ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: J. G. Endres, J. Iavicoli, F. A. Kummerow, H. S. Liles, C. C. Litchfield, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

Effects of different levels of vitamin A, B Apo 8′ carotenal and alfalfa on yolk color. M. L. Sunde (Univ. of Wisc., Madison). *Poultry Sci.* **41**, 532–41 (1962). Feeding program influenced yolk color sufficiently to affect egg grade during certain seasons of the year. Six to seven percent corn approximately equaled one percent alfalfa as far as pigmenting properties are concerned. This was true even though the alfalfa contained about ten times as much xanthophyll and about sixty times as much vitamin A activity as corn. High levels of vitamin A reduced yolk color materially in diets containing 55% corn and 5% alfalfa. The A.O.A.C. method for determining yolk color correlated well with readings taken on a Heiman-Carver color rotor except when the Heiman-Carver scores were 17 or over. Yolks made very light in color by high levels of vitamin A still contained about the same number of micrograms of carotenoid plus vitamin A as did the darker yolks. As the vitamin A was increased in the yolk, the amount of xanthophylls decreased. B-apo-8′ carotenal at the level of 6 mgs. per kg. in a white corn diet produced a yolk score (Heiman-Carver) of about 13. About this same score was obtained with 5% alfalfa. Nine mgs. of the pigment per kg. produced a yolk reading of about 15 which is slightly less than that provided by 10% alfalfa.

Pro-oxidants in spontaneous development of oxidized flavor in milk. G. J. Smith and W. L. Dunkley (Dept. of Food Science and Tech., Univ. of Calif., Davis). *J. Dairy Sci.* **45**, 170–81 (1962). The objective of this study was to clarify the roles of copper, ascorbic acid and xanthine oxidase in the spontaneous development of oxidized flavor in milk. At a mole ratio as low as 3.5 moles of neocuproine to one of copper, the cuprous chelator neocuproine effectively prevented oxidized flavor. Consequently, of the metals in milk, copper must have been the only one affected, indicating that it is an essential metal catalyst in lipid oxidation. Destruction of ascorbic acid by the relatively specific catalyst ascorbic acid oxidase prevented spontaneous peroxidation; but when the original ascorbic acid level was restored, spontaneous oxidized flavor developed.

Detection of milk fat adulteration by molecular distillation. E. H. Sander and E. W. Bird (Dept. of Dairy and Food Ind., Iowa State Univ., Ames). *J. Dairy Sci.* **45**, 317–22 (1962). An apparatus and a method are described for the molecular distillation at 250C for 1 hour of food fats and oils without decomposition or polymerization. Seasonal variations in milk fat composition were shown to influence the distillate yield. Distillate yields from mixtures of milk fat, produced in different seasons of the year, and domestic food fats or oils, indicated that molecular distillation can detect additions of these fats or oils but not of coconut oil. If the production season of the milk fat were unknown, a minimum addition of 18–20% domestic food fat or oil could be detected; the detectable amount could well be less than 5% with milk fat produced at certain seasons of the year. Deviations in the refractive indices of the distillates, obtained from milk fat—edible fat and oil mixtures, from those considered normal for milk fat, indicated a possibility of detecting additions of coconut oil but not of domestic food fats or oils. If the production season of the milk fat were unknown, a minimum addition of 30% coconut oil could be detected; the detectable amount could be less than 5% with milk fat produced at certain seasons of the year.

Procedure for cleanup of butterfat prior to analyses for dieldrin residues. W. P. McKinley and G. Savary (Food and Drug Directorate, Dept. of Nat'l. Health, and Welfare, Ottawa, Ont., Canada). *J. Agr. Food Chem.* 10, 229–32 (1962). A procedure is presented for the isolation of dieldrin from 50-gram samples of butter oil. The dieldrin is free enough from extraneous fatty material to be identified by paper chromatography. The procedure consists of partitioning the fat between acetonitrile and n-hexane followed by elution from a Darco G60-Solka Floc column with acetone.

Procedure for the purification of fat samples prior to analyses for DDT, DDE and Rhothane. W. P. McKinley, G. Savary, and Constance Webster (Food and Drug Directorate, Dept. of Nat'l. Health, and Welfare, Ottawa, Ont., Canada). *J. Agr. Food Chem.* 10, 226–29 (1962). A procedure is presented for the removal of pigments and fat from fat extracts, prior to determining residues of DDT, DDE, and Rhothane by qualitative paper chromatographic procedures or by a quantitative colorimetric method. Fats are precipitated from acetone in three stages: one at 5° and two at −70°C. Pigments and remaining traces of fat are removed on a Florisil column. The data show the percentage recovery of the three pesticides from several types of animal fats.

Fatty acid composition of the lipids from pooled, raw milk. R. G. Jensen, G. W. Gander and J. Sampugna (Dept. of Animal Inds., Storrs Ag. Exp. Sta., Storrs, Conn.). *J. Dairy Sci.* **45**, 329–31 (1962). The fatty acid compositions of 106 milk samples taken during the period of June, 1960, to June, 1961, are given as biweekly averages. Analyses were made by gas-liquid chromatography. Seasonal trends were noticeable, with 18:0 and 18:1 higher in the summer than in other seasons. This trend was reversed with 12:0, 14:0, and 16:0. Average values (per cent of total lipids) for the major acids were 4:0—3.75, 6:0—2.22, 8:0—1.17, 10:0—2.54, 12:0—2.81, 14:0—10.06, 16:0—24.97, 18:0—12.07, 18:1—27.09, 18:2—2.39, and 18:3—2.06. Values are given for 11 additional acids.

Analyses of milk fatty acids by gas-liquid chromatography. G. W. Gander, R. G. Jensen and J. Sampugna (Dept. of Animal Inds., Storrs Ag. Exp. Sta., Storrs, Conn.). *J. Dairy Sci.* **45**, 323–28 (1962) A method for the analysis of milk fatty acids, employing separation of methyl and butyl esters by gas-liquid chromatography (GLC), has been developed. The methyl esters were separated on a diethylene glycol succinate (DEGS) column and the butyl esters on an Apiezon L Column with temperature programming, in order to estimate the short-chain esters. Known mixtures of fatty acids and milk fat were analyzed. Average per cent recoveries for the short-chain fatty acids were, as butyl esters: 4:0—61, 6:0—79, 8:0—96. Recoveries for the rest of the common milk fatty acids were approximately 100%. For the analysis of milk fatty acids, butyl esters with suitable correction factors were used to determine 4:0, 6:0, and 8:0, and the rest of the acids were determined as methyl esters.

Relation of linoleate and linolenate to the flavors of autoxidized milk fat. A. M. El-Negoumy, M. S. de Puchal and E. G. Hammond (Dept. of Dairy and Food Ind., Iowa State Univ., Ames, Iowa). *J. Dairy Sci.* **45**, 311–16 (1962). Flavor concentrates obtained by high-vacuum distillation of the fat from autoxidized butter were fractionated by gas chromatography on butanediol succinate. The tallowy flavor of the concentrate was reproduced by recombining three of the 12 gas chromatograph fractions. The first of these components migrated close to octanal on the gas chromatograph and gave an oxidized flavor to milk. The second component migrated close to undecanal and gave a grassy flavor to milk. The third component was 2,4-decadienal, which gave milk an oily flavor. The component which gave an oxidized flavor in homogenized milk at low concentration gave a metallic flavor in the fat phase at higher concentrations. Methyl linoleate was a precursor for the oxidized and oily flavors, and methyl linolenate was a precursor of the grassy flavor. These compounds are probably responsible for the major flavor characteristics of other autoxidized fats and oils.

