ABSTRACTS

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

• Fats and Oils

The modified Hauchecorne reaction. G. Petruccioli (Olive Exp. Inst., Spoleto, Italy). *Olearia* 17, 187–92 (1963). Based on a very large number of determinations, it is concluded that the Hauchecorne reaction, as modified by several authors, yields results that are directly related to the oil's state of oxidation and is not specific for esterified oils.

Minor components of vegetable oils: Triterpenic alcohols and sterols. P. Capella *et al.* (Exp. Sta. Fats and Oils, Milan, Italy). *Riv. Ital. Sostanze Grasse* 40, 660–5 (1963). A recently developed TLC method provides a rapid means for fractionating the unsaponifiable portion of vegetable oils. The application of this technique to the study of many oils is described as well as the recovery of the separated individual components for further study and identification.

Studies on the autoxidation of polyunsaturated fats, II. E. Fedeli *et al.* (Exp. Sta. Fats and Oils, Milan, Italy). *Riv. Ital. Sostanze Grasse* 40, 619–26 (1963). The catalytic action of chelates of salicyl aldehyde-ethylenediamine on the autoxidation of fatty substrates varies in character as a function of the chelating metal. Chelates of Fe^{++} yield reaction curves without any induction period, while chelates of Co^{++}, Cu^{++} and Ni^{++} have appreciable induction periods (approx 50 hr) and finally chelates of Zn^{++} have a pronouncedly negative catalytic effect. The experimentally determined catalytic action of these chelates is qualitatively the same when operating on a substrate of methyl oleate as when a more unsaturated substrate (linseed oil) is used. The objective of this work was to study the applicability of the autoxidation reaction for preparative purposes.

Estimation of the polymerizing activity of linseed oil. J. Pokorný (Inst. Chem. Tech., Prague). *J. Inst. Chem. Tech. Prague* 5–3, 51–6 (1961). The polymerizing activity of autoxidized linseed oil depends largely on the presence of conjugated double bonds. However, the content of such bonds in oxidized samples is difficult to determine, because various other oxidation products interfere in the analysis, e.g. by absorbing UV radiation in the same wavelengths as conjugated dienes and trienes. An approximate method, due to Taniewski and Bulczynska, has been found to give satisfactory results. The method consists in measuring iodine values both by the Hanus method and by the bromine vapor method. Since conjugated double bonds do not react quantitatively in the Hanus method while they do in the bromine vapor method, the difference between the two determinations can be used as an index of the percentage of conjugated double bonds. This difference increases at the beginning of the autoxidation, remains nearly constant (at 20–60 units) during the second stage of oxidation and decreases rapidly at the end of the reaction. Higher values are obtained in oils oxidized under a strong oxygen flow. A good correlation exists also between the analytical parameter and the curve of viscosity variation during the reaction.

Several aspects in the refining of soybean oil. A. Vargas Romero and F. Ramos Ayerbe (Inst. of Fats and Oils, Seville, Spain). *Rev. Franc. Corps Gras* 11, 3–12 (1964). Degumming, refining, decoloration and deodorization of soybean oil is reviewed.

Notes on the reversion of edible fats and oils. H. Debruyne. *Rev. Franc. Corps Gras* 11, 13–21 (1964). A review is given of the literature on the reversion, particularly flavor reversion, of edible fats and oils.

Control of the source of tallow by gas liquid chromatography. J. P. Wolff and F. Audiau. *Rev. Franc. Corps Gras* 11, 77–89 (1964). Through the gas chromatographic analysis of the fatty acid composition of over one hundred samples of animal fats the authors have determined the mean values of the ratios of certain characteristic fatty acids. With these ratios the authors are able to accurately differentiate between the following animal fats, tallow, calf, mutton, bone tallow, horse and lard, and with somewhat less precision, mixtures of the above fats.

On the modification of fatty acids during the selective hydrogenation under industrial conditions of rapeseed oil. A. Jakubowski and Z. Kowzan (Inst. for Industrial Fats and Oils, Warsaw, Poland). *Rev. Franc. Corps Gras* 11, 67–76 (1964). It has been shown that all the linolenic acid has been removed after 1.5 hr of hydrogenation and at this point the iodine value of the oil is 85. The saturated acid content, stearic and behenic acids, is about 4%. The geometrical isomer content is high. The *trans* content is about 65% of the total unsaturates. The maximum *trans* level is obtained after 3 hr of hydrogenation when the iodine value is 81. The speed of isomerization is ca. 2.5, four times the speed of the hydrogenation of the double bonds.

Preparation of pure and bleachable fatty acids without distillation. C. von Erhardt. *Oleagineux* 19, 195 (1964). The author emphasizes the difficulties created by the use, at high temperatures, of concentrated sulfuric acid for the splitting of soap stocks. He describes a process by which these soap stocks are purified by thorough treatment with tannates, aluminates or pyrophosphates. He cites examples of application to cotton, linseed and soybean oils and olive cake oils. The splitting process is described which employs catalysts at room temperature. The resulting fatty acids can be further purified by the use of active carbon and bleaching earths. The technical and economic advantages are examined and the possibilities of various areas of utilization are discussed.

Chromatographic separation of critical pairs of fatty acids by bromomethoxylation. A. Jobtscheff, A. Popoff, I. Micev and S. Spassov (Inst. of Organic Chem., Bulgarian Academy of Science, Sofia). *Fette Seifen Anstrichmittel* 65, 913–15 (1963). A method for the paper chromatographic determination of critical pairs of fatty acids was developed. The bromomethoxylated fatty acids were obtained with an N-bromo succinate reagent at room temperature for one hour. A sample of this solution was subjected to paper chromatography without further separation. The solvent system employed was 90% N-decane acetic acid. The paper employed was impregnated with a mobile phas of 0.2% N-decane. The results indicated that the bromomethoxylated fatty acids possess considerably greater R$_f$ values than those corresponding unsaturated fatty acids. Critical pairs of fatty acids were plainly separated in this way.

A new paper chromatographic method for separation and identification of synthetic antioxidants. E. A. J. Sedlacek (Inst. for Food Res., Prague). *Fette Seifen Anstrichmittel* 65, 915–18 (1963). A new and simple method for the chromatographic separation and identification of gallates, gallic acid, BHA, and NDGA is reported. Presently used methods are reviewed and the application of different developing solutions is discussed. A detailed tabulation of the developing solvent employed in the paper chromatographic separation of antioxidants as well as the R$_f$ values which have been found is reported. The author has indicated that the best method available utilizes chloroform:acetic acid in a ratio of 99:1 as a developing agent.

Photo oxidation of cholesterol in egg containing foods. L. Acker and H. Grebe. *Fette Seifen Anstrichmittel* 65, 1009–12 (1963). The authors report that egg containing foods when kept in the presence of light under extreme conditions lead to the formation of cholesterol hydroperoxides and 7-hydroxy cholesterol. The loss of cholesterol by photo oxidation is considerable when the material as fine powders in thin layers is exposed to sunlight for a long period of time. The exchanges are however limited when the egg dough products are stored in unground form. The light protected packages showed no change in cholesterol content even after two years.

Quantitative gravimetric analysis of bovine semen lipids by thin-layer chromatography. R. J. Komarek, R. G. Jensen and B. W. Pickett (Dept. of Animal Industries, Univ. of Connecticut, Storrs, Conn.). *J. Lipid Res.* 5, 268–70 (1964). The quantitative thin-layer chromatographic technique described affords advantages in preparative analysis. By increasing the thickness of the layer, lengthening the plate, and using two consecutive solvent systems on each plate, the procedure can successfully manage larger quantities of lipid.

Quantitative analysis of mixtures of glycerides. G. Jurriens, B. de Vries and L. Schouten (Unilever Research Lab., Vlaardingen, The Netherlands). *J. Lipid Res.* 5, 267–8 (1964). The accuracy of a method for the estimation of glycerides separated by thin-layer chromatography has been tested and found to be high. Mono-, di- and triglycerides separated on silica gel, and triglycerides of differing degrees of unsaturation separated on silver nitrate-impregnated silica gel, were found to give equally reproducible results.

Test tube chromatography for the detection of adulterations of pumpkin seed oil. G. Gorbach and Chr. Weber (Inst.

Biochem. Technol., Lebensmittel Chemie and Mikrochemie der Techs. Hochsschule, Graz). *Fette Seifen Anstrichmittel* 65, 989–95 (1963). Using chromatography on narrow paper strips in test tubes with undecane as the stationary phase, the adulterating fatty acids of pumpkin seed oil were detected. The addition or contamination of rapeseed oil can be ascertained to the extent of 1% on the basis of its erucic aid content. The detection of soybean or linseed oil with the acid of linolenic acid and safflower oil with the aid of lignoceric acid is possible. Small additions have been detected with great accuracy by extraction of the fatty acids from several chromatograms and rechromatographing the concentrated fatty acid material. The method is characterized by simplicity and ease and high reproducibility of the R_f values obtained for the individual fatty acids as well as reproducible results with respect to concentrations determined.

