic acid or supplementation of diet with 0.17% of adenine. When perfused in situ, livers from orotic acid-fed rats released α-lipoprotein, albumin, and other plasma proteins but no detectable β-lipoprotein. They released smaller amounts of cholesterol and phospholipid than normal livers and no triglyceride although they contained 10 times normal amounts of triglycerides. The fatty liver produced in rats by orotic acid appears to result from an inhibition of synthesis or release of hepatic β-lipoprotein, supporting the concept that β-lipoprotein has a specific role in the normal transport of triglyceride out of the liver.

Recovery of rat tissue lipids from essential fatty acid deficiency: Plasma, erythrocytes and liver. B. L. Walker (Dept. of Nutr., Univ. of Guelph, Guelph, Ontario, Canada). *J. Nutr.* **92**, 23–6 (1967). To determine the ability of various tissues to incorporate essential fatty acids, rats maintained with a diet deficient in essential fatty acids for 25 weeks were transferred to a diet containing 10% corn oil. The fatty acid compositions of plasma, erythrocyte and liver lipids were determined at intervals over an 81-day period. Lipids from the deficient animals were low in linoleic and arachidonic acids and high in palmitoleic, oleic and eicosatrienoic acids. Supplemental feeding with corn oil resulted in a rapid increase in linoleic and arachidonic acids and decrease in palmitoleic, oleic and eicosatrienoic acids in the plasma and liver, although the latter acid remained above the level in the control animals for a longer period than palmitoleic and oleic acids. In the erythrocyte, linoleic acid was rapidly incorporated and oleic acid lost with equal facility. Incorporation of arachidonic acid, while initially rapid, proceeded throughout the 81 days of the experiment. Loss of eicosatrienoic acid was also a long-term process. The rate of incorporation of essential fatty acids by tissues from deficient rats was a function of each tissue and each fatty acid.

Inhibition of β-glucuronidase by cholesterol and retinol. A. L. Tappel and C. J. Dillard (Dept. of Food Science and Tech., Univ. of Calif., Davis, Calif. 95616). *J. Biol. Chem.* **242**, 2463–9 (1967). The relatively specific inhibition of β-glucuronidase by cholesterol and retinol (vitamin A alcohol) has been studied. Both hydrolysis and transfer reactions are inhibited. The hydrolysis reaction is inhibited 70% by 1×10^{-4} M retinol and by 7.8×10^{-5} M cholesterol. Among known β-glucuronidase activators, deoxyribonucleic acid reversed inhibition about 50% while proteins had less effect. Inhibition was constant with time, was reversible upon dilution, was uncompetitive, and the inhibitions of retinol and cholesterol were not additive. Addition of α-tocopherol or ubiquinone did not affect inhibition. Glutamate dehydrogenase and pyruvate kinase, known to be inhibited by steroid hormones, were tested. Glutamate dehydrogenase is inhibited 50 and 64%, respectively, by cholesterol and retinol at 1×10^{-4} M; and pyruvate kinase is not inhibited. Blood serum inhibits the enzyme and inhibition is correlated with serum levels of cholesterol found in normal and abnormal serum standards. It is suggested that the previously reported "anti-glucuronidase" of blood serum may be cholesterol and that inhibition of β-glucuronidase by cholesterol may occur *in vivo*.

Conversion of beta sitosterol to cholesterol blocked in an insect by hypocholesterolemic agents. J. A. Svoboda and W. E. Robbins (Entomology Res. Div., U.S. Dept. of Agr., Beltsville, Maryland 20705). *Science* **156**, 1637–9 (1967). Two vertebrate hypocholesterolemic agents (triparanol and 22,25-diazacholesterol) block the conversion of β-sitosterol to cholesterol in the larva of the tobacco hornworm, *Manduca sexta* (Johannson). A primary site of inhibitory action is the terminal step in this conversion—the reduction of desmosterol (24-dehydrocholesterol) to cholesterol. This is also the site at which these compounds inhibit *de novo* cholesterol biosynthesis in higher animals. Both agents severely inhibit growth and maturation of the tobacco hornworm.

The isolation of low-density (β)-lipoprotein from small volumes of human serum. R. P. Stokes, A. Jacobsson and K. W. Walton (Dept. of Experimental Pathol., Univ. of Birmingham, England). *J. Atheroscler. Res.* **7**, 187–96 (1967). A method is described for the isolation of low-density β-lipoprotein which is applicable to small volumes of serum. The method is based on the selective precipitation of this protein by high molecular weight dextran sulphate. Subsequent treatment of the redissolved dextran sulphate-lipoprotein complex with diethylaminoethyl Sephadex (either as a column or batch procedure) has been shown to remove the sulphated polysaccharide completely and to yield β-lipoprotein in satisfactory yield and purity. During development of this procedure, a modified method for the assay of dextran sulphate was evolved and is described. This technique of preparation of lipoprotein was designed primarily for the isolation of β-lipoprotein from human serum but has been found also to be applicable to the recovery of β-lipoprotein from the serum of cholesterol-fed rabbits.

Lipid in the aortic intima—the correlation of morphological and chemical characteristics. E. B. Smith, P. H. Evans and M. D. Downham (Courtauld Inst. of Biochem., Middlesex Hosp. Med. School, London, W.1, England). *J. Atheroscler. Res.* **7**, 171–86 (1967). Correlated studies were made on the morphological and chemical characteristics of the lipid in 119 samples of human aortic intima. The cases covered an age range of 13–84 years and most samples were either macroscopically normal or showed diffuse thickening, diffuse fatty flecking or fatty infiltration. A small group of definite fatty streaks was included for comparison. Lipid was found in two distinct morphological forms: (a) perifibrous lipid, fine extracellular droplets which were often aligned along collagen and elastic fibres. (b) fat-filled cells, containing coarser lipid droplets. Chemically the two types of lipid were clearly differentiated. In perifibrous lipid the cholesterol esters contain about 28% oleic acid and 40% linoleic, which is comparable with serum lipid. In fat-filled cells there is much more cholesterol ester, which contain about 48% oleic acid and 14% linoleic acid. Perifibrous lipid increases in normal intima with increasing age.

Potentiation of diethylstilbestrol-induced aortic ruptures of turkeys with thiouracil. C. F. Simpson and R. H. Harms (Dept. of Veterinary Sci., Univ. of Fla., Gainesville). *Proc. Soc. Exp. Biol. Med.* **125**, 245–7 (1967). Thirty-seven percent of turkeys fed DES died from aortic ruptures, while 69% of poults fed DES and thiouracil died from the disease. Total plasma lipid and cholesterol values were elevated by both treatments, but more so by DES alone. Turkeys fed DES or DES-thiouracil were hypotensive, but systolic blood pressure was lowest in turkeys fed the 2 combined drugs. There was pronounced hypertrophy of the gland of poults fed DES. Body weights were depressed and the diameter of the lumen and thickness of the wall of abdominal aortas appeared to be reduced by DES-thiouracil feeding, as compared to feeding of DES alone.

Low-density lipoprotein accumulation in actively growing xanthomas. P. J. Scott and C. C. Winterbourn (Medical Unit, Auckland Hosp., Auckland, New Zealand). *J. Atheroscler. Res.* **7**, 207–23 (1967). Low-density lipoprotein labelled with ^{125}I in the peptide component was injected intravenously into five patients showing clinical evidence of rapid xanthoma deposition. Four patients had idiopathic hypercholesterolaemia and one was suffering from alcohol-induced hyperlipaemia. Tissue was removed from xanthomas 66–72 h after the intravenous injection. The four patients with idiopathic hypercholesterolaemia were either exposed to or protected from friction and movement. Radioactivity in the tissue samples was compared with that of control tissues and serum. The accumulation of radioactivity in xanthoma tissue was out of proportion to its vascularity and was twice as great in xanthomas exposed to friction and movement. The bulk of the radioactivity present was shown to be peptide bound. This study has shown that low-density lipoprotein enters into xanthomas, and these results are discussed in relation to lipid accumulation in arterial walls.

Myocardial lesions: Spontaneous development in captive ground squirrels. J. P. Schmidt and J. A. Rehkemper (USAF School of Aerospace Med., Brooks Air Force Base, Texas). *Proc. Soc. Exp. Biol. Med.* **125**, 213–5 (1967). Microscopic examination revealed that hearts of arctic ground squirrels killed in the field (noncaptive) were free of myocardial lesions but numerous areas of focal necrosis were found in the hearts of animals held captive for 2, 3 or 4 weeks. The etiology of these degenerative changes may be associated with the stress of captivity, but remains to be determined.

