

• Fats and Oils

A STUDY OF THE PERFORMANCE OF PACKED GAS CHROMATOGRAPHY COLUMNS. S. D. Nogare and J. Chiu (Plastics Dept., DuPont, Wilmington, Del.). *Anal. Chem.* **34**, 890-96 (1962). The van Deemter-Jones plate height equation was used to evaluate the performance of small packed columns. Three well defined limiting efficiencies at optimum carrier gas velocity can be derived for specific values of the partition ratio, k . The plate height is shown to be proportional to the support particle diameter. The existence of the postulated gas phase mass transfer and velocity distribution terms is established, and an estimate of the gas phase correlation term and gas diffusion distance in terms of particle diameter is made. The relation between β (the ratio of free gas space to liquid phase volume in the packing) and resolution is derived. A criterion is established for β consistent with best resolution and efficiency.

QUALITATIVE GAS CHROMATOGRAPHIC ANALYSIS BY MEANS OF RETENTION VOLUME CONSTANTS. C. Merritt Jr. and J.A. Walsh (Pioneering Res. Div., Quartermaster Res. and Eng. Center, U. S. Army, Natick, Mass.). *Anal. Chem.* **34**, 903-7 (1962). A method for the functional group classification and subsequent qualitative identification of chromatographic peaks from retention volume data alone is described. The method employs two columns having different liquid phases. When appropriate liquid phases are employed, the ratio of isothermal retention volumes, or the difference between programmed temperature retention volumes, of compounds within an homologous series is constant. Different constants are found for various homologous series. From criteria established from this behavior, the functionality of a given compound can be determined. The method can be applied to chromatograms obtained either isothermally or with programmed temperature and with either packed or capillary columns. In this study, criteria are established for the identification of members of homologous series of normal alkanes, alkyl benzenes, alcohols, aldehydes, ketones, ethers, esters, thioalkanes, and thiols.

SIMULTANEOUS DUAL COLUMN GAS CHROMATOGRAPHY. *Ibid.*, 908-11. A gas chromatography apparatus which employs two columns having different liquid phases and which displays simultaneously the chromatograms obtained from each column on separate channels of a dual channel recorder is described.

A MERCURY DERIVATIVE-CHROMATOGRAPHIC METHOD FOR THE SEPARATION OF UNSATURATED FATTY ACID ESTERS. D. F. Kuemmel (Procter & Gamble, Miami Valley Labs., Cincinnati, Ohio). *Anal. Chem.* **34**, 1003-07 (1962). A quantitative chromatographic method has been developed for separating fatty acid esters according to their degree of unsaturation. When this separation is used in conjunction with the well known infrared measurement of *trans* unsaturation, the composition of fats and oils in terms of various geometrical isomers can be determined. The method involves formation of the mercuric acetate addition compounds of unsaturated methyl esters, followed by a chromatographic separation on an alumina column into three fractions containing the saturated, monounsaturated, and polyunsaturated components, respectively. The composition of the sample is reported in terms of saturated, *cis* monoenoic, *trans* monoenoic, and *cis,cis* and *cis,trans* polyenoic acids. The method is primarily intended for partially hydrogenated oils such as soybean, cottonseed, corn, and peanut containing 10 to 35% saturated acids, 15 to 65% monoenoic acids, and 10 to 60% dienoic acids.

CAPILLARY PROGRAMMED TEMPERATURE GAS CHROMATOGRAPHY; SOME THEORETICAL ASPECTS. H. W. Habgood (Res. Council of Alberta, Edmonton, Alberta, Can.) and W. E. Harris. *Anal. Chem.* **34**, 882-85 (1962). Previously developed relationships for the retention characteristics and intrinsic resolution in programmed temperature gas chromatography are considered for the special case of capillary columns. Capillary columns have a free volume or dead space per gram of stationary phase about two orders of magnitude greater than that for packed columns. This restricts much of the effectiveness of temperature programming to very low values of the ratio, r/F (heating rate to flow rate per gram of solvent). Even with low r/F the large dead space tends to be detrimental, and with higher values it causes the intrinsic resolution to fall off rapidly. However, capillary columns permit very much larger flow rates per gram of solvent so that programs with lower r/F values than for packed columns are readily attainable.

Two hypothetical compounds previously examined were chosen for purposes of illustration. It is shown how a significant decrease in analysis time without loss in resolution can be expected with temperature programming of a capillary column.

FAILURE OF THE EDDY DIFFUSION CONCEPT OF GAS CHROMATOGRAPHY. J. C. Giddings and R. A. Robison (Dept. of Chem., Univ. of Utah, Salt Lake City). *Anal. Chem.* **34**, 885-90 (1962). A critical examination of the status of eddy diffusion in gas chromatography is made in terms of past experimental results and some new experimental work. Previous experimental anomalies, such as negative eddy diffusivities, are examined in the light of both old and new theoretical concepts, and possible explanations are given for the departure from the expected pattern. A summary of this work strongly indicates the failing of the classical eddy diffusion concept. This is confirmed by further experimental results using an inert glass bead column in which the plate height is sometimes less than the particle diameter. An alternative to the classical concept, the coupling theory of eddy diffusion, is in satisfactory agreement with past and present results.

EXTRACTION OF LIPIDS FROM OXIDIZING MULLET. Marelynn W. Zipser, Jacqueline Dupont, and Betty M. Watts (Dept. of Food & Nutrition, Florida State Univ., Tallahassee, Florida). *J. Food Sci.* **27**(2), 135-139 (1962). Total lipids, lipid phosphorus, and total polyenes extracted from mullet tissues with chloroform-methanol show a progressive decrease in oxidizing mullet tissue. Thiobarbituric acid values from extracts of oxidized tissues are only 30-50% of the values obtained from unextracted tissue. It is believed that much of the TBA-reactive material becomes concentrated in the interfacial fluff during extracting.

STUDY OF DETERIORATION OF MARGARINE. II. BAKERY MARGARINE. K. Nakazawa, I. Niiya, and K. Furukawa (Japan Margarine & Shortening Makers Assoc.). *J. Oil Chem. Soc. Japan* **11**(4), 195-198 (1962). Preparing 5 (almost 1/2 lb) samples, for each of eight kinds of bakery margarine from the market, observation was made on appearance, moisture, peroxide value, acid value, and color of the surface and the inside, every month for five months. Moisture measurement shows what is hard and fragile in structure has a high rate of moisture reduction, and what is soft has a low rate. But inside observation shows only a minor change during the whole period, showing a little change with the hard one. All the samples show an increase in peroxide value which is in proportion to linoleic acid content in general, because they contain no milk ingredient. There is a little difference between the surface to the inside. Oxidation is found to take place at the inside almost at the same level as is on the surface. Most samples show very small increase in acid value since they have no hydrolyzing element such as mold and coconut oil. The difference between the surface and the inside is small. All the samples discolor on the surface. The surface color becomes slightly darker in the first month and after the first month sharp discoloration occurs, and the difference in color value between the surface and the inside grows increasingly wider. Compared with household margarine which almost did not discolor, the average value of the difference for bakery margarine after 5 months is 7.0 against 0.9 for household margarine, when expressed as the difference value between the surface and the inside.

UTILIZATION OF RICE BRAN OIL. VII. COMPARISON OF OIL PRODUCING BY EXPRESSION AND SOLVENT EXTRACTION. Y. Takeshita and M. Shoji (Tokyo Oils & Fats Co., Ltd., Edogawa Fac.). *J. Oil Chem. Soc. Japan* **11**(3), 101-104 (1962). The authors discussed the mechanism of oil separation from the tissue of rice bran by comparing oils obtained by expression and by solvent extraction. Assuming that the main components of rice bran oil are free fatty acids, glycerides, and wax esters, the wax esters are separated first and the free fatty acids follow in the expression method while the reverse occurs in the solvent extraction. However, data show that the differences and elevation in the acid value of crude oil by both methods are small.

VIII. THE UPPER LIMIT OF NATURAL HYDROLYSIS OF RICE BRAN OIL AND THE INFLUENCE OF HYDROLYSIS IN RICE BRAN CELL TO EXTRACTION OF OIL BY SOLVENT. Y. Takeshita. *Ibid.*, 105-109. The upper limit of acid value of rice bran oil, after naturally

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stored as rice bran and as the oil for 1 to 2 years, has been discussed statistically. The average properties of rice bran samples were 12.6% moisture and 18.9% oil. From the results obtained, it is presumed that fatty acids are solvent-extracted more readily than the glycerides and esters.

IX. THE REFINING OF CRUDE RICE BRAN OIL. Y. Takeshita and Y. Kai. *Ibid.*, 165-168. For the separation of moisture and impurities, the centrifuge process was superior to the heating and settling process. For optimum conditions of the centrifuge process, temperature was 80-90C, rotation 1,400 rpm with 71 cm diameter at 1 ton per hr capacity, whereby moisture and impurities were reduced from 5% to 1%. The darkening of bleached, highly acidic rice bran oil was found not only to be attributable to the color of the metallic soap, but also to the pigment activated by metallic ions. A tin, aluminum, or zinc storage vessel was suitable for storage of the bleached oil. Storage in a tin plated iron vessel for five months hardly affected oil color. Storage in an iron drum darkened the oil by a factor of 5.

X. HYDROGENATION OF RICE BRAN OIL. Y. Takeshita and I. Oba. *Ibid.*, 168-174. The presence of 1.0% trichloroethylene in rice bran oil has a beneficial effect on bleaching and aids in regulating hydrogenating velocity in high pressure hydrogenation. In high pressure hydrogenation, up to 2.0% water content does not affect results. The soapstock could not be hydrogenated using 1.0% nickel oxide catalyst. But, if recovered and refined, it could be hydrogenated in the presence of un-reduced 1.0% Cu-Ni catalyst.