VARIATIONS IN CONTENT AND IODINE VALUES OF FATS IN UNDERDEVELOPED SEEDS AND THE PHENOMENON OF MARGINAL FAT SYNTHESIS. A. R. S. Kartha. *Indian J. Chem.* 1,(6), 280–81 (1963). Variations in oil contents and I.V.s of oil in underdeveloped seeds of linseed, groundnut, sunflower and castor have been studied. Oil content in the case of sunflower and castor seeds has been found to remain unchanged whereas it shows progressive decrease with underdevelopment in linseed and groundnut. It is suggested that decrease in oil content in underdeveloped seeds in linked to the physiology of ripening of the seeds and is observed in plants werein the fat content of seeds increases progressively during the entire period of ripening as in the case of linseed. This happens probably because the fat cells can make use only of carbohydrates coming directly from the plant and cannot make use of carbohydrates stored in other cells in the same seeds; the same reason explains the phenomenon of marginal fat synthesis in detached unripe seeds. The I.V.s of the oil in the underdeveloped seeds have been found to be the same as in the mature seeds at all stages of underdevelopment thereby indicating that the dehydrogenating enzymes are geared to produce fatty acid mixtures of definite I.V.s in a particular biologic source, irrespective of the relative proportions of enzymes and fatty acids present. (Rev. Current Lit. Paint Allied Ind.)

MOLECULAR DISTILLATION OF THE GLYCERIDES OF TALL OIL FATTY ACIDS. M. Antila, O. Lehtinen and R. Leimu. *Suomen Kemistilehti* 35B, 84–5 (1962). Experiments involving the molecular distillation of the mixture of glycerides prepared by esterification of the fatty acid fraction of tall oil show that the unsaponifiable compounds become concentrated in the first distillate fractions. (Rev. Current Lit. Paint Allied Ind.)

[NEW] β′ [CRYSTAL FORM] OF 2-PALMITOYLDISTEARIN. F. R. Hugenberg and E. S. Lutton. *J. Chem. Eng. Data* 8, 606–8 (1963). (Rev. Current Lit. Paint Allied Ind.)

VACUUM REFINNING OF FATTY AND RELATED MATERIALS. R. François. *Vide* 17, No. 101, 453–6 (1962). Aspects discussed include solvent extraction of oils; drying of fatty substances; bleaching of oils; deodorisation; distillation, fractionation and esterification of fatty acids; concentration and purification of glycerol, and drying by atomisation. (Rev. Current Lit. Paint Allied Ind.)

CAPILLARY GAS CHROMATOGRAPHY USING MICROVOLUME THERMAL CONDUCTIVITY DETECTORS. D. L. Camin, R. W. King, and S. D. Shawhan (Sun Oil Co., Marcus Hook, Pa.). *Anal. Chem.* 36, 1175–8 (1964). Two capillary chromatographs that utilize microvolume thermal conductivity detectors have been designed and constructed. Experience with these instruments has shown that such detectors are capable of producing a usable signal from as little as 10^{-10} gram of material, and have sufficiently low dead volume and rapid response to permit their use with 0.02-inch i.d. capillary columns. When used in a well designed capillary system for quantitative analysis, microvolume cells will, without prior calibration, produce data that are within 10% of the true value. In addition, they are nondestructive and exhibit a response for materials that escape ionization detection. Examples of the practical application of these instruments for the separation of complex hydrocarbon mixtures demonstrate that thermal conductivity detectors can be used to construct simple, inexpensive and reliable capillary chromatographs that exhibit excellent operating characteristics at temperatures up to 250C.

STRUCTURE OF MILK FAT TRIGLYCERIDES. M. L. Blank and O. S. Privett (The Hormel Inst., Univ. of Minnesota, Austin, Minn.). *J. Dairy Sci.* 47, 481–8 (1964). The distribution of fatty acids among the triglycerides of milk fat was studied by thin-layer chromatographic (TLC) techniques and lipase hydrolysis. The triglycerides were first separated into two fractions by thin-layer chromatography on silicic acid. The fraction with the higher Rf value consisted almost entirely of long-chain triglycerides; the other fraction contained essentially all of the short-chain fatty acids. Treatment of the short-chain triglyceride fraction with sodium methoxide gave three fractions resolvable by silicic acid-TLC. The triglycerides of these fractions contained 0, 1 and 2 short-chain fatty acids per molecule, respectively, and demonstrated the nonrandomness of the distribution of the short-chain fatty acids in this fraction of the original triglycerides. A nonrandom distribution of the fatty acids in the long-chain triglyceride fraction was demonstrated by fractionation and analysis of this fraction by silver nitrate-silicic acid-TLC and lipase hydrolysis.

THEORY OF GAS-LIQUID CHROMATOGRAPHY. POTENTIAL FOR ANALYTICAL USE AND THE STUDY OF SURFACE KINETICS. J. C. Giddings (Dept. of Chemistry, Univ. of Utah, Salt Lake City 12, Utah). *Anal. Chem.* 36, 1170–5 (1964). The theory of gas-solid chromatography in packed and capillary columns has been developed and discussed. Particular emphasis has been placed on expressing the important plate height coefficient, C_k, in terms of known parameters. The accommodation coefficient, α, a parameter which has often been measured in connection with surface studies, is used to express the rate of adsorptive-desorptive mass transfer. The theory shows that C_k is very small, the order of 10^{-7} second, for typical packed columns with uniform adsorptive sites. Nonuniform surfaces exhibit a C_k which is larger by a heterogeneity factor, σ. The equation for σ provides the first quantitative basis for the effects of nonuniformity, and indicates the energy difference between sites required for column deterioration. An examination of the analytical potential of gas-solid chromatography indicates real advantages in terms of column efficiency and high speed analysis. A great potential is shown to exist for enhancing selectivity by making use of the steric nature of the adsorption forces. Finally, gas-solid chromatography is shown to have a real potential for the measurement of surface kinetics.

MICRO BEADS COATED WITH A POROUS THIN LAYER AS COLUMN PACKING IN GAS CHROMATOGRAPHY. SOME PROPERTIES OF GRAPHITED CARBON BLACK AS THE STATIONARY PHASE. I. Halász and C. Horváth (Institut für Physikalische Chemie der Universität Frankfurt am Main, Germany). *Anal. Chem.* 36, 1178–86 (1964). Preparation of porous layer glass beads (PLGB) is described and the technological fundamentals are discussed. Many powdered solids can be used as supports or stationary phases for PLGB. A variety of examples illustrated the applicability of PLGB in gas solid chromatography (GSC) and gas liquid chromatography (GLC). Polar and high boiling substances can be separated with GSC. Properties of graphited carbon black as the stationary phase are described. An attempt is made at comparing the efficiency of PLGB with that of conventional column packings.

PETROLEUM HYDROCABONS: GENERATION FROM FATTY ACID. J. W. Jurg and E. Eisma (Koninklijke/Shell Exploratie en Produktie Laboratorium, Rijswijk, Netherlands). *Science* 144, 1451 (1964). In the presence or absence of water, behenic acid generates hydrocarbons during heating at 200C with bentonite. Without water the ratio of isobutane or isopentane to normal butane or normal pentane is much higher than with water. Besides C_{21} and lower *n*-alkanes, *n*-alkanes with 22 to 34 carbon atoms are also formed.

MIXED SOLVENTS IN GAS LIQUID CHROMATOGRAPHY. R. A. Keller (Dept. of Chemistry, Univ. of Arizona, Tucson, Ariz.) and G. H. Stewart. *Anal. Chem.* 36, 1186–90 (1964). Two liquids may be used in gas liquid chromatography by either joining two columns in sequence, each containing a single liquid; mixing packings, each holding a single liquid; or using a packing coated with a solution of the two liquids. There is disagreement as to whether the three methods are equivalent when the number of moles of each liquid is the same in each case. In the idealized limiting case of zero pressure gradient, the solvents may interact if such interaction is of the kind associated with ordinary solution phenomena, without changing chromatographic behavior. This conclusion is based on a thermodynamic treatment of

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solutions. The three methods should be equivalent if these assumptions are applicable. The reasons for the observed nonequivalence should be sought in the kinetic aspects of the process and not in the thermodynamic equilibrium aspects such as solution-solvent interaction.

Structure and synthesis of milk fat. VI. Unity of the phospholipids in milk. S. Patton, A. Durdan and R. D. McCarthy (Lipids Lab, Ag. Expt. Sta. and Dept. of Dairy Sci., Pennsylvania State Univ., University Park, Pa.). *J. Dairy Sci.* **47**, 489–95 (1964). While recent findings have emphasized the complexity of milk phospholipids (P-lipids), as revealed by the classes present and their fatty acid compositions, results of this study indicate that these P-lipids occur in units of relatively homogeneous lipid composition. This unity also was detected in fractions derived by freezing and thawing tubes of milk or buttermilk that had been centrifuged in a manner (25,000 X g for 6 hr) to yield differentiation of the P-lipids by sedimentation. In both milk and buttermilk the bulk of the P-lipids tended to deposit with a particle that settled mainly in the upper level of the casein layer.

Titration of oxygen and antioxidants using 2,4,6-tri-tert-butylphenoxy free radicals. J. P. Paris, J. D. Gorsuch and D. M. Hercules (Dept. of Chem., Juniata College, Huntingdon, Pa.). *Anal. Chem.* **36**, 1332–4 (1964). A sensitive, quantitative, titrimetric procedure has been developed to determine uncombined oxygen in organic solvents and labile hydrogen atoms in antioxidants and other oxidizable species. The titrant chosen was a solution of 2,4,6-tri-tert-butylphenoxy (TTBP) radicals, which was standardized spectrophotometrically. The quantitative reaction between TTBP radicals and oxygen occurs in a 2 to 1 ratio, the end point being determined either potentiometrically or photometrically. The stoichiometry of the reaction of TTBP radicals with antioxidants and other oxidizable species depends, to a first approximation, on the number of labile hydrogen atoms present. The limit of detectability of oxygen and antioxidants was approximately 10^{-8} mole, with a relative error of $\pm 10\%$.