Oxidation of long chain fatty acids by rat liver mitochondria. C. R. Rossi, L. Galzigna, A. Alexandre and D. M. Gibson (Inst. of Biol. Chem., Consiglio Nazionale delle Ricerche, University of Padua, Italy). *J. Biol. Chem.* **242**, 2102–10 (1967). Long chain fatty acids are oxidized by rat liver mitochondria provided that endogenous adenosine triphosphate is not depleted. If endogenous ATP is depleted, e.g. by 2,4-dinitrophenol, external ATP as well as carnitine is required

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for fatty acid oxidation. Atractyloside does not block this reaction in media containing orthophosphate buffer. Oligomycin can substitute for carnitine, but the oligomycin-dependent route is inhibited by atractyloside. These experimental situations localize two ATP-dependent fatty acid-activating systems, one of which is linked to carnitine.

EFFECT OF ENVIRONMENTAL TEMPERATURE ON FATTY LIVERS PRODUCED BY VARIOUS HEPATOTOXIC AGENTS IN RATS. M. W. Radomski and T. Orme (Defence Res. Med. Lab., Toronto, Ontario, Canada). *J. Nutr.* 92, 19–22 (1967). The effect of a low environmental temperature on the development of fatty infiltration of the liver after various treatments was studied. Rats, housed at environmental temperatures of 22C and 4C for 14 days, were treated with a choline-deficient diet, carbon tetrachloride, ethionine, 4-aminopyrazolopyrimidine, orotic acid or ethanol. Fatty liver was produced by each of the treatments in the rats housed at 22C. A temperature of 4C prevented the development of fatty liver in the rats fed the choline-deficient diet in confirmation of previous results, but had no effect on fatty livers caused by the administration of carbon tetrachloride, ethionine, 4-aminopyrazolopyrimidine and orotic acid. A partial lipotropic effect of cold exposure was observed in the animals treated with ethanol.

BIOSYNTHESIS OF PHOSPHATIDIC ACID, LYSOPHOSPHATIDIC ACID, DIGLYCERIDE AND TRIGLYCERIDE BY FATTY ACYLTRANSFERASE PATHWAYS IN ESCHERICHIA COLI. R. A. Pieringer, H. Bonner, Jr. and Roberta S. Kunnes. (Dept. of Biochem., Temple Univ. School of Med., Phil., Pa. 19140). *J. Biol. Chem.* 242, 2719–24 (1967). Fatty acyl coenzyme A-glycerol 3-phosphate, fatty acyl coenzyme A-lysophosphatidic acid, fatty acyl coenzyme A-monoglyceride and fatty acyl coenzyme A-diglyceride acyltransferase activities were found in a particulate fraction of broken cell preparation of *Escherichia coli*. The synthesis of phosphatidic acid and lysophosphatidic acid catalyzed by these enzymes was demonstrated to be dependent upon the presence of glycerol 3-phosphate, fatty acyl-CoA, and magnesium ion. Magnesium ion was partially replaceable by calcium ion. Isolated, radiochemically pure lysophosphatidic acid served as a substrate in the synthesis of phosphatidic acid in an enzymatic reaction with fatty acyl-CoA. This observation suggests that lysophosphatidic acid functions as an intermediary in the synthesis of phosphatidic acid from glycerol 3-phosphate and fatty acyl-CoA. Under similar conditions of incubation both monoglyceride and diglyceride functioned as acceptors of the fatty acyl moiety from fatty acyl-CoA. Glycerol, however, did not serve as a substrate in the acylation reaction. Glycerol was incorporated into phospholipid only when adenosine triphosphate was added to an incubation system capable of acylating glycerol 3-phosphate. Lauryl, myristic, palmityl, oleyl, linoleyl, linolenyl, *cis*-vaccenyl, and *trans*-vaccenyl coenzyme A derivatives were tested and found to be active substrates *in vitro* in the acylation of glycerol 3-phosphate. However lauric, stearic, linoleic, linolenic, and *trans*-vaccenic acids have not been reported to exist as constituents of the phospholipids of *E. coli*. This finding suggests that the acyl transferase reaction does not possess the specificity required for excluding certain fatty acids.

EFFECT OF COLD SHOCK AND FREEZING ON LOSS FROM SPERMATOZOA. B. W. Pickett and R. J. Komarek (Dept. of Animal Industries, Univ. of Conn., Storrs). *J. Dairy Sci.* 50, 753–7 (1967). Semen from bulls and boars was divided into three fractions and treated as follows: control, cold shocked, and frozen. There was a loss of lipid from bovine spermatozoa that had been cold shocked ($P < 0.05$) or frozen ($P < 0.01$) compared to the controls. This loss was accompanied by a significant increase in lipid in seminal plasma of the corresponding fractions treated prior to separation from the cells. There were no significant changes in lipid or dry weight (DW) of porcine spermatozoa due to treatment.

METABOLISM OF LINOLEIC ACID IN RELATION TO DIETARY MONOENOIC FATTY ACIDS IN THE RAT. H. Mohrhauer, J. Seufert and R. T. Holman (The Hormel Inst., Univ. of Minnesota, Austin). *J. Nutr.* 91, 521–7 (1967). To study the interaction of dietary monoenoic fatty acids with the metabolism of essential fatty acids, weanling rats were fed a fat-free diet supplemented with oleic and linoleic acids in several ratios. The fatty acid composition of liver lipids was determined by gas-liquid chromatography. The conversion of oleic to eicosatrienoic acid was inhibited by dietary linoleic acid at all dietary levels of oleic acid investigated. The metabolism of linoleic acid could be influenced only when extremely high ratios of oleic to linoleic acid were fed. Petroselinic and erucic acids, representing isomers and homologues of oleic acid, were also fed as possible inhibitors of the metabolism of linoleic acid. Petroselinic acid interfered with the metabolism of linoleic and oleic acids, whereas erucic acid had little effect.

METABOLISM OF LINOLEIC ACID IN RELATION TO DIETARY SATURATED FATTY ACIDS IN THE RAT. H. Mohrhauer and R. T. Holman. *Ibid.*, 528–34. To study the interactions of dietary saturated fatty acids with the metabolism of essential fatty acids, triglycerides of saturated fatty acids of chain lengths C-4 to C-15 were fed in a semipurified diet to groups of weanling rats at 20% of calories for 80 days. All groups were given a daily oral supplement of ethyl linoleate at a level of 0.5% of total calories. The fatty acid composition of liver lipids was determined by gas chromatography. The conversion of linoleic to arachidonic acid was not hindered by the dietary triglycerides of saturated fatty acids. Levels of 20:4ω6 were, in fact, higher in rats fed the triglycerides of saturated fatty acids than in rats fed linoleic acid only. The content of 20:3ω9 was slightly lowered by triglycerides of even-numbered saturated fatty acids of chain lengths up through C_{14}, whereas it is significantly diminished by dietary triglycerides of fatty acids with chain lengths C_5 and C_{11}. Weight gain data revealed that triglycerides of dietary saturated fatty acids enhanced growth if minimal levels of linoleic acid were provided. Odd-numbered fatty acids affected growth adversely.

BIOLOGICAL EFFICACY OF D- AND DL-*α*-TOCOPHERYL ACETATE IN CHICKENS. W. L. Marusich, G. Ackerman and J. C. Bauernfeind (Agr. Res., Hoffmann-LaRoche Inc., Nutley, New Jersey 07110). *Poultry Sci.* 46, 541–7 (1967). d- and dl-*α*-Tocopheryl acetate have been compared in the chick using two biological parameters: plasma tocopheryl levels and incidence of encephalomalacia with 3 methods of administration: continuous in diet feeding of dry supplements, single oral doses of oil solution or dry products in capsules and intramuscular injection of experimental parenteral emulsions. All comparisons were made on an I. U. basis. No statistically significant difference could be seen by either plasma levels or the incidence of encephalomalacia between d- and dl-*α*-tocopheryl acetate. These data confirm the accepted biological potency ration of 1.0 mg. d-*α*-tocopheryl acetate being equal to 1.36 I. U. and 1.0 mg. of dl-*α*-tocopheryl acetate being equal to 1.0 I.U. of vitamin E activity.

