ABSTRACTS

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

• Fats and Oils

CHEMISTRY AND TECHNOLOGY OF EDIBLE FATS, II. S. Anselmi (Istituto di Sanitá, Rome) and A. Montefredine. *Olearia* **15**, 293–307 (1961). A review with detailed comments on the nutritional and biological effects of hydrogenation, trans isomers, transesterification, and oxidized fats.

PURITY OF OLIVE OIL AS AFFECTED BY OIL PRODUCTION TECHNIQUES. O. T. Rotini (Univ. of Pisa). *Rivista Ital. delle Sostanze Grasse* **38**, 532–40 (1961). A review of the effects of refining and esterification on the biological properties of edible olive oil.

RECENT DEVELOPMENTS IN LIPOCHEMISTRY. C. Paquot (Lab. de Lipochimie CNRS, Bellevue). *Rivista Ital. delle Sostanze Grasse* **38**, 518–31 (1961). A detailed review of recent work on the chemistry of lipo compounds, stressing the wide ranging development of this branch of organic chemistry, whose scope goes beyond the traditional field of edible products and detergents.

VARIATIONS IN THE CHARACTERISTICS OF EDIBLE OILS INDUCED BY REFINING. V. G. B. Martinenghi (Fats Research Inst., Milan). *Olearia* **15**, 308–11 (1961). Experiments on olive oil have shown that formation of brown color on HNO_3 addition (Hauchecorne reaction) is not specifically due to the presence in the oil of esterified fatty acids but is an index of alteration of unidentified color forming compounds accompanying natural oils. This alteration can be caused by the refining chemicals, by autoxidation, or by thermal action.

COLORIMETRIC ANALYSIS OF PEROXIDES IN OXIDIZED FATS. J. Pokorny (Inst. of Food Technology, Prague). *Rivista Ital. delle Sostanze Grasse* **38**, 482–83 (1961). The oxidized fat whose peroxide content is to be determined is dissolved in a mixture of propionic acid and chloroform containing a small amount of lactic acid. Titanium tetrachloride is used as a selective reagent for the determination of the peroxides, giving a yellow coloration. The lactic acid serves the purpose of stabilizing the color, which tends to be destroyed through formation of peracids.

ANALYSIS OF PEROXIDES IN FATTY ACIDS BY PAPER CHROMATOGRAPHY. J. Pokorny (Inst. of Food Technology, Prague). *Rivista Ital. delle Sostanze Grasse* **38**, 484 (1961). Oxidized ethyl esters of sunflower oil fatty acids were chromatographed on paraffin impregnated paper, using aqueous solutions of pyridine, methanol, or acetic acid as developers. At least 3 different types of peroxides were identified: monohydroxyperoxides, cyclical diperoxides, and polymerized peroxide compounds.

TRACE ANALYSIS OF BHA AND BHT IN FOOD PRODUCTS. K. G. Sloman, R. J. Romagnolia, and J. C. Cavagnol (General Foods Corp., Tarrytown, N. Y.). *J. Assoc. Offic. Agr. Chem.* **45** (1), 76–80 (1962). The method presented in this paper was developed for quality control of butylated hydroxyanisole and butylated hydroxytoluene, which requires a reasonably fast, accurate, and simple procedure. The upper limit of each antioxidant in the samples to be tested was 10 ppm. The Filipic and Ogg's steam distillation through a magnesium oxide suspension has been combined with two simple concentration steps and the use of selective reagents for the two antioxidants to provide a general method for either or both of them. To prevent the adsorption of very small quantities of BHT in the magnesium oxide suspension, it was found necessary to heat the suspension. To prevent small losses of BHT as occurs in a standard steam distillation, isopropyl alcohol was added to the distillation flask to provide a more rapid distillation at a lower temperature. For color reactions of the antioxidants the Gibbs reagent is used for BHA and the 3,3'-dimethoxybenzidine method suggested by Szalkowski and Garber was used for BHT.

THE "BANCO" TEST: A RAPID METHOD FOR FAT IN MEAT AND EDIBLE MEAT PRODUCTS. B. B. Anderson, L. L. Robinson, and J. E. Hodgkins (Anderson Labs. Inc., Fort Worth, Texas). *J. Assoc. Offic. Agr. Chem.* **45** (1), 13–17 (1962). A simple, rapid, and accurate method is presented for determining the fat content of edible meats and meat products such as hamburger, pork trimmings, and various types of sausage and meat loaf. The quantitative method, based on the principle of the "Detergent Test" for the determination of fat in milk and milk products, has been developed for the determination of fat in meat and meat products. The method is rapid and non-hazardous, and has proved to have an excellent degree of accuracy and reproducibility. The usual application requires about 30 minutes, compared to about 6 hours for the standard AOAC method.

GAS-LIQUID CHROMATOGRAPHY: THE INTRODUCTION OF SAMPLES, THE PRECONDITIONING OF POLYESTER LIQUID PHASES, AND THE MEASUREMENT OF R_f VALUES IN THE ANALYSIS OF FATTY ESTERS. T. Gerson (Fats Research Lab., Dept. of Scientific and Industrial Res., Wellington, New Zealand). *J. Chromatog.* **6**, 178–181 (1961). This paper describes some improvements in the operation of gas-liquid chromatography relating to the preconditioning of polyester columns, the ease and accuracy of introducing the samples within a capsule at the top of the column, the consequences of overloading an ionization detector, and a method of accurately determining unpublished R_f values of methyl esters of fatty acids.

EXTRACTING AND REFINING AVOCADO OIL. G. M. Montano, B. S. Luh, and L. M. Smith (Dept. of Food Sci., Univ. of Calif., Davis). *Food Technol* **16**, 96–101 (1962). A method of direct extraction of fresh avocado tissues with a mixture of 95% ethanol and Skellysolve B (3:2 v/v) was investigated. Ethanol dehydrates the tissues, facilitating extraction. A need for preheating, drying, and grinding is thereby eliminated. Avocado oil so obtained was refined by alkali treatment and bleaching. The changes in tocopherol, phosphatides, chlorophyll, peroxide value, and iodine number of the oil during refining and bleaching are presented.

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO THE ANALYSIS OF OILS AND FATS. J. W. C. Peereboom (Government Dairy Station, Leiden, The Netherlands). *Chem. Weekblad* **57**, 625–30 (1961). A survey is given of the different applications of thin-layer chromatography (TLC) to the analysis of oils, fats, and several fat-based chemicals. Separations by TLC of fatty acids, different kinds of glycerides, soybean lecithin, styrene modified oils, and emulsifiable oils are presented. Components of the unsaponifiables of oils and fats can be separated in solvents like isooctane-ethyl acetate (85:15). These chromatographic "fingerprints" can be used for the analysis of mixtures of oils and fats. The sterol-free unsaponifiables may be used for the same purpose. Analysis of fat soluble food additives such as antioxidants or fat soluble dyestuffs is presented. A method for the detection of 0.05 per cent tricresyl phosphate in olive oil is discussed.

THEORY OF MINIMUM TIME OPERATION IN GAS CHROMATOGRAPHY. J. C. Giddings (Univ. of Utah, Dept. of Chem., Salt Lake City, Utah). *Anal. Chem.* **34**, 314–19 (1962). The theory of minimum analysis time for packed and capillary columns is developed with particular emphasis on the role of the column pressure drop. Using a previously derived equation for the effect of pressure gradients on plate height, this analysis shows that the column outlet should be held under vacuum for optimum performance. The column inlet should be maintained somewhat higher than the critical pressure, P_c, the inlet pressure below which a separation can never be obtained. Using optimum inlet and vacuum outlet pressure, the best carrier gas is found as that with the largest diffusivity to viscosity ratio. In the order of decreasing desirability one obtains H_2, He, N_2, CO_2, and Ar. In addition, the theory is used to obtain the optimum thickness on the liquid layer in capillary columns. It is found that the capacity factor, k, directly related to thickness, is variable, being sometimes less than unity.

TURBIDIMETRIC DETERMINATION OF THE EXTRACTABILITY OF POLYETHYLENE FOOD PACKAGING FILM IN VEGETABLE OIL. D. P. Johnson and F. E. Critchfield (Union Carbide Chemicals Co., S. Charleston, W. Va.). *J. Agr. Food Chem.* **10**, 36–38 (1962). The extractability of polyethylene food packaging film in vegetable oil is determined by the amount of turbidity produced when the extract is treated with a mixture of ethyl and isopropyl alcohols. The turbidity, in nephelos, is applied to a calibration curve prepared with standard hexane solutions obtained by digesting the film in this solvent at various temperatures. The extractability of polyethylene in vegetable oil at 57C., as specified by the Food and Drug Administration, coincides with the extractability of the polymer in hexane at 37C.

A SCREENING METHOD FOR THE DETERMINATION OF ORGANICALLY BOUND CHLORINE FROM CERTAIN INSECTICIDES IN FAT. L. Koblitsky, H. R. Adams, and M. S. Schechter (U. S. Dept.

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to increase as per cent of salad oil in the fall. Although there is a price seasonal in corn oil which appears to be vaguely related to both the corn price seasonal and to seasonal weakness in competing oils, there is not much divergence on its spread to other oils. Since wet corn milling is not a seasonal operation, I am not sure why this seasonal increase takes place. There must be some outside factor at work and it will be interesting to see if the same tendency eventually shows in margarine.

The actual final total influence of the "product seasonals" is limited in importance by the fact that total factory consumption of the three items does not vary anywhere near as widely as do the month-to-month items themselves. (See Chart 1) So, when salads are soaring, margarines are moping, the total goes rolling along.