Effects of the deodorization temperature upon the quality of soybean oil. K. Yasuda, H. Watanabe and T. Tokunga (Nisshin Oil Mills, Ltd., Res. Lab., Japan). *J. Oil Chem. Soc. (Japan)* 11 (1), 2–5 (1962). Soybean oil, after undergoing the refining, bleaching and deodorization, generally develops objectionable flavors and also tends to increase in color during storage. These phenomena, commonly termed ''flavor reversion'' and ''color reversion,'' are very undesirable when soybean oil is used for preparing salad oil. In this paper, effects of the deodorization temperature (240, 270 and 295C) upon the color reversion and other properties of soybean oil were studied with the following results: (1) Increased deodorization temperature causes a progressive decrease in tocopherol content and greater color-stability of the deodorized oil, but it is attended with a progressive lowering of iodine value. As the deodorization temperature becomes higher, the linoleic and linolenic acid content of the deodorized oil decreases, while the conjugated diene content increases, and (2) Increase in deodorization temperature lowers the A.O.M. stability of the deodorized oil. The A.O.M. stability is, however, improved by adding citric acid to the deodorized oil, and (3) the formation of *trans*-isomers becomes more marked as the deodorization temperature becomes higher.

Studies on selective hydrogenation of fatty oils and catalysts. III. Stability comparison of selectively hydrogenated fatty oils. K. Maebashi and M. Yano (Asahi Electro Chemical Co., Ltd., Japan). *J. Oil Chem. Soc. (Japan)* 11 (1), 19–24 (1962). In order to prepare samples for stability tests, hydrogenated fatty oils were treated with boiling, dilute sulfuric acid solution then followed by washing, alkaline refining, activated earth bleaching, and deodorizing. Such refining was found to be satisfactory for the purpose of eliminating copper and other pro-oxidant metals. A routine test for evaluating stability was proposed, comprising of exposing refined and deodorized specimens under direct sunlight or artificial ultra violet light and determining the order of their stability by organoleptic evaluation on the slightly reverted specimens. From the results of the experiments it was found that hydrogenated tallow, lard and finback whale oil developed reversion flavor when their peroxide value were still well under 5 meq./kg. Also an evaluation was made on stability of five hydrogenated finback whale oils having almost the same iodine number (68–69) prepared with Adkins, Cu-Cr (9:1), Cu-Al (3:2), Cu-Ni (9:1) and KW type catalysts.

Study on the reaction of higher fatty acid methyl esters with metallic sodium. VIII. Bouveault-Blanc reduction of oleic, erucic, dibrominated linoleic and linolenic acid methyl esters. M. Fukushima (Nihongi Plant, Nippon Soda Co., Ltd., Japan). *J. Oil Chem. Soc. (Japan)* 10 (10), 635–642 (1961). Bouveault-Blanc reduction of oleic, erucic dibrominated linoleic and linolenic acid methyl esters was studied for the purpose of examining the properties and isomerization of unsaturated fatty alcohols. No geometrical isomer was observed by infrared spectroscopic study in the case of esters of monoethylenic acids such as oleic and erucic acid. With the increase of the number of double bonds the yield of the fatty alcohol slightly decreased. It shows that Bouveault-Blanc reduction has little effect on the double bond of dienoic and trienoic acid esters. From ultraviolet spectroscopy linolenyl alcohol contains more conjugated double bonds than linoleyl alcohol, showing that the higher content of double bonds favors the more rapid conjugation when reduced under the same conditions. When methyl linoleate and linolenate are reduced with an excess of reducing alcohol, more conjugation results than in the case where the reducing alcohol is not in excess.

IX. Bouveault-blanc reduction of methyl α-eleostearate. *Ibid.*, 701–707 (1961). The fatty alcohol was prepared from methyl α-eleostearate by Bouveault-Blanc reduction. The yield of the fatty alcohol was only 83% of theory. The fatty alcohol was separated by liquid chromatography into dienoic and trienoic alcohols. The infrared absorption curves of these two parts showed *cis,trans* conjugated diene and isolated *trans* ethylene, not coresponding to that of original methyl α-eleostearate. The ultraviolet absorption curves of these two samples showed that the dienoic alcohol is mainly composed of conjugated diene and the trienoic alcohol contains less conjugation than the dienoic alcohol. The paper chromatography of oxidation products by potassium permanganate in acetone was studied for the purpose of determining the double bond position of fatty alcohols. It brought about the conclusion that the dienoic alcohol is a mixture of 10,12-octadecadiene-l-ol and 11-octadecene-l-ol, and trienoic alcohol is a mixture of some positional isomers, namely 9,12,15-,9,12,14-9,11,13-octadecatriene-l-ol which were consequently formed by the shift of double bonds. The mechanism of double bonds shift and isomer formation is discussed.

Studies on the preparation of cacao butter-like fat. I. Fractional crystallization of palm kernel oil. T. Tateishi, T. Takatsuki and M. Fujiwara (Fuji Oil Refining Co., Japan). *J. Oil Chem. Soc. (Japan)* 10 (10), 592–596 (1961). It was thought that a cacao butter-like fat could be prepared from palm kernel oil by removing the fraction of low melting point. Selecting acetone and n-hexane as solvents for fractional crystallization, the authors tested the effect of washing the crystals, concentration of solution, and temperature of segregation. Hexane is inferior to acetone for the fractionation of palm kernel oil. During fractional crystallization in acetone, two washings were sufficient. The yield was about 40 per cent and the product had a satisfactory melting point for cacao butter-like fat.

II. Properties of the fractionated palm kernel oil. T. Tateishi, M. Fujiwara and K. Murase. *Ibid.*, 662–665. In this paper, the products from palm kernel oil were examined for the fatty acid composition, cooling curve, micropenetration, solid fat index and stability tests. The fatty acid composition of the fractionated palm kernel oil was compared with those of the original palm kernel oil. The linoleic acid and caprilic acid were reduced to zero, oleic acid and capric acid were decreased, and myristic acid and palmitic acid were increased. Cooling curve, micropenetration and solid content index of the fractionated palm kernel oil showed that the products have a narrow melting range. The AOM stability test showed that the fractionated palm kernel oil was more stable than cacao butter. From the above results, the fractionated palm kernel oil has a satisfactory quality as cacao butter-like fat.

III. Preparation of chocolate using fractionated palm kernel oil. T. Tateishi, M. Fujiwara and S. Nakayama. *Ibid.*, 666–670. The condition for making chocolate using fractionated palm kernel oil, and the quality of the products were investigated. The results were as follows: (1) When making bitter type chocolate, mixing the fractionated palm kernel oil in cacao butter caused melting point lowering, but it was proved that up to 40% of the cacao butter could be replaced with fractionated palm kernel oil, and (2) In the case of cacao-type chocolate, a chocolate was prepared by fractionated palm kernel oil only. The product was of good quality with a higher melting point than that using cacao butter only. It showed good quality as summer chocolate. It was noticed that the fractionated palm kernel oil did not require tempering.