Determination of nickel in hydrogenated fats by neutron activation analysis. A. G. Souliotis (Nuclear Research Center, "Democritus" Chemistry Department, Athens, Greece). *Anal. Chem.* **36**, 1385–6 (1964). Quantitative nickel data for hydrogenated and for nonhydrogenated fats have been obtained using both extraction and hydrolysis. This method utilizes radiochemical seperations resulting in striking purity of the isolated precipitate. Primary extractions and isolations of nickel result in the elimination of the hydrolysis method of nickel determination which is tedious and at times gives erratic results due to incomplete hydrolysis or incomplete separation of the two phases.

Isolation of erucic acid from the fatty acids of rapeseed oil. H. Grynberg and J. Cyganska (Inst. of Gen. Chem. Warsaw, Poland). *Tluszcze Srodki Pior.* **7**, 319–25 (1963). This work describes the use of two methods for the isolation of pure erucic acid, distillation of the methyl esters, and crystallization of the fatty acid from a solvent. By distillation the authors were only able to obtain erucic acid with a purity of 96.5%. The sole impurity was eicosenoic acid. With the use of fractional crystallization an erucic acid of 97–98% purity was obtained. (Rev. Franc. Corps Gras)

Refining of tobaccoseed oil. B. R. Reddy, K. Ramavarma, B. A. R. Somayajulu, S. D. Thirumala Rao and K. S. Murti (Oil Tech. Res. Inst., Anantapur, India). *Oils and Oilseeds J. (Bombay)* **16**, 6 (1964). The refining and bleaching of tobaccoseed oil has been studied under different conditions. The most satisfactory products are obtained with the method recommended by the AOCS for peanut oil. Addition of tetrasodium pyrophosphate, 0.5 per cent of the weight of the oil, reduces refining losses by about 30%.

Mandarin orange seed oil—Physico-chemical characteristics. B. P. Shalika, A. D. Barua, D. Mahanta and G. S. Siddappa (Cent. Food Tech. Res. Inst., Mysore-2, India). *Indian Oil Soap J.* **29**, 71–4 (1963). The seed oil of the mandarin orange of Assam has an extremely bitter taste, which can be removed by refining with caustic soda solution. The physicochemical characteristics of the oil compare well with those of seed oil of other citrus fruits like grapefruit, tangerine, sweet orange, etc. The mixed fatty acids in the oil contain 3.49% linolenic, 35.97% linoleic, 24.51% oleic and 36.06% saturated acids. The residual cake is rich in protein, phosphorus and calcium.

On the bleaching of oils by adsorbtive agents: VII. Influence of the oxidized chain. M. Lachamp and M. Naudet (Nat. Lab. of Fatty Materials (I.T.E.R.G.), Marseille, Fr.). *Rev. Franc. Corps Gras* **11**, 205 213 (1964). It has been possible, by a comparative study of the bleaching isotherms (at 80C for 30 minutes) of a standard oil and an oil enriched with oxidized chains, to point out the poisoning effect of the latter on the bleaching process. Oxidized fats, which already have a color which cannot be eliminated by adsorption, have their chromophoric power enhanced by the action of the bleaching earths. Thus, the oils will have a color than cannot be eliminated, and which also reduces the bleaching power of the earth. The formation of the color depends upon the nature and the amount of the oxidized chains present in the oil to be bleached and of the nature of the bleaching earths used.

Catalytic action of transition of metalcarbonyl. I. Selectivity and side reactions in the hydrogenation of cottonseed oil by iron pentacarbonyl. Akira Misonou, Ikuei Ogata and Fumiyasu Funami (Univ. Tokyo). *Yukagaku* **13**, 21–7 (1964). Catalytic behaviors of $Fe(CO)_5$ in the hydrogenation of C:C bond have been investigated. Thirty grams each of cottonseed oil was made to react with 1.2 or 2.4 g of $Fe(CO)_5$ with initial pressure of hydrogen at 25 or 50 kg/sq cm at 180–200C for 2 or 4 hours. The result indicated that there was the selectivity of hydrogenation between linoleic acid and oleic acid, and using of higher temperature and a small amount of catalyst were favorable for selective formation of oleic acid, while the reaction of using higher temperature and pressure of hydrogen and larger amount of catalyst accelerated the formation of stearic acid. Also, there was a side reaction product containing high-boiling substance and iron carbonyl compound; the former is considered as a dimer of linoleic acid and the latter was presumed to be formed by the reaction at low temperature in the presence of more catalyst. In the explanation of this reaction mechanism, a certain labile complex compound such as monoene-iron-tetracarbonyl is formed at first from linoleic acid. In case of a presence of large amount of $Fe(CO)_5$, such intermediate is also formed from oleic acid. In the next step of hydrogen-cracking, oleic acid or stearic acid is formed from each of their respective intermediates. The intermediate, formed from linoleic acid, is simultaneously converted into comparatively stable type of diene iron-carbonyl, which can also be produced directly through the conjugation reaction of linoleic acid followed by complex formation reaction. This compound is decomposed by the excessive heating and converted into the dimer; in this case $Fe(CO)_5$ residue of transition state may also act as the catalyst for dimerization.

Polymerization of unsaturated fatty acids. I. Catalytic polymerization of linoleic acid and its ester in the presence of iron pentacarbonyl. Keizo Tanabe and Tetsutaro Hashimoto (Government Chem. Ind. Research Inst., Tokyo). *Yukagaku* **13**, 16–21 (1964). Constants of methyl linoleate and linoleic acid prepared from safflower seeds oil showed: n_D^{25} 1.4600, 1.4678; saponification value 189.7, 196.9; iodine value 171.1, 176.4; and conjugated dienoic acid % 0.4, 0.3. The polymers were obtained in high yields and the maximum polymer content of the crude reaction product was about 65%. The yield of crude polymer from linoleic acid was smaller than that of methyl linoleate under the same reacting condition. The time required to reach 60% of polymer content was decreased with an increase in the reaction temperature and the amount of catalyst. The polymer showed darker color, higher acid number and lower saponification number than the original ester. The polymeric fraction consisted mainly of a dimer and a small amount of polymers of high molecular weight.

Seed oils of peach, Polygonum japonicum and cowpea. Shigeru Hamada and Sei-ichi Ueno (Kinki Univ., Osaka). *Yukagaku* **13**, 195–9 (1964). Extraction of seeds of peach after removal of kernels yielded 16.47% oil. The oil contained 40.41% solid acid and 59.59% liquid acid. The solid and liquid acids showed the following constants: d_4^{15} - - -, 0.9118; n_D^{20} - - -, 1.4657; neutralization no. 202.8, 200.2; iodine no. 74.2, 123.1. The whole seed oil showed acid no. 110.2, saponification no. 183.8 and unsaponifiable matter 2.50%. The solid

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acid contained mainly C_{18} and C_{16} acids with a small amount of C_{10} and C_{12} acids, and elaidic acid. The liquid acid consisted mainly of C_{16} and C_{18} acids, and a small amount of C_{12} acid. *Polygonum japonicum* seeds contained 2.70% oil, d_4^{15} 0.9273, n_D^{20} 1.4741, acid no. 33.4, saponification no. 184.4, iodine no. 126.8 and unsaponifiable matter 5.85%. The oil contained 17.42% solid acid composed mainly of C_{18} and C_{16} acids and a small amount of C_{14} and C_{12} acid, and 82.58% liquid acid composed mainly of C_{18} and C_{16} acids, and a small amount of C_{14} and C_{12} acids. Cowpea seeds yielded 0.56% oil, d_4^{15} 0.9331, n_D^{20} 1.4733, acid no. 5.9, saponification no. 187.6, iodine no. 129.7, and unsaponifiable matter 7.64%. The oil yielded 63.87% solid acid (mainly C_{16} and C_{18} and a small amount of C_{14} acid), and 36.14% liquid acid (mainly C_{16} and C_{18} acids with a small amount of C_{12} and C_{14} acids. The melting points of the unsaponifiable matter of each oil is given.

• Fatty Acid Derivatives

BRASSYLIC ACID ESTERS AS PLASTICIZERS FOR POLY (VINYL CHLORIDE). H. J. Nieschlag, J. W. Hagemann and I. A. Wolff (Northern Regional Res. Lab., Peoria, Ill.) and W. E. Palm and L. P. Witnauer (Eastern Regional Res. Lab., Philadelphia, Pa.). *I&EC Product Res. & Dev.* 3, 146–9 (1964). Twenty diesters of brassylic (tridecanedioic) acid were prepared and evaluated as plasticizers for poly-(vinyl chloride). Data on several of the brassylates indicate that they are excellent low-temperature plasticizers with exceptional light stability. Brassylic acid can be derived via oxidative ozonolysis from the erucic (*cis*-13-docosenoic) acid present (55 to 60%) in oil from crambe, a potential new oilseed crop under investigation by the U. S. Department of Agriculture.

A GAS CHROMATOGRAPHIC STUDY OF SOME AMIDES. J. Parrot and M. Paty (Univ. of Bordeaux, France). *Riv. Ital. Sostanze Grasse* **41**, 143–7 (1964). The chromatograms of several amides have been obtained, including those of the heterocyclic amides derived from piperidine. All the examined substances (aliphatic amides, N-acetopiperidine and the N-mono-, di- and trihalogen acetopiperidines) give very asymmetrical peaks whose tails are more elongated for the less volatile and less stable substances.