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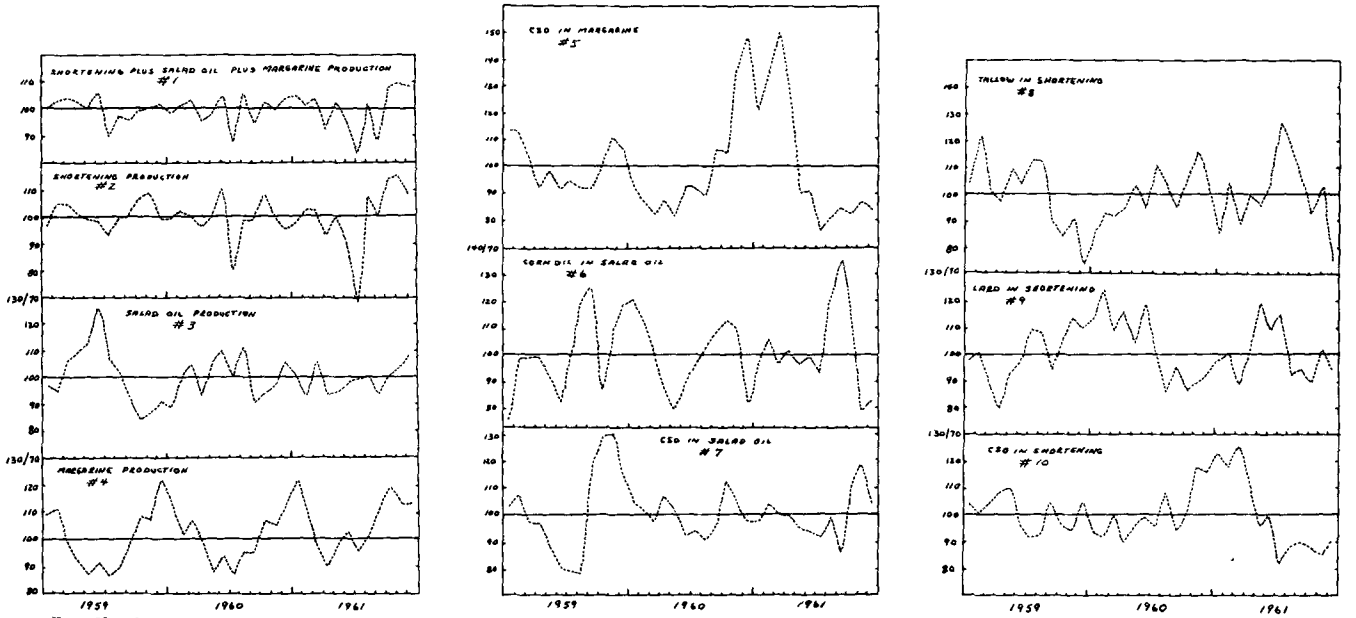

In all of these charts a monthly mean of the calendar year has been constructed. Then variations from the mean per cent (or mean production) have been plotted with the mean as 100.

of Ag., Moorestown, N. J., and U. S. Dept. of Ag., Beltsville, Md.). *J. Agr. Food Chem.* 10, 2-5 (1962). This method is designed primarily for screening residues of DDT and the more common chlorine-containing pesticides in amounts above 5 ppm in fat. The rendered fat sample dissolved in hexane is cleaned up by shaking with strong sulfuric acid, then with a potassium bicarbonate-potassium permanganate solution. After concentration, the solution is treated with dispersed sodium and the resulting inorganic chloride is determined by an automatic coulometric titration.

CONCENTRATION GRADIENT DEVELOPMENT IN THIN LAYER CHROMATOGRAPHY. S. M. Rybicka (Paint Res. Sta., Teddington, Middlesex). *Chem. & Ind. (London)* 1962, 308-9. Thin layer chromatography on silicic acid separates mono-, di-, and triglycerides predominantly on the hydroxyl content of the molecules without appreciable separation on unsaturation. Mixtures of linseed oil glycerides, pentaerythritol esters of linseed oil fatty acids, and of pentaerythritol linseed oil reaction mixture can be separated satisfactorily by eluting with a mixture of petroleum ether/diethyl ether varying in concentration from 9:1 (v/v) to 4:6.

YOGURT CONTAINING AN UNSATURATED VEGETABLE FAT. J. Metzger (Beatrice Foods Co.). *U. S. 3,025,165.* A process for preparing a yogurt containing an unsaturated vegetable fat comprises forming an emulsion of the fat in milk and then preparing the yogurt by incubation with a yogurt bacteria.

RECOVERY OF OIL FROM ACETONE-HEXANE-WATER MIXED SOLVENT EXTRACTS OF RAW COTTONSEED MEATS. W. H. King and V. L. Frampton (Sec'y of Agriculture, U.S.A.). *U. S. 3,025,314.* Raw, decorticated, and flaked cottonseed meats are extracted with a homogeneous, constant boiling mixture consisting of 53 parts by volume of acetone, 44 parts hexane, and 3 parts water to obtain a cottonseed meal and a miscella which contains the cottonseed oil, the undesirable pigments, gums, acetone, hexane, and water. The miscella is mixed with hexane or water and heated at a temperature not exceeding about 60C until all the acetone has been removed by azeotropic distillation. A 2-layer system is thus produced in which one of the layers comprises a hexane solution of the cottonseed oil and the pigments and the other layer, an aqueous dispersion of the gums. The hexane layer is subjected to an alkaline wash to remove the pigments. The refined oil can then be isolated from the hexane.

METHOD OF PROCESSING ANIMAL FATS. D. J. Krumm and R. A. Stewart (Wilson & Co., Inc.). *U. S. 3,025,315.* Animal fat is rendered by direct contact with steam under pressure and the products of rendering are separated by standing in a non-agitated condition. The separated liquid fat phase which contains some separated water is withdrawn to a zone where the pressure is in the range of atmospheric to about 10 inches of water subatmospheric pressure. An atmosphere of steam is maintained in contact with the hot fat to prevent contact with air. The hot liquid fat is removed at a temperature above 230F to a treatment zone where a subatmospheric pressure in excess of 24 inches of mercury is maintained. Simultaneously water present in the fat is vaporized, the hot fat cooled, and the moisture content of the cooled fat is reduced to less than 0.1%.

MARGARINE. M. Murray. *U. S. 3,026,207.* The described margarine consists of an oil-in hydrated fatty carboxylic acid soap emulsion in which the oil phase is a normally liquid glyceride oil containing at least 20% polyunsaturated fatty acids and constitutes at least 80% of the margarine. The continuous soap phase is a water-in-soap hydrate and contains at least 5% of soap based on the total weight of water and soap present.

• Fatty Acid Derivatives

GAS CHROMATOGRAPHIC ANALYSIS OF FATTY AND CHLORINATED FATTY ACIDS. E. D. Smith and A. B. Gosnell (Grad. Inst. of Tech., Univ. of Ark., Little Rock, Ark.). *Anal. Chem.* 34, 438-39 (1962). In this work, the authors were concerned with the development of a gas chromatographic analysis method for the chlorinated acid acids. They were able to obtain appreciable response for these acids on a variety of column packings using a thermistor detector.

PROCESS FOR PREPARING HIGHER FATTY ACID SALTS OF NEOMYCIN. G. H. van de Griendt (S. B. Penick & Co.). *U. S. 3,022,286.* Approximately stoichiometrically equivalent quantities of neomycin base and a higher fatty acid are dissolved in a lower alkanol so that the final pH of the reaction mixture is between 6.5 and 7.5.

DRAWING LUBRICANT COATING COMPOSITION. A. M. Fucinari and E. L. King (The H. A. Montgomery Co.). *U. S. 3,023,163.* A coating composition for the formation of metal working films consists of a non-congealing aqueous solution of an amine soap and an alkali metal soap which have been formed from fatty acids having a titer below 30C. The amine soap is formed from a water-soluble aliphatic amine having a boiling point above 100C. The amine soap comprises between 25 and 75% by weight of the total soap; the proportion of water is sufficient to prevent gelation of the solution at ambient temperatures and sufficient to maintain the viscosity between about 20 and 5000 centipoises at 70F.

STABILIZED METAL-WORKING LUBRICANT. J. W. Gaynor and R. J. Eisenhauer (Standard Oil Co.). *U. S. 3,024,193.* A metal-working lubricant composition containing calcium carbonate from which the calcium carbonate will not settle out in a packed layer consists of (1) 5-15% of an anionic or nonionic organic emulsifying agent; (2) 15-30% of a fatty material such as animal, vegetable, or marine fats or fatty oils; (3) 5-50% of a hydrocarbon oil; (4) 15-30% water; (5) 5-30% calcium carbonate; (6) 0.1-1.0% magnesium stearate; and (7) 0.25-2.0% of a polyacrylamide having a molecular weight of from 50,000 to 100,000.