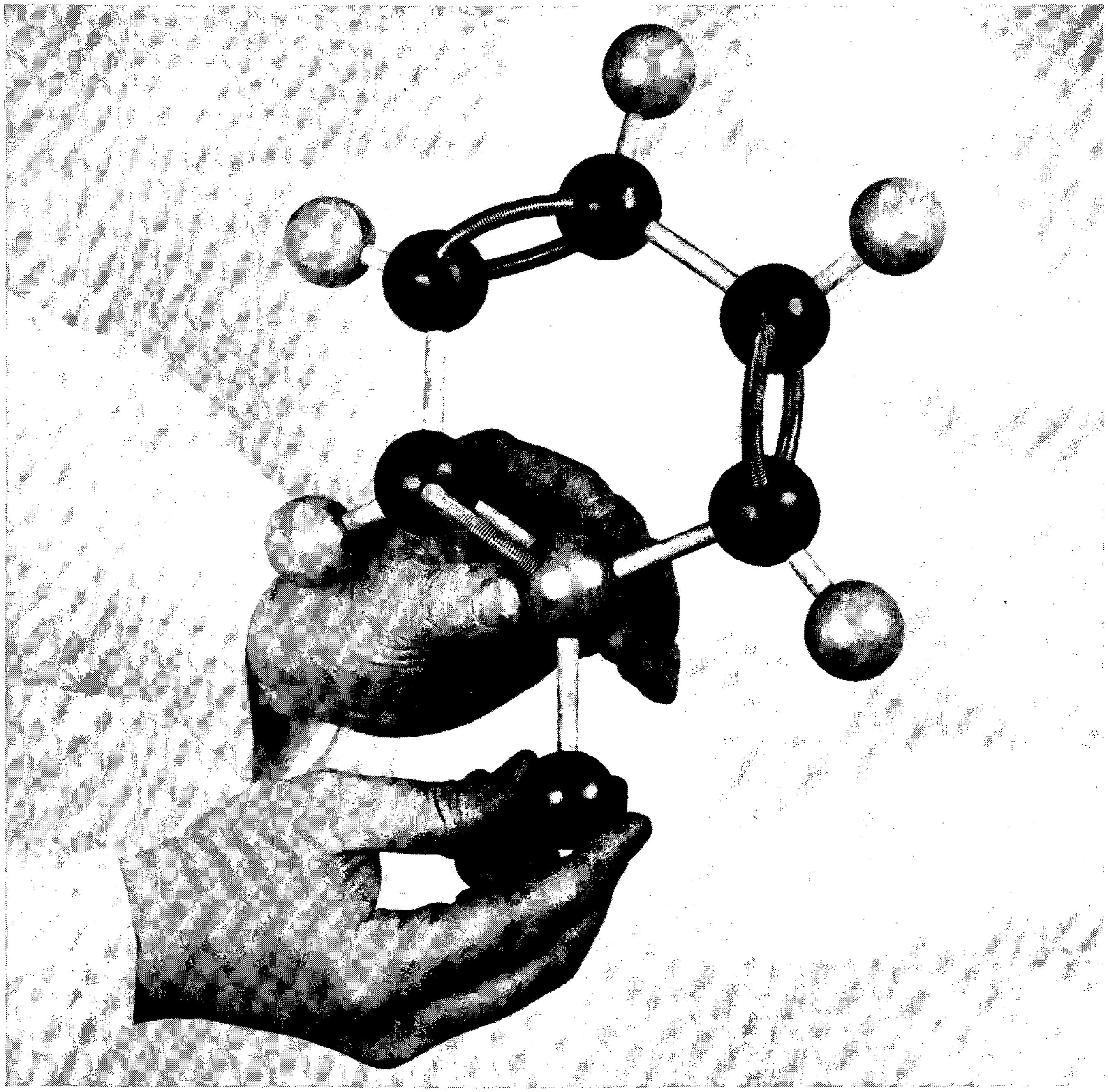
Fatty acid composition of food fats. Joyce L. Beare (Food & Drug Labs., Ottawa, Canada). *J. Agr. and Food Chem.* 10 (2), 120–123 (1962). Gas-liquid chromatography was employed to investigate the nature of the fatty acids present in margarines, spreads, shortenings, and some meat fats. The results obtained from polyester and silicone columns generally agreed, and showed that C_{22} fatty acids were present in 3 of 16 margarines, 6 of 14 spreads, and 1 of 7 shortenings. In these products marine oils appeared to be the main source of the long-chain fatty acids. Fat of animal origin also contained fatty acids of odd-numbered carbons.

Speculations on fishy odors and flavors. M. E. Stansby (U. S. Bureau of Commercial Fisheries, Tehcnological Lab., Seattle, Wash.). *Food Technol.* 16 (4), 28–32 (1962). Many types of fishy odors and flavors occur in fish; there is no predominant odor that is *the* fishy odor. These odors range from those characteristic of the individual species of fish through altered changes as oxidative deterioration of fish oils and lecithin and bacterial or enzymatic degradation. The mechanisms of reaction and the nature of the chemical compounds responsible for fishy odors are still very imperfectly understood. Five experiments are given to attempt to determine the relationship of reactions between nitrogen and oil for the development of fishy odors and flavors. Various sources of nitrogen were used in conjunction with several different fish oils.

Utilization of rice bran oil. VI. Molecular distillation of rice bran oil. Y. Takeshita, Y. Kai, Y. Ono, H. Nakagawa and T. Hamada (Phys. & Chem. Res. Inst. of Japan). *J. Oil Chem. Soc. (Japan)* 11 (2), 52–54 (1962). Rice bran oils having a range of acid values were molecular-distilled. Mono- or diester contents, as estimated from the hydroxyl values of each fraction, were small for each sample of various acid values. Residue from the oil of high acid value contained more unsaponifiable matter of high melting point than that from the samples of medium or low acid value.

Studies on extraction of soybeans by liquid butane. III. Quality of the extraction products. K. Yasuda, H. Watanabe and T. Tokunaga (Nisshin Oil Mills, Ltd. Res. Lab., Japan). *J. Oil Chem. Soc. (Japan)* 10 (9), 527–531 (1961). The butane extraction products from newly harvested soybeans are of good quality. Butane extracted oil is light-colored and has low acid value and lecithin content. The refined, bleached and deodorized oil has good stability showing little reversion tendency. The fatty acid composition of butane extracted oil is practically the same with that of hexane extracted oil. Lecithin from the butane extracted oil is light-colored. Butane extracted meal contains soluble proteins in a proportion of about 90–93% of the total proteins. The superiority of butane extracted oil to that of hexane extracted oil is attributable to preferential extraction of neutral glycerides in addition to the low extraction temperature.

IV. Methods of drying soybean flakes. K. Yasuda and T. Tokunga. *Ibid.*, 630–634. In this paper, results of studies on drying soybean flakes using a through circulation dryer



are reported. This dryer operated under the optimum conditions has been found very effective, giving dried flakes of a moisture content of about 8% or less. The decrease of soluble proteins during drying is only 1% or less (on the basis of total proteins). Data on the design of a 200 ton per day dryer is presented.

Polyunsaturated fatty acids. V. Transformation of double bonds in the thermal isomerization. T. Miyakawa, H. Nomizu and F. Yaku (Osaka Industrial Research Inst., Japan). *J. Oil Chem. Soc. (Japan)* 10 (5), 303–309 (1961). Highly unsaturated fatty acids of more than 4 nonconjugated double bonds were prepared from cuttle fish oils. These acids changed their structure from non-conjugated polyene to conjugated polyene, that is, to *cis-cis-trans* conjugated triene structure, when heated to 200C with agitation by air. When heated at 250C, conjugated diene was formed. The produced triene gave the absorption maxima at 266, 277 and 287.5 $m\mu$ and changed to the conjugated diene form when heated higher than 230C. The compounds of conjugated triene structure were monomeric and distillable at 155–167C/0.01 mm Hg and were easily isomerized to conjugated polyene by 21% KOH-glycol, whereas the conjugated diene bearing compounds were polymeric and were hardly isomerized by alkali.

Studies on the deterioration of frying oils. III. Influence of the temperature on the deterioration. H. Kumazawa (Nagoya Municipal Hygienic Res. Institute, Japan). *J. Oil Chem. Soc. (Japan)* 10 (9), 531–536 (1961). This paper reports that the deterioration of oil was accelerated at higher frying temperatures. Potato chips and wheat flour doughs were fried in corn oil containing no antioxidants or synergists. Frying has been carried out at 170 or 200C to investigate the relationship between deterioration and AOM stability of oils used in frying. Color, viscosity, refractive index, peroxide value, iodine value, carbonyl value and conjugated dienoic acid contents were determined on the used oils. Deterioration indicated by the above values had not progressed so markedly in the test made at lower temperature, but considerable changes were observed in the oil used at higher temperature. The degree of deterioration after three hours frying at 200C corresponded closely with that of five hours at 170C. As a result, higher temperature frying had a great influence upon the deterioration of oil. Regarding the oxidation stability of fried oil by the AOM test, the fried oil at 200C proved to be more stable than that at 170C. A complicated relationship must exist between frying and AOM test.

Volatile products of edible oils by open air heating. I. Volatile substances from soybean oil. B. Toi, S. Ota and N. Iwata (Food Res. Lab., Ajinomoto Co., Ltd., Japan). *J. Oil Chem. Soc. (Japan)* 10 (9), 536–540 (1961). Volatile products formed by open air heating of soybean oil at 240C were identified mainly by gas chromatography. The following substances were found in the volatile products of soybean oil; normal hydrocarbons such as ethane, propane, n-butane, n-pentane, n-hexane, n-heptane, n-octane, ethylene, propylene, 1-butylene, 1-pentene, 1-hexene, 1-heptene, 1-octene and two unknown octenes; methyl-cyclopentane; cyclohexane; benzene; aldehydes such as acetaldehyde, propionic aldehyde, butyric aldehyde, n-valeric aldehyde, n-capronic aldehyde, acrolein, crontonaldehyde; and ketones such as acetone and methyl ethyl ketone.