GAS CHROMATOGRAPHIC STUDY OF SOME REACTIONS OF AMIDES DERIVED FROM PIPERIDINE. J. Parrot and M. Paty (Univ. of Bordeaux, France). *Riv. Ital. Sostanze Grasse* **41**, 149–52 (1964). The stability of halogenated heterocyclic amides and their decomposition mechanism are reported as well as the reaction of piperidine with tribromomethyl acetate. The kinetics of the reaction between piperidine and methyl α-chloropropionate are also discussed.

TALL OIL AMIDE FOR INHIBITING CORROSION. W. H. Kirkpatrick and V. L. Seale (Nalco Chemical Co.). *U.S. 3,134,759.* Described is a compound from the class consisting of organic polycarboxy acid and organic polycarboxy acid salts of an organic monocarboxy acid amide of an aliphatic polyalkylene polyamine containing at least 2 primary amino groups and at least one secondary amino group interconnected by 2 to 3 carbon atoms in a linear chain.

ALKALI METAL SOAPS OF ROSIN AND ROSIN FATTY ACID MIXTURES. C. M. Lambert (Hercules Powder Co.). *U.S. 3,135,698.* A rosin soap adapted for use as an emulsifier in aqueous emulsion polymerization processes is selected from the group consisting of sodium and potassium soaps of disproportionated rosin and mixtures of disproportionated rosin with fatty acids selected from the group consisting of tall oil fatty acids, hydrogenated tall oil fatty acids, tallow fatty acids, and hydrogenated tallow fatty acids. The soap is stabilized against crystallization by having incorporated in it from 5 to 20% by weight of the rosin of tetrahydrorosin acids. The tetrahydrorosin acids are neutralized to the extent of 30–95% with sodium and potassium hydroxides or carbonates.

• Biology and Nutrition

ESTRONE INHIBITION OF CHOLESTEROL BIOSYNTHESIS AT THE MEVALONIC ACID STAGE. A. J. Merola and A. Arnold (Sterling-Winthrop Res. Inst., Rensselaer, N. Y.). *Science* **144**, 301–2 (1964). Studies on the synthesis of cholesterol with cell-free homogenates of liver from rats treated with graded doses of estrone show that, at doses of estrone which cause a reduction in blood cholesterol, there is an accompanying inhibition of cholesterol biosynthesis. Furthermore, this inhibition appears to occur at the stage of cholesterol biosynthesis at which mevalonate is decarboxylated.

LIPID METABOLISM IN CULTURED CELLS. V. COMPARATIVE LIPID NUTRITION IN SERUM AND IN LIPID-FREE CHEMICALLY DEFINED MEDIUM. J. M. Bailey (Dept. of Biochem., George Washington Univ. School of Med., Washington, D. C.). *Proc. Soc. Exp. Biol. Med.* **115**, 747–50 (1964). Mammalian cells in tissue culture derive most of their lipid requirements from serum customarily used in growth medium. L-strain mouse fibroblasts were grown both on serum supplemented medium and on a recently developed chemically defined lipid-free medium (NCTC 109). Lipid composition of cells was essentially independent of growth medium used. When grown in synthetic medium, cell lipids were synthesized *de novo* from C^{14}-acetate added to medium. In serum supplemented medium *de novo* synthesis from C^{14}-acetate was almost completely depressed. C^{14}-labeled cell lipids were fractionated on silicic acid columns. Serum depressed acetate incorporation approximately equally in all lipid classes. It seems possible that this represents operation of feedback type mechanism for control of cellular lipid composition.

THE INFLUENCE OF GLUCOSE ON AMINO ACID CARBON INCORPORATION INTO PROTEINS, FATTY ACIDS AND CARBON DIOXIDE BY LACTATING RAT MAMMARY GLAND SLICES. S. Abraham, J. Madsen and L. L. Chaikoff (Dept. of Physiology, Univ. of Calif., Berkeley). *J. Biol. Chem.* **239**, 855–64 (1964). The incorporation of specific carbons from C^{14}-labeled alanine, glycine, serine,

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methionine, leucine, aspartic acid, glutamic acid, lysine and phenylalanine into CO_2, lipids, fatty acids and proteins by lactating rat mammary gland slices was studied in the presence and absence of glucose in the incubation medium. In the absence of glucose, almost all of the C^{14}-activity recovered in the total lipid fraction was found in fatty acids when alanine, leucine, or aspartic acid were the C^{14}-substrates, whereas only a small fraction of the total lipid C^{14}-activity was in the isolated fatty acids when glycine, serine, or methionine served as labeled substrates.

STUDIES ON METABOLISM OF VITAMIN A. 5. DIETARY PROTEIN CONTENT AND METABOLISM OF VITAMIN A. D. S. Deshmukh, P. Malathi and J. Gangula (Indian Institute of Science). *Biochem. J.* **90**, 98–104 (1964). Growing rats maintained on diets containing 5, 10 and 20% of casein, when given a single massive dose of vitamin A acetate, showed that the efficiency of absorption of the vitamin increases progressively with the increase in the dietary protein content. The enzyme activities of the pancreas and intestinal mucosa hydrolyzing and synthesizing vitamin A esters, and of the liver oxidizing retinene, were progressively decreased with the lowering of the dietary protein content. When adult male rats with considerable liver reserves of vitamin A were maintained on the diets of the 3 protein concentrations, the blood albumin and vitamin A contents of those receiving the diets containing 5 and 10% of protein fell with the progress of time, those rats receiving the least protein showing the maximum decrease. Blood concentrations were restored with the 20% protein diet.

STUDIES ON THE MODE OF ACTION OF EXCESS OF VITAMIN A. 9. PENETRATION OF LIPID MONOLAYERS BY COMPOUNDS IN THE VITAMIN A SERIES. A. D. Bangham, J. T. Dingle and J. A. Lucy (Strangeways Res. Lab., Cambridge). *Biochem. J.* **90**, 133–40 (1964). Vitamin A_1 alcohol forms a monomolecular film that has a collapse pressure of 22.5 dynes/cm at an air-water interface. This collapse pressure is greater than that of the films formed by a number of closely related derivatives. Compounds in the vitamin A series are able to penetrate a monolayer of lecithin-cholesterol held at 30 dynes/cm and constant area. Vitamin A_1 alcohol, vitamin A_1 acid and vitamin A_2 alcohol cause the greatest increases in surface pressure on penetration of the lipid film. Vitamin A_1 alcohol is the only compound of those studied that is able to cause both a large increase in surface pressure at constant area and also a large increase in area of a lecithin-cholesterol film at a constant surface pressure of 30 dynes/cm. Vitamin A_1 alcohol interacts more strongly with lecithin than with cholesterol. The penetration of a film of lecithin-cholesterol by vitamin A_1 alcohol indicates that penetration of lipoprotein membranes may be an initial step in certain actions of the vitamin; the molecular specificity observed in the experiments with lipid films may be the basis of the molecular specificity observed in many of the functions of vitamin A.

THE ANALYSIS OF THE FATTY ACIDS OF NORMAL HUMAN DEPOT FAT BY GAS-LIQUID CHROMATOGRAPHY. K. J. Kingsbury, D. M. Morgan and T. D. Heyes (St. Mary's Hospital, London). *Biochem. J.* **90**, 140–7 (1964). The sample preparation and gas-liquid chromatographic analysis of the fatty acids in fully hydrogenated and non-hydrogenated human depot fat are described and discussed. Exact scale copies of tracings of representative column runs are shown, together with tables in which retention times and percentage concentrations of 40–45 commonly occurring fatty acids are given. A thorough analysis of the trace fatty acids is presented, including for the first time the series of branched-chain acids from C_{13} to C_{24}.

DETERMINATION OF UBIQUINONE AND TOCOPHEROL IN SOME TISSUES OF SHARK (CARCHARIAS ELLIOTI DAY). D. J. Nazir and N. G. Magar (Institute of Science, Bombay). *Biochem. J.* **90**, 268–70 (1964). The liver, heart and muscle tissues of the shark contained 10.83, 3.14 and 0.13 mg ubiquinone and 9.81, 4.88 and 2.94 mg tocopherol per 100 g of tissue. Paper chromatography of ubiquinone consistently gave a spot having the same R_F as standard ubiquinone-30 for the fraction obtained from liver tissue; extracts of heart and muscle gave spots having the same R_F as standard ubiquinone-45. Only α-tocopherol was detected in these 3 tissue extracts.

QUANTITATIVE ANALYSIS OF PHOSPHOLIPIDS BY THIN-LAYER CHROMATOGRAPHY. V. P. Skipski, R. F. Peterson and M. Barclay (Sloan-Kettering Institute for Cancer Res.). *Biochem. J.* **90**, 374–8 (1964). Analyses of lipids from pooled rat livers gave the following results: phosphatidylcholine, 55.0%; phosphatidylethanolamine, 25.3%; phosphatidylinositol, 8.8%; phosphatidylserine, 3.0%; sphingomyelin, 1.8%; lysophosphatidylcholine, 0.9%; phosphatidic acid and cardiolipin, 5.1%. The method is simple, rapid, reproducible and reliable.