PURIFICATION OF OILS AND FATS BY ION-EXCHANGE RESIN. VII. CONCENTRATION OF ORYZANOL IN RICE BRAN OIL. H. Inoue and T. Noguchi (Industrial Res. Inst., Hokkaido). *J. Oil Chem. Soc. Japan* 11(3), 109-112 (1962). In as much as the oryzanol can be efficiently recovered from rice bran oil, two processes using an anion exchange resin were investigated. In the first process, oryzanol and free fatty acid adsorbed by resin were simultaneously desorbed with the mixture of benzene, methanol, and hydrochloric acid (or acetic acid, boric acid, etc.) solution from which oryzanol was recovered with good result. In the second, oryzanol was separately adsorbed by resin esterifying the free fatty acid and then oryzanol was desorbed and recovered with the same mixed solution. Both processes were recommended as practical.

VIII. SELECTIVE EXTRACTION OF ADSORBED COMPONENTS BY METHANOL-ACID SYSTEM. *Ibid.*, 113-118. When rice bran oil dissolved in some organic solvents is passed through a bed consisting of strongly basic anion exchange resin, most of the free fatty acids and oryzanol contained in the oil can be adsorbed by the resin. In order to obtain a selective extraction method of both components, a MeOH-H₃BO₃ system and a MeOH-HCl system were tested. Satisfactory results were obtained with the former system in which most of the oryzanol was desorbed but almost all of the fatty acids were not.

IX. DECOLORIZATION OF RICE BRAN OIL. *Ibid.*, 162-165. The decolorization of the rice bran oil dissolved in organic solvents by means of the ion exchange resins was investigated. This method was not effective for decolorization of crude rice bran oil, but it was very effective for the rice bran oil which had been treated with H₃PO₄ and H₂SO₄. In decolorization of the rice bran oil after treating with acids, the anion exchange resin (Amberlite IRA-401 OH form) was more effective than the cation exchange resin (Amerlite IR-120 H form). Using both the anion and cation exchange resins in series was very effective for the decolorization of the rice bran oil, when the anion exchange resin was used prior to the cation exchange resin.

STUDY ON THE REACTION OF HIGHER FATTY ACID ESTERS WITH METALLIC SODIUM. XII. GAS CHROMATOGRAPHY OF HIGHER FATTY ALCOHOLS. M. Fukushima (Nihongi Plant, Nippon Soda Co., Ltd.). *J. Oil Chem. Soc. Japan* 11(3), 128-133 (1962). Chromatographic separation of acetic acid esters of higher fatty alcohols was studied for purpose of application of gas chromatography to analysis. When diethylene glycol succinate on high silica diatomaceous earth was used as the partitioning agent, the peak area ratio of each acetate coincided approximately with weight ratio. The operating conditions were discussed and the analytical method of unsaturated fatty alcohols prepared by sodium reduction is proposed.

STUDIES ON THE IMPROVEMENT OF SOYBEAN LECITHIN. III. ON THE PRODUCTION OF POWDERED SOYBEAN LECITHIN. K. Yoshitomi, T. Arai, and T. Tokunaga (Nisshin Oil Mills, Ltd., Res. Laboratory). *J. Oil Chem. Soc. Japan* 11(3), 123-127 (1962).

To analyze the miscella stripping process of solvent extraction of soybeans, the specific interfacial tensions of hexane miscella to water and their boiling points in various concentration were investigated. It was found necessary to concentrate hexane miscella at the beginning of stripping to prevent emulsification. It was possible to separate hydrated soybean lecithin of high purity by adding water into the stripper at the end of stripping process and also by charging water into the settling tank prior to the finished oil. Conditions were investigated to break down lecithin miscella and to bleach it by using hydrogen peroxide as a bleaching agent and ammonium hydroxide as an assistant. A powdered soybean lecithin of 92-96% purity could be prepared without using any solvent.

STUDIES ON THE ISOMERIZATION OF UNSATURATED FATTY ACIDS. VII. A DIMER OF METHYL LINOLEATE. Y. Nagano and T. Taniaka (Dept. of Applied Chem., Faculty of Engineering, Kyushu Univ.). *J. Oil Chem. Soc. Japan* 11(3), 119-123 (1962). The authors thermally polymerized four different isomers of methyl linolate in inert gas atmosphere. From an investigation of polymers thus prepared, it was confirmed that isomerization of double bond resulted in the formation of conjugated *trans-trans* and nonconjugated *trans* isomers and then these two isomers underwent Diels-Alder's type addition.

STUDY ON DETERIORATION OF MARGARINE. I. HOUSEHOLD MARGARINE. K. Nakazawa, I. Niya, and M. Imuro (Japan Margarine & Shortening Markers Assoc., Japan). *J. Oil Chem. Soc. Japan* 10(12), 761-767 (1961). Twenty samples of ¼ lb, 10 wrapped and 10 unwrapped, of 10 different brands of margarine (8 domestic and 2 American products) were obtained. These samples were observed once a month for five months in order to find out how the products changed in moisture loss, rancidity, hydrolysis, and appearance under different conditions. With the lapse of time, the central part did not show any change, but the surface showed a drastic change in moisture. Aluminum foil was much better than parchment paper in retention of moisture. There was no difference between parchment paper and unwrapped samples. Wrapping had no effect on halting the increase of peroxide value. Rancidity of margarine is an inner problem. Increase in the acid value is influenced by mold, but when there is no mold, there is little difference in the acid value increase between wrapped and unwrapped samples. The inner part was darker than the surface, and it fades slightly with the lapse of time. However, when the surface became darker, the color increased with the lapse of time, and in this case the surface sometimes became darker than the inner part. The heavy coloration of surface was believed to be caused by oxidation of color.

POLYUNSATURATED FATTY ACIDS. VI. THE STRUCTURE OF THE CONJUGATED POLYENES PRODUCED BY THERMAL ISOMERIZATION. T. Miyakawa and H. Nomizu (Osaka Industrial Research Inst., Japan). *J. Oil Chem. Soc. Japan* 10(12), 724-727 (1961). Highly unsaturated fatty acid esters of more than four non-conjugated double bonds changed their structure to the conjugated form when heated. The compounds produced by heating at 200C without solvent were linear and had the *cis-cis-trans* conjugated triene form showing absorption maxima at 266, 277, and 287.5 m μ , whereas those prepared by treating at 215C consisted both of the linear and of the ring compounds, in nearly the same proportion. In both cases, the conjugated triene compounds were all monomeric and dimeric triene was never found. When heated at 250C without solvent, the conjugated diene produced had the absorption maximum at 236 m μ and consisted mainly of the dimeric compounds having the cyclohexane ring structure.

STUDIES ON THE PREPARATION OF CACAO BUTTER-LIKE FAT. IV. PREPARATION FROM PALM OIL AND ITS QUALITIES. T. Tateishi, M. Fujiwara, and K. Murase (Fuji Oil Refining Co., Japan). *J. Oil Chem. Soc. Japan* 10(12), 717-720 (1961). The yield of cacao butter-like fat from palm oil was 15%, which was obtained by two fractional crystallizations using methyl ethyl ketone as the solvent. For the purpose of increasing the yield, the fractional crystallization of hydrogenated palm oil was investigated. After testing selective and nonselective conditions of hydrogenation, cacao butter-like fat of good quality was obtained from the palm oil hydrogenated under selective conditions and twice crystallized from methyl ethyl ketone. The yield was 20 per cent. The cacao butter-like fat thus obtained showed no melting point lowering when mixed with cacao butter, and the melting point, softening point, and solid content index were satisfactory.

ASCORBIC ACID OXIDATION AND LIPID PEROXIDATION IN MILK. G. J. Smith and W. L. Dunkley (Dept. of Food Sci. and
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Technol., Univ. of Calif., Davis, Calif.). *J. Food Sci.* 27(2), 127-135 (1962). Ascorbic acid oxidation was studied in relation to the natural copper level and to lipid peroxidation in milk produced by cows receiving alfalfa hay or pasture. The correlation between lipid peroxidation (TBA Test) and ascorbic acid oxidation rate was very highly significant in alfalfa milk but nonsignificant in pasture milk. Results obtained do not support the theories of the role of the ascorbic acid radical, or of hydrogen peroxide, in the initiation of oxidized flavor.

A RAPID METHOD FOR THE EXTRACTION OF LIPIDS FROM WHEAT PRODUCTS. C. C. Tsen, I. Levi, and I. Hlynka (Grain Res. Lab., Board of Grain Commissioners for Canada, Winnipeg 2, Canada). *Cereal Chem.* 39(3), 195-203 (1962). This is a modified method of that proposed by Folch et al. [*J. Biol. Chem.* 226, 497 (1957)] using a ternary mixture of chloroform, methanol, and water. It has proven useful in isolating lipids with minimum changes. It yields results comparable with those obtained by ethanol or water-saturated *n*-butyl alcohol and by acid hydrolysis extractions, but gives higher lipid values than petroleum ether extractions.

REMOVAL OF INTERFERING PIGMENTS IN DETERMINING MALONALDEHYDE BY THE 2-THIOBARBITURIC ACID REACTION. T. C. Yu and R. O. Sinnhuber (Dept. of Food and Dairy Technol., Oregon State Univ., Corvallis, Oregon). *Food Technol.* 16(6), 115-117 (1962). The procedure described permits the separation of yellow interfering pigments from the red TBA pigment by two alternative methods. The yellow pigments (absorption maxima at 450-460 $m\mu$) give erroneously high values at 532-535 $m\mu$, the absorption maximum for the TBA-malonaldehyde pigment.