Studies on the improvement of soybean lecithin. II. The effect of processing and extracting soybean on the quality of paste lecithin. K. Yoshitomi, H. Watanabe and T. Tokunaga (Nisshin Oil Mills, Ltd., Res. Lab., Japan). *J. Oil Chem. Soc. (Japan)* 10 (9), 540–542 (1961). The effects of processing and extracting soybeans on the color of lecithin as the criterion of quality were studied. Browning of soybean lecithin in the miscella desolventizing process was investigated. Considerable coloring of lecithin occurred in the miscella concentrating process followed by further browning in the stripping process. The color of lecithin was improved by dehulling soybeans before extraction and extraction of lecithin at the elevated extraction temperature resulted in a higher yield of a darker product.

The influence of added metals on margarine. The influence of iron. K. Nakazawa, I. Niiya and M. Imuro (Japan Margarine & Shortening Makers Assoc., Japan). *J. Oil Chem. Soc. Japan* 10 (9), 573-578 (1961). Thirty-eight samples of margarine including eleven control samples were prepared from three kinds of margarine-standard margarine, the margarine with skim milk and margarine with antioxidant —each having "A" formulation (containing lauric oil) and "B" formulation (containing soft oil) to which 10, 100, 500 and 1,000 ppm of iron were added in the form of metallic soap. Peroxide value and acid value were measured every two weeks and appearance judged every four weeks for sixteen weeks. Iron had drastic effects on rancidity and increased peroxide value in proportion to the added quantity. Rate of hydrolysis was affected little. Skim milk showed excellent antioxidant properties in margarine, halting oxidation of margarine completely even with samples containing 1,000 ppm of iron in the case of "A" formulation. With "A" formulation, mold appeared quickly, often producing a strong ester odor in the presence of skim milk. But with "B" formulation mold hardly appeared and the ester odor was not produced. Hydrolysis occurred in proportion to the extent of mold, but it was halted by a strong oxidative trend. The effect of antioxidant was observed slightly with "A" formulation, very slightly with "B" formulation.

Alteration of olive cakes ("orujo") during storage. II. Microbiological aspects. J. Gracian, F. Gonzalez, and G. Arevalo (Instituto de las Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 17–27 (1962). The microorganisms present in olive cakes ("orujo") after hydraulic extraction of the oil were isolated, counted, and identified. The results obtained showed a relationship between the number of microorganisms present, the free fatty acid content of the residual oil, and the dryness of the olive cake. The moulds and yeasts present were found to have no influence on the total fat content of the olive cake.

Antioxidant properties of gossypol, dianilinogossypol, and related materials. M. H. Chahine, M. M. Hafez, A. S. Radwan, and N. El Hawary (National Research Centre, Dokki, Cairo, Egypt). *Grasas y Aceites* 13, 10–16 (1962). (In English). The antioxidant properties of gossypol, dianilinogossypol, gossypol acetic acid, mixed tocopherols, BHT, and propyl gallate were compared in olive, corn, and linseed oils. The antioxidant activities of gossypol, dianilinogossypol, and gossypol acetic acid were about equal on a molar basis and were all less effective than mixed tocopherols, BHT, and propyl gallate.

Physical-chemistry studies on ground olive pastes. XII. The action of surface active agents on the pastes. J. M. Martinez, C. Gomez, C. Janer, and R. Caravaca (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 1–9 (1962). Many different surfactants (113) were tested with ground olive pastes to determine if higher yields of oil could be obtained. Several sulfosuccinates, amides, and polyoxyethylene derivatives significantly improved oil yields from certain types of pastes, but no one surfactant was effective with all kinds of pastes.

Autoxidation of oleic acid at 60 and 80c: the volatile products formed and a hypothesis on the mechanism of the degradation of the chain at these temperatures. M. Loury and G. Lechartier (Lab. of Jean Ripert, Inst. of Corps Gras, Paris, France). *Revue Francaise Corps Gras* 9, 133–140 (1962). Pure oleic acid was autoxidized at 60 and 80C. The volatile products were analyzed. The usual aldehydes and acids were found whose presence can be explained by the scission of the classic peroxide, but there was also a considerable quantity of formic acid. The amount of formic acid detected was probably low since formic acid is easily oxidized to carbon dioxide in the presence of the peroxide radical. The authors postulate a mechanism to explain the presence of large quantities of formic acid by the existence of several forms of transitory diperoxides in the oleic acid chain.

Gas chromatography of a number of less common fats and oils. A Prevot and F. Cabeza (Inst. du Corps Gras, Paris, France). *Revue Francaise Corps Gras* 9, 149–152 (1962). The fatty acid composition of a number of fats and oils not commonly encountered is presented. The materials investigated were horse fat, fat extracted from corn gluten, fat of the apricot kernel, fat of sweet almond and the fat of *Voantamenaka, Lallementia Imberica,* and *Calaphyllum,* the fat of the endosperm of grapes, the fat of olive seeds, and the fat from the kernels of *Parinarium macrophyllum* were also analyzed.

Simple vacuum distillation procedure for determination of the volatile carbonyl content of autoxidising edible fats. C. H. Lea and P. A. T. Swoboda (Low Temperature Research Sta., Cambridge). *J. Sci. Food Agr.* 13, 148–58 (1962). A vacuum distillation procedure is described which, when applied to 10 g. of fat, will recover quantitatively added aliphatic aldehydes ranging in volatility from propanal to dodecanal at a concentration of 0.1 μmole/g. With autoxidizing fats the method estimates, more directly than chemical tests for rancidity in present use, the class of substances responsible for rancid and reverted off-flavors.

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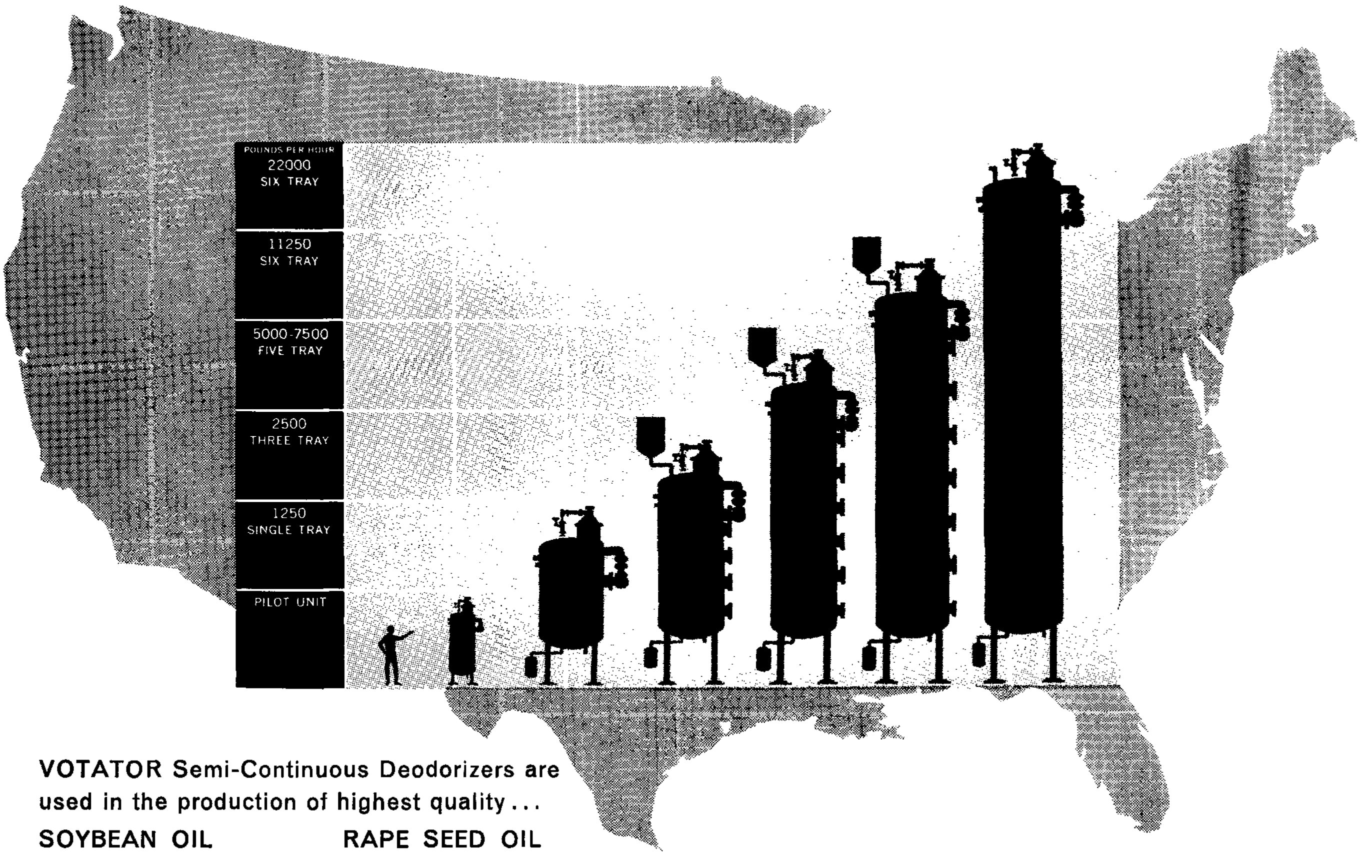