THE COMPONENT FATTY ACIDS OF STOAT, WEASEL AND WILD FERRET FATS. L. Hartman and A. R. Johnson (Dept. of Scientific & Industrial Research, Wellington). *J. Sci. Food Agr.* **15**, 127–9 (1964). The fatty acid composition of the body fat of a weasel and of the lipids obtained from various tissues of a stoat and of a feral ferret has been determined by gas-liquid chromatography. The body fat of the weasel and the perirenal fat of the stoat contained 6–7 mole% of stearic acid, whereas the perirenal fat of the feral ferret contained 15.6 mole% of this acid. This is attributed to differences in dietary fats. Fatty acid composition of badger and mink fats is included for comparison.

HUMAN PLASMA SPHINGOMYELINS. P. D. S. Wood and S. Holton (Inst. for Metabolic Res., Highland-Alameda County Hosp., Oakland, Calif.). *Proc. Soc. Exp. Biol. Med.* **115**, 990–2 (1964). The sphingomyelin region of human plasma lipids, entirely free from lecithin, has been fractionated into two components by thin-layer chromatography. Both components had properties characteristic of sphingomyelins, but markedly different fatty acid patterns, acids above C_{20} being concentrated in the less-polar material. On hydrolysis each component appeared to yield several different long-chain bases, but no striking difference was observed in the distribution of these bases between the two components.

ERYTHROCYTE FATTY ACID COMPOSITION AND APPARENT PERMEABILITY TO NON-ELECTROLYTES. B. L. Walker and F. A. Kummerow (The Burnsides Res. Lab., Univ. of Illinois, Urbana, Ill.). *Proc. Soc. Exp. Biol. Med.* **115**, 1099–1103 (1964). Variations in the nature of the dietary fat resulted in changes in the mixed fatty acid composition of rat erythrocytes. An increase in linoleate content of the diet led to an increased cellular linoleate and arachidonate content whereas diets deficient in linoleate resulted in accumulation of palmitoleic, oleic and eicosatrienoic acids. The changes in cellular essential fatty acids were accompanied by changes in the apparent permeability of the erythrocytes, as measured by rate of hemolysis of the cells in isotonic solutions of non-electrolytes. Increasing levels of cellular essential fatty acids resulted in decreases in hemolysis rates of the erythrocytes. The relationship between the relative rate of hemolysis in isotonic glycerol and the concentration of essential fatty acids was approximately linear. An attempt has been made to correlate the increased hemolysis of the cells from the deficient rats with the changes in fatty acid composition and the possible modification of the phosphatide structure resulting from these changes.

VITAMIN D AND PHOSPHOLIPID METABOLISM. V. W. Thompson and H. F. DeLuca (Dept. of Biochemistry, Univ. of Wisconsin, Madison 6, Wis.). *J. Biol. Chem.* **239**, 984–9 (1964). The addition of vitamin D to the diet of rats caused a 3-fold increase in the incorporation of P^{32}-orthophosphate into the phospholipids of intestinal mucosa, while the incorporation into non-lipid organic phosphate was not altered by the vitamin. Similar, but much smaller, stimulation of P_i^{32} incorporation into the lipids of kidney slices, but not of liver slices, was observed. The incorporation of C^{14}-labeled glycerol and serine into phospholipids of intestinal mucosa was not stimulated by vitamin D, nor was the total amount of phospholipid present in intestinal mucosa altered by vitamin D. A stimulation of the incorporation of P_i^{32} into the lipids could be observed 3 hr after the administration of 2000 i.u. of vitamin D. The effect of the vitamin was not dependent upon the presence of calcium in the medium. The incorporation of P_i^{32} into the phospholipids was totally dependent on oxidative metabolism.

METABOLIZABLE ENERGY VALUES AND COEFFICIENTS OF DIGESTIBILITY FOR PROTEIN AND FAT OF STARFISH MEAL AND STARFISH MEAL COMBINED WITH FISH MEAL. M. W. Stutz and L. D. Matterson (Dept. of Poultry Sci., Storrs Ag. Exp. Sta., Univ. of Connecticut, Storrs, Conn.). *Poultry Sci.* **43**, 474–8 (1964). An experiment was conducted to determine the metabolizable energy values and the coefficients of digestibility of the protein and fat in starfish meal and starfish meal combined with fish meal (1:3). All diets were mixed on a dry matter basis, and all test ingredients were added at the expense of the whole reference ration. The following values were obtained for starfish meal, starfish meal combined with fish meal (1:3), and fish meal respectively; moisture, 2.3, 4.1, 5.1%; crude protein, 24.9, 51.5, 60.0%; fat, 0.02, 14.02, 20.1%; and ash for starfish meal 67.5%. Gross energy in calories/lb were 521, 1,909, 2,333; metabolizable calories/lb 71, 1,226, 1,660; per cent gross

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energy metabolized 13.6, 64.3, 71.2; coefficients of digestibility for protein 15.1, 67.8, 70.7; and for fat 0.0, 91.0, 93.6.

VARIABILITY OF SERUM CHOLESTEROL VALUES IN BABOONS. J. P. Strong, P. B. Radelat, M. A. Guidry and C. A. McMahan (Dept. of Pathology and Biostatistics, School of Med., Louisiana State Univ., New Orleans, La.). *Circulation Res.* 14, 367–72 (1964). Variability of serum cholesterol in baboons was studied in order to obtain estimates of biological and technical variation for use in planning a long term dietary experiment. Variability due to animals, to laboratories, to the day on which blood was drawn, and to laboratory work day was estimated. Implications for the design of experiments involving serum cholesterol in baboons are discussed.

THE RELATIVE ANTI-MUSCULAR DYSTROPHY ACTIVITY OF THE D- AND L-EPIMERS OF α-TOCOPHEROL AND OF OTHER TOCOPHEROLS IN THE CHICK. M. L. Scott and I. D. Desai (Dept. of Poultry Husbandry and Graduate School of Nutrition, Cornell Univ., Ithaca, N.Y.). *J. Nutr.* 83, 39–43 (1964). The relative anti-muscular dystrophy activities (AMDA) of the d- and l-epimers of α-tocopheryl acetate and of β- and γ-tocopherols determined in chick bioassay were found to be 1.46, 0.36, 0.12 and 0.05 units/mg, respectively, as compared with a reference standard dl-α-tocopheryl acetate (unofficial ANRC) which was assigned an AMDA value of 1.0 unit/mg. Blood plasma tocopherol analyses showed that prevention of muscular dystrophy was correlated directly with total plasma tocopherol levels and that 900 to 1025 μg tocopherol/100 ml of blood were present when muscular dystrophy was prevented completely.

COENZYME A-INDUCED INHIBITION OF CONVERSION OF PALMITIC ACID TO KETONE BODIES IN RAT LIVER HOMOGENATES. J. A. Ontko (Dept. of Biochemistry, Univ. of Tennessee Medical Units, Memphis, Tenn.). *Proc. Soc. Exp. Biol. Med.* 115, 1136–8 (1964). A cofactor mixture containing ATP, cytochrome C and coenzyme A decreased ketone body formation from added palmitic acid in a rat liver homogenate system. The conversion of caprylic acid to ketone bodies, however, was not appreciably altered under these conditions. It was found that the decreased ketogenesis from palmitate was caused by coenzyme A. Other sulfhydryl-containing compounds tested did not affect ketone body production from palmitate in this system.

EFFECTS OF DIETARY CHOLESTEROL ON SKIN LESIONS OF RATS WITH SUBACUTE MAGNESIUM DEFICIENCIES. E. J. Olson and H. E. Parker (Purdue Univ., Lafayette, Indiana). *J. Nutr.* 83, 73–8 (1964). Skin lesions were observed in rats with both acute and subacute magnesium deficiencies when they were fed diets containing blood fibrin, glucose and saturated coconut oil as their main constituents. Cholesterol consistently increased the incidence of these skin lesions when added to diets with marginal magnesium levels. Further investigations showed that magnesium is not depleted from the skin immediately before the development of visible skin lesions. On the contrary a moderate elevation of skin magnesium levels on fresh weight basis was observed in skin that was taken from rats fed low magnesium diets just before or as skin lesions develop. The percentage dry weight of skin was lowered by lowering the dietary level of magnesium. The addition of cholesterol to diets induced the same changes in skin dry matter and magnesium content that were caused by the lowering dietary level of magnesium.

EFFECT OF EXPERIMENTAL ALLERGIC ENCEPHALOMYELITIS ON GUINEA PIG PLASMA LIPID FRACTIONS. P. Mueller, M. W. Kies, E. C. Alvord, Jr. and R. S. Yamamoto (Natl. Inst. of Arthritis and Metabolic Disease, Bethesda, Md.). *Proc. Soc. Exp. Biol. Med.* 115, 1095–9 (1964). Significant elevations of plasma free fatty acid (FFA) concentrations have been observed in guinea pigs with experimental allergic encephalomyelitis (EAE). FFA values correlated well with disease index. Increased values were observed prior to marked clinical signs of disease and preceded development of visible lipemia. Those animals with lipemia had the highest FFA concentrations observed. Significant increases in other plasma lipid fractions were noted in guinea pigs fasted from one to ten days but these were smaller in all fractions than increases noted in encephalomyelitic guinea pigs, except for plasma cholesterol. Normal FFA concentration and no visible lipemia were noted in guinea pigs with severe aspermatogenesis.