AUTOXIDATION OF METHYL LINOLEATE. ISOLATION AND CHARACTERIZATION OF HYDROPEROXIDES. E. N. Frankel, C. D. Evans, D. G. McConnell, E. Selke, and H. J. Dutton (Northern Regional Res. Lab., Peoria, Ill.). *J. Org. Chem.* 26, 4663-4669 (1961). Relatively pure hydroperoxides were isolated from methyl linoleate that was autoxidized at 37°C. The hydroperoxides were monomeric, had three double bonds, and had a conjugated diene system with mostly *cis,trans* and some *trans,trans* configuration. Reduction of the hydroperoxides gave conjugated diene hydroxylinolenate. Catalytic hydrogenation of the hydroperoxides gave a mixture of 9,12,13,16-hydroxystearates. The location of the hydroxyl group was determined by boric acid dehydration of the hydroxy stearates and oxidative splitting of the resulting monoenoic stearates. It was concluded that the hydroperoxides consisted of a mixture of 9,12,13,16-hydroperoxyoctadecatrienoates with double bonds at the 10,12,15; 9,13,15; 9,11,15; and 9,12,14 positions, respectively.

THE ROLE OF LIPIDS IN OXIDATION OF DOUGHS. C. C. Tsen and I. Hlynka (Grain Res. Lab., Board of Grain Commissioners for Canada, Winnipeg, Canada). *Cereal Chem.* 39(3), 209-219 (1962). Results obtained with the thiobarbituric acid method on lipids extracted from flour provide direct evidence that peroxides are formed in dough during mixing in air or oxygen. Doughs mixed in air or oxygen gave a higher TBA value than those mixed in nitrogen. Addition of peroxides, hydroperoxides, and lipoxidases also increased the rate of peroxidation of flour lipids while the addition of antioxidants inhibited the peroxidation essentially to the level of the doughs mixed in nitrogen. Also sulfhydryl-blocking reagents and improving agents (iodate and bromate) caused peroxidation to increase. On a basis of all results, a unified hypothesis for the role of lipids in oxidation of doughs is presented.

THE SIMULTANEOUS DETERMINATION OF GLYCEROL AND FATTY ACIDS IN GLYCERIDES BY GAS-LIQUID CHROMATOGRAPHY. L. A. Horrocks and D. G. Cornwell (Dept. Physiol. Chem., The Ohio State Univ., Columbus, Ohio). *J. Lipid Research* 3, 165-169 (1962). The conversion of glycerol esters to derivatives suitable for gas-liquid chromatography was accomplished by hydrogenolysis with lithium aluminum hydride followed by direct acetylation of lithium aluminum alcoholates with acetic anhydride. Fatty acids and glycerol were converted quantitatively to their corresponding acetate esters by this procedure. Gas-liquid and thin-layer chromatographic procedures were used to demonstrate quantitative acetylation. Acetate esters of fatty alcohols and glycerol were recovered together and analyzed by gas-liquid chromatography to give a simultaneous estimation of fatty acid composition and the ester-glycerol ratio. Quantitative results were obtained for mono-, di-, and triglycerides.

THE DISTRIBUTION OF FATTY ACIDS IN NATURAL GLYCERIDES OF VEGETABLE ORIGIN. F. D. Gunstone (The University, St. An-

draws, Fife). *Chem. & Ind. (London)* 1962, 1214-23. Of a number of theories of acyl group distribution which have been proposed, the one which best provides a correlation of most of the available experimental results states that the secondary hydroxyl group of glycerol is preferably acylated by unsaturated C_{18} acids such as oleic, linoleic, and linolenic. The two primary hydroxyl groups are subsequently acylated by the acids that remain. Thus, disaturated-monounsaturated glycerides should be mainly of the symmetrical type (SUS) and monosaturated-diunsaturated glycerides should be mainly of the unsymmetrical type (SUU).

SEPARATION OF HIGHER FATTY ACID ISOMERS AND VINYLOGUES BY THIN-LAYER CHROMATOGRAPHY. L. J. Morris (Brunel College). *Chem. & Ind. (London)* 1962, 1238-40. Described is a method for the resolution, by thin-layer chromatography on silicic acid impregnated with silver nitrate or boric acid, of *cis* and *trans* isomers of mono-ethenoid fatty acids, of vinylogues of non-oxygenated and of oxygenated fatty acids, and of *threo* and *erythro* isomers of vicinal dihydroxy fatty acids.

STABILIZED CAROTENE COMPOSITIONS. B. Borenstein (Nopco Chemical Co.). *U. S. 3,039,877*. A process for preparing yellow popped corn consists of heating popcorn at temperatures of 400-500°F in the presence of at least one popping oil, carotene, and at least one carotene stabilizer such as butylated hydroxy anisole, *n*-propyl gallate, nordihydroguaiaretic acid or butylated hydroxy toluene. The carotene is present in amounts of from 0.007 to 0.02% based on the weight of the popping oil, and the stabilizer is present in amounts of 0.005 to 0.03%.

REMOVAL OF GOSSYPOL FROM COTTONSEED PRODUCTS. T. R. Seshadri and K. Chander (Council of Sci. and Ind. Res., New Delhi). *U. S. 3,043,856*. Cottonseed oil is mixed with an aqueous solution of borax or borax and sodium hydroxide at a concentration of 0.5 to 1.5 parts by weight per 100 parts of cottonseed oil to convert the gossypol to water-soluble borate complexes. The mixture is then stirred at a temperature between 20 and 75°C and washed with water between 20 and 98°C to remove the borate complexes from the oil.

• Fatty Acid Derivatives

Thalictrum polycarpum FATTY ACIDS—A NEW CLASS OF FATTY ACIDS FROM VEGETABLE SEED OILS. M. O. Bagby, C. R. Smith, Jr., K. L. Mikolajczak, and I. A. Wolff (Northern Reg. Res. Lab., Peoria, Ill.). *Biochemistry* 1, 632-39 (1962). The principal fatty acid of *Thalictrum polycarpum* seed oil is the previously unknown *trans*-5,*cis*-9,*cis*-12-octadecatrienoic acid (35%). The oil also contains *cis*-9-octadecenoic (oleic) acid; *trans*-5-octadecenoic acid, not previously demonstrated in plant material; and two major components which were not characterized, a C_{18} -dienoic acid (18%) and an unknown C_{18} - acid (8%).

THE DETECTION OF POLYOXYETHYLENE GLYCOL IN BAKERY PRODUCTS. P. A. Veitch and J. B. Jones (Food & Drug Lab., Dept. of National Health & Welfare, Winnipeg, Canada). *Cereal Chem.* 39(3), 220-225 (1962). Polyoxyethylene monostearate (POEMS) was separated from bread by chloroform extraction of acid-treated bread crumbs. The chloroform was passed through an alumina column which retained the POEMS, lipids, and other related substances. The polyoxyethylene glycol portion was eluted with ethanol and determined semiquantitatively by paper chromatography.

CULINARY MIXES. W. T. Bedenk (Procter & Gamble Co.). *U. S. 3,037,864*. A dry prepared wax contains sugar, farinaceous material, and shortening, the shortening containing from 1.5 to 20%, by weight of shortening, of at least one ester combining a monomeric polyhydric alcohol and saturated fatty acid having more than 20 carbon atoms. The fatty acid should have an iodine value not greater than 10, and the ester should have at least one free hydroxyl group per molecule of polyhydric alcohol. The shortening should not contain more than 50% fatty material which is solid at room temperature.

MIXTURES OF ALKALI METAL SALTS OF FATTY ACIDS HAVING IMPROVED SOLUBILITY IN LIQUID HYDROCARBONS. C. A. Sandy and J. H. Wernitz (E. I. du Pont de Nemours & Co.). *U. S. 3,041,154*. The described mixture consists of a liquid hydrocarbon having dissolved in it from 0.01 to 20.0 grams of an alkali metal such as sodium, potassium, or lithium per liter in the form of the alkali metal salts of aliphatic branched open chain carboxylic acids.

LINOLEATE-DERIVED CYCLIC MONOMER FRACTION. C. R. Scholfield, J. C. Cowan, and J. P. Friedrich (U.S.A., Sec'y of Agr.).

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U. S. 3,041,360. The described method consists of (1) heating linseed oil or methyl linolenate with an excess of KOH in an ethylene glycol medium for at least 7 hours at a temperature of 200–250°C; (2) acidifying the reaction mixture to produce a mixture of fatty acids; (3) esterifying the mixture with diazomethane or a lower alcohol; (4) reacting the esterified mixture with urea to produce an insoluble adduct; and (5) distilling the non-urea-adduct-forming residue at a temperature of 154–161°C to recover an unsaturated non-urea-adduct-forming monomer.

SHORTENING EMULSIFIER AND METHOD FOR PREPARING THE SAME. D. P. Kidger (Swift & Co.). *U. S. 3,042,530.* A shortening agent consists of a major amount of a glyceride material having shortening properties and a small amount, sufficient to improve creaming properties, of the mixture produced by the reaction between an aliphatic hydroxy polycarboxylic acid, an aliphatic dihydric alcohol and monoglycerides.

GREASES THICKENED WITH LITHIUM SOAPS AND CALCIUM SOAPS OF FATTY ACIDS CONTAINING 12–14 CARBON ATOMS. L. U. Franklin and J. C. Gebhart (Gulf Oil Corp.). *U. S. 3,042,615.* A lubricating composition consists of a mineral lubricating oil thickened to the consistency of a grease with about 1.7 to 17% by weight of a lithium soap of a fatty acid having from 16 to 22 carbon atoms and about 0.3 to 8% of a calcium soap of a saturated fatty acid having from 12 to 14 carbon atoms.