• Biology and Nutrition

ESSENTIAL FATTY ACIDS. H. J. Thomasson (Unilever Res. Lab., Vlaardingen, Holland). *Rivista Ital. delle Sostanze Grasse* 33, 541-48 (1961). An experimental technique used for bio-assays of essential fatty acids (EFA) is described. Since rats fed EFA-deficient diets showed larger water consumption, amplitude of the response (weight gain) was magnified by equalizing water intake for all rats. Based on bio-assays of a large number of oils and fats, a straight line relationship between biologically activity and diunsaturated acids content was found to exist. Marine oils have lower activities than expected from their diene content, probably due to dienoic acids other than linoleic being present. Acids with 4 or more double bonds, present in large amounts in marine oils, have little or no biological activity. The biological inactivity of saturated and monosaturated fatty acids was confirmed, as well as the fact that the biologically active diunsaturates have their double bonds in the 6-7 and 9-10 positions from the terminal CH_3. Introduction of a third double bond in the 12-13 position increases the biological activity, but if the third double bond is in the 3-4 position, very low activity results. Activity of C_{18} fatty acids with two or three double bonds is invariably very low.

TOCOPHEROL DETERMINATION: CHARACTERIZATION OF TOCOPHEROLS IN VEGETABLE OILS BY INFRARED SPECTROPHOTOMETRY. W. W. Morris and E. O. Haenni (Food and Drug Administration, Washington 25, D. C.). *J. Assoc. Offic. Agr. Chem.* 45 (1), 92-98 (1962). Procedures are described for the concentration of the tocopherols from the non-saponifiable fraction of vegetable oils by adsorption chromatography and for their detection by a spot test based on the phosphomolybdic acid color reaction. Infrared spectrophotometry was applied to the identification of the form of tocopherol present in different vegetable oils. In samples with high amounts of non-uniform background, spectrophotometric neutralization techniques can be used to estimate *alpha*-tocopherol content.

FRACTIONATION OF THE COMPONENT(S) RESPONSIBLE FOR SEX ODOR/FLAVOR IN PORK. H. B. Craig, A. M. Pearson, and N. B. Webb (Dept. of Food Sci., Michigan State University, East Lansing, Mich.). *J. Food Sci.* 27, 29-35 (1962). Sex odor/flavor in pork was produced when fat, lean (with fat), and most organs from a boar were heated in a skillet or in boiling water. Sex odor was found to be water-insoluble, ether-soluble, and definitely associated with the fatty tissues of boars. Cold saponification of boar fat yielded a small quantity of unsaponifiable matter that produced a concentrated, permeating sex odor on exposure to heat. Thus, agents responsible for sex odor in pork are located in the unsaponifiable material. Cholesterol and squalene which were both found in this fraction, did not produce sex odor when heated.

HYDROPERICARDIUM ASSAY AND SAFETY OF FATS AND FATTY ACID PRODUCTS. J. C. Alexander, R. J. Young, C. M. Burnett, and H. D. Hathaway (Procter and Gamble Co., Miami Valley Labs., Cincinnati 39, Ohio). *Poultry Sci.* 41, 22-32 (1962). A reliable, rapid chick assay procedure for the hydropericardium factor was developed, and used to determine the safety of a number of fats and fatty acid products. All of the fats and fatty acid components of which the formulation of hydrolyzed animal and vegetable fat is comprised were free from the hydropericardium factor, and from any other

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evidence of toxicity as shown by the bioassay and broiler feeding studies. On the other hand, some of the test fats procured elsewhere were lethal to chicks and produced HP and other symptoms. The unknown factor in certain fats, lethal to chicks and capable of producing the unique HP syndrome at levels of less than 0.05 ppm. in the ration, was studied.

COMPARATIVE VALUE OF DIETARY RAPESEED OIL, SUNFLOWER SEED OIL, SOYBEAN OIL, AND ANIMAL TALLOW FOR CHICKENS. J. L. Sell and G. C. Hodgson (Univ. of Manitoba, Winnipeg, Manitoba, Canada). *J. Nutrition* **76**, 113–118 (1962). Chickens were fed from zero to 8 weeks of age, rations containing 4 or 8% of animal tallow, soybean oil, rapeseed oil, or sunflower seed oil. As compared with a ration with no added fat, only the inclusion of 4% of animal tallow in the ration failed to increase weight gain significantly. In general, all fat additions markedly improved efficiency of feed utilization. The use of equivalent levels of animal tallow, rapeseed oil, and sunflower seed oil resulted in ration metabolizable energy values which were approximately equal. However, the metabolizable energy content of rations containing soybean oil was significantly higher than that of rations containing comparable levels of other fat sources. Fatty acid analysis by gas chromatography showed that the composition of chick adipose tissue reflected that of the dietary fat. The presence of substantial portions of eicosenoic and erucic acids in adipose tissue of chicks receiving dietary rapeseed oil provides additional evidence for an apparent direct deposition of some unaltered dietary fatty acids in the body fat stores.

AN IN VITRO METHOD FOR DETERMINING THE AVAILABILITY OF SOYBEAN OIL IN UNEXTRACTED SOYBEAN PRODUCTS FOR THE CHICK. L. B. Carew, Jr., M. C. Nesheim, and F. W. Hill (Dept. of Poultry Husbandry, N. Y. State Ag. Exp. Sta., and Grad. School of Nutrition, Cornell Univ., Ithaca, N. Y.). *Poultry Sci.* **41**, 188–93 (1962). A method was described for determining the rate of ether extraction of the oil in samples of unextracted soybean products. The oil in flaked, pelleted and expanded soybeans was extracted rapidly, and greater than 90% of the oil was extracted in a time of 40 minutes to one hour. In contrast, the oil in ground whole soybeans and ground dehulled soybeans was extracted at a much slower rate and about 4 hours was required to extract 90% of the oil. A high degree of correlation was found between the rate at which the oil in soybean products was extracted by ether and the biological availability of the oil to the chick. This indicated that the *in vitro* extraction technique could be employed in place of the *in vivo* test for fat absorbability as a measure of the availability to the chick of the oil in unextracted soybean fractions.

THE UTILIZATION OF A NUMBER OF FATS, FATTY MATERIALS, AND MIXTURES THEREOF EVALUATED IN TERMS OF METABOLIZABLE ENERGY, CHICK WEIGHT GAINS, AND GAIN:FEED RATIOS. I. R. Sibbald, S. J. Slinger, and G. C. Ashton (Dept. of Nutrition, Ontario Agr. College, Guelph, Ontario, Canada). *Poultry Sci.* **41**, 46–61 (1962). Two randomized block design experiments each involving 16 treatments replicated 4 times were conducted to study the utilization of a number of fats and fat mixtures by growing chicks. In the first experiment no synergism could be shown between a sample of feed grade tallow and a sample of undegummed soybean oil; however, when 3% of dried soybean gums or 2% of crude soybean lecithins were added to the tallow the utilization of the energy therein appeared to be increased. Possible explanations for the lack of agreement between the findings of this experiment and those reported by Sibbald *et al.* are discussed. In the second experiment 3 samples of tallow, differing widely in composition, together with the undegummed soybean oil used in the first experiment, a sample of acidulated soapstocks and dried soybean gums were fed. A linear increase in the M.E. values of the tallows associated with: 1) increasing iodine values, 2) decreasing titers, and 3) increasing linoleic acid content, was observed but the relationship did not apply to the other fats.

A COMPARISON OF FEED GRADE TALLOW AND ACIDULATED SOAPSTOCKS IN PRACTICAL CHICK STARTER RATIONS. I. R. Sibbald, W. F. Pepper, and S. J. Slinger (Dept. of Nutrition and Poultry Sci., Ontario Agr. College, Guelph, Ontario, Canada). *Poultry Sci.* **41**, 120–24 (1962). An experiment was conducted in which feed grade tallow, acidulated soapstocks, and three mixtures thereof were fed at levels of 2, 4, and 6% to chicks for four weeks. The metabolizable energy and protein contents of the rations were determined. The fats did not differ either in terms of chick weight gains or gain:feed ratios even though previous work had shown them to differ in M. E. content by 300 calories per pound. An extra-caloric effect of the fats on both weight gains and gain:feed ratios was observed indicating the M. E. alone is not a satisfactory measure of the value of a fat.

BIOSYNTHESIS OF β-CAROTENE BY CELL-FREE EXTRACTS OF PHYCOMYCES BLAKESLEEANUS. H. Yokoyama, T. O. M. Nakayama, and C. O. Chichester (Dept. Food Sci. and Tech., Univ. of Calif., Davis, Calif.). *J. Biol. Chem.* **237**, 681–86 (1962). A cell-free enzyme system capable of synthesizing β-carotene was obtained from *Phycomyces blakeleeanus*. The conditions of incubation and cofactor requirements for carotenoid biosynthesis were defined. The system, when incubated with acetate, hydroxymethylglutarate, or mevalonic acid, gave rise to labeled-β-carotene. Of the substrate acids, mevalonic acid was by far the most effective precursor of β-carotene. Diphosphopyridine nucleotide appears to act as a key cofactor in the channeling of intermediates into sterol rather than carotenoid synthesis.

EFFECTS OF A HIGH CHOLESTEROL DIET ON SYNTHESIS OF PLASMA LOW DENSITY LIPOPROTEIN. J. B. Marsh and Francilla Sherry (Dept. of Biochem., School of Medicine, Univ. of Penn., Philadelphia). *Proc. Soc. Exp. Biol. Med.*, **109**, 14–15 (1962). The results indicate that addition of 5% of cholesterol to the diet resulted in a 3-fold increase in amount of cholesterol in low density lipoprotein appearing in the perfusion fluid with no significant increase in amount of the protein moiety. The high cholesterol diet caused a 3-fold increase in liver cholesterol content but only a 15% rise in plasma cholesterol.