SERUM LIPIDS, DIETARY FACTORS AND ISCHEMIC HEART DISEASE. S. L. Malhotra (Chief Medical Officer and Head of Med. Dept., Western Railway, Bombay, India.). *J. Clin. Nutr.* 20, 462–74 (1967). Serum lipid levels in 28 pairs of age-matched railwaymen from two geographically different population groups with disparate consumption of fats and large differences in mortality rates from IHD showed no significant differences in total and ester cholesterol, free and esterified fatty acids, and total serum triglycerides, although the consumption of fats from animal origin was 10 times more in one group than in the other.

IN VIVO FATTY ACID SYNTHESIS IN ADIPOSE TISSUE AND LIVER OF MEAL-FED RATS. G. A. Leveille (Dept. of Animal Sci., Univ. of Ill., Urbana). *Proc. Soc. Exp. Biol. Med.* 125, 85–8 (1967). The results of these studies show that lipogenesis is enhanced in liver and adipose tissue of intact rats as a consequence of meal-feeding. Fatty acid synthesis was approximately 200-fold higher in adipose tissue and 9-fold higher in liver of meal-fed as compared to nibbling rats. Increases in fatty acid radioactivity in adipose tissue, liver and serum were observed between 6 and 9 hours after the initiation of the meal. A possible explanation for these changes is proposed. Serum glucose and serum liver total lipid and cholesterol levels were also determined and no significant alterations due to meal-feeding were noted. From the observed rates of glucose-U-^{14}C incorporation into liver and adipose tissue fatty acids an estimate was made of the relative importance of these tissues as sites of fatty acid synthesis. These calculations suggest that in the nibbling rat 50–90% of the fatty acids are synthesized in adipose tissue whereas when fatty acid synthesis is stimulated by meal-feeding, adipose tissue apparently accounts for about 95% of the total fatty acids synthesized.

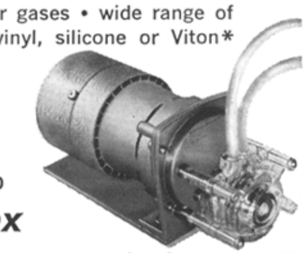
EFFECT OF ω3 FATTY ACIDS ON THE GROWTH RATE OF RAINBOW TROUT, SALMO GAIRDNERII. D. J. Lee, J. N. Roehm, T. C. Yu and R. O. Sinnhuber (Dept. of Food Science and Tech., Oregon State Univ., Corvallis, Oregon). *J. Nutr.* 92, 93–8 (1967). The growth response of fingerling rainbow trout to additions of unsaturated fatty acids with the $\omega 3$ structural configuration was determined by substituting into a 10% corn oil control diet either 5% salmon oil, 1% salmon oil, 10% soybean oil, or 1% linolenic acid (in a linolenic acid concentrate). The respective average weight gains of fish fed the above diets for 12 weeks were 4.2, 13.9, 7.9, 9.2 and 8.4 g. Mortalities dropped from 25% in the controls to 6% or less in the other 4 groups. Determination of the fatty acid composition of phospholipids from fish fed the test diets showed that fish given the corn oil control diet had much lower levels of $22{:}6\omega 3$ (one-half or less) and higher levels of $20{:}4\omega 6$ and $22{:}5\omega 6$ than the fish fed the supplemented diets. The neutral lipid fraction did not show any marked differences between experimental groups but did reflect the high levels of linoleic acid present in all the diets.

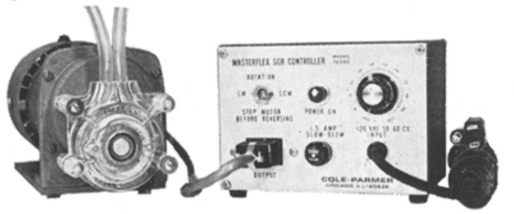
INFLUENCE OF FATTY ACIDS ON LEVELS OF SERUM CHOLESTEROL. F. A. Kummerow (The Burnsides Res. Lab., Univ. of Ill., Urbana). *J. Dairy Sci.* 50, 787–94 (1967). Dietary fats represent the most compact food energy source available to man. However, dietary fats should not be thought of solely as providers of unwanted calories, as fats are as vital to cell structure and biological function as protein. Tissue fat can be synthesized either from carbohydrate or from protein; therefore, the total caloric intake rather than any one dietary component is crucial to the amount of deposition of lipids into the tissue. An optimum intake of essential fatty acids may be important to the integrity of the cell wall of erythrocytes. However, until the entire picture of the role of dietary fats in optimum nutrition is clarified, it would seem judicious to consume a well-balanced diet of meat, milk, eggs, vegetables, fruits, and sufficient cereals and bread to provide for an adequate protein, vitamin, and caloric intake. The optimum total intake of linoleic acid in the American dietary pattern could be increased through availability of less severely hydrogenated shortenings, but the indiscriminate dietary substitution of soft for hard fats or the elimination of eggs from the diet seems undesirable.

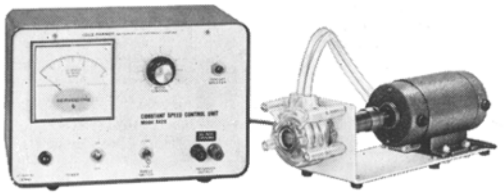
ATHEROSCLEROSIS AND CHOLESTEROL. D. Kritchevsky (The Wistar Inst. of Anatomy and Biology and School of Veterinary Med., Univ. of Pa., Philadelphia). *J. Dairy Sci.* 50, 776–80 (1967). The field of atherosclerosis research is still developing. Reports that specific cholesterol-free diets are atherogenic for rabbits suggest that dietary cholesterol may not be the sole culprit. Elevation of β-lipoproteins which occur in the rabbits fed cholesterol-free diets suggest that factors affecting lipoprotein synthesis in the liver must be carefully assessed. Olson has suggested that atherosclerosis may be a hepatic disorder. Further research in the areas of lipoprotein biochemistry (synthesis, turnover, and metabolism) and of aortic metabolism should yield important clues towards solution of this perplexing problem.

EXPERIMENTAL PRODUCTION OF PULMONARY HYPERTENSION AND PULMONARY ATHEROSCLEROSIS IN THE RABBIT. Kazunobu Komuro and D. Y. Rosenzweig (Dept. of Med. and Allen-Bradley Med. Science Lab., Marquette Univ. School of Med., Milwaukee County Hosp., Milwaukee, Wis. 53226). *Circulation Res.* 20, 545–51 (1967). The experimental production of pulmonary atherosclerosis was studied in 39 rabbits. Variables examined included age, pulmonary hypertension after pneumonectomy, and high-fat diet. Right ventricular pressures were measured and then stress-strain elasticity measurements and histologic examination were made of the pulmonary arteries. High-fat diet alone produced neither right ventricular hypertension nor pulmonary atherosclerosis. Right ventricular hypertension occurred after pneumonectomy alone, but there were no anatomic changes unless the rabbits had eaten a high-fat diet. Pneumonectomy plus a high-fat diet was followed by persistent hypertension with right ventricular systolic pressures more than twice control values and by progressive pulmonary atherosclerosis consisting of discrete atheromata in the larger vessels and intimal fibrosis in the smaller arteries.

QUANTITATIVE ESTIMATION OF DIETS TO CONTROL SERUM CHOLESTEROL. E. S. Fetcher, Nedra Foster, J. T. Anderson, F. Grande and A. Keys (Lab. of Physiolog. Hygiene, Univ. of Minnesota, Minneapolis, Minn. 55455). *J. Clin. Nutr.* 20, 475–90 (1967). The serum cholesterol responses of men to alterations of the fatty acid and cholesterol composition of their diets have been described by previously published, empirical equations derived from data on groups of middle-aged men, under metabolic ward conditions. A nomograph is here presented, constructed from these equations, to facilitate the estimation of serum cholesterol changes to be expected from specific fatty acid and dietary cholesterol changes. The nomograph can also be used to estimate dietary lipid changes







required to effect a predetermined serum cholesterol change. A listing of foods is given, with lipid compositions in additive units, such that daily intakes can be readily computed and either applied directly ot the nomograph or derived from it. This material is communicated as an interim tool for the approximate prediction of dietary and serum cholesterol changes, and for evaluation and eventual improvement of predictive accuracy.