MIXTURES OF ESTERS OF SULFOsuccinic ACID. W. S. Fair and K. D. Ballou (Am. Cyanamid Co.). *U. S. 3,043,706.* The described mixture consists of (1) a bis-ester of sulfosuccinic acid with a bi-molecular quantity of a member selected from the group consisting of higher fatty acid glycerides, higher fatty acid glycols, higher fatty acid alcohols, and mixtures of these, the fatty radicals having from 12 to 20 carbon atoms and (2) a mixed di-ester of sulfosuccinic acid with a mono-molecular quantity of saturated aliphatic alcohols having from 4 to 10 carbon atoms and a mono-molecular quantity of higher fatty acid glycerides, glycols, alcohols, or mixtures, the fatty radicals containing 12 to 20 carbons. Fractions (1) and (2) are present in a molecular ratio of 1:3 to 3:1, respectively.

• Biology and Nutrition

UNSATURATED FATTY ACIDS IN MICROORGANISMS. G. Scheuerbrant and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge, Mass.). *J. Biol. Chem.* 237, 2064–67 (1962). The unsaturated fatty acids isolated from the total lipids of various microorganisms have been analyzed by oxidative degradation and gas-liquid chromatography. Δ^{11} -Octadecenoic and palmitoleic acids are the major unsaturated acids in all the eubacteria examined. Some of these organisms contain in addition Δ^7 -C₁₆, Δ^{11} -C₁₈, Δ^9 -C₁₈ acids and the previously unknown Δ^7 -tetradecenoic acid. The lipids of *Mycobacterium phlei* have been shown to contain *cis*- Δ^{30} -hexadecenoic acid in addition to smaller amounts of palmitoleic acid. The Δ^{30} acid is formed by desaturation of palmitic acid. Palmitoleic acid is not a precursor of the Δ^{30} isomer. The correlation between the double bond structure of microbial fatty acids and the type of synthetic mechanism employed by the organism is discussed.

EFFECT OF DIETARY BILE ACIDS ON PLASMA CHOLESTEROL OF THE RAT. E. E. Howe and C. F. Hutchison (Merec Inst. for Therapeutic Research, Rahway, N. J.). *J. Nutrition* 77, 237–40 (1962). It has previously been shown in the mouse that dietary lithocholic, hydoxycholic and chenodeoxycholic acids counteract the hypercholesteremic effect of exogenous cholic acid. In contrast, in the rat it has now been observed that lithocholic acid has little or no anticholic acid effect and that chenodeoxycholic acid augments rather than counteracts the effect of dietary cholic acid. As in the mouse, hydoxycholic acid neutralizes the plasma cholesterol-elevating effect of cholic acid and in neither species is this effect eliminated by dietary antibacterial agents. It has been reported that orally administered deoxycholic acid depressed plasma cholesterol in the rat and that hydoxycholic acid elevated it. Under the conditions of our experiments deoxycholic acid exerted only an elevating effect and hydoxycholic acid was without significant effect.

HEREDITARY OBESITY IN THE RAT ASSOCIATED WITH HIGH SERUM FAT AND CHOLESTEROL. T. F. Zucker and Louis M. Zucker (Lab. of Comparative Pathology, Stow, Mass.). *Proc. Soc. Exp. Biol. Med.* 110, 165–71 (1962). A rat mutation leading to obesity noticeable by 5 weeks of age and produced on a low fat stock diet is described. It is associated with approximately

normal blood sugar levels, but with a spectacular hyperlipemia, involving a 10-fold rise in total fatty acids, 4-fold rise in cholesterol and lipid phosphorus, and a milky appearance of the blood serum.

LIPOPROTEIN LIPASE IN HUMAN ADIPOSE TISSUE. C. A. Stern, J. M. Iacono, and J. F. Mueller (Lipid Research Lab., Dept. of Internal Med., Univ. of Cincinnati College of Med., and Cincinnati General Hosp., Cincinnati, Ohio). *Proc. Soc. Exp. Biol. Med.* 110, 366–68 (1962). Subcutaneous adipose tissue was obtained from 8 patients undergoing various surgical procedures. All were in good nutritional balance. In each instance it was possible to demonstrate considerable lipolytic activity *in vitro* in the fatty tissue. It was further possible to identify this hydrolytic enzyme as lipoprotein lipase, similar in its characteristics to that previously reported in animal blood and tissue and human blood.

NUTRITIONAL AND CHEMICAL CHANGES IN THE LIPID FRACTION OF HERRING MEALS WITH AND WITHOUT ANTIOXIDANT TREATMENT. B. E. March and J. Biely (Poultry Nutrition Lab., Univ. British Columbia, Vancouver 8, B. C.), F. E. Claggett and H. L. A. Tarr. *Poultry Science* 41, 873–80 (1962). The nutritive value for the chick of the lipid fraction of herring meal has been studied. When fed at a level of 10% in a vitamin-deficient diet, chloroform-methanol extracts of herring meal, in common with herring oil, depressed growth. Most severe growth inhibition resulted from the feeding of fat extracted from a meal which had been stabilized with BHT. The growth depressing effect of fats was overcome completely when the diet was adequately fortified with vitamins. Utilization of the lipid fraction of freshly prepared meal was approximately 80% that of herring oil. This value dropped to about 70% after storage of the meal for 11 months. BHT treatment of herring meal protected the fat content against oxidative changes. The rates of decrease in solvent extractability and in the iodine value of the fat were retarded. Utilization of the fat in BHT-treated herring meal was likewise improved. In freshly prepared BHT-treated meal the fat was utilized 91% as well as herring oil and after storage for 11 months the relative utilization dropped only to 82%.

FURTHER STUDIES ON EGGS FROM HENS ON DIETS DIFFERING IN FAT CONTENT. Ruth Jordan, Gladys E. Vail, J. C. Rogler, and W. J. Stadelman (Depts. of Home Econ. and Poultry Science, Agricultural Experiment Station, Purdue Univ., Lafayette, Indiana). *Food Technol.* 16, 118–20 (1962). Three groups of White Leghorn hens were fed 8 weeks on special diets: 1) control diet with no added fat; 2) a diet supplemented with 10% corn oil; 3) a diet containing 10% beef tallow. In all three the ratios of protein, vitamins, and minerals to calories were the same. The iodine value of the lipids of eggs from the corn-oil group increased, in contrast to that for the control and the beef-tallow groups. Cakes made from the eggs of the corn-oil group were larger in volume than those of the other groups, and there was a significant increase in volume as the period progressed, indicated by a highly significant regression of volume on time. No statistically significant difference was found in the stability of emulsions made from the eggs, although a slight trend developed for lower stability in the beef-tallow group. The color of yolks and the cakes was much lighter yellow for the corn-oil group than for the other groups.

CHOLESTEROL METABOLISM: A GUIDE TOWARD ITS UNDERSTANDING. M. Friedman, S. O. Byers, and R. H. Rosenman (Harold Bruun Inst., Mt. Zion Hosp., and Medical Center, San Francisco, Calif.). *Prog. in Cardiovascular Diseases* 4, 419–38 (1962). If there is reasonable assurance that the administration of large quantities of unsaturated fat will lower the plasma cholesterol (15–25%) there is almost no proof that the course of atherosclerosis is being influenced. Studies of tissues after administration of these fats, at best, are equivocal in respect to any real change being accomplished either in the quality or quantity of cholesterol in normal or deranged arterial tissues. The clinical investigator would be naïve who confidently expects any decline in the morbidity and mortality from coronary artery disease to ensue during the next few years because of the contemporary modest culinary diversion from saturated to unsaturated fats. Indeed, if enthusiasts advocate excessive ingestion of unsaturated fats, the strong possibility exists that an increase of lipemia-induced coronary thromboses may occur.

THE PHOSPHATIDES OF SOME MOUSE ASCITES TUMORS AND RAT HEPATOMAS. P. H. Figard and D. M. Greenberg (Dept. of Biochem., Univ. of Calif. School of Med., San Francisco,

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Calif.). *Cancer Res.* 22, 361-67 (1962). An investigation of the phosphatide characteristics of certain experimental tumors yielded the following results. The enzyme system for methylating phosphatidylaminoethanol to phosphatidylcholine was found to be largely lacking in mouse ascites tumors and rat hepatomas. Only in the Morris hepatoma was it present in amounts greater than 10% of that in normal liver. The total phosphatide content of the tumors was much less than that in liver, largely owing to a lower total lipide content. The proportions of principal phosphatide components were not greatly altered in the tumor. Where there was a change, it was in the direction of increased cephalin and decreased lecithin, as compared with the level in normal tissue. The fatty acid patterns of the tumor lipides were not significantly different from those of the lipides of liver and blood cells.

LIPID EXCHANGE BETWEEN SERUM LIPOPROTEINS *in vitro*. Laura Evans and S. Patton (Dept. of Dairy Sci., Pa. Ag. Exp. Station, University Park, Pa.). *J. Dairy Sci.* 45, 589-94 (1962). Lipid incorporation and exchange in whole blood by bovine serum lipoproteins of high ($D > 1.063$) and low density ($D < 1.063$) have been studied *in vitro*. The high-density lipoproteins evinced a strong binding capacity for cholesterol and phospholipids. Low-density lipoproteins showed a great affinity for cholesterol palmitate and tripalmitin. Palmitic and linoleic acids were bound almost entirely by serum proteins. Cholesterol exchanged between high- and low-density lipoproteins, rate of transfer being in the direction of the former. Cholesterol palmitate moved only from low- to high-density lipoproteins. Tripalmitin and phospholipid did not transfer in either direction. Palmitic and linoleic acids transferred from both lipoprotein groups to the serum proteins. Cholesterol and tripalmitin labeled lipoproteins of high and low density lost a small amount of radio-activity to the blood cells.