AORTIC LIPOPROTEIN LIPASE ACTIVITY IN RELATION TO SPECIES, AGE, SEX AND BLOOD PRESSURE. S. Mallov (Dept. of Pharmacology, State Univ. of New York Upstate Medical Center, Syracuse, N.Y.). *Circulation Res.* 14, 357–63 (1964). It has been suggested that lipoprotein lipase (LPL) activity may play a role in the etiology of atherosclerosis. To determine whether there is an inverse relationship between arterial LPL activity and the tendency for arteries to become atherosclerotic, determinations were made of the activities of the enzyme in homogenates of the aortas of animals under conditions associated with a greater or lesser tendency for atherosclerosis to develop. It was found that the LPL activities of the aortas of old rats and rabbits were significantly lower than those of young animals of the same species. Rats, which are resistant to the development of atherosclerosis, manifested about twice the aortic LPL activties that rabbits did, the latter animals being notorious for the ease with which they develop the disease. This was true regardless of the age and sex of the animals compared. These results support the hypothesis that low arterial LPL activity may be associated with increased atherogenesis.

DIETARY BILE ACIDS AND LIPID METABOLISM. VI. PROTECTIVE EFFECT OF CHOLIC ACID IN LITHOCHOLIC ACID FED CHICKS. G. A. Leveille, R. D. Hunt and H. E. Sauberlich (U. S. Army Med. Res. and Nutr. Lab., Fitzsimons Gen. Hosp., Denver, Colo.). *Proc. Soc. Exp. Biol. Med.* 116, 92–4 (1964). Dietary lithocholic acid increased plasma lipid levels, decreased liver fat, increased liver size and induced a marked biliary hyperplasia in chicks fed either a cholesterol-free or supplemented diet. Lithocholic acid increased liver cholesterol levels in chicks fed a cholesterol-free diet and decreased liver cholesterol in chicks fed a cholesterol-supplemented diet. Cholic acid supplementation partially prevented the changes in liver size and plasma liver lipid levels resulting from ingestion of a lithocholic acid-supplemented cholesterol-free diet. In cholesterol-fed chicks, cholic acid afforded almost complete protection against the effects of dietary lithocholic acid.

THE BIOSYNTHESIS OF Δ^9- AND Δ^5-MONOSATURATED FATTY ACIDS BY BACTERIA. A. J. Fulco, R. Levy and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge 38, Mass.). *J. Biol. Chem.* 239, 998–1003 (1964). *Corynebacterium diphtheriae* and *Micrococcus lysodeikticus* desaturate stearic and palmitic acids to the *cis*-Δ^9 derivatives. Resting cell experiments indicate that the desaturation reaction is oxygen-dependent. Growing and resting cells of *Bacillus megaterium* KM convert stearic and palmitic acids to the previously unknown *cis*-5-octadecenoic and *cis*-5-hexadecenoic acids, respectively. Myristic and lauric acids are not desaturated by *B. megaterium* but instead are chain-elongated to palmitic acid, which is then desaturated to the Δ^5 derivative. Oxygen appears to be an absolute requirement for these desaturation reactions also. The conversion of exogenous palmitic acid to *cis*-5-hexadecenoic acid in growing cultures of *B. megaterium* is temperature-dependent, increasing from negligible values in cultures grown at 30C to almost complete desaturation at 23C.

COFACTOR REQUIREMENTS FOR THE FORMATION OF Δ^9-UNSATURATED FATTY ACIDS IN MYCOBACTERIUM PHLEI. A. J. Fulco and K. Bloch (James Bryant Conant Lab., Harvard Univ., Cambridge 38, Mass.). *J. Biol. Chem.* 239, 993–7 (1964). Particles prepared from cell-free extracts of *Mycobacterium phlei* by sedimentation at 100,000 X g catalyze the conversion of palmityl coenzyme A and stearyl coenzyme A to the Δ^9-unsaturated derivatives. The cofactor requirements for the desaturation include reduced triphosphopyridine nucleotide (TPNH), O_2, Fe^{++}, and either flavin adenine dinucleotide or flavin mononucleotide. TPNH is required in substrate amounts while flavin functions catalytically. The cofactor requirements appear to be specific. TPNH not replaced by DPNH, TPN^+ or reduced sulfhydryl compounds. Neither flavin adenine dinucleotide nor O_2 were replaced by other electron acceptors tested. Reduced pteridines (tetrahydrofolic acid, 2-amino-4-hydroxy-6,7-dimethyltetrahydropteridine) are unable to substitute for either TPNH or FAD and do not stimulate desaturation in combination with these cofactors. The requirement for ferrous ion was not satisfied by a variety of other metal ions.

VITAMIN E DEFICIENCY IN THE MONKEY. VI. METABOLISM OF CREATINE-1-C^{14}. C. D. Fitch and J. S. Dinning (Dept. of Biochem., School of Med., Univ. of Arkansas, Little Rock,

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Ark.). *Proc. Soc. Exp. Biol. Med.* **115**, 986–9 (1964). After creatine-1-C^{14} injection half-times of body creatine of 38, 40 and 51 days were found in 3 normal rhesus monkeys. Three vitamin E-deficient monkeys had shortened half-times of body creatine: 20, 21 and 23 days. This abnormality points to a defect in the ability of skeletal muscle to retain creatine as the explanation for the low concentration of creatine in muscle of vitamin E-deficient animals.

Proteolipids. I. Formation of phospholipid-cytochrome c complexes. M. L. Das and F. L. Crane (Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.). *Biochemistry* **3**, 696–700 (1964). A method is described for the formation of complexes between cytochrome c and phospholipids. These complexes are shown to approach certain stoichiometric proportions depending upon the conditions of formation. The major proteolipid complex formed from mixed phospholipids contains 22 g atoms of phosphorus per 1 M of cytochrome c when the original cytochrome c is in excess of the phospholipid. When more mixed phospholipid is added the ratio approaches 32:1. Alcohol hastens the formation of the stoichiometric complex. Inhibition of complex formation by nonovalent cations is proportional to ionic strength of the solution whereas di- and trivalent cations completely inhibit complex formation. The evidence indicates that mixed phospholipids produce a complex in which the amount of phosphorus bound to cytochrome c approaches the available number of charged sites on the cytochrome c.

Metabolism of albumin-bound palmitate-1-C^{14} by the isolated perfused goat liver. J. D. Connolly, H. H. Head and W. F. Williams (Dept. of Dairy Sci., Univ. of Maryland, College Park, Md.). *J. Dairy Sci.* **47**, 386–90 (1964). The data in this study indicate the importance to ruminant species of free fatty acid (FFA) catabolism by the liver. Ruminant liver FFA catabolism can give rise to blood acetate and ketone bodies. The acetate resulting from liver metabolism may account for the major share of endogenous acetate turnover. Free fatty acid catabolism in this perfusion system contributed a variable proportion of the acetate produced by the liver. The ketone bodies undoubtedly contribute to the persistent ketonemia routinely observed in these species. The relative importance of several metabolic processes involved in FFA catabolism has been indicated. The ketone body, derived acetone, and acetate specific activities suggest that four carbon units and the hydroxymethyl glutaryl-CoA pathway are of primary importance in ketone body synthesis in the ruminant liver.

Effects of hypervitaminosis A and D on skeletal metabolism. I. Clark and M. R. Smith (Depts. of Orthopedic Surgery and Biochemistry, Columbia Univ. College of Physicians and Surgeons, New York 32, N.Y.). *J. Biol. Chem.* **239**, 1266–71 (1964). Increased bone mineral turnover has been observed with large amounts of vitamin A. Toxic amounts of vitamin A decrease mucopolysaccharide and collagen content of bone with no demonstrable changes in ash content. Toxic amounts of vitamin D decrease the ash while increasing the absolute amounts of mucopolysaccharide and collagen content. The combination of large amounts of vitamin A with vitamin D partially prevents the pathological changes observed in the skeleton in hypervitaminosis D. It is suggested that the beneficial effect of vitamin A results from increased mucopolysaccharide and collagen turnover. Vitamin A does not prevent the enchanced intestinal absorption of calcium resulting from an excessive intake of vitamin D.

The influence of thyroid status on the utilization of vitamin A and carotene by chickens. I. Ascarelli, P. Budowski, I. Nir and A. Bondi (National Univ. Inst. of Agriculture, Rehovot, Israel). *Poultry Sci.* **43**, 370–77 (1964). Vitamin A storage is increased in thyroxine-fed chicks. The effect is dependent on the levels of feeding of both the thyroxine and the vitamins. The optimal level of thyroxine for New Hampshire X White Leghorn chicks is 5 μg/g. The effect is most pronounced at moderate levels of vitamin feeding, being already much less marked at 300 IU/100 g than at lower levels. Thiouracil does not affect carotene conversion to vitamin A.

Nutrients in alfalfa, lipids of dehydrated alfalfa (Medicago sativa). J. W. Van der Veen and H. S. Olcott (Inst. of Marine Resources, Dept. of Nutr. Sci., Univ. of Calif., Berkeley, Calif.). *J. Agr. Food Chem.* **12**, 287–9 (1964). Lipids of dehydrated alfalfa (6.4%) were fractionated by silicic acid chromatography. The first fraction, accounting for 30% of the total lipids, contained 30% low molecular fatty acids, mainly C$_8$. The main glyceride lipids were mono- and digalactosyldiglycerides. The galactolipids contained approximately 80% linolenic acid. Considerable amounts of unsaponifiables were present in all fractions.

Thin layer chromatography of blood lipids. B. A. Sachs and L. Wolfman (Endocrine Service, Medical Div., Montefiore Hosp., N.Y. City). *Proc. Soc. Exp. Biol. Med.* **115**, 1138–41 (1964). A simple method is described for the fractionation of blood lipids by thin layer chromatography. Lipid patterns for different disorders of lipid metabolism were demonstrated. A difference was noted in the triglyceride fraction between plasma and serum.