POUNDS PER HOUR
22000 SIX TRAY
11250 SIX TRAY
5000-7500 FIVE TRAY
2500 THREE TRAY
1250 SINGLE TRAY
PILOT UNIT

Vegetable oils. X. Examination of component acids of argemone mexicana seed oil by reversed-phase chromatography. R. C. Badami and F. D. Gunstone (The University, St. Andrews, Fife). *J. Sci. Food Agr.* 13, 255–7 (1962). Samples of argemone oil from Jamaica and from India were found to contain myristic acid (0, 1), palmitic (9, 12), stearic (5, 5), arachidic (0, 1), oleic (33, 23), and linoleic acids (53, 58%, respectively). It appeared unlikely that the oil contained ricinoleic or any other hydroxy acid except perhaps in very small amounts (1–2% at most); even this may have been produced by atmospheric oxidation.

Method of making margarine. F. E. Elwood, W. H. Clune, and W. L. Schaub (Corn Products Co.). *U. S. 3,033,689.* In a process for the manufacture of margarine substantially free from occluded air a predetermined quantity of superchilled liquid margarine emulsion is continually passed to an elongated solidification and heated molding zone having the cross-sectional area of the final print. The liquid margarine is fed to the molding zone so that a portion of the solidified margarine corresponding to the final print size is discharged intermittently. The solidifying margarine is subdivided to final print size as it is being discharged from the molding zone.

Method for preparing bakery products using mixed partial ester compositions. N. H. Kuhrt and R. A. Broxholm (Eastman Kodak Co.). *U. S. 3,034,897.* Incorporated into the baking mix prior to baking is 0.1 to 3% by weight of a partial ester composition composed predominantly of concurrently solidified fatty acid monoesters of glycerol and 1,2-propanediol. The partial ester composition contains 33–60 mole % of monoesters of glycerol and 40 to 65 mole % monoesters of 1,2-propanediol, a substantial portion of the glycerol monoesters being in a normally unstable polymorphic form. The fatty acid moieties consist essentially of saturated fatty acids having 16 to 20 carbon atoms; at least 75% of the fatty acids of the glycerol esters are the same as the fatty acids of the propanediol esters. Less than 5% of the fatty acid moieties are unsaturated. *U. S. 3,034,898* by the same inventors describes a process for preparing a partial ester composition in which a substantial portion of the glycerol monoesters are in a normally unstable polymorphic crystalline form.

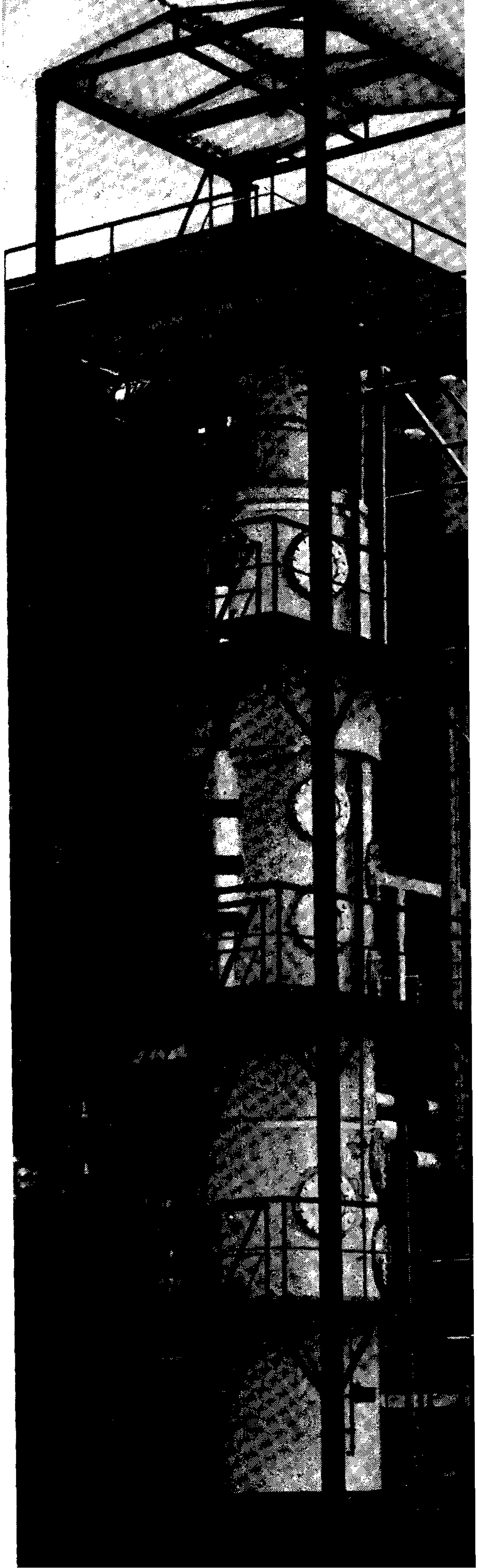
Blue cheese flavoring composition. V. S. Bavisotto (Chas. Pfizer & Co., Inc.). *U. S. 3,034,902.* A flavoring composition having the flavor and aroma of blue cheese consists of a first concentrate including stabilized cottonseed oil 80%, acetone 3, 2-pentanone 3, 2-heptanone 1.5, 2-octanone 1.0, 2-nonanone 1, 2-undecanone 0.5, ethanol 1.0, acetaldehyde 0.04 parts by weight and a second concentrate containing stabilized cottonseed oil 27.9, butyric acid 16.8, caproic acid 24.1, caprylic acid 5.7, and capric acid 15.5 parts by weight. Betwen 0.018 and 0.9 parts by weight of the first concentrate and between 0.22 and 0.45 parts of the second concentrate are combined with 100 parts of the product to be flavored.

• Fatty Acid Derivatives

Process for simultaneous oxidation and esterification of unsaturated fatty acids. G. Piekarski and H. Reinecke (Wacker-Chemie G.m.b.H.). *U. S. 3,031,480.* A process for the prdouction of ester acids having an iodine number below 3 and an epoxy oxygen content below 1% consists of reacting a long chain unsaturated fatty acid containing 10–22 carbon atoms with hydrogen peroxide in the presence of acetic acid and an esterification catalyst such as sulfuric or sulfonic acid at a temperature between 70 and 85C. The quantity of hydrogen peroxide is at least 1 mol per mol of double bond of the unsaturated fatty acid, acetic acid about 0.5 to 1 mol per mol of the double bond, and the catalyst 1.5 g to 8.5 g per mol of the double bond of the unsaturated acid.