SERUM AND EGG CHOLESTEROL LEVELS IN MATURE HENS AS INFLUENCED BY DIETARY PROTEIN AND FAT CHANGES. H. M. Edwards, Jr., J. E. Marion, and J. C. Driggers (Poultry Dept., Univ. Georgia, Athens, Ga.). *Poultry Science* 41, 713-17 (1962). The influence of changes in dietary protein level, calorie protein ratio, and type of fat on the cholesterol and iodine number of egg fat was studied. The results indicated that these factors have very little influence on cholesterol content of eggs from hens fed diets low or devoid of cholesterol. Of the factors studied, only the type of fat appeared to exert a definite effect on the fatty acid composition of egg fat as determined by iodine number.

PHYSICAL CHANGES IN EGGS PRODUCED BY HENS RECEIVING STERULIA FOETIDA OIL SUPPLEMENTS. A. R. Dobernz, D. L. Schneider, A. A. Kurnick, M. G. Vavich, and A. R. Kemmerer (Depts. of Agricultural Biochemistry and Poultry Science, Univ. of Arizona, Tucson). *Poultry Science* 41, 700-05 (1962). Stored eggs produced by hens fed 0.15 g of *S. foetida* oil daily were different from eggs produced by hens fed 0.15 g of corn oil. Eggs from the *S. foetida* oil group showed pink discoloration after two weeks of storage, and the pH of the yolks increased to essentially the same value as the whites after one month of storage. Plotted pH values of yolks and whites from the *S. foetida* lots concurred at pH 8.3-8.5 and one month of storage. Eggs from the *S. foetida* oil fed group had more viscous yolks than comparable eggs from the corn oil fed group. Holding the eggs at a cold temperature (7°C) overnight increased the viscosity of the *S. foetida* yolks to a semi-solid or putty-like consistency.

EVIDENCE FOR THE PRESENCE OF A THERMOLABILE GROWTH INHIBITOR IN RAW WHEAT GERM. R. D. Creek, Valeria Vasaitis, W. O. Pollard, and G. Schumaier (Poultry Dept., Univ. of Maryland, College Park, Md.). *Poultry Science* 41, 901-04 (1962). Evidence as to the presence of a thermolabile growth inhibitor which affected young chicks has been presented. The factor seems specifically to block utilization of fat; however, nitrogen retention is also improved somewhat by heat treatment indicating that protein availability might be increased.

QUINONES IN LIPOPROTEIN ELECTRON TRANSPORT SYSTEMS. F. L. Crane (Dept. of Biological Sciences, Purdue Univ., Lafayette, Indiana). *Biochemistry* 1, 510-17 (1962). Coenzyme Q, vitamin K, and plastoquinone are lipophilic quinones which participate in electron transport reactions associated with oxidative or photosynthetic phosphorylation. Evidence for formation of the chromanol from vitamin K is consistent with mechanisms proposed for quinone function in phosphorylation reactions, but there is no clear evidence that the other quinones form chromanols. Further studies are indicated to determine the reactions of chromanols in biological systems as well as the distribution and site of function of quinones.

FATTY ACID COMPOSITION OF DERMAL AND EPIDERMAL TRIGLYCERIDES AND PHOSPHATIDES IN MOUSE SKIN DURING NORMAL AND ABNORMAL GROWTH. C. Caruthers (Dept. of Biochem. Res., Roswell Mem. Inst., N. Y. State Dept. of Health, Buffalo). *Cancer Res.* 22, 294-98 (1962). The fatty acid composition of the triglycerides and phosphatides was determined in mouse epidermis and dermis in anagen and telogen stages of the hair growth cycle (normal growth) and compared with fatty acid composition of mouse epidermis and dermis undergoing malignant transformation as a result of the application of methylethanthrene. The fatty acids of the triglycerides and phosphatides were esterified to the methyl esters, which were subjected to gas-liquid chromatography for the estimation of the various fatty acids. Other investigators have shown that the types of phosphatides and fatty acid composition of the phosphatides of the erythrocytes of various species appear to be related to the permeability of these cells. Also, differences in the fatty acid composition have been found between the phosphatides of rat liver cells and azo dye-induced hepatoma cells. Attempts are made to interpret the results of the fatty acid composition of the triglycerides and phosphatides.

THE EFFECT OF PROTEIN SOURCE ON THE GROWTH PROMOTING ACTION OF SOYBEAN OIL, AND THE EFFECT OF GLYCERINE IN A LOW FAT DIET. A. J. Campbell and F. W. Hill (Dept. of Poultry Husbandry, Univ. of Calif., Davis). *Poultry Science* 41, 881-82 (1962). The addition of 10% soybean oil to purified diets based on isolated soybean protein, fillet fish flour, heated egg albumin, and blood fibrin was found to promote highly significant growth increases with all protein sources. Modifying the physical nature of a low fat diet by the addition of 20% glycerol did not promote increased growth.

ON THE METABOLISM OF THE BRAIN PHOSPHOINOSITIDE COMPLEX. H. Brockerhoff and C. E. Ballou (Dept. of Biochem., Univ. of Calif., Berkeley, Calif.). *J. Biol. Chem.* 237, 1764-66 (1962). Rabbit brain slices have been incubated separately with myoinositol- H^3 and glycerol- $2-C^{14}$, and the amount of incorporation of label into each of the three components of the phosphoinositide complex was determined. The specific activity of the two moieties decreases progressively from monophosphoinositide to diphosphoinositide to triphosphoinositide. The results are essentially identical, qualitatively and quantitatively, with those found for the incorporation of P^{32} -labeled inorganic phosphate into the phosphatidyl phosphate group of the three substances. Taken together, they offer conclusive support for the hypothesis that the glyceryl-phosphoryl-myoinositol structure remains intact during the metabolic interconversions of the three inositides.

PHOSPHOLIPID PATTERNS OF THE DEVELOPING CHICK EMBRYO. A. L. Bieber, V. H. Cheldelin, and R. W. Newburgh (Science Res. Inst. and Dept. of Chem., Oregon State Univ., Corvallis, Oregon). *Biochemistry* 1, 532-36 (1962). The phospholipids of unincubated egg yolks and of chick embryos of eggs incubated 4, 6, 12, 14, and 18 days have been separated by silicic acid chromatography. The major components have been identified as lipids containing ethanolamine, choline, sphingosine, and inositol in the egg and the embryos. Serine-containing lipids were found in the embryo but not in the egg yolk. The phospholipid pattern in the developing embryo was similar throughout the period studied, although changes in the relative amounts of the individual phosphatides were apparent as development progressed. Serine lipids increased and lecithin decreased. The most prominent change occurred in the sphingomyelins, which at least doubled in relative amount between 4 and 18 days of incubation. It has been suggested that the change in the sphingomyelin is a reflection of nerve myelination in the chick embryo. The lipid phosphorus content was found to remain relatively constant throughout the period studied when determined from DNA content. When determined on the basis of fat-free Kjeldahl nitrogen or fat-free dry weight, lipid phosphorus declined steadily.

FEEDBACK CONTROL OF CHOLESTEROL BIOSYNTHESIS IN THE MOUSE. W. T. Beher, Gizella Baker, and W. L. Anthony (Edsel B. Ford Inst. for Med. Res., Henry Ford Hosp., Detroit, Mich.). *Proc. Soc. Exp. Biol. Med.* 109, 863-68 (1962). Effects of cholic acid on biosynthesis of hepatic cholesterol and bile acids were studied. Mice maintained on a basal diet, or this diet supplemented with 0.5% cholic acid, received single intraperitoneal injections of mevalonic acid- $2-C^{14}$ or cholesterol- $4-C^{14}$. Feces were collected at 24-hour intervals, fecal steroid- C^{14} was isolated and fractionated, and $\alpha + \beta$ -steroid- C^{14} and bile acid- C^{14} were determined. In control mice the distribution of C^{14} activity in fecal steroids was 60% in the sterol fraction and 40% in the bile acid fraction. This ratio was constant with time after the first 24-hour interval, regardless of the sub-

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stance injected. It was shown that cholic acid brings about equal decreases in the rates of both hepatic cholesterol and bile acid biosyntheses. Since a preceding study had shown that the rate of bile acid synthesis in mouse liver is inhibited by cholic acid independently of its effect on cholesterol synthesis, it was concluded that the rate of hepatic cholesterol biosynthesis in mice is controlled by cholic acid and its conjugates by means of a double feedback reaction.

COMPARISON OF SERUM CHOLESTEROL ESTERS IN GERBIL AND RAT. H. J. Albers and S. Gordon (Biochem. Dept., Lederle Labs., Amer. Cyanamid Co., Pearl River, N.Y.). *Proc. Soc. Exp. Biol. Med.* 109, 860-63 (1962). The presence of only trace quantities of arachidonic acid in the CEFA of gerbil serum is at variance with the hypothesis of a negative correlation between arachidonic acid levels in CEFA and susceptibility to atherosclerosis. Fasting for 18 hours resulted in a 66% increase of arachidonic acid at the expense of linoleic acid in CEFA of the rat, while in the gerbil, CEFA remained unchanged. In both species, palmitoleic and oleic acids were the major acids associated with cholesterol transport. The CEFA pattern in cholesterol-fed animals suggested an incipient essential fatty acid deficiency.