Isolation and characterization of low-density lipoproteins in native egg yolk plasma. A. Saari, W. D. Powrie and O. Fennema (Dept. of Dairy and Food Industries, Univ. of Wisconsin, Madison, Wis.). *J. Food Sci.* **29**, 307–15 (1964). The composition of water-washed yolk granules was different from that of yolk plasma. The lipid content of the granules was about 35%, in contrast to that of plasma (81%). Concentrations of phospholipid, phosphorus-containing protein, and protein nitrogen were not the same for the granules and plasma. A method was developed for the isolation of two ultracentrifugally distinguishable fractions, LPL$_1$ and LPL$_2$, from yolk plasma by a differential flotation procedure. The differences in composition of LPL$_1$ and LPL$_2$ were small but significant. LPL$_1$ and LPL$_2$ behaved differently when treated by heat and a proteolytic enzyme. A major yolk steroid, isolated by digitonin precipitation, had a melting point and infrared spectrum similar to those for cholesterol.

Beta-carotene: thermal degradation. I. Mader (Hauptlaboratorium der Margarine Union, Hamburg-Bahrenfeld, W. Germany). *Science* **144**, 533–4 (1964). Thermal treatment of crystalline β-carotene (240C in a vacuum) results in the formation of a volatile fraction containing chiefly aromatic hydrocarbons such as toluene, *m*- and *p*-xylene, 2,6-dimethylnaphthalene and ionene. These compounds have been identified by means of gas-liquid chromatography, infrared spectroscopy, and, in the case of ionene, by additional nuclear magnetic resonance and mass spectroscopy. The principal degradation product is a yellowish-brown, glutinous mass which can be separated by means of preparative thin-layer chromatography in a number of fractions different in molecular weight. The structure of these fractions is not yet clear.

Milk fat analysis, the protection of milk fat tocopherols during saponification with ascorbic acid. V. N. Krukovsky (Dept. of Dairy and Food Sci., N.Y. State College of Agriculture, Cornell Univ., Ithaca, N.Y.). *J. Agr. Food Chem.* **12**, 289–92 (1964). Difficulties encountered in attempting to determine the total tocopherols on the unsaponifiable matter of milk fat were overcome through the use of ascorbic acid in the saponification mixture. An analytical procedure was evolved utilizing this step in the chemical determination of tocopherols, that enables one to determine concurrently and with high degree of precision vitamins A and E and carotenoids on the unsaponifiable matter of fat, permitting the analysis of six samples in one day. Information on the protective influence which ascorbic acid extends to tocopherols in alkaline medium is of value in connection with studies of organoleptic and nutritional properties of lipid-containing food products processed with ionizing energy, and of metabolic processes involving vitamin E.

Spectrophotometric determination of tocopherol in milk and milk lipides. D. R. Erickson and W. L. Dunkley (Dept. of Food Science and Technol., Univ. of California, Davis, Calif.). *Anal. Chem.* **36**, 1055–58 (1964). A spectrophotometric method for the determination of tocopherol in milk and related product is described. The tocopherol is extracted from milk with ethanol and hexane, separated from interfering compounds by silicic acid chromatography, and determined spectrophotometrically after reaction with 4,7-diphenyl-1,10-phenanthroline. A correction is made for interference of carotenoids. The method is applicable to milk, cream, butter-milk and lipides obtained from milk products.

Tocopherol distribution in milk fractions and its relation to antioxidant activity. D. R. Erickson, W. L. Dunkley and L. M. Smith (Dept. of Food Sci. and Tech., Univ. of Calif., Davis, Calif.). *J. Food Sci.* **29**, 269–75 (1964). Studies were made of the distribution of tocopherol between the lipid in the fat globule membrane and inside the milk fat globule, and the relation of that distribution to the loss of tocopherol during

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lipid oxidation. Two fractionation procedures were used, one based on churning of cream, the other on washing cream by repeated dilution with sucrose-saline solution and separation, followed by treatment with sodium deoxycholate. The tocopherol concentration was at least three times higher in the lipid of the fat globule membrane than inside the fat globule. During lipid oxidation, the tocopherol associated with the fat globule membrane was lost more rapidly. The results demonstrated that, in determining the oxidative stability of milk, the membrane tocopherol is more important than that inside the fat globule.

Enzyme is stereospecific. Anon. *Chem. Eng. News* 24(4), 44 (1964). D 9-H^3-, L-9-H^3-, D-10-H^3- and L-10-H^3-stearic acids were individually incubated with growing cultures of *Corynebacterium diphtheriae* for 22–26 hr. Subsequent measurement of oleic acid radioactivity showed that the bacterial enzyme system converts stearic to oleic acid by stereospecific removal of the D-9 and D-10 hydrogens.

Thin layer chromatography of synthetic dyes used as food additives. E. Synodinos *et al.* (State Chem. Lab., Athens, Greece). *Riv. Ital. Sostanze Grasse* 40, 674–7 (1963). A thin layer chromatographic method for the identification of seven synthetic dyes authorized for food use in Greece is described. Experimental details of the method and the R_f values for the seven dyes are reported. The method achieves separation of F.D.&C. Red No. 1 from F.D.&C. Red No. 4, which is especially dnfficult by paper chromatographic methods.

Gas chromatographic study of the action of sodium hypochlorite on amino acids. M. Severin and M. Renard (State Agr. Inst., Gembloux, Belgium). *Riv. Ital. Sostanze Grasse* 40, 649–52 (1963). The reaction between sodium hypochlorite can be utilized to develop a general method of gas chromatographic analysis of mixtures of amino acids. By conducting the reaction at 60C, with pH buffered at 10.8, on a number of different amino acids, it has been shown that in each case a peak corresponding to the C_{n-1} nitrile is obtained, in contrast to previous findings by other authors that the reaction product is the C_{n-1} aldehyde.

Separation of carotenoids in vegetable oils and forages. P. Capella *et al.* (Exper. Sta. Fats and Oils, Milan, Italy). *Riv. Ital. Sostanze Grasse* 40, 666–73 (1963). The carotenoids present in vegetable oils can be separated by subjecting the neutralized unsaponifiable to TLC. Beta carotene and xanthophyll can subsequently be extracted from the plates and analyzed quantitatively by spectrophotometric methods. Approx 90% of the beta carotene originally present is recovered. The method has a reproducibility of ±10%.

Some observations on the specificity of phospholipase A. J. H. Moore and D. L. Williams (Natl. Inst. for Res. in Dairying, Shinfield, Reading, Great Britain). *Biochim. Biophys. Acta* 84, 41–54 (1964). A detailed investigation has been made of the hydrolysis of egg yolk lecithin by phospholipase A derived either from snake venom or from pig pancreas. Hydrolysis was stopped after various times and the components, i.e. free fatty acids, lysolecithin and unchanged lecithin, of the reaction mixtures were separated by chromatography on columns of silicic acid. The fatty acid composition of each of the reaction products was determined by gas chromatography. Marked changes occurred in the composition of the lysolecithin fatty acids and in the composition of the fatty acids released from the β-position of the lecithin during the early stages of the reaction. The composition of the lecithin hydrolysed at each stage of the reaction indicated that the specificity of phospholipase A was such that the rate of hydrolysis of the various types of lecithin molecules decreased in the order: α-unsaturated β-saturated $>$ α-unsaturated β-unsaturated $>$ α-saturated β-polyunsaturated $>$ α-saturated β-monosaturated $>$ α-saturated β-saturated.

Method of treating alimentary canal ulcers with sagebrush oil. A. Sherman (Planta Labs., Inc.). *U.S. 3,133,860.* The method of treating ulcerations of the alimentary canal comprises internally medicating the ulcers directly with an essential oil from a sagebrush plant of the non-toxic species of the genus *Artemisia* accompanied by a carrier.

Buccal tablet containing vitamin A and sodium proteinate. I. B. Wershaw and E. G. Kuehns (Miles Labs., Inc.). *U.S. 3,133,862.* A buccal tablet which disintegrates slowly when placed in the mouth consists of an admixture of 75–85% by weight of sodium proteinate derived from soy bean flour and containing from 85–90% of protein; 5–20% vitamin A acetate; 2–4% tricalcium phosphate; and 2–8% cellulose.

Stabilization of iodine isomerized A esters. C. E. Maxwell, III (Chas. Pfizer & Co., Inc.). *U.S. 3,136,794.* A stable vitamin A composition is obtained by iodine isomerizing in a reaction-inert solvent a member selected from the group consisting of vitamin A, neovitamin A and carboxylic esters thereof and subsequently treating the isomerization mixture at a temperature from about −20C to 25C with an alkali metal borohydride as reducing agent for the iodine in which the alkali metal has an atomic weight from 6 to 40.

• Drying Oils and Paints

Highly elastic polyesters based on dimerised fatty acids. P. Penczek, Z. Klosowska and R. Ostrysz. *Plaste u. Kautschuk* 10(5), 262–5 (1963). Unsaturated polyester resins have been prepared from dimer acids, maleic anhydride and propylene glycol. Dissolved in styrene and cured with the usual catalysts they dry to elastic films without surface air inhibition. (Rev. Current Lit. Paint Allied Ind.)