EFFECT OF ETHANOL INFUSION ON MILK FAT CONTENT AND COMPOSITION AND ON VOLATILE FATTY ACIDS IN THE RUMEN LIQUOR. E. R. Orskov and R. W. Hemken (Dept. of Dairy Sci., Univ. of Md., College Park) and L. A. Moore. *J. Dairy Sci.* **50**, 692–95 (1967). Three lactating dairy cows received a complete pelleted ration of 20% alfalfa hay and 80% concentrate, a diet which resulted in depressed milk fat percentages. Infusion of ethanol into the rumen (approximately 875 g/day) resulted in increases in the milk fat per cent, increased proportion of acetic, isovaleric, and valeric acids, and appearance of caproic acid up to approximately 7 molar %. The proportion of propionic acid was depressed. Blood ethanol increased from traces to 5 meq/liter. Concentration of ethanol in the rumen decreased with length of infusion period, suggesting an adaptation effect.

A PROBABLE DIRECT ROLE OF ETHANOL IN THE PATHOGENSIS OF FAT INFILTRATION IN THE RAT. R. M. Dajani and C. Kouyoumijian (School of Pharmacy, American Univ. of Beirut, Lebanon). *J. Nutr.* **91**, 535–9 (1967). Recently, a fat release mechanism was proposed that could explain, at least partially, fat infiltration resulting from carbon tetrachloride poisoning. Hence a study was made to determine whether such a mechanism also operates subsequent to alcohol intoxication. Normal and chronically ethanol-treated rats were used after maintaining them with an adequate purified diet for 40 weeks. The ethanol-treated rats were given 20% alcohol as the sole drinking fluid. Either water or a 1:1 ethanol solution (95% ethanol: water, v/v) was given to the animals of both groups with a stomach tube and a fat-clearing blocking agent (Superinone) was injected intravenously 2 hours after intubation. Ninety minutes later blood plasma and livers were analyzed for triglyceride content. The results indicate that ethanol during both acute and chronic intoxication probably produces a direct toxic effect on the liver which could interfere with the release of hepatic triglycerides into the blood. Moreover, the transport of peripheral triglycerides to the liver does not appear to be a major factor in alcoholic fatty infiltration.

STUDY OF THE MOVEMENT IN VIVO AND IN VITRO OF LABELLED CHOLESTEROL ACROSS THE AORTA OF THE NORMAL RAT. R. Charman and S. R. Lipsky (Dept. of Internal Med., Yale Univ. School of Med., New Haven, Conn.). *J. Atheroscler. Res.* **7**, 143–50 (1967). A radioautographic technique is described for studying cholesterol transport across a blood vessel wall in a system *in vivo* and *in vitro*. A study of the distribution of the tritium-labelled sterol within the intima of the rat aorta demonstrated a concentration of radioactive granules in the intimal cells. The radioactivity within the media in studies both *in vivo* and *in vitro* appeared to be concentrated in and adjacent to the smooth muscle cells. These findings are indicative of the important role which these cells play in the transport of cholesterol in the rat arterial wall.

EFFECT OF ETHANOL ON PLASMA GLYCEROL IN MAN. L. Feinman, and C. S. Lieber (Liver Disease and Nutrition Unit, Cornell Univ. Med. College, New York City). *J. Clin. Nutr.* **20**, 400–3 (1967). To assess peripheral lipid mobilization, one of the mechanisms implicated in the pathogenesis of the alcoholic fatty liver, the effect of ethanol on plasma glycerol and free fatty acids (FFA) was investigated in five alcoholic volunteers. The subjects were healthy, well-nourished men who had abstained from alcohol for over 3 weeks. A 15% ethanol solution (in a noncaloric beverage) was fed at rest, after an overnight fast, at a rate of 1 g/kg per hr for 60 min, followed by two 30-min periods of 0.5 and 0.1 g/kg per hr, respectively. Sequential arterial blood samples during the first 30 min of ethanol administration revealed an abrupt simultaneous fall in plasma FFA (averaging 46% of base-line value; $P < 0.02$) and glycerol (averaging 36% of base-line values; $P < 0.05$). Plasma glucose levels remained unchanged. Since hepatic glycerol uptake has been reported to be depressed by ethanol and since renal excretion is small even with high blood glycerol levels, the lowering of plasma glycerol observed in the present study indicates an absolute decrease in adipose tissue glycerol release and thus supports the finding of a reduction in peripheral lipid mobilization after ethanol.

FATE OF SELENIUM FROM SELENITE OR SELENO-METHIONINE, WITH OR WITHOUT VITAMIN E, IN LAMBS. C. F. Ehlig, D. E. Hogue, W. H. Allaway and D. J. Hamm (U.S. Plant, Soil and Nutr. Lab., Agr. Res. Service, U.S. Dept. Agr.). *J. Nutr.* **92**, 121–6 (1967). Se-methionine and Na_2SeO_3, with or without vitamin E, were compared as sources of Se for lambs. Lambs, supplemented orally with 0.40 mg Se/400 g feed (1 ppm) daily for 10 days, excreted in feces about 35 to 50% of the ^{75}Se supplied either as Se-methionine or Na_2SeO_3. Lambs on the Na_2SeO_3 treatments excreted 29 to 34% of their daily dose in urine, whereas lambs on the Se-methionine treatments excreted only about 23% of their daily dose in the urine. After 6 days of differential treatment, blood levels of Se were slightly higher on the Se-methionine treatments than on the Na_2SeO_3 treatments. Thirteen days after initiation of differential treatments, tissues from lambs on the Se-methionine treatments contained significantly more Se than tissues from lambs on the Na_2SeO_3 treatments. In both treatments, the Se in the kidney and liver was incorporated primarily into protein. Absorption and retention of Se was not significantly affected by oral dose of 110 IU of vitamin E.

OBSERVATION ON FEEDING TUNG OIL TO LAYING HENS WITH A NOTE ON IDENTIFICATION OF ELAEOSTEARIC BY GLC. H. M. Edwards, Jr., F. A. Suso and J. Mason (Poultry Dept., Univ. of Ga., Athens, Georgia 30601). *Poultry Sci.* **46**, 564–8 (1967). Two experiments with Single Comb White Leghorn laying hens showed that the inclusion of crude tung oil in the ration caused an abrupt drop in egg production and in egg size as compared to the controls. As the level of tung oil in the diet was increased from 2 to 4 to 8%, the egg production and egg size were more severely influenced. The highest level of tung oil caused a sharp drop in body weight of hens. The majority of the hens that received crude tung oil in the ration went into a molt, as evidenced by loss of coloration and reduction in size of comb and wattles and a loss of feathers. At the termination of the experiment an autopsy revealed that the birds receiving the tung oil had excessive amounts of a straw colored fluid in the pericardial sac, thoracic cavity and abdominal cavity. Hatchability of fertile eggs and survival and growth of progeny from the hens were not influenced by feeding tung oil. It was demonstrated that the use of both polar and nonpolar liquid phases for GLC analysis along with hydrogenation strengthens evidence for identification of elaeostearic acid in fats such as tung oil.

LIPID COMPOSITION OF CHICK EMBRYO AND YOLK AS AFFECTED BY STAGE OF INCUBATION AND MATERNAL DIET. W. E. Donoldson (Poultry Sci. Dept., North Carolina State Univ., Raleigh, N. C. 27607). *Poultry Sci.* **46**, 693–7 (1967). Eggs from Single Comb White Leghorn hens fed either a fat-free or an oleic acid supplemented diet were incubated for 0, 12 or 20 days. Yolk and embryo lipids were extracted, and the following analyses were performed: 1) lipid distribution by thin-layer chromatography, and 2) fatty acid distribution of phospholipid and triglyceride by gas-liquid chromatography. Yolk lipid composition was stable during the first 21 days of development. By 20 days, the phospholipid and triglyceride levels of yolk were lower while the levels of the remaining lipids were higher. Twelve-day embryos contained high levels of phospholipid and low levels of triglyceride. At 20 days, this result was reversed. The oleic acid diet produced yolk and embryo fatty acid distributions that were more unsaturated than the controls, except that at 20 days, the fatty acid composition of embryo phospholipid was identical for both diets. Irrespective of diet, embryo triglycerides contained higher levels of saturated fatty acids than did yolk triglycerides initially or after 12 and 20 days of incubation.

