ABSTRACTS

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

• Fats and Oils

Lipids of Japanese littleneck, Tapes Japanica Deshayes. III. On the ceramide 2-aminoethylphosphonate. Shigejiro Yasuda (Hiroshima Univ.). *Yukagaku* 18, 239–41 (1969). The sphingolipid isolated was identified as ceramide 2-aminoethylphosphonate. It was obtained from ether-insoluble fraction of acetone-insoluble lipids followed by mild alkaline hydrolysis. By hydrolysis with CH_3OH-HCl, 2-aminoethylphosphonic acid was confirmed. Sphingosine was in erythro form. Fatty acid was composed of 87% palmitic acid.

Böhmer number. IX. Correlation between physical properties and Böhmer number of lard. Masao Imamura, Isao Niiya and Taro Matumoto. *Yukagaku* 18, 124–31 (1969). Addition to lard of hardened beef tallow, hardened palm oil, hardened lard, lard-stearin or tallow-stearin results in rapid rise in the melting point and enlargement of plastic range, but the Böhmer number decreased rapidly. Addition of these kinds of hardened fats at 5% concentration gives values outside the range of pure lard. Hardened lard and lard-stearin can be distinguished from pure lard by the content of C_{15} and the ratio of C_{14}/C_{16}, even if they have a low Böhmer number. The ester-exchanged lard has good physical properties but its Böhmer number is markedly low and it cannot be distinguished from beef tallow. However, characterization of pure lard is possible from the ratio of C_{14}/C_{16}, $C_{18:1}/C_{18:2}$, and $C_{14} + C_{16} + C_{18}/C_{18:2}$.

Böhmer number. X. Discrimination of foreign fat by heating DTA. Masao Imamura, Isao Niiya, Takenori Maruyama. *Ibid.* 171–6. In order to detect foreign fats in lard, DTA (differential thermal analyses) were carried out on lard, tallow, horse fat, mutton tallow and hardened lard, and on lard mixed with tallow, horse fat or hardened lard in 5, 10, 20, 40, 60 or 80% amounts. The samples were melted at 60 C, cooled to 0C in 30 minutes, tempered at 20C for 24 hours and gradually raised at the rate of 3C/min. Lard showed two and tallow showed three endothermic peaks. Scattering of peak temperature was narrow among the same species. Mutton tallow showed the same curve as beef tallow, but horse fat did not show any clear peak. Presence of 10% tallow in lard can be easily detected because of the peak on the low-temperature side characteristic of tallow. This is more sensitive than the Böhmer number. The amount of tallow mixed in lard can be determined from the shape of the curve and the ratio of peak heights. The same would probably be true in the presence of mutton tallow. The presence of more than 10% of horse fat also showed the same tendency as that of beef tallow but the presence of 10–40% of horse fat cannot be distinguished from that of beef tallow, though the ratio of peak heights make it possible to discriminate between beef tallow and horse fat.

Identification of the major components of nutmeg oil by gas chromatography and mass spectrometry. G. M. Sammy and W. W. Nawar (Dept. Food Sci., Univ. of Mass., Amherst, Mass.). *Chem. Ind.* (London) 38, 1279–80 (1968). The fatty acid composition of nutmeg oil has been determined to be as follows: C_{12}, 2.0%; C_{13}, 0.7%; C_{14}, 90.4%; C_{15}, 0.2%; C_{16}, 2.2%; C_{17}, 0.2%; C_{18}, 0.4% and $C_{18:1}$, 3.9%.

Composition of the neutral lipids and fatty acids from whale brains. P. Lesch, S. Neuhaus-Meier and K. Bernhard (Univ. of Basel, Basel, Switzerland). *Helv. Chim. Acta* 51, 1655–62 (1968). The lipids from the brain of six pilot whales were extracted and separated into different fractions. The grey matter was found to contain 8% cerebrosides, 6% sphingomyelins, 21% ethanolamine cephalines, 26% lecithins and 22% cholesterol; the white matter 22, 8, 17, 12 and 25%, respectively. The fatty acid composition of each fraction is also reported. In comparison to the human brain the brain of the pilot whale has a higher content of glycerophosphatides and a lower content of sphingolipids, and in comparison to the fin whale it has a higher content of cerebrosides.