THE INFLUENCE OF RESERPINE ON PLASMA CHOLESTEROL, HEMODYNAMICS, AND ARTERIOSCLEROTIC LESIONS IN THE BROAD BREASTED BRONZE TURKEY. E. W. Spackmann and R. K. Ringer (Dept. of Poultry Sci., Mich. State Univ., East Lansing, Mich.). *Poultry Sci.* **41**, 40–5 (1962). Plasma cholesterol increased with age in both male and female Broad Breasted Bronze (BBB) turkeys from 8 weeks of age (148 mg. percent) to 16 weeks of age (249 mg. percent) after which age the plasma cholesterol level plateaued. There was no sexual difference in plasma cholesterol; however, a sexual difference has been reported for systolic blood pressure. In these experiments arteriosclerosis began prior to 8 weeks of age in turkeys. Arteriosclerotic scores of the abdominal aorta indicated a greater severity for the males than for the females. Reserpine administration at the level of 0.1 ppm and 0.2 ppm in the feed did not offer any protection against the increase in plasma cholesterol or the severity of arteriosclerosis with advancing age. Mean systolic blood pressures at 27 weeks of age were considerably lower than reported blood pressures for the same variety of turkeys and these levels were not further reduced by the addition of 0.1 ppm or 0.2 ppm reserpine to the feed.

THE EXTRACTABILITY OF SERUM LIPIDS IN NORMAL SUBJECTS, CORONARY DISEASE, HYPERLIPEMIA, AND HYPERCHOLESTEREMIA. D. S. Amatuzio, F. Grande, and S. Wada (Jay Phillips Res. Lab. of Mount Sinai Hospital and the Univ. of Minn., Minneapolis, Minn.). *Circulation* **25**, 540–44 (1962). The lipid extraction of fasting serum samples was studied with various alcohol-ether solution. The release of cholesterol and esterified fatty acids from the serum lipoproteins was found to be significantly different in the various disease states studied as compared to the normal subject. The fraction of lipid release from fasting serum was not related to the total level of the cholesterol or esterified fatty acids in normal subjects, coronary artery disease, and hypercholesteremia.

THE EFFECT OF DIETARY FAT LEVEL ON THE RATE OF MORTALITY IN CAGED LAYERS. B. E. March and J. Biely (Dept. of Poultry Sci., Univ. of British Columbia, Vancouver, B.C., Canada). *Poultry Sci.* **41**, 9–12 (1962). Mortality was studied in White Leghorn pullets subjected to three dietary regimens under which the birds received 2.5, 7.5, or 12.5 percent of fat from the time of hatching until they were 3 years old. Mortality from liver derangement was approximately doubled when either 7.5 or 12.5 percent of fat was fed but no other untoward effects on mortality rate were noted. The lack of general adverse effects from the addition of fat may be explained by the fact that the level of energy in the diet was not increased commensurate with the level of supplementary fat. It is concluded that fat *per se*, when fed continuously at levels up to 12.5 percent in a well-balanced ration not excessive in energy content, has no adverse metabolic effects.

EFFECT OF MER-29 ON EGG PRODUCTION IN THE CHICKEN. T. L. Burgess, C. L. Burgess, and J. D. Wilson (Dept. of Internal Med. Univ. of Texas Southwestern Medical School, Dallas). *Proc. Soc. Expl. Biol. Med.* **109**, 218–21 (1962). Administration of MER-29 to laying hens is followed over a 2-week period of gradual replacement of 85% of the egg cholesterol by desmosterol. The accumulation of desmosterol in the egg is followed by cessation of egg production; following withdrawal of MER-29 from the diet, egg production returns to normal only after a lag phase of 12 days. This sequence of events suggests that MER-29 inhibits maturation of the ova rather than the subsequent events in egg formation.

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EFFECT OF HYPOCHOLESTEREMIC AGENTS ON PROTOZOA. S. Aaronson, Barbara Bensky, M. Shifrine, and H. Baker (Haskins Lab., New York; School of Vet. Med., Univ. of Calif., Davis; Seton Hall College of Med. and Dentistry, Jersey City, N. J.). *Proc. Soc. Exp. Biol. Med.* **109**, 130–32 (1962). The hypocholteremic agents, triparanol and benzmalecene, inhibit the multiplication of the sterol-synthesizing phytoflagellates, *Ochromonas danica, O. malhamensis, Euglena gracilis,* and the non-sterol-synthesizing ciliate, *Tetrahymena pyriformis.* The inhibition of multiplication of the *Ochromonas* species may be prevented by cholesterol, ergosterol, farnesol, squalene, lauric acid, oleic acid, linoleic acid, and linolenic acid. Oleic acid and linolenic acid were most effective.

EFFECTIVENESS OF SELENIUM IN PREVENTION OF NUTRITIONAL MUSCULAR DYSTROPHY IN THE CHICK. C. C. Calvert, M. C. Nesheim, and M. L. Scott (Dept. of Poultry Husbandry and Grad. School of Nutrition, Cornell Univ., Ithaca, N. Y.). *Proc. Soc. Exp. Biol. Med.* **109**, 16–18 (1962). Results have been presented which show that whereas supplementation of a dystrophy-producing diet of severly vitamin E-depleted chicks with either 2.5 mg of d-alpha tocopherol acetate or 1.0 mg. of selenium as sodium selenite per kilogram of diet alone has no effect upon dystrophy, supplementation with these amounts of selenium and vitamin E together completely prevents muscular dystrophy. These results indicate therefore, that both selenium and vitamin E are concerned in prevention of nutritional muscular dystrophy in the chick.

ANTIFUNGAL ACTIVITY OF DECANOIC HYDROXAMIC ACID. G. R. Gale, F. Bernheim, and Ann Marie Welch (V. A. Hospital and Dept. of Physiology and Pharmacology, Duke Univ. Med. Center, Durham, N. C.). *Proc. Soc. Exp. Biol. Med.* **109**, 188–92 (1962). Decanoic hydroxamic acid (DHA was markedly inhibitory to growth of certain fungi, both mycelial and yeast-like. Quantitatively it was approximately 4 times as active as the unsubstituted acid on *Candida albicans.* Activity was apparently not mediated through a release of free hydroxylamine. Toxicity upon parenteral administration to experimental animals was not primarily to liver, spleen, bone marrow, or kidney. Topical application of 1% DHA in propylene glycol on patients with cutaneous *C. albicans* infections caused considerable regression of lesions in one week. No evidence of sensitization or primary irritation was observed in this group.

THE BIOSYNTHESIS OF OLEIC AND 10-METHYLSTEARIC ACIDS IN MYCOBACTERIUM PHLEI. W. J. Lennarz, G. Scheuerbrandt, and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge 38, Mass.). *J. Biol. Chem.* **237**, 664–71 (1962). In growing cells of *Mycobacterium phlei,* oleic acid is formed directly from stearic acid. In resting cells, molecular oxygen is required for this conversion. Oleic acid is converted to 10-methylstearic acid by *M. phlei.* Methionine serves as a source of the C_1 unit in this conversion. The relative proportions of oleic and 10-methylstearic acids in cells of *M. phlei* are a function of the age of the culture.

EFFECT OF FAT-FREE DIETS AND LIPID UNSATURATION ON RAT TISSUE CHOLESTEROL LEVELS. E. Diller, M. Kory, and O. Harvey (Biochemical Research Div., Lilly Research Labs., Indianapolis, Ind.). *Proc. Soc. Exp. Biol. Med.* **108**, 637–640 (1961). Rats were fed diets which were either fat-free or contained 5% lipid and either without or with 2% cholesterol. Dietary lipids with 3 degrees of unsaturation were obtained by use of unhydrogenated oil, completely hydrogenated oil, and 1:1 mixture of the two. A dissociation of plasma and hepatic cholesterol was observed. Liver reflected changes in cholesterol metabolism more sensitively than did plasma. Hepatic cholesterol concentrations were directly related to degree of unsaturation of dietary lipid when cholesterol was fed. The increase in hepatic cholesterol was confined to esterified cholesterol. Dietary lipid was not obligatory for cholesterol absorption. However, absorption appeared to be dependent upon digestibility and fatty acid composition of dietary lipid.

VITAMIN K DEFICIENCY IN THE BABY PIG. H. E. Schendel and B. C. Johnson (Dept. of Animal Science, Univ. of Illinois, Urbana, Illinois). *J. Nutrition* **76**, 124–130 (1962). Vitamin K has been shown to be an essential nutrient for newborn pigs housed in raised wire-bottom cages and fed a "synthetic" liquid diet. Fourteen out of 15 animals developed symptoms which include a highly significant increase in prothrombin time, hypersensitivity, anemia and, finally, anorexia and weakness. Whereas the animals died by the 4th or 5th week if they did not receive some source of this vitamin, they responded clinically and biochemically to the oral or intramuscular injection of vitamin K in 2 to 4 hours.

CHOLESTERYL ESTER FATTY ACID PATTERNS OF PLASMA, ATHEROMATA AND LIVERS OF CHOLESTEROL-FED RABBITS. E. Evrard, J. Van Deu Bosch, P. De Somer, and J. V. Joossens (Rega Institute for Medical Research and Central Klinisch Laboratorium, Univ. of Louvain, Leuven, Belgium). *J. Nutrition* **76**, 219–222 (1962). The cholesteryl esterified fatty acids (CEFA) of plasma, liver, and aortic lesions of cholesterol-fed rabbits were analyzed by gas-liquid chromatography. The patterns of these acids were characterized chiefly by a high percentage of oleic acid, especially in the aortic intima and in the liver, where the oleic-linoleic acid ratio was increased up to 3.1 and 4.7, respectively, against 2.1 in the plasma and 0.9 in the plasma of normal rabbits. In each instance the sum of the relative concentrations of oleic and linoleic acids represented approximately 75% of the total CEFA. The dissimilarity between the CEFA patterns of plasma and atheromata excludes the likelihood that the cholesteryl esters accumulate in the aortic intima by a simple random deposition of the plasma cholesteryl esters. The CEFA patterns of rabbit atheromata closely resemble those reported by other authors in human early atheromatous lesions.