Preparation of conversion products of ricinoleates. W. Stein and H. Hennig (Henkel & Cie, G.m.b.H.). *U. S. 3,031,482.* A ricinoleic compound (alkali metal salt of ricinoleic acid, castor oil or castor oil fatty acid) is heated to a temperature of about 150–450C in the presence of an alkali metal hydroxide and a catalyst in the form of an alloy having a melting point below the reaction temperature. The alloy consists of 5–95% by weight of an active metal selected from the group of lead, bismuth and thallium and at least one second metal selected from the group consisting of a different member of the last mentioned group, cadmium, indium, tin and antimony.

Nutritive food glaze. J. J. Alikonis. *U. S. 3,302,422.* The described composition consists of an aqueous alcohol-soluble prolamine and a mixture of mono- and di-glycerides of edible fats and oils having a mono-glycerides content of at least about 65% by weight.



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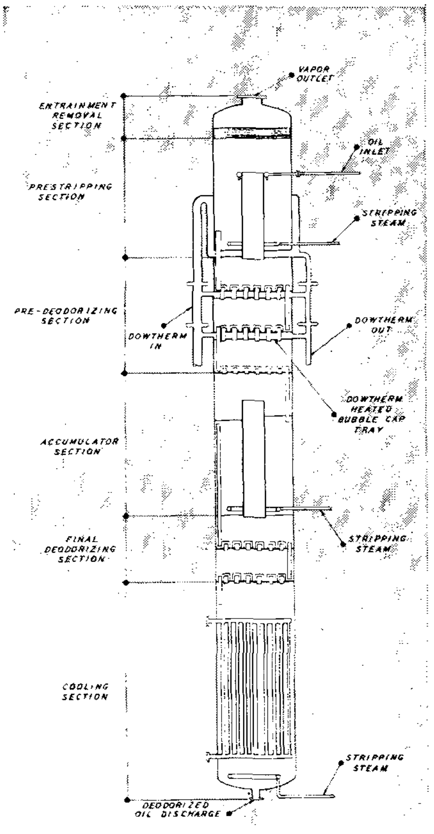

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• Drying Oil and Varnishes

ALUMINUM SOAPS FROM VARIOUS HIGHLY UNSATURATED FATTY ACIDS. G. Marwedel (Schramberg). *Farbe und Lack* **68**, (1962). It is possible to manufacture about 40% concentrations of aluminum soaps from many fatty acids. These soaps have quite good compatibility with most fatty oils and alkyd resins. It is, however, necessary to use only certain solvent combinations. The bulking properties of different aluminum soaps and their combination with oil solvents are examined. In many cases an improvement was obtained, while in other cases, there was no deterioration in bulking even with additions of 10–20%. This is important in that the addition of aluminum soaps aids the flash and deep drying of binders containing oil without the usual phenomena of over-siccativation occurring. Lasting elasticity and adhesion are obtained even with stove enamels.

TUNG OIL-LATEX COATING. C. A. Murray, C. R. Campbell, and A. C. Richard (Crosby Forest Products Co.). *U. S. 3,033,808.* A coating composition composed essentially of a pigmented synthetic latex aqueous oil-in-water emulsion paint has up to about 50% of the latex emulsion component replaced by emulsified raw tung oil containing an emulsifying agent of the oil-in-water type.

CONDENSATION PRODUCTS OF AN EPOXIDIZED FATTY OIL AND AN ALKYLENE POLYAMINE. R. W. Fulmer (General Mills, Inc.). *U. S. 3,035,000.* Described is a condensation product of (A) a polycarboxylic acid selected from the group of polymeric fat acids and non-fatty polycarboxylic acids in which the carboxyl groups are separated by 3 to 8 carbon atoms and (B) a condensation product of an epoxidized fatty oil and a polyamine having the formula $H_2N(RNH)_xH$ where R is an alkylene radical having from 1 to 8 carbon atoms and x is an integer from 1 to 6, the condensation reaction being carried out at a temperature of 100 to 300C.

TREATMENT OF EPOXY FATTY COMPOSITION. T. W. Findley, J. L. Ohlson, and F. E. Kuester (Swift & Co.). *U. S. 3,035,069.* An epoxidized triglyceride is reacted with an aliphatic alcohol in the presence of a boron trifluoride or stannic chloride catalyst. The alcohol is present in sufficient quantity to prevent polymerization of the fatty glycerides.

• Detergents

THE PHYSICAL-CHEMICAL MECHANISM OF DETERGENCY. C. Gomez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* **13**, 28–37 (1962). A review.

PHOSPHATE SURFACTANTS—PROPERTIES AND USES. R. L. Mayhew and F. Krupin (Antara Chemicals, Div. of General Aniline & Film Corp.). *Soap Chem. Specialties* **38** (4), 55–8, 93, 95 (1962). This is the first part of a review dealing with a group of complex phosphate ester surfactants which have evolved from research work at General Aniline & Film Corp. These detergent formulations offer built-in rust inhibition, dedusting properties, and good stability to alkaline builders.

BUILT NONIONIC LIQUID DETERGENTS. PART II. D. B. Fordyce, R. E. Wolfrom, and J. Dupre (Rohm & Haas Co.). *Soap Chem. Specialties* **38** (4), 59–62 (1962). The use of small amounts of alkali-soluble acrylic emulsions makes it possible to prepare stable, built liquid detergent formulations with nonionic surfactants. Such formulations find use in liquid laundry detergents, dishwashing formulations, waterless hand cleaners, liquid scouring cleaners, and latex paints.

PREPARATION OF BARIUM SULFONATES. L. A. Bryan and C. B. Miles (FMC Corp.). *U. S. 3,031,497.* Insoluble barium compounds (sulfate, sulfite, or carbonate) are decomposed by heating with a source of silicon dioxide at a temperature between 1,300 and 1,500C in a barium to silicon ratio of from 1.1:1 to 3:1 to produce a polybarium silicate. The polybarium silicate is then reacted with an oil-soluble organic sulfonic acid derived from a hydrocarbon having at least 18 carbon atoms (or an ammonium or alkali metal salt of the acid) in the presence of water and a hydrocarbon solvent at refluxing temperatures. Barium salts of the organic sulfonic acids and a silicon dioxide-containing residue are recovered, and the residue is recycled as a source of silicon dioxide.

PREPARATION OF DETERGENT COMPOSITIONS. P. J. Pengilly (Procter & Gamble Co.). *U. S. 3,031,498.* The process for the preparation of a detergent composition of low inorganic salt content in which the reaction mixture is obtained by sulfonation of alkylbenzene having an alkyl group of 8 to 20 carbon atoms to form a sulfonic acid phase and an aqueous sulfuric acid phase consists of the following steps: (1) separating the aqueous phase and removing it from the reaction mixture; (2) mixing the reaction mixture with at least 20% of its own weight of a lower alkyl aliphatic solvent (C_1 to C_4 alcohol or ketone), an agent such as caustic soda, soda ash, potassium carbonate or bicarbonate, etc. in an amount at least sufficient to react with the free sulfuric acid present so as to form a crystallizable sulfate which precipitates, and water; (3) separating the precipitated material; and (4) neutralizing the sulfonic acid and working up the desired product.

NONIONIC SURFACE ACTIVE AGENT. S. B. Crecelius (Economics Laboratory, Inc.). *U. S. 3,031,510.* A nonionic surfactant having hydrophilic and hydrophobic groups is produced by a process which consists of reacting trihydroxy mixed poly (oxyethylene oxy-1,2-propylene) ether of glycerol in which the ethylene oxide represents from 20 to 80 mol % and from 8 to 300 oxyalkylene groups per glycerol nucleus with an epoxy compound such as butylene oxide, epichlorohydrin, styrene oxide, epoxystearyl alcohol, or 1,2-diisobutylene oxide and a catalyst. The mixture is heated to a temperature of from 130–180C. After the reaction the resulting nonionic surfactant, containing from 25–45% by weight of the added epoxy compound, is separated.

AMMONIUM SOAPS OF TUNG OIL ACIDS AS A FUGITIVE EMULSIFIER AND STICKING AGENT. R. S. McKinney and L. A. Goldblatt (Sec'y of Agr., U.S.A.). *U. S. 3,032,467.* An insecticidal spray formulation consists of an aqueous emulsion of an active ingredient to be spread and the ammonium soaps of tung oil fatty acids as a fugitive emulsifier and sticking agent.