In vivo 'quantum' synthesis of fat in ripening seeds of twenty four plant species. A. R. S. Kartha and H. S. Nainawati (Indian Agr. Research Inst., New Delhi, India). *J. Sci. Food Agr.* 20, 46–8 (1969). The proportion of partial (incompletely acylated) glycerides present in oils from ripening seeds at different stages of oil development were determined by a gravimetric method for 24 plant species belonging to 16 families. A total of 133 samples were examined, with 17 of them representing stages of oil development below 10%. No detectable amounts of mono- and diglycerides were present in any case, thus suggesting the existence of a 'quantum' mechanism of fat synthesis in all the species studied.

Observations on the elaidic acid content of olive oils and olive husk oils and its variability during refining operations. G. Taponeco (Prov. Chem. Lab., Pisa, Italy). *Riv. Ital. Sostanze Grasse* 45, 773–8 (1968). The possible effect of several refining operations on the elaidic acid content of olive oil has been studied. An increase in the *trans* acid content of olive oil, of the order of 0.1–0.2%, occurs during bleaching and deodorizing operations. The presence of small (0.05–0.25%) amounts of *trans* acids in virgin, unrefined olive oils has also been confirmed, thus lending weight to the supposition that the olive itself contains factors favoring the *cis-trans* conversion.

Preliminary observations on the seasonal variability of the lipid contents in the tissues of some clupeids found in the Adriatic Sea. R. Viviani *et al.*, (Inst. of Biochem., Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 45, 779–90 (1968). The seasonal variability has been studied of the tissue lipids of *Sardina pilchardus* (Walb.), *Clupea sprattus L.* and *Engraulis encrasicholus L.*, found in the upper Adriatic Sea. The tissue lipid content of these marine species is known to vary during the course of the year, depending on the degree of sexual development. From the experimental results obtained, relative to a single November to March period, considerable seasonal variations have already been observed in total lipids, phospholipids and neutral fat content in fillets and livers of the Clupeids under examination. Such findings represent useful indications not only for understanding the lipid metabolism of these marine forms but also for the purpose of a more rational utilization of this natural resource.

The olive oil triglyceride structure. M. Catalano (Inst. Agr. Ind., Univ. of Bari, Bari, Italy). *Riv. Ital. Sostanze Grasse* 45, 791–8 (1968). The triglyceride composition of olive oil has been studied through a combination of column and thin-layer chromatography, pancreatic lipase hydrolysis and gas chromatography of fatty acid methyl esters and triglycerides. Seven triglyceride constitute approx. 90% of the oil: OOO (41%), POO (22%), OLO (7%), LOO (7%), PLO (6%), SOO (4%) and POP (3%). About half of the remaining 10% is formed by 23 triglycerides with unsaturation varying from 1 to 4 and the second half by 15 triglycerides with 5 or more double bonds, only partially resolved. Glycerides containing saturated acids in the 2-position represent only 1.5% of the oil. Thirty of the 75 triglycerides theoretically possible from a combination of five acids are absent. The fatty acid distribution in the triglycerides corresponds closely to a 1,3-random, 2-random distribution.

Method of refining vegetable and animal oils. A. Koebner and T. Thornton (Marchon Products Ltd.). *U.S. 3,440,253.* The alkali refining of edible oils is carried out in the presence of a concentrated, e.g. 25–40%, aqueous solution of a mononuclear aryl or alkyl aryl sulphonic acid in which the total number of C atoms of the alkyl chains is not greater than 4. The mixture resolves into a refined oil phase and an aqueous phase containing the soapstock. After separation, the soap is split by acidification and the resulting free fatty acids are recovered. The aqueous residue is preferably recycled after crystallizing out excess inorganic salts.

Method of determining the fat content of milk and related products. P. E. Aegidius (A/S N. Foss Electric). *U.S. 3,442,623.* A method of colorimetrically determining the fat content of milk comprises as a first step adding a protein chelating agent to a milk sample and then homogenizing the sample at constant pressure. The sample is then placed in a cuvette of a colorimeter, the distance between the cuvette and the photoelectric cell being such that a curve representing light transmission through the cuvette vs. homogenizing pressure shows a distinct minimum at the homogenizing pressure. The light transmission reading may be compared with the curve for samples of known fat content.