BIOCHEMICAL STUDIES IN PHRYNODERMA (FOLLOWING HYPERKERATOSIS). II. POLYSATURATED FATTY ACID LEVELS IN PLASMA AND ERYTHROCYTES OF PATIENTS SUFFERING FROM PHRYNODERMA. K. S. Bhat and B. Belavady (Nutr. Res. Lab., Indian Council of Med. Res., Tarnaka, Hyderabad-7, India). *J. Clin. Nutr.* **20**, 386–91 (1967). Polyunsaturated fatty acid (PUFA) levels in plasma and erythrocytes of patients with phrynoderma and control children of the same age group were determined. Plasma of patients had significantly higher ($P = 0.01$) levels of trienoic acid and the ratio of trienoic to tetraenoic acids (a parameter of EFA nutritional status) in plasma was also significantly higher ($P = 0.02$) than that found in normal children. Successful treatment of the condition either with safflower oil or with vitamins of B-complex group resulted in a decrease of plasma trienoic acid and in the ratio of trienoic to tetraenoic acids. Treatment with vitamins of the B-complex group brought about a decrease in the plasma dienoic and tetraenoic fatty acids also. Treatment of phrynoderma brought about changes in PUFA levels in the erythrocytes similar to plasma PUFA. Administration of safflower oil or B-complex vitamins reduced the trienoic acid considerably. However, the decrease was not statistically significant. These studies would indicate that phyrnoderma is a manifestation of essential fatty acid deficiency and vitamins of the B-complex group play a significant role in the etiology and treatment of the condition. The relationship between metabolism of EFA and vitamins of the B-complex group is not clear at present and needs further investigation.

VITAMIN A, VITAMIN E, AND LIPIDS IN SERUM OF CHILDREN WITH CYSTIC FIBROSIS OR CONGENITAL HEART DEFECTS COMPARED WITH NORMAL CHILDREN. Mildred J. Bennett and Barbara F. Medwadowski (Bruce Lyon Mem. Res. Lab., Children's Hospital Med. Center, Oakland, Calif.). *J. Clin. Nutr.* 20, 415–21 (1967). The serum levels of vitamin A, vitamin E and cholesterol and the fatty acid distribution in the serum total fatty acids of children with cystic fibrosis (CD) or congenital heart defects (CHD) were compared with those of normal children. Fatty acid composition of dietary fat was calculated from 7-day diet records. Although the linoleate level in sera of CF and CHD patients was about two-thirds the normal value, the levels of arachidonic and 8,11,14-eicosatrienoic acids, metabolic products of linoleic acid, were similar in all groups. The serum values for vitamin A and vitamin E in CF patients were about one-half the values for the normal but in CHD patients the values were similar to the normal. Thus, the low linoleate values in CHD did not appear to be related to serum vitamin E levels. Nor did the differences in serum fatty acid patterns appear to be directly related to diet, since the diet patterns of the CHD subjects were like that of the normal while the CF children consumed fat which had a higher ratio of linoleate-to-saturated fat.

PHOSPHOENOLPYRUVATE CARBOXYKINASE AND THE SYNTHESIS OF GLYCERIDE-GLYCEROL FROM PYRUVATE IN ADIPOSE TISSUE. F. J. Ballard, R. W. Hanson (Fels Res. Inst., Dept. of Biochem., Temple Univ., Philadelphia, Penna. 19140), and G. A. Leveille. *J. Biol. Chem.* **242**, 2746–50 (1967). In the absence of glucose, significant amounts of labeled pyruvate were converted to glyceride-glycerol by rat epididymal fat pads *in vitro*. Using specifically labeled pyruvate-^{14}C twice as much C-2 was incorporated into glyceride-glycerol as C-1. Although this ratio is not affected by changes in dietary conditions, the amount of pyruvate incorporated into glyceride-glycerol is decreased 3-fold in fasted rats as compared to fasted-refed animals. The addition of glucose to the incubation medium depressed the appearance of label in glycerol and stimulated the formation of fatty acids from pyruvate. Under all dietary conditions, over 90% of pyruvate C-1 and 43 to 49% of pyruvate C-2 incorporated into glycerol were in the α carbon atoms. These results indicate the occurrence of the dicarboxylic acid shuttle in adipose tissue.

LIPID METABOLISM IN CULTURED CELLS. VII. LINOLEIC ACID CONTENT OF CELLS GROWN ON LIPID-FREE SYNTHETIC MEDIUM. J. M. Bailey and J. Menter (Dept. of Biochem., George Washington Univ., Washington, D.C.). *Proc. Soc. Exp. Biol. Med.* **125**, 101–5 (1967). The fatty acid composition of L-strain mouse fibroblasts growing both in serum and in lipid-free synthetic medium was measured. Linoleic acid comprised about 17% of the total fatty acids in cells grown on serum-supplemented medium and about 6% in cells grown for prolonged periods in lipid-free chemically defined medium. In contrast to other fatty acids however linoleic acid was not synthesized from ^{14}C-acetate added to the growth medium. The most probable explanation of these anomalous findings is that cells under deficiency conditions can conserve traces of linoleic acid which are present below detectable levels in the culture environment. No synthesis of positional isomers of linoleic acid similar to that which may occur in linoleic acid deficiency *in vivo* was observed.

A LONG CHAIN TERPENYL PYROPHOSPHATE SYNTHETASE FROM MICROCOCCUS LYSODEIKTICUS. C. M. Allen, W. Alworth, A. Macrae and K. Bloch (Conant Lab., Harvard Univ., Cambridge, Mass.). *J. Biol. Chem.* **242**, 1895–1902 (1967). A new terpene pyrophosphate synthetase (Enzyme II) distinct from the previously reported geranylgeranyl pyrophosphate synthetase (Enzyme I) has been isolated from extracts of *Micrococcus lysodeikticus* and partially purified. Enzyme II catalyzes the elongation of terpenoid allyl pyrophosphates by isopentenyl pyrophosphate to long chain products.

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• *New Products*

PHARMACIA FINE CHEMICALS AB, Uppsala, Sweden, is marketing spherical agarose gel particles, with the trade name Sepharose. Sepharose is used for gel filtration of viruses, and high molecular weight macromolecules such as proteins, polysaccharides and nucleic acids which are totally excluded from Sephadex G-200. Thus is a valuable complement to the available series of Sephadex types.

PALL CORPORATION, Glen Cove, Long Island, N. Y., has introduced a new series of ultrafine filtration media for purifying liquids and gases. Typical applications include use in the purification of distilled, deionized or turbid water, beer, sugar syrups an solvents, as well as for hydraulic fluids, jet fuels, parenterals and heat affected fluids. Expanding the firm's line of Ultipor filter media, the materials have ratings of 0.1 to 175 microns nominal and 0.35 to 3.0 microns absolute.

GENERAL ANILINE & FILM CORPORATION, New York, has developed Antarox BL-25, a new low coat, low foaming biodegradable surfactant, based on a linear primary alcohol. The new surfactant shows properties which could make it particularly useful for hard surface cleaning and as a wetting agent for textile processing.

LACHAT CHEMICALS, INC., Chicago Heights, Ill., can now supply the following in 2 kilo or more quantity: caproic anhydryde, diolein (1,3-glycerol dioleate), ethyl lignocerate (ethyl tetracosanoate), ethyl linoleate, 2-hendecanol (2-undecyl alcohol), lauronitrile (n-undecyl cyanide), methyl oleate, Microside L (benzalkonium chloride quaternary compounds), monomethyl azelate, 11-tricosene. Catalog available upon request.

Detergents Short Course Brings 170 to Pocono Inn

Representatives of all major soap and detergent companies were on hand for the AOCS 1967 Detergent Short Course, "Advances in Soaps and Detergents," held at the Pocono Manor Inn, Pennsylvania, June 25–28. More than 170 participants were registered, many of them accompanied by their wives.

A bonus value for the Society is the fact that over 30 of the men attending who had not previously held membership status in the AOCS, joined the American Oil Chemists' Society following this excellent symposium.

Special interest was engendered in the sessions dealing with the effect of detergents on the many new fabrics now being developed; varying views were given on the status of antibacterial soaps; the latest developments in soap processing technology were considered.

A unit publication, including all of the papers delivered at the Symposium will be published in the very near future, in the JAOCS technical section.

As in the 1963 Symposium, Eric Jungermann, of Armour & Co., served as Chairman. J. F. Gerecht, Colgate-Palmolive Co., and L. J. Garrison, Jefferson Chemical Co., were again among the committee members, serving to make this meeting as successful as its predecessors.