THE MECHANISM OF GOSSYPOL DETOXIFICATION BY RUMINANT ANIMALS. R. Reiser and Hwei C. Fu (Dept. of Biochem. and Nutrition, Texas Ag. Exp. Station, College Station, Texas). *J. Nutrition* **76**, 215–218 (1962). The indifference of the degree of gossypol binding of rumen liquor to aerobic or anaerobic incubation, high or low temperature, centrifugation or proteolytic enzymes, and the simultaneous disappearance of two moles of lysine ϵ-amino groups to each mole of gossypol, demonstrates convincingly that the mechanism of ruminant detoxification of gossypol is by binding to soluble proteins, and that the bond is permanent during protein digestion.

ROLE OF VITAMIN A IN INDUCTION OF VITAMIN K DEFICIENCY IN THE RAT. J. T. Matschiner and E. A. Doisy, Jr. (Dept. of Biochem., St. Louis Univ. School of Medicine, St. Louis, Mo.). *Proc. Soc. Exp. Biol. Med.* **109**, 139–42 (1962). Evidence is presented to indicate that the level of dietary vitamin A is closely related to development of symptoms of vitamin K deficiency in the rat. Under appropriate experimental conditions, 0.5 and 5 i.u. of vitamin A per gram of diet gave reduced prothrombin concentrations which were not observed on corresponding rations deficient in vitamin A. This extends the previously known hemorrhagenic toxicity on vitamin A to physiological levels and emphasizes the need for careful consideration of the level of vitamin A in studies of vitamin K deficiency in the rat. The effect of vitamin A was more severe in male than in female rats. In further studies with male rats, vitamin A acid was markedly more hemorrhagenic than vitamin A acetate.

EFFECT OF VITAMIN E-DEFICIENCY ON PROTEIN SYNTHESIS IN SKELETAL MUSCLE OF THE RABBIT. J. F. Diehl and L. L. Sanders (Dept. of Biochem., Univ. of Arkansas Med. Center, Little Rock). *Proc. Soc. Exp. Biol. and Med.* **109**, 8–10 (1962). Normal and vitamin E-deficient rabbits were injected with glycine-1-C^{14} and sacrificed at time intervals ranging from 0.5 to 12 hours. Homogenates of skeletal muscle were fractionated by differential centrifugation, and specific activity of the subcellular protein fractions determined. In all subcellular fractions and at all time intervals the proteins of vitamin E-deficient animals had a much higher specific activity. The effect of vitamin E-deficiency on incorporation of glycine-C^{14} was approximately the same in all subcellular protein fractions. Compared with control animals the radioactivity of the non-protein supernatant fraction rose and fell faster in muscle of vitamin E-deficient animals.

BIOSYNTHESIS OF PHOSPHATIDIC ACID FROM LYSOPHOSPHATIDIC ACID AND PALMITYL COENZYME A. R. A. Pieringer and L. E. Hokin (Dept. of Physiological Chemistry, Univ. of Wis., Madison 6, Wisconsin). *J. Biol. Chem.* **237**, 659–63 (1962). Chemically synthesized α- and β-(α'-oleyl)lysophosphatidic acid labeled with phosphorus-32 was found to be readily converted to an α-phosphatidic acid by an enzyme present in the cytoplasmic particulate fractions of either guinea pig brain or liver. S-Palmityl coenzyme A stimulated this conversion. α-Glycerophosphate was not implicated in this reaction.

DIFFERENTIATION OF VITAMINS D_2 AND D_3 BY INFRARED SPECTROPHOTOMETRY. W. W. Morris, Jr., J. B. Wilkie, S. W. Jones, and L. Friedman (U. S. Dept. of Health, Ed., and Welfare, Washington, D. C.). *Anal. Chem.* **34**, 381–88 (1962). Infrared spectrophotometry can be used to determine the form of vitamin D present, either by visual examination of the spectrum between 10 and 11 microns or by spectrophotometric neutralization techniques when nonuniform background is present. The amounts of vitamin D_2 or D_3 can also be estimated by spectrophotometric neutralization. A technique is described that is potentially useful for the determination of the proportion of each form of vitamin D present in mixtures of the

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two by means of a reference curve relating the ratio of absorbance differences $(A_{10.3_4}-A_{10.5})/(A_{10.4_4}-A_{10.5})$ to the per cent composition of the mixture. The amount of each form could then be calculated from the total vitamin D content of the sample. The accuracy of these procedures is within ± 15%.

EFFECTS OF SATURATED AND UNSATURATED FATS AND THEIR MIXTURES ON THE LIPID METABOLISM OF MONKEYS. Gladys A. Emerson, Jane B. Walker, and Seetha N. Ganapathy (Div. of Nutritional Sciences, School of Public Health, Univ. of Calif., Los Angeles). *J. Nutrition* **76**, 6–10 (1962). Young, adult male rhesus monkeys about 5 years of age were maintained for 6 months with purified diets containing 20% of butter fat, 20% of safflower oil or mixtures of these fats. The mixed fats were fed on a basis of approximately 10% of saturated and 10% of polyunsaturated fatty acids and 18% of saturated and 2% of polyunsaturated fatty acids, respectively. The animals were maintained in good condition and all groups made slight weight gains. Plasma was examined for total lipids, free and total cholesterol, total sterols, and phospholipids. Total lipids and their fractions were highest for the group fed 20% of butter fat in the diet. Average values for plasma lipid constituents were lowered by the feeding of as little as 1.8% of safflower oil to 18% of butter fat (2.3% of polyunsaturated to 17.7% of saturated fatty acids): a maximal lowering was observed when the mixture containing 13% of safflower oil and 7.5% of butter fat (10.1% of polyunsaturated to 10.4% of saturated fatty acids) was fed. Levels with latter were as low as observed when safflower oil was fed as the sole fat at the 20% level.

METABOLISM OF CHOLESTEROL IN THE CHICK EMBRYO. III. LOCALIZATION AND TURNOVER OF DEMOSTEROL (24-DEHYDROCHOLESTEROL). W. Fish, J. Boyd, and W. Stokes (Med. Research Laboratory, Providence College, Providence, R. I.). *J. Biol. Chem.* **237**, 334–337 (1962). Chick embryos, ranging in age from 9 days' incubation to hatching, were injected with acetate-1-C^{14}, and their crude sterols were separated by chromatography into a cholesterol fraction and a complex fraction, the major component of which was demosterol (24-dehydrocholesterol). A remarkably high concentration of the desmosterol fraction, up to 11.2% of the total sterol, was found in the brain, but, toward the end of incubation, the relative amount diminished significantly. The carbon activity in the desmosterol fraction of the brain had a turnover time of about 1 day, and the distribution of activity indicated that it was the major source of newly synthesized cholesterol in the brain. In addition, evidence exists for other biosynthetic routes leading to cholesterol. In the remainder of the embryo, the desmosterol pool, approximately 1.5% of the total sterol, was comparatively inert.

REARRANGEMENT OF GLYCERIDE FATTY ACIDS DURING DIGESTION AND ABSORPTION. F. H. Mattson and R. A. Volpenhein (Procter & Gamble Co., Miami Valley Labs., Cincinnati 39, Ohio). *J. Biol. Chem.* **237**, 53–5 (1962). Rats were fed glyceryl α-[palmitate-1-C^{14}] dioleate, glyceryl β-[palmitate-1-C^{14}] dioleate, a mixture of oleic or linoleic acid and palmitic-1-C^{14} acid, or a mixture of triolein or trilinolein and palmitic-1-C^{14} acid. The position of the palmitic acid on the glycerol in the triglycerides of the lymph was determined. When the mixtures of free acids were fed, the palmitic acid was essentially randomly distributed among all three positions of the lymph triglyceride molecules. From 85 to 90% of the palmitic acid in the dietary mixed triglycerides was found in its original position on the triglyceride molecule after the processes of digestion and absorption. When the mixtures of triglyceride and free palmitic acid were fed, 22% of the palmitic acid in the lymph triglycerides was found to be esterified with the β position. The extent of absorption of palmitic acid depended on the form in which it was fed. Absorption was greatest when palmitic acid was fed as β-palmitoyl diolein, and least when it was fed as the free acid.

STUDIES ON THE BIOSYNTHESIS OF CHOLESTEROL: XIV. THE ORIGIN OF PRENOIC ACIDS FROM ALLYL PYROPHOSPHATE IN LIVER ENZYME SYSTEMS. J. Christophe and G. Popjak (Medical Res. Council, Exptl. Radiopathology Res. Unit, Hammersmith Hospital, London, W. 12, England). *J. Lipid Research* **2**, 244–257 (1961). Allyl pyrophosphates (3,3-dimethylallyl, geranyl, and farnesyl pyrophosphate), which are known intermediates in the biosynthesis of squalene from mevalonate, are also metabolized in the liver by an alternate pathway to acids. The first step in the conversion of the allyl pyrophosphate into the acids is their irreversible dephosphorylation into free prenols by a microsomal phosphatase. The free prenols are irreversibly dehydroxylated to the acids by liver alcohol dehydrogenase and aldehyde dehydrogenate present in a soluble protein fraction of liver homogenates. This dehydrogenation proceeds best at pH 7.5 and is inhibited by sulfhydryl reagents. The formation

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of free prenols and of prenoic acids from mevalonate was also observed *in vivo*.