Pan and grill fry shortening. E. J. Reid (Hunt Foods Industries, Inc.). *U.S. 3,443,966.* A pumpable pan and grill fry shortening having consistency similar to that of unhydrogenated peanut butter at room temperature is produced by slowly chilling a mixture of hydrogenated soybean oil and coconut oil to obtain an intermediate product having most of its crystals in excess of 200 microns in their largest dimension. This intermediate product is milled to produce a shortening in which most of the crystals are less than 20 microns in their largest dimension. The shortening is stable at relatively high storage temperature. In use it is further characterized by a reduced level of spattering and a reduced amount of sticking when foods are fried.

Salad oil from zero-erucic acid rapeseed oil. B. F. Teasdale (Canada Packers Ltd.). *U.S. 3,443,967.* Zero-erucic acid rapeseed oil is hydrogenated in the presence of a nickel hydrogenation catalyst to a linolenic acid content between about 0.1 and 1.5% and winterized to provide a salad oil in unexpectedly high yields.

Fats protected against rancidity. P. A. Wolf and A. K. Prince (Dow Chem. Co.). *U.S. 3,443,970.* Fats are protected from rancidity by incorporating therein a small amount of an acylacetone, the acyl group of which contains 10-26 C atoms, optionally with the inclusion of a very small amount of a free radical acceptor. The acylacetone very strongly suppresses the formation of free radicals, which initiate rancidity. Consequently, the capacity of a very small amount of a free radical acceptor in inhibiting the development of rancidity is greatly enhanced.

Stabilized fatty product and method of producing same. T. B. Tribble and E. L. Rondenet (Flavor Corp. of America). *U.S. 3,444,218.* A preserved fatty product is obtained by treating organic fatty materials with a new anti-oxidant preservative containing butylated hydroxytoluene or butylated hydroxyanisole or mixtures thereof and anthranilic acid or its methyl or ethyl esters, to obtain fats, oils, greases and tallows which are stabilized against oxidative rancidity for prolonged periods of time.

Process for the continuous hardening of unsaturated oils and fats. T. Voeste and H. J. Schmidt (Metallgesellschaft A.G.). *U.S. 3,444,221.* A process is described for the continuous hydrogenation of fats and oils in the presence of a suitable hydrogenation catalyst under elevated pressures (2–10 atm.) and preferably high temperatures (150–200C). The reaction is conducted in a confined zone completely filled with the reactants, the volume occupied by the liquid phase bearing a ratio of at least 10:1 (preferably 10–50:1) to the volume occupied by the gaseous phase. Unused hydrogen is preferably recycled along with fresh make-up hydrogen.

Pyrolysis of esters of saturated fatty acid. II. Pyrolysis of methyl acetate. Masayoshi Miyagawa (Tottori Univ.). *Yukagaku* **18**, 296–8 (1969). Methyl acetate was pyrolyzed at 450, 500, 550, 600, 650, 700, 750 and 800C, respectively, and the pyrolyzates were analyzed. Methyl acetate was difficult to decompose; at 650C only 44% decomposed. At the higher temperatures the reaction proceeded rapidly with a maximum (more than 90%) at 800C. The principal products in the temperature range above 700C were carbon monoxide and methane although considerable quantities of water, carbon dioxide, acetone, methanol, acetic acid and formaldehyde were formed. Among these products, carbon monoxide, methane and formaldehyde increased in the quantity with the rise of pyrolysis temperature, whereas, water, acetone and methanol were produced in large quantity in the range up to 650C and then decreased as the temperature rose.

Ferulates contained in rice bran oil. IV. Isothermals of artificial mixtures and their chemical changes during heating. Tomio Endo, Kiichiro Ueno, Osamu Misu and Yanosuke Inaba (Nakataki Pharm. Ind. Co., Tokyo). *Yugagaku* **18**, 305–9 (1969). Melting points were determined on mixed samples of steryl ferulates (campesteryl and β-sitosteryl 46:54 wt%) and of cycloartenyl and 24-methylene cycloartenyl ferulates. A mixture of cycloartenyl and steryl ferulates (52:48%) showed a minimum melting point of the eutectic type. Also, a minimum melting point at the eutectic type was observed with a mixture of 24-methylenecycloartenyl and steryl ferulate (25:75%). The order of heat stabilities at 120, 195 and 240C was found to be as follows: campesteryl ferulate > β-sitosteryl ferulate > cycloartenyl ferulate > 24-methylenecycloartenyl ferulate.