CHOLESTEROL METABOLISM AND GALL-STONE FORMATION IN ANIMAL EXPERIMENTS. INFLUENCE OF FATS AND CARBOHYDRATES. H. Dam (Denmark Tech. Høch, Copenhagen). *Fette Seifen Anstrichmittel* 64, 193-198 (1962). The golden hamster was shown to be a suitable test animal for the study of gall-stone formation. Cholesterol gall stones are formed if the food contains an easily resorbable sugar as the carbohydrate component and no fat. Small quantities of fat protect against cholesterol stone formation; and this protective activity increases with unsaturation.

RAPID THIN LAYER CHROMATOGRAPHIC SEPARATION OF PHOSPHOLIPIDS AND NEUTRAL LIPIDS OF SERUM. W. C. Vogel, W. M. Doizaki, and L. Zieve (Radioisotope Service and Dept. of Med., V. A. Hospital, Univ. Minn., Minneapolis 17, Minn.). *J. Lipid Research* 3, 138-40 (1962). A method for the separation of the phospholipids and neutral lipids of serum is described. Thin layers of silic acid are spread on the chromatograph plates. The plates are activated at 95° for 2 hr., cooled and spotted with aliquots of sample. Separation of phospholipids is accomplished in 30 minutes or less at room temperature using chloroform-methanol-water, 80:25:3 (v/v). The spots are located by spraying with 0.2% 2',7'-dichlorofluorescein in ethanol and viewing under UV light.

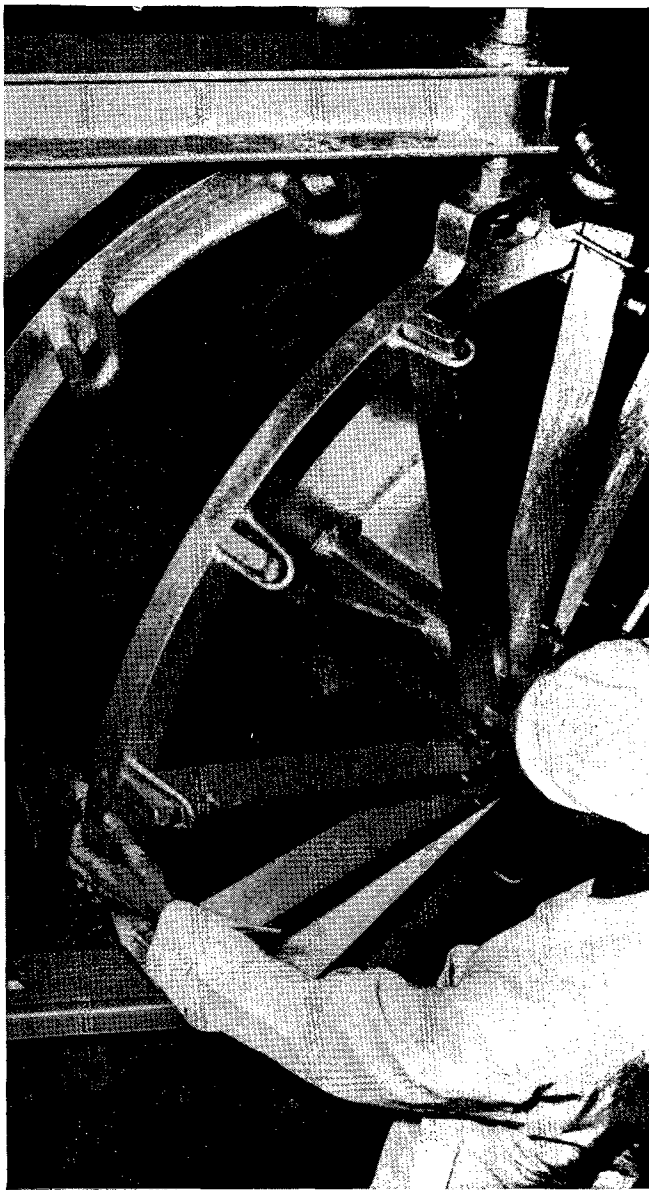
A SPECTROPHOTOMETRIC DETERMINATION OF SPHINGOSINE. C. J. Lauter and E.G. Trams (Laboratory of Neurochemistry, Nat. Inst. of Neurological Diseases and Blindness, N.I.H., Bethesda, Md.). *J. Lipid Research* 3, 136-138 (1962). A method for the determination of sphingosine based on its reaction with methyl orange is described. A sample containing 0.01 to 0.10 μ -moles sphingosine is described in 0.01 N HCl; made alkaline with NaOH, and then extracted with ethyl acetate. Acetate buffered methyl orange is added and the sample measured at 415 μ . From 0.01 to 0.10 μ -moles of sphingosine can be determined in this way.

THE LIPID COMPOSITION OF RAT-LIVER MITOCHONDRIA, FLUFFY LAYER AND MICROSOMES. G. S. Getz, W. Bartley, F. Stirpe, Brenda M. Notton, and A. Renshaw (University of Oxford). *Biochem. J.* 83, 181-91 (1962). The lipids of the subcellular particles from rat liver were separated by silicic acid chromatography and the fatty acid composition of each fraction was measured. On a weight basis, 26% of the mitochondria was lipid, 33% of the fluffy layer, and 55% of the microsomes. Lecithin and cephalin were present in the mitochondria in almost equal amounts (each about 38% of the total phospholipid); 60% of the total phospholipid of the microsomes was lecithin and 30% cephalin. The fluffy layer had quantities of these phosphatides intermediate between those of the mitochondria and the microsomes. The cephalins contained a higher proportion of arachidonic acid and docosahexanoic acid than had other lipids. The fatty acid patterns of the mitochondria, fluffy layer and microsomes are given.

PROCESS FOR EXTRACTING VITAMIN A FROM SOURCE OILS. F. J. Sevigne (Collett-Week Corp.). *U. S.* 3,035,981. The process fundamentally consists of separating an unsaponifiable fraction of fish oil in solution from the oil and concentrating the fraction. The improvement involves extracting the concentrated unsaponifiable fraction serially, first with solvent alcohol and then acetonitrile, to obtain the vitamin A concentrate.

WATER SOLUBLE COMPOSITION OF LIPOID SOLUBLE VITAMINS. R. A. Lehman (Campbell Pharmaceuticals, Inc.). *U. S.* 3,036,

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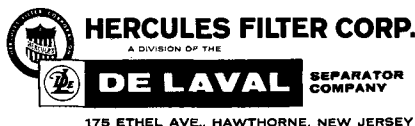
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957. A vitamin composition miscible with water and aqueous glycerol to form clear, stable, aqueous solutions consists of (1) a lipid soluble vitamin and (2) a mixture of a monoester of a polyethylene glycol, the glycol moiety of which has a molecular weight of about 400 (the laurate, coconate, or oleate ester) and a water-insoluble, lipophilic, nonionic surfactant such as long chain fatty diester of polyethylene glycol, long chain fatty alcohol, or a long chain fatty acid monoester of sorbitan, glycerol, or propylene glycol in the range of from 1/2 to 5 parts by weight of the surfactant to 10 parts of the polyethylene glycol monoester. About 6 parts by weight of the mixture is present to each part of the vitamin.

THE INFLUENCE OF VARYING LEVELS OF DIETARY PROTEIN, CARBOHYDRATE AND FATS IN THE NUTRITION OF THE RAT. A. J. Siedler, M. Rice, Patricia Maloney, C. Lushbough, and B. S. Schweigert (Dept. of Biochem., Univ. of Chicago, Ill.). *J. Nutrition* 77, 149-54 (1962). The effects of varying levels of dietary protein, carbohydrate and fats on the nutrition of the rat over a 57-week feeding period were studied. After the rats had received the test diets for 4 weeks, those fed diets containing 50% of their calories as casein had superior rates of gain and utilization of crude calories as compared with rats fed diets containing either 20 or 80% of their calories as casein. Lard or corn oil substituted at the expense of sucrose increased the caloric efficiency of rats fed the diets containing 50 or 80% of their calories as casein. No apparent differences in average serum cholesterol, average total serum polyunsaturated fatty acids, and average liver cholesterol were noted between the dietary groups through the initial 22 weeks of this study. However groups varied after 57 weeks and these results are discussed, with the differences obtained by substitution of various fats in the diets. No evidence of abnormal fat deposits was observed in any of the hearts and aortas from these animals.

STUDIES IN RELATION TO LIPID METABOLISM IN MAN. I. POLYUNSATURATED FATTY ACIDS IN RELATION TO TOTAL FATTY ACIDS IN MALE AND FEMALE PATIENTS OF DIFFERENT AGES, WITH COMPLAINTS OF ANGINA PECTORIS. G. Pol, L. M. Dalderup, and E. A. M. Meyknecht (Netherlands Inst. of Nutrition, Wageningen, Holland). *J. Nutrition* 77, 343-8 (1962). An inverse relationship between the serum total fatty acid content and its relative amounts of polyunsaturated fatty acids was demonstrated in patients with anginal complaints. The decrease in polyunsaturated fatty acid content with higher total fatty acid levels was sharper in men than in women. With increasing age there was a decrease in polyunsaturated fatty acids found at a certain total fatty acid level. This was true both for men and women. Apart from the other polyenes, triene did not vary in harmony with the total polyunsaturated fatty acid content. Therefore, the triene-tetraene ratio increased in correlation with the total fatty acid content. Alterations in polyunsaturated fatty acid composition in relation to serum polyunsaturated fatty acid content were not statistically significant, the composition being almost the same in men and women. No differences were found between the patients who had had a myocardial infarction previously and those with anginal complaints only.