INFLUENCE OF ESTRADIOL ON APPARENT PHOSPHATIDYL CHOLINE SYNTHESIS IN RATS. E. N. Bowser, W. J. Henderson, and H. J. Zimmerman (Radioisotope Service, V. A. West Side Hospital, and Dept. of Medicine, Chicago Med. School, Chicago 8, Ill.). *J. Lipid Research* 2, 278–280 (1961). Oophorectomized Sprague Dawley rats, 28–30 days old, were fed for 31 days on either a normal, high fat, low protein, low choline diet, with or without vitamin B_{12}. Sesame oil or estradiol oil were administered subcutaneously twice weekly. Animals on the high fat, low choline diet showed severe fatty metamorphosis of the liver, a decreased hepatic lecithin concentration, and a two-fold increase in the relative specific activity of lecithin. Estradiol inhibited fatty metamorphosis, and increased the lecithin concentration slightly. Animals receiving a B_{12} and estradiol supplemented diet showed the greatest lipotropic effect and an increased liver lecithin concentration. The prevention of fatty livers by estradiol depends on mechanisms other than those involved in the lipotropic properties of choline or vitamin B_{12}.

PAPER CHROMATOGRAPHY IN THE FIELD OF FATS: THE COMPOSITION OF SPERM WHALE WAX. ISOLATION AND CHARACTERIZATION OF PALMITOLEIC ACID. H. P. Kaufmann and Z. Schoeb (Deut. Inst. Fettforsch., Munster). *Fette Seifen Anstrichmittel* 63, 609–614 (1961). Qualitative and quantitative analysis of the fatty acids and alcohols of sperm whale wax was carried out using paper chromatography. The composition of the alcohols by type and percent is respectively: myristyl 3.5; palmityl 7.3; stearyl 17.9; palmitoleyl 11.9; olecyl 50.8; eicosenyl 8.6. The fatty acid composition according to acid and percentage was: lauric 0.7; myristic 8.8; myristoleic 3.3; palmitic 15.9; palmitoleic 14.8; hexadecadienoic 5.7; stearic 8.2; oleic 23.6; linoleic 5.4; linolenic 1.9; arichidic 8.7; erucic 3.0.

LONG-CHAIN FATTY ACID SYNTHESIS BY ISOLATED PLANT LEAVES. A. T. James (National Institute for Medical Research, London). *Biochem. J.* 82, 28 P (1962). Uptake of 2-C^{14} acetate by isolated plant leaves (especially *Ricinus communis*) through the stem or by chopped leaves in phosphate buffer led to the synthesis of the C_{14}, C_{16}, and C_{18} saturated acids and also oleic, linoleic, and linolenic acids. Labeled octanoic, decanoic, and dodecanoic acids gave rise to labeled oleic acid, the position of the label suggesting an *in toto* incorporation. Labeled palmitic and stearic acids did not produce any labeled unsaturated acids. Labeled oleic acid produced labeled linoleic, the label position being preserved.

SYNTHESIS OF OLEIC ACID AND PALMITIC ACID FROM ACETATE BY LETTUCE CHLOROPLAST PREPARATIONS. P. K. Stumpf and A. T. James (National Institute for Medical Research, London). *Biochem. J.* 82, 28 P (1961). When acetate was added to a reaction mixture maintained in the dark under aerobic conditions, ATP, CoA, Mn^{++}, Mg^{++}, CO_2 and TPN are required for maximum incorporation (4–10% in 2 hours at room temperature at pH 7.4). Approximately 57% of the C^{14} was in palmitic acid and 38% in oleic. When exposed to light, the reaction mixture incorporated labeled acetate again into palmitic and oleic acids in approximately the same ratio. Exposure to light increased acetate incorporation approximately 1.7–2.4 times in contrast to incubation in absence of light. The authors suggest that the process of photosynthetic phosphorylation provides conditions for the synthesis of fatty acid, namely the continuing formation of ATP, O_2, and TPNH.

PREPARATION OF STABLE AQUEOUS ISOMERIC VITAMIN A COMPOSITIONS. S. R. Ames (Eastman Kodak Co.). *U. S. 3,026,249.* The process for preparing a stabilized vitamin A composition consists of incorporating the following isomeric mixture of an ester of synthetic vitamin A alcohol (acetate or palmitate) into an aqueous medium: 50–60% of the all-*trans* isomer, 15–25% of the 2-*cis* isomer, 15–20% of the 6-*cis* isomer, and 5–10% of the 2,6-di-*cis* isomer.

PROCESS FOR THE HYDROGENATION OF PHOSPHATIDES. P. F. Davis (Central Soya Co., Inc.). *U. S. 3,026,341.* The catalyst is first contacted with hydrogen in the absence of phosphatide material. The phosphatide is then contacted with hydrogen in the presence of the hydrogen-treated catalyst to promote a decrease in the unsaturation of the phosphatide.

• Drying Oils and Paints

COATING COMPOSITIONS. G. D. LaBarre, Jr. (E. I. du Pont de Nemours & Co.). *U. S. 3,014,881.* The described liquid coating composition contains as the essential organic film-forming material a compatible mixture of (a) 20–50% by weight of a carboxyl-containing interpolymer of a monomer mixture consisting mainly of styrene, a small proportion of a polymerizable monocarboxylic acid such as methacrylic or acrylic acid, and a minor proportion of at least one ester of the polymerizable acids and a C_1 to C_4 alkanol; (b) 20–50% of a drying fatty acid ester varnish which in 100 parts consists of at least 40 parts of resinous epoxyhydroxypolyether and 15 to 60 parts of drying fatty acid materials with 12 to 22 carbon atoms; and (c) 10–40% of a urea- or memalmine-formaldehyde-C_1-C_4 alkanol condensate.

DRIER CATALYST ACTIVITY OF 1,10-PHENANTHROLINE IN ORGANIC COATINGS. LOWERING OF THE ACTIVATION ENERGY. G. K. Wheeler, W. H. Canty (R. T. Vanderbilt Co., East Norwald, Conn.) and R. R. Myers. *I&EC Product Res. and Dev.* 1, 52–6 (1962). The over-all activation energy for the oxidative polymerization of a number of alkyd vehicles, in the presence of metallic driers, has been determined. The effect of adding 1,10-phenanthroline to these systems has been observed, and the resultant lowering of the over-all activation energy is discussed in terms of both steric and energetic factors of the complexes formed, and in relationship to conventional theories of the oxidative polymerization mechanism.

HYDROPERICARDIUM AND ASCITES IN CHICKS FED A CHLORINATED HYDROCARBON. E. L. McCune, J. E. Savage and B. L. O'Dell (Depts. of Vet. Bacteriology, Univ. of Missouri, Columbia, Mo.). *Poultry Sci.* 41, 295–99 (1962). Chicks fed fractions of an epoxy-resin paint developed hydropericardium and ascites. These symptoms were similar to those observed in the "toxic-fat" syndrome. The toxicity was found to be caused by a chlorinated biphenyl product used as a plasticizer in the paint. Chlorinated biphenyl was moderately toxic when fed at a level of 0.02% and caused highly mortality and extensive pathology within 4 weeks at a dietary level of 0.04%. Gross pathology included hydropericardium, hydroperitoneum, enlarged heart, liver and kidneys, and hemorrhage of internal organs. Microscopically the kidneys showed marked tubular dilatation and numerous casts.

URETHANE MODIFIED VEGETABLE OIL. H. M. Schroeder and D. L. Waythomas (Textron, Inc.). *U. S. 3,022,326.* The method of preparing a urethane modiified ethylenically unsaturated vegetable oil having drying properties consists of reacting, by bringing into contact and heating, a hydrocarbon diisocyanate and a diol system comprising a diol ester of an ethylenically unsaturated vegetable oil fatty acid with a lower hydrocarbon polyol which is at least trifunctional and a polygyleol having a molecular weight in the range 150 to 2000. The polyglycol amounts to 8 to 50% by weight of the diol system, the amount of diisocyanate used is about equivalent to the total hydroxyl of the diol system, and the amount of diol ester is sufficient to produce a final oil length of 20% to 75%. The reaction is continued under heating until the resultant urethane modified oil possesses no free isocyanate.

URETHANE MODIFIED VEGETABLE OIL. D. J. Waythomas (Textron, Inc.). *U. S. 3,022,327.* The method of preparing a urethane modified ethylenically unsaturated vegetable oil having drying properties consists of reacting, by bringing into contact and heating, a hydrocarbon diisocyanate and a diol system comprising a diol ester of an ethylenically unsaturated higher fatty acid of a vegetable oil and a lower hydrocarbon polyol having greater than 2 hydroxyl groups in the molecule, and 3 to 18%, based upon the weight of the diol ester, of a hydrocarbon diol having a molecular weight of less than 120. The amount of diisocyanate used is approximately equivalent to the total hydroxyl of the diol system, and the amount of diol ester is sufficient to produce a final oil length of 30 to 80%. The reaction is continued under heating until the resultant urethane modified oil possesses no free isocyanate.

CORE OILS, FOUNDRY CORES AND MOULDS, AND METHODS OF MAKING THE SAME. A. Tobler. *U. S. 3,023,112.* A cold setting, non-deforming core oil consists of an admixture of a blown non-conjugated drying oil and a conjugate bonded oil. The mixture has an iodine number not less than 100 and a diene number not less than 7.