Annual periodical fluctuation in physical values of Japanese margarine and shortening. Hiromu Kanematsu, Isao Niiya, Masao Imamura and Taro Matsumoto (Japan Margarine & Shortening Makers Assoc. Found., Tokyo). *Yukagaku* **18**, 318–25 (1969). Average melting point of household margarine was 33.1C and the difference in maximum and minimum melting point (R) was 8.1C. In bakery margarines the corresponding values were 35.1C and 11.2C, while those of shortening were 37.8C and 10.8C. Six of the household margarines showed almost no difference in the melting point and SFI value throughout the year, and therefore nearly no change in physical properties or fatty acid composition. There was a correlation between the melting point and SFI or iodine value. A correlation was also found to exist between dienic + trienic and melting point or SFI.

Recent progress of hydroboration. Akira Suzuki (Hokkaido Univ., Sappro). *Yukagaku* **18**, 285–91 (1969). A review with 75 references.

Seed oils from two species of cucurbitaceae. Setsuko Endo, Yoshiya Yamamoto and Fusae Ogata (Tokyo Gakugei Univ.). *Yukagaku* **18**, 314–18 (1969). Ether extract of seeds of Kikarasu-uri and Prince Melon, respectively, yielded oils of following value: d^{24}_{4} 0.9235, 0.9180; n_D 1.4555, 1.4756; iodine no. 121.5, 135.1; acid no. ——, 3.5; saponification no. 210.5, 190.7. Composition of the fatty acid and the sterols of these oils are given.

Bömer number. XI. Cooling differential thermal analysis (DTA) of foreign fat in lard. Masao Imamura, Isao Niiya, Takenori Maruyama and Taro Matsumoto. *Yukagaku* **18**, 292-5 (1969). As a means of detecting foreign fats in lard, cooling DTA were carried out on lard, beef tallow, horse fat, mutton tallow and lard mixed with beef tallow or horse fat. Samples were melted at 70C for 10 minutes, then chilled to −40C at the rate of 3C/min. Lard showed 3–4, beef tallow 2 and mutton tallow 2 exothermic peaks. Horse fat showed 2 exothermic peaks in the temperature range examined but the peaks were smaller than those of other fats. The presence of more than 5% beef tallow in lard can be detected by the characteristic peak and the amount mixed can be known from the peak area. This is more precise than heating DTA. The presence of more than 20% horse fat can be detected from the characteristic peak and the ratio of peak area but this method is less precise than heating DTA.

Simultaneous measurements of X-ray diffraction and differential thermal analysis (DTA). Midori Goto, Eiichi Asada, Takashi Uchida and Katsuo Ono (Gov. Chem. Ind. Res. Inst., Tokyo). *Yukagaku* **18**, 299–305 (1969). In studying phase transition of fats and fatty compounds, a simultaneous measurement of X-ray diffraction and DTA was desired. A simple devise was designed to work in the −180C to +200C range by modifying a low temperature X-ray diffractometer attachment. With this device, ammonium nitrate, triglycerides (trilaurin, trimyristin, tripalmitin) and potassium laurate were examined. Changes in X-ray diffraction pattern coincided with DTA data. Even the small heat of transition of ammonium nitrate (−16C, 130 kcal/mol) was detected. It is expected that the transitions accompanying hysteresis phenomenon will be successfully observed by this device, because X-ray diffraction and DTA can be measured under identical condition.

Liquid extraction of acetone solutions of vegetable oils. E. F. Buhtareva *et al. Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* **69**, 117–121 (1969). Liquid extraction of the acetone miscella by aqueous acetone permits removal of free fatty acids, phosphatides, color bodies and gossypol. The volume ratio of the 80% acetone solvent to the acetone miscella was 1:1. (Rev. Franc. Corps Gras)

Development of a sorption procedure for use in miscella refining of cottonseed oil. M. Tursunov *et al. Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* **69**, 47–50 (1969). In the miscella refining of cottonseed oil, it is necessary to use a silica gel of 0.25–0.5 mm. particle size with a time of 30 minutes. The best order of sorption columns to use is anionite-silica gel-anionite. The optimum concentration of oil in the miscella is 8–10%. The inlet velocity is 16.2 mm./min. Following acidification by 10% sulfuric acid, the soap solution yields a clear mixture of fatty acids of 86.6 I.V. and 58.6 thiocyanogen number. (Rev. Franc. Corps Gras)