QUANTITATIVE ASPECTS OF CHOLESTEROL FLUX IN RABBIT ATHEROMATOUS LESIONS. H. A. I. Newman and D. B. Zilversmit (Dept. of Physiology, Univ. of Tennessee, Memphis). *J. Biol. Chem.* 237, 2078-84 (1962). The feeding of 1% cholesterol containing cholesterol-4-C¹⁴ to rabbits for 21-87 days revealed that plasma cholesterol was the primary source of the cholesterol in the atheromatous aorta. According to these data, the accumulation of cholesterol in the atherosclerotic lesion is not a static process but is subject to continuous turnover.

COMPARISON OF ATHEROSCLEROSIS IN SWINE FED A HUMAN DIET OR PURIFIED DIETS. Doris H. Calloway and R. B. Potts (Quartermaster Food and Container Inst. U. S. Army, Chicago, Ill.). *Circulation Research* 11, 47-52 (1962). Miniature male swine were fed a human diet (military ration) for six months, or synthetic diets containing varying levels of fat and other in groups given high-fat diets. Grade 1 lipid-bearing lesions were seen in the aortic arch of about two-thirds of the population studies. Neither gross nor histopathological changes were related to serum lipids, to the ratio of one lipid component to another, or to diet.

COMPARISON OF THE LIPIDS IN MATERNAL AND CORD BLOOD AND OF HUMAN AMNIOTIC FLUID. F. M. Helmy and M. H. Hack (Depts. of Med. and Anatomy, Tulane Univ. School of Med., New Orleans, La.). *Proc. Soc. Exp. Biol. Med.* 110, 91-94 (1962). A paper chromatographic analysis of the lipids in

maternal and cord blood and human amniotic fluid was made. The reduced lipid content of cord blood was confined to the plasma where phosphatidyl ethanolamine and the corresponding plasmalogen were disproportionately reduced. The amniotic fluid had a number of PAS positive components not observed in blood cells or plasma.

• Drying Oils and Paints

APPLICATION OF DEGRADATION TECHNIQUES TO THE ANALYSIS OF POLYMERS. J. Dandoy (Centr. Lab. of V.C.B., Brussels, Belgium). *Ind. Chim. Belge.* 27, 355-64 (1962). After having described the results obtained by thermogravimetric analysis of the polymers, the author shows the importance of the pyrolysis techniques for such polymers coupled with other modern analytical methods. Although the results obtained by mass spectroscopy and infrared spectroscopy are interesting, they are exceeded to a great extent by those obtained by gas-liquid chromatography. The coupling of pyrolysis and chromatography is increasingly used in the qualitative and quantitative analysis of polymers, mixtures of polymers and copolymers. Further, this technique can be applied even to substances difficultly volatilizable.

QUICK DRY VEHICLE AND METHOD OF DRYING SAME. B. L. Sites and M. S. Agruss (Miehle-Goss-Dexter, Inc.). *U. S. 3,041,203*. A method of rapidly indurating a polymerizable binder of the drying oil type having a conjugated system of double bonds consists of (1) forming a non-aqueous solution of the binder and a soluble photopolymerization catalyst such as a saturated organic titanate or diisocyanate, (2) forming a film of the solution, and (3) irradiating the film with actinic rays adapted to activate the catalyst.

REACTION PRODUCTS OF EPOXIDIZED OILS. H. W. Chatfield and G. A. Weeks (A. Boake, Roberts & Co., Ltd.). *U. S. 3,042,687*. An oxirane compound containing internal oxirane oxygen consists of the reaction product of an epoxidized long chain fatty acid material selected from the group consisting of epoxidized drying, semi-drying, or non-drying oils and the epoxidized mono- and polyhydric alcohol esters (other than glycerol esters) of the acids of those oils, and an acid oxychloride such as phosphorous oxychloride, sulfur chloride, chromyl chloride, thionyl chloride, or phosgene. The method for the production of these compounds is also covered.

• Detergents

TEMPERATURE DEPENDENCE OF MICELLAR WEIGHT OF NON-IONIC SURFACTANT IN THE PRESENCE OF VARIOUS ADDITIVES. 3. ADDITION OF SODIUM DODECYL SULFATE. K. Kuriyama, H. Inoue, and T. Nakagawa (Res. Lab., Shionogi and Co., Ltd., Osaka, Japan). *Kolloid-Z.* 183, 68-71 (1962). By means of light scattering method, the micellar weight, critical micelle concentration, and second virial coefficient of mixtures of ionic and non-ionic surfactants were determined at 30, 50, and 70°C. Mixtures of methoxy-polyoxyethylene dodecyl ether and sodium dodecyl sulfate in various mixing ratios were examined in 0.2 M sodium chloride solution. The micellar weight of the non-ionic surfactant increases with rising temperature, whereas that of the ionic surfactant decreases. In the case of the mixture the increase in micellar weight caused by the temperature elevation is progressively suppressed by an increasing addition of ionic surfactant. When the addition of the ionic surfactant exceeds a certain ration (about 20%), the micellar weight decreases with the elevation of temperature. Similar behaviors were observed in the critical micelle concentration and the second virial coefficient.

STUDIES ON THE EVALUATION METHODS OF SURFACE ACTIVE AGENTS. III. SEMIMICRO DISC METHOD OF WETTING TEST. W. Yano, T. Isazi, and W. Kimura (Dept. of Applied Chem., Nagoya Univ., Japan). *J. Oil Chem. Soc. Japan* 11(4), 183-190 (1962). In the studies of performance tests of surface active agents, new Semimicro Disc Methods of Wetting Test (Horizontal Method and Vertical Method) have been developed. The data obtained by the new "Horizontal Method" agrees with that by the original macro-method. The new "Vertical Method" is applicable in transparent or opaque solutions. The accuracy of measurement was improved by the "Vertical Method," although the manipulation of the "Horizontal Method" is a little simpler. The influence of the load and the depth of the disc in the test solution on the sinking time was investigated, and it was concluded that the sinking time

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is an inverse linear function of load. The sinking time is not affected by the depth of the disc between 10 and 15 mm. The accuracy of measurement increases in proportion as the load decreases.

IV. SEMIMICRO CONTINUOUS METHOD OF WETTING TEST (TENSIO-METER METHOD). W. Yano and W. Kimura. *Ibid.*, 190-195. In the studies of performance tests of surface active agents, a new semimicro continuous method of wetting test, the "Tensiometer Method" has been developed. The method consists of measuring the change of apparent density of a standard felt disc, immersed in a test solution, with the Du Nouy tensiometer. The change of apparent density is plotted against time on semi-log paper, and the entire progress of wetting is clearly shown by the apparent density-time curves. The method is simple, accurate, and needs only very small quantities of test solution, can be applied to dye-, mercerisation-, and other transparent and opaque processing solutions.

STUDIES ON THE ANALYSIS OF A SURFACE ACTIVE AGENT. XV. ANALYSIS OF THE CATIONICS-AMPHOLYTICS-NONIONICS TERNARY SYSTEM. I. SEPARATION AND DETERMINATION OF NONIONICS IN THE MIXTURES. Y. Izawa, O. Nakagawa, and W. Kimura (Dept. of Applied Chem., Nagoyka Univ. Japan). *J. Oil Chem. Soc. Japan* 11(4), 174-179 (1962). The "Cation Exchange-Schönfeldt" method and "Semimicro Cation Exchange-UV Spectrophotometry" method have been developed for the analysis of nonionics in cationics-ampholytics-nonionics mixtures. These methods consist of, first, ion-exchange separation of nonionics from mixtures by means of a column method and, second, determination of isolated nonionics by Schönfeldt method or UV absorption spectrophotometry. Results showed that nonionics were separated quantitatively from the mixtures in 10% isopropanol aqueous solution, by using Amberlite IR120 (H+) and adjusting to pH 2.0-2.5, and that the isolated nonionics were determined with satisfactory accuracy by Schönfeldt method and by measuring extinction of the effluent at 277 m μ .

XVI. ANALYSIS OF THE CATIONICS-AMPHOLYTICS-NONIONICS TERNARY SYSTEM. 2. DETERMINATION OF NONIONICS IN THE MIXTURE BY UV ABSORPTION SPECTROPHOTOMETRY. Y. Izawa and W. Kimura. *Ibid.*, 180-183 (1962). For the rapid and accurate analysis of nonionics in cationics-ampholytics-nonionics mixture, the direct determination of nonionics in the mixture without separating the component surfactants has been investigated and the "Direct UV Spectrophotometry" method was developed. The cationic and nonionic components exhibited the characteristic absorption bands but the ampholytic (imidazoline type) did not. The wave length of maximum absorption was determined as follows: Lauryl, benzyl, dimethyl, ammonium chloride, 257.5, 263, 269.2 m μ ; POE nonyl phenol ($n = 8 \sim 9$), 277, 283.5 m μ . Vierdordt's method could not be applied to the analysis of mixture, while our experimental results showed that at 277 m μ the observed extinctions of cationics and ampholytics were 0 at a concentration less than 0.03 and 0.025%, respectively, and that the nonionics in mixture could be determined by measuring the extinction of the sample solution, of which the concentration of each component being nonionics, 0.002 ~ 0.036%; cationics, <0.03%; and ampholytics, 0.025%.

STUDIES IN HEAVY METAL SOAPS. SYNTHESIS OF CHLORIDE SOAPS OF ALUMINIUM. R. C. Mehrotra and A. K. Rai (Chemical Labs., Univ. of Gorakhpur, U. P.). *J. Indian Chem. Soc.* 39(1), 1-4 (1962). Mono- and dichloride soaps and tri-soaps of aluminium have been synthesized by the interaction of anhydrous aluminium chloride and fatty acids in different stoichiometric ratios in different organic solvents. All chloride soaps and tri-soaps give mobile solutions of low viscosity in organic solvents.