WATER-REDUCIBLE COATING COMPOSITION. J. B. Boucher (Rinshed-Mason Co.). *U. S. 3,023,177.* The described composition consists of from 75–95% by weight of an acrylic resin latex, from 5–25% of an oil and amine modified water-soluble alkyd resin dispersed in the latex, and a pigment dispersed in the alkyd resin. The alkyd resin is the reaction product of an aliphatic amine and a resin having an acid number of from 25 to 70 which is the reaction product of a polycarboxylic acid, a monocarboxylic acid and a polyhydric alcohol.

EPOXIDE CONVERSION OF UNSATURATED ACIDS. S. O. Greenlee and J. W. Pearce (S. C. Johnson & Son, Inc.). *U. S. 3,023,178.* The process of forming an insoluble, infusible, flexible tack free protective film on a base consists of applying to a base a miscible mixture consisting of an aliphatic ethylenically

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unsaturated monocarboxylic acid containing at least 6 carbon atoms and a polyepoxide having an average of more than 2.5 oxirane groups per molecule in a ratio of at least one oxirane group to each carboxyl group. The polyepoxide may be epoxidized polyesters of tetrahydrophthalic acid and saturated aliphatic glycols or epoxidized esters of ethylenically unsaturated vegetable oil acids. The film is heated on the base to a temperature from 100 to 225C, whereby the acid is simultaneously esterified with the polyepoxide and polymerized through its unsaturated aliphatic chain. The film thus consists of the reaction product of the aliphatic ethylenically unsaturated monocarboxylic acid and the polyepoxide.

RESINOUS COATING COMPOSITION. R. E. Layman, Jr. (American Cyanamid Co.). *U. S. 3,025,251.* The described composition consists of a mixture of (1) from 10–50% by weight of a water dispersible polymethyl ether of polymethylol melamine and (2) 90–50% of an ammoniated salt of a material selected from the group consisting of (a) a dimer of unsaturated fatty acids having from 14 to 24 carbon atoms and (b) an addition reaction product of a polymerizable styrene and an unsaturated fatty acid having from 14 to 24 carbon atoms.

MODIFIED OXIDIZED POLYMER OIL. T. M. Mozell and A. H. Gleason (Esso Research and Engineering Co.). *U. S. 3,026,279.* A process for improving the properties of a liquid polymer of a conjugated diolefin of 4 to 6 carbon atoms consists of mixing the liquid polymer with 5–35% of a material such as natural drying oils, semi-drying oils, dicyclopentadiene and methyl dicyclopentadiene and blowing the mixture in a hydrocarbon solvent with air or oxygen at a temperature between 20 and 150C until at least a small amount of oxygen has been incorporated into the polymer.

• Detergents

PAPER CHROMATOGRAPHY OF SULPHATED FATTY ALCOHOLS. J. Borecky (Res. Inst. for Org. Syntheses, Pardubice-Rybitvi, Czechoslovakia). *Chem. & Ind. (London)* **1962**, 265. Best results were obtained with paper impregnated with lauryl alcohol and a mixture of methanol and ammonia (1:1) as the mobile phase. The movement of the compounds on the chromatogram is dependent on the number of carbon atoms in the alkyl chains. The longer the chain, the lower are the R_f values. Results are also dependent on temperature; at temperatures above 25–30C the spots are round, well-formed and the R_f values convenient. Lowering of the R_f values is obtained by addition of 1–5% formic or acetic acid to the mobile phase. The time necessary for development is 7 hours at 35–36C. A mixture of ethanol-ammonia (4:6) may also be used, but movement is slower. The alkyl sulphates are detected by spraying with a 0.05% aqueous solution of pinacryptol yellow. Under u.v., the alkyl sulphates C_{12}–C_{18} appeared as yellow fluorescent areas, the oleyl sulphate as a brownish yellow spot, decyl sulphate as a grownish orange spot, and octyl sulphate as a golden yellow fluorescent spot on a pale bluish green background.

CLEAR DETERGENT SOLUTIONS CONTAINING LANOLIN. K. L. Russell and S. Hoch (Malmstrom Chemical Corp.). *Drug and Cosmetic Ind.* **90**, 294–6, 325–6, 328 (1962). A process for the preparation of clear detergent solutions containing lanolin oil is described that employs a combination of a lanolin alcohol polyoxyethylene oxide ether and a fatty acid alkanolamide to solubilize the lanolin oil. The process permits the use of a wide range of concentrations of nonionic lanolin derivatives, lanolin oil and the alkanolamide to obtain desired properties. The first two are known emollients and conditioners; the diethanolamide is commonly used to boost and/or stabilize foam or to adjust viscosity of detergent solutions.

HYDROTROPES IN LIQUID SYNDETS. M. Mausner and P. Sosis (Ultra Chemical Works, Inc.). *Soap Chem. Specialties* **37** (2), 47–50, 105, 107 (1962). The role of hydrotropes (organic compounds having hydrophile-hydrophobe properties, and capable in high concentration of increasing the solubility of other organic compounds in water or in aqueous salt solutions) in heavy duty liquid detergent systems is discussed. Emphasis is placed on alkyl aryl sulfonates. The use of such agents as anti-blocking agents in spray dried detergents and in the cold caustic pulping process is suggested.

LOW FOAMING DETERGENT FOR AUTOMATIC DISHWASHING MACHINE. R. A. Grifo and R. L. Mayhew (General Aniline & Film Corp.) *U. S. 3,022,250.* A low-foam detergent composition for use in a swinging-arm dishwasher consists of (1) a phenol having an aliphatic substituent with an average of 9 carbon atoms per chain and, as a second substituent, condensed ethylene oxide in an average of 4 molecules per molecule of phenol and (2) builders which are a mixture of sodium metasilicate and sodium tripolyphosphate in the proportion of 1:3, respectively. The builders account for 95 parts of the mixture to 5 parts of nonylphenol ethylene oxide.

HEAVY DUTY LIQUID DETERGENT. R. B. Doan (The Atlantic Refining Co.). *U. S. 3,023,168.* The described composition is a stable aqueous suspension of the following ingredients in weight % based on the total weight of the composition: potassium tripolyphosphate, 7.5–25.0; sodium tripolyphosphate, 0–10; triethanolamine C_9–C_{15} alkyl benzene sulfonate. 10.0–25.0; laurylethanolamide, 0–5.0; and sodium carboxymethylcellulose, 0.2–1.0. The total quantity of the tripolyphosphate salts should not exceed 25.0 weight %, the sum of the nitrogen containing compounds should not exceed 25.0 weight %, and the ratio of the tripolyphosphate salts to the sum of the nitrogen compounds ranges between 0.8 to 1.0 and 1.25 to 1.0.

DETERGENT COMPOSITION. M. Dohr, C. Wulff, and B. Werdelmann (Henkel & Cie. G.m.b.H.). *U. S. 3,024,197.* The described composition consists of an anionic or nonionic surface active agent and from 1–100% by weight (on surface active agent) of a water-insoluble boric acid ester of a fatty acid alkylol amide having a melting point of at least 40C. The fatty acid radical of the amide contains between 8 and 30 carbon atoms; the alcohol radical contains up to 5 carbon atoms. The boric acid ester contains from 1 to 3 fatty acid alkylolamide molecules for each atom of boron present, any free hydroxyl groups of the boric acid ester having been esterified with an alcohol having between 1 and 30 carbon atoms.

PREPARATION OF ESTER SALTS OF DI- AND TRISACCHARIDES. W. Harge, G. Matthaeus, and M. Quaedvlieg (Farbenfabriken Bayer Aktiengesellschaft). *U. S. 3,024,229.* A process for preparing a surface active ester salt of a sugar comprises heating a higher fatty acid ester of a disaccharide or trisaccharide with a dicarboxylic acid anhydride in the presence of the carbonates of sodium, potassium, or ammonium. The carbonate must be present in an amount sufficient to convert the acid reaction product into the corresponding salt during the reaction.

PROCESS FOR THE PRODUCTION OF FATTY HYDROXALKYLAMIDES. R. Ernst (Textilana Corp.). *U. S. 3,024,260.* A fatty carboxylic acid is condensed with an alkanol amine containing a labile hydrogen at a temperature of 120 to 180C. The reaction is continued until the fatty acid content of the reaction product is reduced to below 5% by weight. The reaction product then consists of a mixture of hydroxyalkylamides and fatty acid esters of the hydroxyalkylamides and fatty acid esters of the hydroxyalkylamines. An alkali metal, alkali amide, or alkali alcoholate catalyst is added in an amount in excess of that required to neutralize any free fatty acid remaining and to compensate for moisture present. The mixture is reacted at temperatures below 100C in the presence of compounds containing an amine radical with a labile hydrogen, thus converting the major portions of the esters to the corresponding amides.

ALKYL GLYCERYL ETHER SULFONATE MIXTURES AND PROCESSES FOR PREPARING THE SAME. D. D. Whyte and E. O. Korpi (Procter & Gamble Co.). *U. S. 3,024,273.* A composition of matter, particularly adapted for use in detergent applications, consists of a mixture of sulfonated aliphatic mono- and polyglyceryl ether compounds in which the alkyl radical contains 8 to 22 carbon atoms.