Opening session at the Detergent Short Course, Pocono Manor Inn, Pennsylvania.

Evening session speakers, left to right: Paul Becher, Atlas Chemical Co.; R. C. Davis, Whirlpool Corp.; Henri Rosano, The City University of New York; and Leo Weaver, Monsanto Chemical Co.

Short Course Program Committee, left to right: I. R. Schmolka, Wyandotte Chemical Corp.; Eric Jungermann, Armour Grocery Products Corp.; J. F. Gerecht, Colgate-Palmolive Co.; Arno Cahn, Lever Bros. Co.; L. J. Garrison, Jefferson Chemical Co.

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• Drying Oils and Paints

(Continued from page 447A)

CONVERSION OF METAL CATALYSTS INTO INHIBITORS OF AUTOXIDATION. A. T. Betts and N. Uri. *Makromol. Chem.* **95**, 22–39 (1966). (in English). It is demonstrated that certain Co compounds which are autoxidation catalysts at low concentrations become inhibitors at higher concentrations. In all these cases inhibition implies a lengthening of the induction period, but only in a few systems (*N*-alkylamide + cobaltous acetate) is the inhibitory effect observable beyond the induction period. In the case of hydrocarbons and Co(II) salicylaldimines the rate of oxygen uptake beyond the substantially increased induction period is not reduced even at the highest catalyst concentrations. A reaction mechanism and a kinetic scheme, consistent with the novel experimental observations, are proposed. (Rev. Current Lit. Paint Allied Ind. No. 297).

EMULSIFICATION OF LINSEED OIL. I. EFFECT OF OIL VISCOSITY, TEMPERATURE, TIME OF AGITATION AND AGE OF EMULSIFICATION ON PARTICLE SIZE DISTRIBUTION. L. H. Princen, J. A. Stolp and W. F. Kwolek (NRRL, USDA, Peoria, Ill.). *Paint Technol.* 39, No. 507, 182–187 (1967). Linseed oils varying in viscosity from 80 to 28,000 cp were emulsified between 40C and 60C under identical mechanical conditions. A Coulter Counter was used to study the particle size distribution of these emulsions during a 40 week period. Highly viscous oils decrease in mean particle size as agitation time increases while oils with a viscosity below 1600 cp reach equilibrium particle size distribution within the first 10 minutes of shear. Shearing force, oil viscosity and the emulsifying system are used to explain this behavior. Special attention is given to the amount of water evaporated during the emulsification process and its effect upon the interpretation of Coulter Counter data.

STORAGE STABLE ISOCYANATE-MODIFIED DRYING OIL AND DRYING OIL-ALKYD COMPOSITIONS AND PROCESS FOR PREPARATION THEREOF. J. A. Seiner (Pittsburgh Plate Glass Co.). *U.S. 3,318,828.* A method of producing an ungelled, storage-stable, isocyanate-modified oil composition essentially free of residual isocyanate groups comprises reacting a drying, semi-drying or non-drying vegetable or marine oil or fatty acid with a polyol and an organic isocyanate to produce a urethane oil, and after at least 95% of the organic isocyanate has reacted, mixing in water in an amount sufficient to react with essentially all of the free isocyanate groups in the urethane oil.

FRACTIONATION OF ALKYD RESINS BY GEL PERMEATION CHROMATOGRAPHY. D. G. Lesnini. *J. Paint Tech.*, 1966, 38, No. 500, 498–507 (1966).—Four alkyds of different oil length were fractionated on the basis of molecular size by gel permeation chromatography. The fractions were characterised by number average mol. wt. Integral and differential mol. wt. distributions are presented and related to theory. (Rev. Current Lit. Paint Allied Ind. No. 299).

STABILIZATION OF OIL-MODIFIED URETHANE COATING VEHICLES MADE WITH METHYL GLUCOSIDE. H. M. Kennedy (Corn Products Co.). *U.S. 3,321,419.* A process is claimed for preparing an oil-modified urethane coating composition stabilized against viscosity increase which comprises reacting a drying oil triglyceride with methyl glucoside, and reacting the resultant product with toluene diisocyanate in the presence of a dibutyltin dilaurate catalyst at a temperature of 90–130C.

• Detergents

LOW FOAMING DETERGENTS. I. R. Schmolka and M. H. Earing (Wyandotte Chemicals Corp.). *U.S. 3,314,891.* A composition adapted to be formulated with automatic dishwashing products for reducing foam during their use in the presence of proteinaceous matter, comprises 50.0 to 99.9% by wt. of a nonionic surfactant selected from the group consisting of polyoxyethylene condensates of alkyl phenols with 6–20 C atoms in the alkyl portion, polyoxyethylene esters of higher fatty acids having 8–22 C atoms in the acyl group, polyoxyethylene condensates of higher fatty amines or fatty amides with 8–22 C atoms in the fatty group, and alkylene oxide adducts of higher aliphatic alcohols and thioalcohols having 8–22 C atoms in the fatty portion; and about 0.1 to 50.0% by wt. of an alkyl phosphate ester component such as stearyl acid phosphate or oleyl acid phosphate.

DETERGENT ALKYLATE AND THE SULFONATE DERIVATIVE. G. C. Feighner and B. L. Kapur (Continental Oil Co.). *U.S. 3,316,294.* A detergent alkylate is claimed, which is obtained by the aluminum chloride catalyzed alkylation of benzene or a lower alkyl substituted benzene. The chlorination product used in this alkylation reaction is prepared by partially chlorinating a petroleum derived hydrocarbon fraction consisting essentially of C_{10} and C_{18} straight chain paraffins, of which 10 to 35 mole percent are chlorinated, this fraction being further characterized as containing a predominant amount of component paraffins with 11 to 15 C atoms.

Process for making alkylene oxide polyol adducts. A. D. Winquist, Jr. and L. F. Theiling, Jr. (Union Carbide Corp.). *U.S. 3,317,508.* A process for forming an alkylene oxide adduct of a polyhydroxylated organic compound comprises intermixing the alkylene oxide with the polyhydroxylated organic compound in the presence of a ditertiary diamine catalyst.

Biodegradable surface active agents. L. G. Nunn, Jr. and L. M. Schenck (General Aniline & Film Corp.). *U.S. 3,317,612.* A biodegradable surface active agent is produced by condensing 1 to 150 moles of ethylene oxide with 1 mole of a complex liquid mixture obtained by the alkylation of 1 mole of phenol with 2–4 moles of butene-2 in the presence of 0.6–1.9 parts by wt. of BF_3 at a temperature of 50–100C for a period of time of 7–24 hrs. The complex liquid mixture produced contains 15 55% of a mixture of 2,4-di-secondary butyl phenol, 2,4,6-tri-secondary butyl phenol, 2-octylphenol and 4-octyl phenol; 40–85% of a mixture of 2-secondary butyl-4-octylphenol and 4-secondary butyl-2-octyl phenol and 0-5% of a mixture consisting substantially of 2-dodecylphenol and 4-dodecylphenol.

Detergent composition in solid form containing a synergistic mixture of CMC and PVP. J. R. Trowbridge (Colgate-Palmolive Co.). *U.S. 3,318,816.* A detergent composition in solid form consists essentially of a water-soluble alkyl benzene sulfonate detergent having from 8 to 15 C atoms in its alkyl group and, as soil-suspending agent, a mixture of sodium carboxymethylcellulose and polyvinylpyrrolidone having an average molecular weight of 15,000 to 40,000. The ratio of detergent to the mixture of soil-suspending agents is from 1:1 to about 200:1 by wt. and the ratio of carboxymethylcellulose to the pyrrolidone polymer is in the range of 60:40 to 10:90 by wt. Such detergent composition exhibits synergistic and enhanced soil-suspending properties as compared to the use of an equivalent proportion of either soil-suspending agent alone.