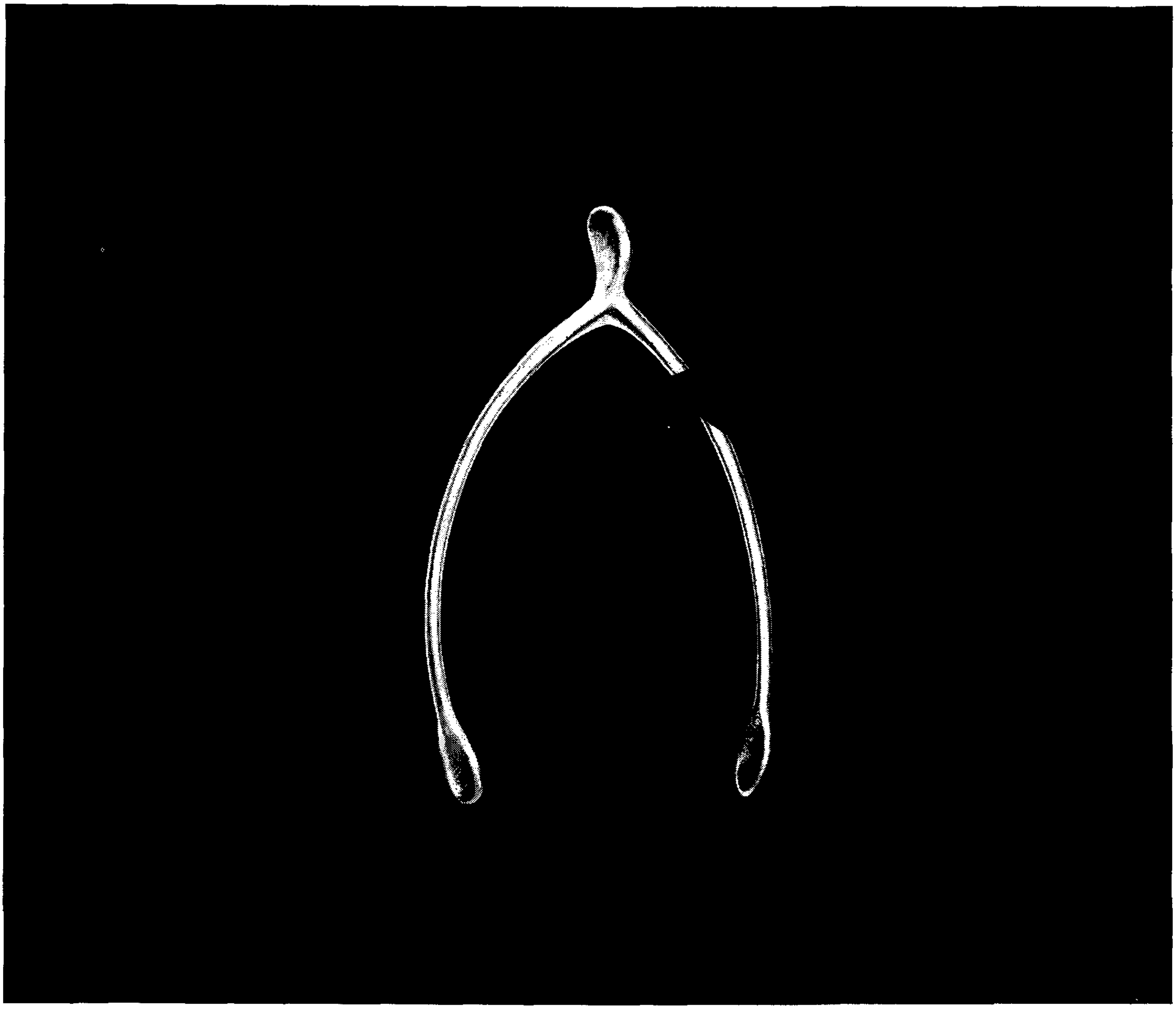
DETERGENT COMPOSITION HAVING IMPROVED FOAM-STABILITY. E. L. Brown (Monsanto Chemical Co.). *U. S. 3,032,506.* A foam-stable detergent composition consists of the combination of a mixture of (1) from 90 to 99.925% by weight of a compound such as sodium alkyl benzene, alkyl toluene, or alkyl xylene sulfonate, in which the alkyl group has from 5 to 18 carbon atoms and (2) from 0.075 to 10% of hydrolyzed polyacrylonitrile.

DETERGENT COMPOSITION. E. B. Michaels (Stamford Chemical Industries, Inc.). *U. S. 3,034,989.* An improved multi-component cleansing and laundry detergent composition, substantially water insoluble, consists of: (a) 1 to 3 parts of a synthetic anionic or nonionic detergent; (b) 1 to 3 parts of an ethylene oxide ether having the general formula R-A-O-$(CH_2CH_2O)_x$-H where R is an alkyl group of from 8 to 12 carbon atoms, A is a radical selected from the class consisting of disubstituted phenyl and ethylidene and x is an integer from 1 to 3; (3) 1 to 3 parts of a polyalkoxy dihydric alcohol; and (d) 1 to 10 parts of an alkali metal polyphosphate.

• Biology and Nutrition

VITAMIN K REQUIREMENTS OF THE GROWING PUP. A. J. Quick, G. E. Collentine, Jr. and Clara V. Hussey (Dept. of Biochem., Marquette Univ. School of Med., Milwaukee, Wisconsin). *J. Nutrition* **77**, 28–32 (1962). The vitamin K requirement of growing pups was studied by inducing a severe deficiency by means of cholecystnephrostomy and testing the amount of vitamin K that had to be injected intravenously daily to obtain and maintain a normal prothrombin time. Two pups were operated at the age of three months and one at 4 months. The vitamin K_1 requirement shortly after the operation when the pups were still in the active growth stage was 10 μg or greater/kg of body weight. As the animals matured and attained a constant body weight, the requirement decreased to less than 5 μg. The greater need for vitamin K of the growing pup than that of the adult dog suggests a relationship to growth.

COCONUT OIL MEAL AS A PROTEIN SUPPLEMENT IN PRACTICAL POULTRY DIETS. O. A. Thomas and M. L. Scott (Dept. of Poultry Husbandry, Cornell Univ., Ithaca, N.Y.). *Poultry Sci.* **41**, 477–85 (1962). The results of this investigation show that copra meal can be used at relatively high levels in poultry diets. The use of copra meal, however, requires careful formulation in order to insure a balance of all nutrients. These results show that copra meal does not contain a toxic or growth depressing activity. When properly supplemented and balanced in terms of all nutrients, starting diets containing 40% copra meal supported growth equal to that obtained with chicks fed a soybean oil meal, fish meal, meat scrap diet. The results of these experiments show that when copra meal is properly supplemented so that the diet is complete in all



known nutrients good growth and feed conversion are obtained. The results of these experiments also demonstrate the necessity of an adequate amount of dietary energy and a balance of other nutrients to energy. Good growth and feed conversion were obtained with diets containing 40% copra meal in a high energy diet. No growth depressing effects were observed from copra meal under these conditions; therefore, the poor response obtained from copra meal diets by other investigators cannot be attributed to a toxic material in the copra meal but was probably due to an inbalance of a number of nutrients in the diets.

CORRELATION OF DIET AND SERUM CHOLESTEROL LEVEL WITH SERUM LIPID FATTY ACID COMPOSITION. Leon Swell, P. E. Schools, Jr. and C. R. Treadwell (V. A. Center, Martinsburg, W. Va. and Dept. of Biochem., School of Med., George Washington Univ., Washington, D. C.). *Proc. Soc. Exp. Biol. and Med.* **109**, 682–85 (1962). The findings suggest that the level of linoleic acid in the diet, age, and possibly other factors may influence the serum cholesterol level and fatty acid composition of the serum lipid fractions.