TREATMENT OF ANIMAL BY-PRODUCTS. W. H. Smith (Birko Chemical Corp.). *U. S. 3,025,166.* The by-products are washed in a cold wash solution of about 1 pound of detergent in 10 gallons of water for a sufficient time to initially clean them. The products are then rinsed in water at about 120F for about 5 minutes and rewashed for about 15 minutes in a 135F detergent solution containing 3 pounds of detergent per 50 gallons of water. The products are then hot rinsed in 140F water for 5 minutes to substantially reduce residual detergent content, washed for 7 minutes in a 150F solution containing 7 ounces of sodium carbonate peroxide in 50 gallons of water, and rinsed in water washes of decreasing temperature for a time sufficient to reduce residual chemical concentration below toxic levels.

SAPONACEOUS DETERGENTS. G. A. Campbell and D. K. Howard (The Geigy Co. Ltd.). *U. S. 3,026,265.* A solid, substantially homogeneous, plastic, self-coherent saponaceous detergent composition consists of sodium-fatty acid soap and from 10–20% of a mixture of an alkali metal tri-salt of ethylenediamine tetraacetic acid and of an alkylolamine tri-salt of ethylenediamine tetraacetic acid. The amount of alkylolamine salt should be between one-third and an equal amount of that of the alkali metal (sodium or potassium) salt.

The use of extremely poisonous insecticides or rodenticides, such as 1080 and DDT, the latter sometimes used in a tracking powder, may result in contamination of foods and ingredients. Careless use in a manner whereby the foods *may* be rendered injurious to health is in violation of section 402(a)(4) of the Food, Drug, and Cosmetic Act. The inspector is constantly on the watch for such chemicals and when he encounters them he observes the manner of their use and explores the reasonable possibilities of contamination. When these highly toxic products are employed in a food factory, strict safeguards are necessary in order to rule out the hazards of contamination. The inspector will collect samples of the powder, bait, or liquid for laboratory identification, fully describe conditions of use, and frequently use photographs to depict proximity to foods and the avenue of possible contamination. He collects samples of the food suspected of being contaminated and, in general, supplies complete facts and data to establish the contamination or its likelihood. The same type of investigation is followed when there is reason to suspect contamination with highly toxic insecticides in a food plant.

III. *Maintenance of Plant and Equipment.* Maintaining a wholesome factory, free of pollution, is of paramount importance. The Food and Drug Inspector pays careful attention to the physical cleanliness of the plant, the sanitary facilities, location and conditions of toilets and lavatories, presence of soap and towels, and numerous other factors which enter into the actual sanitation and which reflect the awareness or ignorance of management of the principles of good sanitation. He checks into the condition of equipment, the cleaning program, and the construction of equipment from the standpoint of ease in disassembling for cleaning. We have encountered flour lines in bakeries, sirup lines in candy factories, pipe lines in soft drink bottling plants, and bins and storage hoppers in cereal plants whose construction has been of a permanent nature and absolutely precluded any cleaning. In other factories we have observed cleanout plates, conveyor lids, and other access points that have been painted over, making it necessary to break the paint seal to gain entry for examination. Obviously, such conditions provide a positive avenue of contamination with storage insects, mold, slime, or whatever end product of neglect can be expected to develop through failure to clean.

The inspector studies carry-over hazards in those operations in which a filling, batter, icing, etc., is added to the hopper at periodic intervals. Such a practice carries possibility of a build-up of harmful bacteria that results in constant infection of the products unless adequate cleaning and safeguards are maintained.

In some food establishments, such as crab meat packing and nut shelling plants, a high degree of sanitation is necessary to prevent pollution of the finished product. It is absolutely essential in this type of operation, as well as highly desirable in any food processing, that the food touch nothing but bacteriologically clean surfaces and hands. The equipment must have a smooth surface resistant to water, oils, or grease, and the cleaning and sanitizing program must be adequate.

IV. *Human Introduction.* The human factor in food processing is an involved and frequently intricate avenue of contamination of the finished product. In an evaluation of this facet of inspection, the Food and Drug Inspector must not only be alert to the more common employee failings but must carefully consider employees' habits and thoughtless actions through which contamination may occur. He will be alert for sores, cuts, or wounds on hands and arms, and for colds, coughs, or other symptoms of a disease condition in those handling foods in various stages of processing. He will also note personal habits showing lack of cleanliness and hygiene, such as failure to wash the hands prior to reporting to his duty post, dirty attire, nervous habits of picking, scratching, or rubbing, clothing. Employees have varying conceptions of sanitation. They may pick spilled or dropped materials from the floor and place them back in the food stream. They may nest containers so that the adhering floor dirt is transferred into the bucket or can upon which it is nested. It would seem that employees at times become inured to the conditions where they work, to the point where rodent filth, flies, storage insects, and

moldy or rotten ingredients are looked upon as routine. We have actually witnessed employees laying molded centers of candy bars upon rodent excreta pellets in wooden trays. Some bakers, largely the "old-time" hands, have asserted that optimum baking properties of flour are not attained until it has aged to the point that beetles have become apparent. A fairly common reply to criticism of use of obviously contaminated or unfit raw materials or ingredients is that the sifting, filtering, straining, or clarifying (as applicable to the particular instance) will take care of any "dirt." The fallacy of such thinking is too apparent to warrant comment. Our inspectors have met with an occasional operator who honestly admitted that he never eats his own product, knowing the conditions and practices under which it is produced. These few examples serve to illustrate the importance of the human factor in food processing.

V. *Flies.* Flies are universally associated with filth, decomposition, and repulsive conditions. They are bred, hatched, and developed to adulthood in filthy or decaying matter. Feces and sputum are attractive to them. They will feed and gorge on filth and in the next few minutes hover over, alight, and feed on exposed foods. Because of his recognized role as a disease carrier, the fly must be kept out of food establishments as a public health measure. The inspector gives close attention to flies and accurately observes their incidence and their traffic pattern, e.g., from toilets or open outdoor privies into manufacturing areas. Attention is given to the presence or absence of screens and to fly propagating areas in the vicinity of the factory. Some raw materials, especially fruits and tomatoes, attract flies and may serve as egg-laying material, so that finished products are contaminated with fly eggs and even maggots. The Food and Drug Inspector will study operations, practices, and conditions and if the likelihood of fly contamination exists he will point out the avenues of contamination and weigh the significance of the infestation.

VI. *Roaches.* Roaches are another insect closely associated with filth. They feed on decaying animal or vegetable matter. They frequently infest food plants but since they are nocturnal in their habits they may not be seen or encountered except in darkened areas. The roach is a prowler, and besides carrying filth, disease, and pollution on his legs, body, and mouth parts, he may carry pathogens in the intestinal tract. Even the roach himself is a potential contaminant in any food plant infested with these pests. The use of insecticides is usually necessary in roach control but this practice offers the possibility of sick and dying insects getting into exposed batches and inadequately protected ingredients. The inspector makes a careful study of the food plant with all the above factors in mind, seeking out evidence of roaches and weighing the likelihood of ultimate contamination.

VII. *Other Animals.* The role of animals in contaminating foods must be recognized. Cats are frequently given the run of food plants; in fact, some spend their life in the factory. Some operators feel that the cat is necessary and peculiarly successful rodent preventive. Obviously, there is a real contamination hazard in cats prowling about the plant, sleeping on bagged raw materials, carrying food and prey on to stored ingredients or equipment, to say nothing of the sand box, sawdust box, or boiler room site designated as the cat's comfort station. Dogs also must be kept out of food plants.

Pigeons, other birds, and even bats are another contaminating influence in some factories, especially in elevators and other cereal warehouses and processing establishments. Foods contaminated by birds have recently been the subject of several seizure actions under the Federal Food, Drug, and Cosmetic Act.

All of these elements must be considered and carefully explored during the course of the sanitary inspection. Obviously, there are many ramifications of each of these elements; hence examination and evaluation of all phases of operations are necessary, otherwise obscure foci of possible contamination may escape unnoticed. The Food and Drug Inspector is trained and experienced in inspection techniques; in a sense he is a diagnostician and is alert for unhealthy symptoms in plant operations and practices. Since he is a regulatory official, and legal action may result from his inspection, he must be unbiased and able to analyze operations in a purely objective manner. His observations and findings must be reported factually and accurately and in such manner as to be readily converted into testimony in event of legal action. Conclusions must be adequately substantiated by facts; there is no place in his inspection or report for speculation or hasty conclusions.

And finally, the FDA Inspector is an effective education officer. He brings to the factory a new objective appraisal of conditions to which employees and management may have become callous. His standards are high but he has seen them work successfully in well-maintained factories. He leaves with the management a written report of conditions he observed that need correction. Not only the owner-manager of a single factory but also heads of nationwide concerns with many subsidiaries have an opportunity to use these reports to "clean house," whether it be erecting a better building or repairing the present one, replacement of unsatisfactory equipment, employing sanitation personnel, or even dispensing with the services of employees who ignore basic sanitary requirements. As the National Sanitation Foundation said in the quote at the beginning of my remarks, sanitation "is nurtured by knowledge."

New Slide Rule Converts Chemical Analysis into Exact Formula

Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey, announces availability of literature on a unique, new timesaving slide rule device for organic chemists. The Mettler Chemo-Calculator is the first slide rule developed specifically for the field of organic chemistry.

With the Chemo-Calculator, the researcher can convert the percentages of each element in a compound found experimentally by chemical analysis into an exact formula without resorting to pencil, paper, or adding machine.

The Chemo-Calculator can also be used to quickly determine molecular weight or the percentage by weight of the elements in a molecule if the formula is known.