Process for preparing detergent tablets. G. C. Smith (Procter & Gamble Co.). *U.S. 3,318,817.* A process for preparing a strong, abrasion resistant, quick-dissolving detergent tablet comprises the steps of: (A) Preparing the tablet from: (1) 5–50% by wt. of a water-soluble detergent capable of being formed into particles prior to forming the tablet, with a particle size between 14 and 100 mesh and a moisture content of less than about 10% by wt., the detergent being selected from a wide group of anionic, non-ionic or zwitterionic detergent compounds; (2) 0–94% by wt. of a detergency builder such as EDTA, tripolyphosphates, pyrophosphates, orthophosphates or phytates and having a particle size distribution between about 35 and 200 mesh; (3) 0–94% by wt. of an inert inorganic salt such as sodium sulfate or chloride, having a particle size distribution between about 35 and 200 mesh; (4) 0–94% by wt. of a tablet disintegrating agent such as a mixture of alkali carbonates and an acidifying agent such as citric acid or acid pyrophosphate, or starch or lactose; the ingredients being formed into a tablet at a pressure of about 20 to 600 psi; (B) Spraying about 1–5% by wt. of a molten, substantially non-hygroscopic, normally waxy fatty amide with a melting point of 100–300F, onto the surface of the tablet in such a way that at least a portion of the amide becomes interparticulately fused to more than one adjacent particle, and thereafter (C) Cooling the detergent tablet below the melting point of the amide.

Process for the production of quaternary ammonium compounds. M. D. Curtin, Jr. (Procter & Gamble Co). *U.S. 3,318,954.* A process for preparing quaternary compounds comprises reacting an agent having the formula $RO[—CH_2—CH(CH_2X)O—]_YH$, wherein R is either an even-numbered alkyl from C_8 to C_{20} or a phenyl, benzyl or alkyl phenyl group, Y is an integer between 1 and 2 and X is a chloride, bromide, iodide or methyl sulfate anion, with a tertiary amine having the formula $NR_1R_2R_3$ with R_2 and R_3 being methyl or ethyl groups and R_1 being a C_2 to C_{20} alkyl group. The catalyst for this reaction is a 19:1 to 2:1 mixture of sodium bicarbonate and sodium hydroxide, the reaction taking place at 100 to 315F, a sufficiently high temperature to provide an essentially homogeneous reaction mixture. The reaction requires from 0.5 to 5 minutes and produces quaternary ammonium compounds in good yield and having good color.

Condensation products of halogen substituted alkylene oxides with polyhydric alcohols in presence of an aluminum alcoholate. M. H. Earing (Wyandotte Chemicals Co.). *U.S. 3,318,960.* A process for the production of halogen-containing hydroxy ethers comprises reacting together at a temperature of 25–300C (1) a polyhydric alcohol initiating compound having a maximum of 8 hydroxy groups and (2) a halogen-containing alkylene oxide in the presence of (3) a reaction catalyst such as an aluminum alcoholate of the same alcohol as the alcohol initiating compound (1), the catalyst (3) being present in an amount such that its aluminum content is at least 1% of the weight of the alcohol initiating compound.

Kinetic investigations into the biodegradation of modern surfactants through trickle filter organisms. L. Hartmann, P. Wilderer and W. Staub (Tech. Hochschule, Karlsruhe, Germany). *Tenside* **4**, 138-43 (1967). Kinetic investigations into the biodegradation of a number of detergents showed that these are substances of poor nutritive quality compared with other organic compounds. The effect of bacterial adaptation to detergents has been examined by means of enzyme-kinetic constants and an explanation for their change is attempted. The experiments show that bacteria, when adapted to detergents, can only partially oxidize the surface active agents.

Perfuming synthetic detergents. V. DiGiacomo (Givaudan Corp.). *Soap Chem. Specialties* **43**(1), 79–82, 119 (1967). The technical and economic problems facing the perfumer in the selection of perfumes for use in synthetic detergents are reviewed.

Results of radiochemical researches into the degreasing effect of surface active agents. H. Uhlich, K. Schumann and W. Nowak (Univ. of Dresden, Dresden, Germany). *Tenside* **4**, 133–8 (1967). A method for determining the degreasing action of surfactants is described, which makes use of radioactive isotopes. This enables the amount of residual fat found on various materials after treatment with wash liquor to be determined in an absolute as well as a relative manner. The degreasing effect is governed by the nature and surface structure of the material being cleaned.

HAND CREAMS AND LOTIONS. M. L. Schlossman (Chas. Pfizer & Co.). *Drug Cosmetic Ind.* **100**, 40–1, 168–70 (1967). Several formulations are given for cosmetic hand creams and lotions.

BIODEGRADABLE DETERGENT FORMULATIONS. I. Mellan. *Soap Chem. Specialties* **43**(5), 61–3, 148 (1967). Several heavy duty detergent formulations are given, containing commercially available biodegradable surfactants.

DETERGENT INTERMEDIATES ANALYSIS. W. Carasik, M. Mausner and G. Spiegelman (Witco Chem. Co.). *Soap Chem. Specialties* **43**(5), 106–12, 277 (1967). An analytical method based on a non-aqueous (acetone) titration has been demonstrated which distinguishes between organic (sulfonic) and sulfuric acids present in detergent products. The method represents an extension of published methods to a broader range of detergent raw materials. The procedure is suggested as a faster means of determining individual acid contents in sulfonic acids and sulfate esters.

EVALUATION OF LIGHT DUTY LIQUID DETERGENTS. C. M. Hemminger (Pilot Chem. Co.). *Soap Chem. Specialties* **43**(5), 58–60, 134 (1967). The performance evaluation results of dishwashing formulas containing 46% solids and variable combinations of LAS, coconut diethanolamide and linear ammonium nonionic sulfate are reported. All formulas contained 6% sodium xylene sulfonate. Special consideration is given to formulation economics.

OPTICAL BRIGHTENERS AND THEIR EVALUATION, I AND II. P. S. Stenby (Geigy Chem. Co.). *Soap Chem. Specialties* **43**(4), 41–44, 98–104; *Ibid.* 43(5), 84 92, 130–4 (1967). An updated summary of factors relating to the correct selection of efficient brightener systems for laundering products is presented. This review deals with the chemistry and performance properties of brighteners currently in use, the effect of brightener purity and physical form on performance and optical properties, the interaction between fibers and brightener in the wash liquor, and visual and instrumental whiteness evaluation.

EXPERIMENTS ON THE ASSESSMENT OF SPECIFIC WASHING POWER OF SURFACTANTS. H. Sonntag and K. Strenge (German Acad. Sci., Berlin, Germany). *Tenside* **4**, 129–33 (1967). The specific washing effect, expressed by the so-called soil suspending power, was determined for a number of different surfactants, using polymers which had been artifically soiled with polar and non-polar oils. The tests showed that this process can be regarded as an example of hetero-coagulation. The decisive step for the absence of soiling is the formation of a mechanically stable, almost saturated adsorption layer of surfactants, both at the oil/surfactant solution as well as at the polymer/surfactant solution phase boundary. The specific effect of surfactants is that the concentration at which saturation occurs varies considerably at the different phase boundaries and can even not appear at all, as in the case of polyethylene.

BIODEGRADABILITY OF NONIONIC DETERGENTS. E. Lashen, G. F. Tribbi, K. A. Booman and J. Dupre (Rohm and Haas Co.). *Soap Chem. Specialties* **43**(1), 55–8, 122–7 (1967). Acclimation of river microflora to octyl phenol ethoxylate (OPE_{10}) occurs naturally. Samples taken from rivers below industrial-urban areas show rapid and extensive degradation of OPE_{10}, while slower rates of degradation were observed in samples taken below areas where usage of these nonionics is estimated to be low. Laboratory studies confirm that acclimation of the river microflora to a surfactant (i.e. rapid degradation) depends on the presence of that surfactant. Increasingly greater rates of degradation are found upon repeated addition of surfactant. These experiments demonstrate the potential for acclimation in rivers currently receiving only small amounts of nonionic surfactants.

ALKYLBENZYLDIMETHYL AMMONIUM CHLORIDES, II. R. A. Cutler, T. J. Okolovich, E. B. Cimijotti and W. F. Wetterau (Sterling Drug Inc.). *Soap Chem. Specialties* **43**(4), 74–80, 92 6 (1967). The complete series of normal alkylbenzyldimethylammonium chloride monohydrates, wherein the normal alkyl group was varied from octyl to nonadecyl, was prepared, each in highly purified form, and subjected to a variety of comparative evaluations. In only two instances did the odd chain homologues differ from what would have been predicted on the basis of the behavior of their even chain counterparts, namely: (a) higher solubility for the odd members in 95% alcohol and (b) slightly greater acute oral toxicity in mice for the majority of the odd chain homologues. Of the twelve quaternaries examined, the most consistently active member of the series, in a variety of microbiological tests, was tetradecylbenzyldimethylammonium chloride. The remaining homologues, on an overall activity basis, are ranked as follows in order of decreasing activity: n = 15, 13, 16, 12, 17, 11, 18, 19, 9, 8.