Thickenings agents for varnishes, paints and related materials. H. Rabate. *Peint. Pig. Vernis* 39(6), 347–9 (1963). The various functions of thickening agents for solvent-thinned paints, emulsion paints, etc., are listed and the principal types described. (Rev. Current Lit. Paint Allied Ind.)

Corrosion resistant paints. L. A. Bryan and W. A. Tidridge (FMC Corp.). *U.S. 3,137,583.* A method of producing a corrosion-resistant paint having a base selected from the group consisting of an air-drying oil base, an alkyd resin base, an epoxy resin base, and a polyvinyl acetate base comprises adding to the paint a barium salt in amounts of 0.5–1.0% by weight. The barium compound is selected from the group consisting of barium cyanurates, barium (2-ethylhexyl) phosphate, barium caprate, barium caprylate, and barium phytate.

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• Detergents

Composition of straight chain alkylbenzenes by gas chromatography. W. J. Carnes (Procter & Gamble Co., Ivorydale Technical Center, Cincinnati, Ohio 45217). *Anal. Chem.* **36**, 1197–1200 (1964). Apiezon-L, SE-30, and DC-550 were evaluated as liquid coatings on 150-foot, 0.01-inch capillary columns. The best separation of components was achieved with a DC-550 liquid substrate and temperature increased uniformly at 1.5C per minute between 120C and 170C. Linear alkylbenzenes with side chain ranging from C_9 to C_{14} were completely separated in 65 minutes. The isomers arising from the position of phenyl attachment were resolved, except for 7- and 6-phenyl substituted alkanes. A criterion for judging column performance is included.

The reversible interaction of sodium dodecyl sulfate with bacterial chromatophores. J. W. Newton (Pioneering Lab for Microbiological Chemistry, Northern Regional Res. Lab., Peoria, Ill.). *J. Biol. Chem.* **239**, 1585–8 (1964). Sodium dodecyl sulfate reacts with bacterial chromatophores, clarifies the particle preparation, and appears to destroy the pigment system with loss of photochemical activity. When suspended in media of high ionic strength, such preparations regain disulfide photoreduction activity and the infrared absorption bands of bacteriochlorophyll. These results show that the changes which take place in the particles on treatment with detergent are at least partially reversible. Chromatophores that have first been incubated in the light with an electron donor system are protected from detergent inhibition.

Soft soap production using Swedish tall oil 22 per cent. M. Aktiebslag (Söderhamn, Sweden). *Soap, Perfumery, Cosmetics* **37**, 411–12 (1964). The preparation of soft soap using tall oil fatty acids is described. Three different formulas are given. In the preparation of a soft soap the lye excess (KOH) must only be 0.05%. Soft soap is extremely sensitive to electrolytes, e.g. potassium chloride and potassium carbonate, water glass or marked excesses of potassium hydroxide. Soft soap must not be exposed to air or sunlight. The author suggests the use of polyethylene bags as an attractive and marketable presentation, which are sufficiently impermeable to ensure freedom from deterioration.

Colorimetric evaluation of trace metals in technical and commercial soaps. M. Loury and C. Finel (Lab. Jean Ripert—Inst. of Fats and Oils, France). *Rev. Franc. Corps Gras* **11**, 133–142 (1964). The nuisance caused by the presence in soaps of trace metals is well known: iron and copper, the most commonly encountered, exert by prooxidant catalysis, an undesirable action on the appearance and shelf life of commercial soaps; nickel and manganese modify unfavorably the properties of technical soaps used for emulsion-polymerization in the manufacture of synthetic elastomers. It is important to the soapmaker to know as exactly as possible the amount of these various metals present in his products in order to determine and eliminate the sources of contamination. For the determination of trace metals the authors selected among the classical methods, those which are the most reliable and which can be applied by simple colorimetry, by means of a color-scale for example, or more accurately by spectrophotometry. The difficulties due to mineralization and sampling are avoided by using acid extraction and using a large sample size.

Chemistry of non-ionic detergents. Part VII. Variations of the micellar structure of some synthetic non-ionic detergents with temperature. P. H. Elworthy and C. McDonald (School of Pharm. Royal Coll. of Sci. and Tech., Glasgow, United Kingdom). *Kolloid Z.* **195**, 16–23 (1964). Three synthetic non-ionic detergents, $CH_3(CH_2)_{15}(OCH_2CH_2)_xOH$, where x equals 7, 8 and 9, have been studied in aqueous solution by light-scattering, viscosity and vapor pressure techniques. The micellar weights and intrinsic viscosities increased as temperature increased, the rise becoming very rapid above threshold temperatures (T_h) of 22C, 36.3C and 47.9C for the three detergents respectively. Micellar hydrations determined by the vapor pressure agreed with those calculated from viscosity intercepts in the region below T_h, where the micelles appeared to be spherical, and hydration was found to increase with temperature. At T_h, micelles of the different detergents contained the same number of monomers. Above T_h the micelles became asymmetric, fitting the oblate ellipsoidal model best. The structure of the micelles was discussed, as was the decrease of second virial coefficient with temperature.

Part VIII. Critical micelle concentrations and thermodynamics of micellisation of synthetic detergents containing branched hydrocarbon chains. P. H. Elworthy and A. T. Florence. *Ibid.*, 23–27. The physical properties of some branched chain non-ionic detergents of general formula $R_2CHCH_2(OCH_2CH_2)_xOH$ where R equals Me, Et, Pr, or Bu and x equals 6 or 9, are reported. Two straight chain *n*-butyl and *n*-hexyl analogues of the hexaoxyethylene branched compounds have also been studied. The surface activity of these compounds has been investigated at 20C, 30C and 40C (where possible) and from these data limiting areas per molecule, critical micellar concentrations (cmc) and conventional heats (delta Hm) and entropies (delta Sm) of micellisation calculated. $\pi A - \pi$ curves were constructed and an equation of the type $(\pi - \pi_o) \cdot (A - A_o)$ equals C was found to fit the experimental points above π equal to 2 dynes per centimeter. The significance of this is discussed. Areas per molecule of 60–80 Å^2, and cmc's of 0.91 to 0.0032 moles per liter were found at 20C. Values of delta Hm varied from 0.8 to 2.9 kilo calories per mole, while delta Sm ranged from 2.2 to 9.7 calories per mole per degree as the series was ascended. Some factors affecting the micellisation of non-ionics are discussed.

Evaluation of the biodegradation of an ethoxylated tallow sucroglyceride. G. Brebion, R. Cabridenc and A. Lerenard (Nat. Inst. of Applied Chem. Res. Vert-le-Petit (S and O). *Rev. Franc. Corps Gras* **11**, 193–204 (1964). The ethoxylated tallow sucroglyceride (obtained by ethoxylation of the reaction product of natural fats, such as tallow, with sucrose) shows unique detergent properites, and therefore can be used a a highly active ingredient for the preparation of washing agents. Ethoxylated sucroglycerides which remain stable in tap water, are rapidly hydrolyzed in water containing partially degraded protein. After hydrolysis the fatty chains are partially removed by formation of calcium and magnesium salts and metabolized more or less rapidly. Also after hydrolysis, the ethoxylated portion is partially metabolized in a first stage, then metabolized more slowly.

Analysis of surface active agents. Wasaburo Kimura and Yasuji Izawa (Suzuka Coll. Technology, Susuka, Mie Pref.). *Yukagaku* **13**, 177–26 (1964). A review with 111 references.

Detergency of nonionic surfactants. VI. Effect of mixing ratio on the detergency of the mixture of nonionic and anionic surfactant. Masaharu Kame, Yasuhiko Danjo, Seiichiro Kishima and Hideyuki Koda (Nippon Oils & Fats Co., Amagasaki City). *Yukagaku* **13**, 30–2 (1964). The detergency of nonionic surfactant (polyoxyethylene nonyl phenyl ether containing 10 CH_2CH_2O groups) blended with anionic surfactant (Na dodecylbenzenesulfonatesulfonate) has been investigated. The detergency becomes lower by blending. There is a sharp fall to a minimum by blending with a small amount of anionic. Dispersing power is also minimized and surface tension is increased to a maximum. It is considered that some change in the micelle of the nonionic occurs on blending to affect detergency.

Polymeric surfactants derived from alkylphenol-formaldehyde condensates. II. Colloidal state of solution. Waichi Hayano, Kou Kitagawa, Takeshi Arai and Kenji Hattori (Nippon Oils & Fats Co., Amagagasaki City, Japan). *Yukagaku* **13**, 33–6 (1964). The aqueous solution of ethoxylated nonylphenol showed a break in concentration-absorbance curve and the determination of critical micelle concentration (cmc) gave values in agreement with this. It is assumed that polymeric surfactants do not take regular configuration like ordinary monomeric surfactants in aqueous solution and that each molecule of the former corresponds to the micelle of the latter in dilute solution. This kind of behavior has been found already in a low polymer (dimer).

Rheology of cosmetics and dentifrices. Teruo Mataumura (The Lion Dentifrice Co., Tokyo). *Yukagaku* **13**, 108–12 (1964). A review with 27 references.

Alkylbenzenesulfonate in water of the Tama River. Takehiko Murakami, Hiroshi Shimizu, Isamu Osawa and Tetsuro Ishiguro (Chuo University, Tokyo). *Yukagaku* **13**, 217–20 (1964). Sodium alkylbenzenesulfonate (ABS) concentrations were measured at 7 points along the river for 5 times during 1962–3. The ABS content in the upper stream remained almost unchanged throughout the year but its content in the lower stream was highest in August, and lower in the order of June, March and October.

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