ANESTHETIC ACTION OF COSMETIC SURFACTANTS. G. Martin, J. H. Draize, and E. A. Kelley (Food and Drug Administration). *Drug Cosmetic Ind.* 91(1), 30-1 (1962). A number of surfactants which, when introduced into the eye mucosa, are capable of producing an anesthesia or an increase in the threshold of pain. The agents which exhibit these properties are mainly alkyl aryl compounds condensed with a number of moles of polyethylene oxide. A number of fatty acid amine condensates also exhibit similar anesthetic properties.

HIGH-FOAM PASTE DETERGENT COMPOSITION. L. F. Cohen (FMC Corp.). *U. S.* 3,039,971. The described composition consists of (1) 18-26% by weight of tetrapotassium pyrophosphate, (2) 19-47% sodium lauryl alcohol sulfate, (3) 0.1-1.7% sodium silicate calculated as SiO₂, (4) 35-55% water, and (5) 3% carboxymethyl cellulose.

CONTINUOUS MANUFACTURE OF BETA-SULFO-ETHYL-ESTERS OF FATTY ACIDS. H. H. Tiedemann (General Aniline & Film Corp.). *U. S.* 3,040,073. A salt of 2-hydroxyalkane sulfonic acid is pulverized to a particle size in the range of 3-200 microns and mixed with a liquid higher fatty acid chloride having at least 6 carbon atoms per molecule. The mixture is then sprayed into a stream of hot gas. The salt and the fatty acid chloride react to form the ester.

METHOD OF MAKING FATTY ALKANOL AMIDES. J. W. Lohr (The Andrew Jergens Co.). *U. S.* 3,040,075. Dialkanolamines are heated with fatty triglycerides at a temperature of 240-260F for a period of 12-18 hours, the molecular proportion of amine to triglyceride being in the range of 4.2-1 to 6-1. The resulting product is mixed with phosphoric acid to segregate the excess amine and some of the glycerine in the phosphoric acid phase. The phosphoric acid phase is separated from the amide fraction and the remainder of the glycerine by gravity separation. The phosphoric acid is present at a concentration of 6-9% by weight of crude amine, and the temperature at which the separation is conducted is about 160-200F.

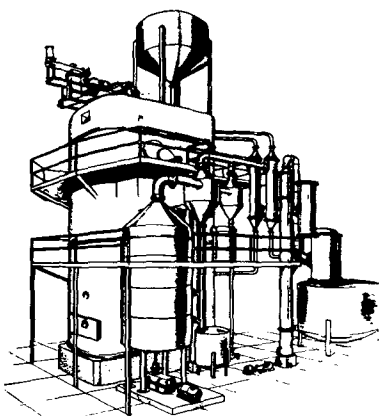
DETERGENT COMPOSITION. H. G. Kirschenbauer (Colgate-Palmolive Co.). *U. S.* 3,042,621. A detergent composition which upon mixture with water yields a non-acidic pH condition and an acidic pH condition successively consists of (1) about 1/2 to 99% by weight of a water soluble detergent selected from the group consisting of water-soluble organic neutral and alkaline anionic and nonionic detergents and (2) a water-soluble acidic compound having a coating of a water-dispersible material resulting in a retarded rate of solubility. The acidic compound is present in excess so that it renders the solution acidic when dissolved after a predetermined time.

SYNTHETIC DETERGENTS AND SURFACE-ACTIVE AGENTS. D. H. Greene (Universal Detergents, Inc.). *U. S.* 3,042,623. A composition having enhanced cleaning, detergent, and water-softening properties consists of: (a) from 40 to 55 parts of a mixture of (1) an alkyl aryl sulfonate normally incapable of

(Continued on page 51)

SOLVENT EXTRACTION SYSTEMS

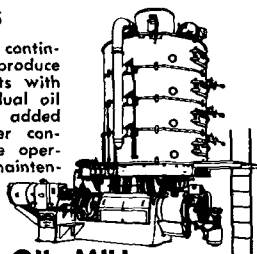
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Northern California Section

The Northern California Section of the AOCS held its spring meeting Friday, May 18 at the Claremont Hotel in Berkeley. Following the social hour and dinner, Chairman L. A. Glodblatt introduced the two speakers: C. E. Claassen, President, Pacific Oilseeds, Inc., of Woodland, Calif., and Lowell Cummings, Chemist, Pacific Vegetable Oil Corp., Richmond, Calif.

Dr. Claassen reviewed the history and development of safflower as a commercial crop in the U. S. Mr. Cummings spoke on the companion story of developing the industrial utilization of safflower oil, particularly in surface coatings.

The next Northern California Section meeting is slated for Fresno's Towne and Country Lodge for Friday evening and Saturday morning, September 21-22. The featured speaker for Friday evening is R. B. Alfin-Slater of the University of California School of Public Health, Los Angeles, who will speak on "How to Succeed in Reducing Without Counting Calories." Two technical presentations are scheduled for the following morning; the first on Oilseed Processing, and the second on Thin Layer Chromatography of Fatty Materials. Two plant trips are also scheduled.

Members of the Southwest Section have been invited to attend the Fresno meeting.

Southwest Section

The Southwest Section of the American Oil Chemists' Society held its first meeting of the current year at the Rodger Young Auditorium in Los Angeles, September 13. The speaker for the evening was R. T. Doughie, of the A.O.C.S. Examining Board, who discussed the role that Referee Chemists play in the American Oil Chemists' Society activities.

• *New Members*

Active

- Jerzy J. Biezanski, Research Associate, Maimonides Hospital, Brooklyn, N. Y.
- Fred E. Boettner, Senior Research Chemist, Rohm and Haas Co., Bristol, Pa.
- Kenneth M. Brobst, Head, Analytical Laboratory, A. E. Staley Mfg. Co., Decatur, Ill.
- Colin J. Cox, Development Engineer, Lever Brothers Ltd., Toronto, Ont., Canada
- John T. Grogan, Product Development Chemist, Standard Brands, Inc., Indianapolis, Ind.
- Walter G. Jennings, Associate Professor and Associate Chemist, University of California, Davis, Calif.
- Kimitoshi Nakazawa, Senior Managing Director, Japan Margarine & Shortening Makers Association, Tokyo, Japan.
- Robert J. McPherson, Assistant Chemist, Kershaw Oil Mill, Kershaw, S. C.
- Robert L. Moore, Jr., American Mineral Spirits Div. of The Pure Oil Co., Atlanta, Ga.
- Myron A. Schmutzer, Manager, Chemical Division, United States Testing Co., Inc., Hoboken, N. J.
- Marlyn W. Stephens, Chemist, Analytical Research Section, Emery Industries, Inc., Cincinnati, O.
- Joseph R. Swartwout, Associate Professor, Dept. of Ob-Gyn., Emory University School of Medicine, Atlanta, Ga.
- Bob W. Wright, Assistant Manager, Chemical Division, United States Testing Co., Inc., Hoboken, N. J.

Active Junior

- P. R. Lakshmanan, Graduate Student, Dept. of Coatings, North Dakota State University, Fargo, N. D.

forming solutions and true liquids at concentrations above 2 to 10% in water, and (2) an alkali metal sulfonate of mixed hydrocarbons substantially comprising alpha and beta methyl naphthalenes and dimethyl naphthalenes, the alkali metal sulfonate being essentially free from olefins and constituting from 40 to 70% of the mixture; (b) from 30 to 38 parts of a water-soluble polyphosphate, and (c) from 20 to 30 parts of an ammonium sulfate. The composition will form water solutions at all concentrations up to about 48% of solids at normal temperatures.

SOAP BAR COMPOSITIONS. W. A. Kelly (Lever Brothers Co.). *U. S. 3,043,778.* A bar of soap which disperses soap from seum in hard water consists of (a) 5-25% by weight of an alkali metal salt of a fatty acid methyl taurate, the fatty acid containing from 12 to 20 carbon atoms and the cationic portion being sodium or potassium; (b) 15-60% of a water soluble alkali metal coconut soap, and (c) 2-25% of free fatty acid containing 12 to 20 carbon atoms. The bar of soap may also contain from 0.1 to 1.0% of 3,4',5-tribromosalicylanilide. It has a pH, as measured in a 10% aqueous solution, of 8.6 to 9.4.

DETERGENT TABLETS. J. P. Parke and D. D. Penketh (Lever Brothers Co.). *U. S. 3,043,779.* Described is a detergent composition in the form of a hard coherent tablet which does not become soft and slimy or sticky on being used or stored after use and which does not dissolve with undesirable rapidity in warm water. It contains from 55-85% of a water-soluble alkali metal soap, from 15-30% of a water-soluble alkali metal fatty-acyl-aminomethane sulphonate in which the fatty-acyl radical has from 8-18 carbon atoms, and from 0.5-10% of a water-soluble salt of a monocarboxylic or monosulphonic acid having from 1 to 8 carbon atoms in the molecule.

DETERGENT COMPOSITION CONTAINING A 3,5-DIAMINOPYRAZINE-2,6-DICARBOXYLIC ACID DERIVATIVE. A. F. Daghish, R. Vonderwahl, and G. A. Tillotson (J. R. Geigy A.-G.). *U. S. 3,043,780.* The described composition consists of a water soluble, synthetic, organic anion-active detergent (a water soluble soap or synthetic, organic non-soap anionic sulphated detergent) and from 0.001 to 5% by weight of a 3,5-bis-diamino-pyrazine-2,6-dicarboxylic acid diamide.

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