ROLE OF DISHWASHER DETERGENTS IN FILMING OF GLASSWARE. R. E. Madden (Whirlpool Corp.). *Soap Chem. Specialties* **43**(4), 45–9 (1967). Filming on glassware is one criterion which, in addition to ability to remove food residues from dishes, is of importance in evaluating the performance of a detergent to be used in a home-type mechanical dishwasher. A gravimetric method for studying film formation on glassware is described and data are given for three different types of glassware filming encountered in home dishwashers. The most common type of filming is caused by inadequate quantities of phosphate in relation to water hardness. This film, primarily calcium phosphate or tripolyphosphate, is removable if more detergent is used. A less common type of filming occurs when hard water is used without any detergent or when washing soda is used as a detergent. This film is primarily calcium carbonate and can be removed with citric acid. A permanent type of filming can be demonstrated even in soft water when low alkali silicates are used. This film is apparently silica that is precipitated by the phosphates in the formulation, acting as acids towards the silicates.

GLYCEROL ESTERS IN COSMETIC EMULSIONS. J. Atherton and W. J. Maxcey (Armour Ind. Chem. Co.). *Drug Cosmetic Ind.* **100**, 50–4, 162–5 (1967). The effect of fatty acid chain length on the consistency and stability of a typical cosmetic lotion was studied. Results indicate that, if hydrophilic-lipophilic balance (HLB) is disregarded, the highest consistency is obtained with glycerol monomyristate. If the lotion is formulated to a constant HLB, the viscosity increases in direct proportion to the chain length of the fatty acid in the monoglyceride. When glycerol esters of mixed fatty acids are used, the consistency is lowest at a eutectic point of the mixed fatty acids involved. The stability of these emulsions is definitely related to the HLB of the emulsifier system independently of the chain length of the glycerol monoesters.

THE EFFECT OF WATER SOLUBLE SURFACTANTS, EXTERNAL ELECTRICAL FIELDS AND TEMPERATURE ON THE COALESCENCE STABILITY OF WATER/OIL EMULSIONS. H. Sonntag and H. Klare, Jr. (German Acad. Sci., Berlin, Germany). *Tenside* **4**, 104 8 (1967). The stability of water/oil emulsions is frequently due to the formation of extremely thin equilibrium films, so-called black films. The effect of adding electrolytes and water soluble surfactants, of applying external fields and of raising the temperature on the stability of these films was examined on a model droplet. It was found that larger amounts of electrolytes cause dehydration of the surface active adsorption layers and promote deemulsification through water soluble surfactants. External electric fields lead to unstable emulsions if the voltage is raised to the point where an electric discharge can take place. Increasing the temperature was found to cause an increase in the rate of flocculation and, because of the desorption of the surfactants, also an increase in the rate of coalescence. The stability of black films already formed is, however, not affected by temperature fluctuations.

APPARATUS FOR SMALL SCALE SULFATION WITH SO_3, I AND II. R. C. Hurlbert, R. F. Knott and H. A. Cheney (Shell Devel. Co.). *Soap Chem. Specialties* **43**(5), 122–8, 248; *Ibid.* **43**(6), 88–94, 100 (1967). A small scale, continuous apparatus is described, suitable for sulfating linear primary alcohols or their ethoxylates or to sulfonate linear alkylbenzenes with SO_3. The apparatus comprises a gas agitated reactor, a vapor/liquid separator, a continuous neutralizer and associated feed systems. It can produce 1.1 lbs/hr of detergent (100% active) from an alcohol feed of 207 mol. wt. The apparatus has been used to study sulfation and sulfonation reactions. Process variables affecting the properties of the finished detergent included N_2/SO_3 mole ratio, SO_3/feed mole ratio and reactor temperature. Variables important in reactor geometry were reactor length and post-reactor residence time.

NITROCELLULOSE LACQUERS ADMIXED WITH COPOLYMERS OF ETHYLENE AND UNSATURATED ESTERS OF FATTY ACIDS. J. G. Unger (Hercules Inc.). *U.S. 3,321,420.* A lacquer is described,

(Continued on page 470A)

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(Continued on page 473A)

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(Continued from page 452A)

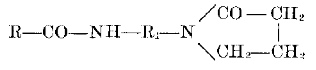
comprising an organic solvent solution of nitrocellulose and a copolymer of ethylene and an ethylenically unsaturated ester of a fatty acid, the copolymer being present in the amount of 20–80%, based on the combined weight of nitrocellulose and copolymer.

SURFACE ACTIVE AGENTS FROM ORGANOMETALLIC COMPOUNDS. J. T. Patton, Jr. and M. H. Earing (Wyandotte Chem. Corp.). *U.S. 3,321,533.* A process for the production of a cogeneric mixture of nonionic surfactants comprises the steps of (1) oxidizing at 50–200C a compound having the formula $Al = (R)(R')(R')$ where R is an alkyl group with 4–30 C atoms and R′ is chlorine, bromine, a hydrocarbon radical or an alkoxy radical with 4–30 C atoms, (2) adding an alkali metal hydroxide in an amount of about 0.1–10% by wt., (3) condensing a lower alkylene oxide with 2–4 C atoms with the product of step (2) at 0–200C, and (4) hydrolizing the product of step (3) by addition of an acid. The hydrophobic hydrocarbon portion of the compound obtained in step (4) constitutes at least about 10% by wt. of the final product.

SODIUM TRIPOLYPHOSPHATE PRODUCT. R. Pals (FMC Corp.). *U.S. 3,322,493.* A process is claimed for producing granular sodium tripolyphosphate containing at least about 17% by wt. Form I crystals, consisting in heating a mixture of monosodium orthophosphate and disodium orthophosphate to a temperature above 350C, then cooling the hot granular sodium tripolyphosphate in an atmosphere containing water vapor with a partial pressure of at least about 40 mm Hg. Exposure to the moist atmosphere should take place while the material is being cooled from about 170C to about 70C.

LAUNDRY PACKAGE. J. Friedman (Montreal, Canada). *U.S. 3,322,674.* A washing product containing a chlorine bleach is contained in a bag having multilayer walls. One of these layers (0.001–0.003 inches thick) is formed of a water soluble film forming material normally reactive with chlorine, and a second layer, in contact with the washing product, comprises a water dispersible film nonreactive with chlorine. Both layers can disperse and dissolve in water between room temperature and 212F to release for use a predetermined amount of washing compound.

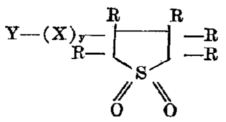
COOL WATER DETERGENT COMPOSITION CONTAINING ACYLAMIDOALKYL PYRROLIDONES. F. L. Diehl (Procter & Gamble Co.). *U.S. 3,322,675.* A detergent composition is claimed, having superior cleaning ability in aqueous solutions at 40–100F, consisting essentially of a detergent compound of the following formula:



where R is an aliphatic radical with 9–13 C atoms and R_1 is an alkylene radical with 2–4 C atoms. This detergent compound is formulated with sodium tripolyphosphate, at detergent to builder ratios from 4:1 to 1:20, to form a built detergent product.

SHAMPOOS. A. Hiestand (Ciba Ltd.). *U.S. 3,322,676.* A hair shampoo preparation is claimed, consisting essentially of: (1) the cationic compound of the formula: $[C_{18}H_{33}—N(CH_3)_2—C_2H_4OH]$ Cl, (2) a non-ionic ethylene oxide adduct of a saturated branched chain alcohol with 6–11 C atoms, containing 5–15 mols of EtO, (3) water, and (4) a cosmetically acceptable acid (e.g. acetic, phosphoric, citric, etc.), in an amount sufficient to give a pH of 3.0 to 7.0. The weight ratio of component (1) to component (2) ranges from 1:1 to 1:100.

NONIONIC SURFACTANTS. H. E. Fritz, H. T. Zika and E. C. Steinle, Jr. (Union Carbide Corp.). *U.S. 3,322,790.* A nonionic surface active compound has the formula:



where Y is an alkyl phenoxy radical having a 4–22 C atoms in the alkyl group, X is a hydrophilic alkyleneoxy chain having C_1–C_4 alkylene groups and an atomic ratio of carbon to oxygen from 1.5:1 to 2.1:1, R is either hydrogen or a C_1–C_4 alkyl radical, and y may vary from 1 to 6.

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