EFFECT OF DIETARY FATS AND VITAMIN E ON OXIDATIVE DENATURATION OF SERUM LOW DENSITY LIPOPROTEINS. T. Nishida and F. A. Kummerow (Dept. of Food Tech., Univ. of Ill., Urbana). *Proc. Soc. Exp. Biol. Med.* **109**, 724–28 (1962). The stability or lability of serum low density lipoproteins appeared to be greatly affected by dietry fat and by the presence or absence of vitamin E. The low density lipoproteins from the serum of chicks which had been fed corn oil stripped of vitamin E under high vacuum were less stable *in vitro* toward oxidative denaturation catalyzed by hemin than the lipoproteins obtained from the serum of chicks fed hydrogenated coconut oil. Although a dietary source of tocopherol partially prevented the oxidative denaturation of serum low density lipoproteins in chick serum, a decrease in the content of unsaturated dietary fat prevented more effectively the oxidative denaturation of serum low density lipoproteins. The percentage of linoleic C_{20} tetraenoic acids in the lipid moiety of the low density lipoproteins as determined by gas chromatography of the methyl esters was shown to be dependent on the percentage of linoleic acid in the dietary fat and was shown to be the most important factor which influenced the stability of the low density lipoproteins. Dietary fats rich in linoleic acid, therefore, should be stabilized with a sufficient amount of vitamin E in order to prevent possible *in vivo* peroxidation of serum and tissue lipoproteins.

FACTORS INFLUENCING THE NUTRITIONAL VALUE OF FISH FLOUR. I. EFFECTS OF EXTRACTION WITH CHLOROFORM OR ETHYLENE DICHLORIDE. A. B. Morrison, Z. I. Sabry and E. J. Middleton (Food and Drug Labs., Dept. of Natl. Health and Welfare, Ottawa, Canada). *J. Nutrition* **77**, 97–104 (1962). Samples of fish flour prepared from cod, herring, rosefish or caplin by a procedure involving the use of chloroform and isopropyl alcohol were superior to casein at the 5 and 10% protein levels, but were toxic to growing rats at the 20% protein level. The toxicity was readily removed by reducing the organic chloride content of the samples with ether extraction, but was resistant to removal by prolonged heating. It was concluded that the process used can markedly influence the nutritional value of fish flour.

OBSERVATIONS ON THE INFLUENCE OF DIET AND AGE UPON LIVER LIPID CHANGES IN THE CHICK. J. E. Marion and H. M. Edwards, Jr. (Poultry Dept. Univ. of Georgia, Athens, Georgia). *J. Nutrition* **77**, 23–7 (1962). Average body weights of chicks at 28 days of age were higher when dietary protein was raised from 15 to 25% and when 5% of corn oil was added isocalorically to a low-fat diet. Feed efficiency for the 4-week period was greater with the high-protein and corn oil-supplemented diets, whereas mean liver weights and liver lipid levels were lower with the same diets. The high percentage of lipid content noted in the livers of newly hatched chicks decreased rapidly with time, with the rate of decrease depending on adequate levels of both dietary protein and fat. The change in the percentage of fatty acid composition of the liver from zero to 28 days of age was dependent upon the presence of dietary fat, and to a lesser extent upon protein level of the diet. The liver fatty acid composition tended to reflect the fatty acid composition of the diet when corn oil was fed. Arachidonic acid was especially affected by both age and diet.

ETIOLOGY OF EXUDATIVE DIATHESIS, ENCEPHALOMALACIA, AND MUSCULAR DEGENERATION IN THE CHICKEN. L. J. Machlin and R. S. Gordon (Monsanto Chem. Co., St. Louis 66, Mo.). *Poultry Sci.* **41**, 473–77 (1962). A review of our present knowledge concerning the effects of various nutrients on the development of vitamin E deficiency symptoms in the young chicken is presented. It was concluded that it is now possible to define the nutritional conditions whereby deletion or addition of specific nutrients will produce only one of the classical vitamin E deficiency symptoms in the young chicken. Diets low in vitamin E and/or certain antioxidants must be used. In addition, in order to produce exudative diathesis, the selenium content of a diet should be low (less than 0.1 ppm.); to produce encephalomalacia, the diet should contain at least 1.5% linoleic and/or arachidonic acid; and to produce muscular degeneration, the diet should be deficient in cystine or total sulfur amino acids. The effect of several other nutrients on the development of these symptoms is also summarized.

Influence of short-term heating on composition of edible fats. D. Kritchevsky, Shirley A. Tepper and J. Langan (The Wistar Inst. of Anatomy and Biol., Philadelphia, Pa.). *J. Nutrition* 77, 127–30 (1962). A number of edible fats were heated at 235 ± 5C and the extent of hydrolysis determined after 20, 40, 60, 90 and 120 minutes. There was some hydrolysis in all cases, but the extent of hydrolysis of any individual fat does not appear to be correlated with composition, iodine number or initial free fatty acid titer. Starting free fatty acid titers ranged between 0.03% (coconut oil) and 2.13% (cod liver oil) and increased as high as 17.8% (cod liver oil), although in most cases free acid titers after two hours of heating were below 1%. Several specially hydrogenated fats were also tested and on heating, behaved like the commercially available materials. There was very little change in iodine value during the heating experiment. Moisture content of the fat appeared to affect hydrolysis. The free fatty acid content of several foods prepared by deep-frying was also determined. Our recent observation that the free fatty acid content of the diet affected the severity of atherosclerosis in cholesterol-fed rabbits was the stimulus for these studies.

Levels of lipoprotein in chicken plasma. K. Homma and S. Kato (Dept. of Animal Physiology, Faculty of Agric., Nagoya Univ., Anzyo, Japan). *Poultry Sci.* 41, 608–14 (1962). Determinations of plasma lipoproteins of hens and roosters were made using macromolecular dextran sulfate as a specific precipitating agent for lipoproteins of high lipid content. The precipitated lipoproteins did not contain any albumin fraction and showed a fairly constant composition. The concentratons of the precipitable lipoproteins in plasma were very low in nonlaying hens and roosters, less than 1 g. % in molting hens, and 1 to 4 g. % in most laying hens. The degree of ovarian activity as expressed by the number of ovarian follicles in the rapid growth phase, exhibited a positive correlation to levels of the precipitable lipoproteins of the plasma. Increasing amounts of estrogenic substances secreted from the follicles in the rapid growth phase may be responsible for the rise in the precipitable lipoproteins in hen plasma that occurs in association with egg laying.

Metabolizable energy value and utilization of different types and grades of fat by the chick. M. P. Cullen, O. G. Rasmussen and O. H. M. Wilder (Div. of Animal Feeds, Amer. Meat Inst. Foundation, Univ. of Chicago, Chicago, Ill.). *Poultry Sci.* 41, 360–67 (1962). Metabolizable energy, absorbability and effect of growth and feed conversion have been measured on a number of fat samples including different grades of tallows and greases, hydrolyzed animal and vegetable fat, and methyl ester of fatty acids when fed to chicks. Energy and absorbability values were measured when the fats were incorporated into a semipractical diet, and three samples were also tested in a semi-purified diet. Average values for metabolizable energy in calories per pound are given for the fats used. Also the apparent absorbabilities of the fats tested are given. In practical feeding tests, all groups of chicks in a second test performed better than those in the first test except those fed a dark-high-acid tallow. It is concluded that any of the grades of animal fat or hydrolyzed animal and vegetable fat that are commonly found on the market will give satisfactory results. Such materials as tallow fatty acids and dark-high-acid tallow were special products which did not perform as well as the other grades of fat.

Effect of triparanol on calcium and cholesterol levels in the blood sera of laying hens. S. Nelson, R. E. Clegg and P. E. Sanford (Kansas State Univ., Manhattan, Kan.). *Poultry Sci.* 41, 664–68 (1962). Laying hens administered triparanol for 10 days exhibited no significant variation in serum calcium levels from those of normal hens. Triparanol did affect the serum cholesterol levels of hens, raising them about 90% by the 10th day of administration of the drug. These levels returned to normal by about 16 days after the drug had been discontinued. By the 10th day of triparanol administration, the yolks and eggs of experimental hens had begun to exhibit a decrease in size, and the rate of egg production was slowed down. Rate of egg production and egg size returned to normal about 16 days after the triparanol was discontinued.