Synthetic foods. A. Rutkowski. *Przemysl Spozywczy* **23**(5), 92–95 (1969). This article reviews the present state of research on this subject and discusses the prospectives for production of synthetic fats, proteins and carbohydrates. (Rev. Franc. Corps Gras)

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INFLUENCE OF THE KIND OF FATTY RAW MATERIAL AND OF THE RENDERING CONDITIONS ON THE STABILITY OF THE RESULTING LARD. S. Wasilewski *et al.* *Przemysl Spozywczy* 23(1), 12–14 (1969). Fat rendered for 20 minutes at 120C (to give a gold color to the cracklings) has better stability than fat rendered at 105C. The stability of the latter depends mainly on the kind of fatty raw material, without regard to the rendering time, while the stability of fat rendered at 120C for 20 minutes correlates well with the protein content of the raw material. (Rev. Franc. Corps Gras)

INFLUENCE OF STORAGE TEMPERATURE ON MICROBIOLOGICAL, PHYSICOCHEMICAL AND ORGANOLEPTIC CHANGES IN MILK MARGARINE. A. Loranc. *Przemysl Spozywczy* 23(1), 25–26 (1969). During a period of 10 days, and after the normal storage life, a comparison was made between pasteurized and unpasteurized margarine and between fresh margarine and margarine stored for 2 months at 2–4C, 10–12C, and 18–20C (75–80% relative humidity). The results show a better quality for the pasteurized margarine. Changes in organoleptic qualities are greatly affected by lipolytic bacteria, yeasts and molds as well as by the composition of the margarine and the storage temperature. (Rev. Franc. Corps Gras)

STATISTICAL EVALUATION OF THE NATURAL LOSSES OCCURRING DURING DRYING OF RAPE SEEDS IN 1967. U. Fal. *Tluszcze Jadalne* 12(6), 255–264 (1968). (Rev. Franc. Corps Gras)

DISCUSSION OF THE FUNDAMENTAL PRINCIPLES INVOLVED IN DEVELOPING A FLUIDIZED PIPE FOR TRANSPORTING AND COOLING EXTRACTED OILSEED CAKE. M. Kubicki. *Tluszcze Jadalne* 12(6), 269–277 (1968). (Rev. Franc. Corps Gras)

MICROORGANISMS APPEARING IN MILK MARGARINE. A. Loranc. *Tluszcze Jadalne* 12(6), 278–291 (1968). (Rev. Franc. Corps Gras)

VITAMIN AND MINERAL COMPOSITION OF CEDAR NUTS. V. A. Rus *et al.* *Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* 69, 12–13 (1969). (Rev. Franc. Corps Gras)

INFLUENCE OF DIFFERENT FATS ON THE QUALITY OF GLUTEN. N. I. Kozin *et al.* *Ibid.*, 36–40 (1969). (Rev. Franc. Corps Gras)

INFLUENCE OF PHOSPHATIDE CONCENTRATES ON THE PROPERTIES OF EMULSIONS FOR SWEET PASTRIES. A. D. Pokopenko *et al.* *Ibid.*, 41–43 (1969). (Rev. Franc. Corps Gras)

VARIATION OF THE CONTENT OF MINOR FATTY ACIDS DURING HYDROGENATION OF SUNFLOWER OIL. B. N. Tjujunnikov *et al.* *Ibid.*, 51–52 (1969). (Rev. Franc. Corps Gras)

EFFICIENCY OF THE FIVE ROLL MILL, TYPE VS-5, IN THE COMMINUTION OF SUNFLOWER SEED KERNELS. V. S. Seskutov. *Ibid.*, 105–107 (1969). (Rev. Franc. Corps Gras)

TYPES OF CHEMICAL TREATMENT OF FATS. IV. PROPERTIES AND USE OF CERTAIN POLYMERS. H. Szczepanska *et al.* *Tluszcze i Srodki Piorace Kosmet.* 13(1), 16–20 (1969). (Rev. Franc. Corps Gras)

STUDIES ON THE PRESERVATION OF THE QUALITY OF SOAPS DURING PROLONGED STORAGE. K. Puciatycki. *Ibid.*, 21–25 (1969). (Rev. Franc. Corps Gras)

PEARLY PIGMENTS FOR COSMETICS. B. Rybclynska. *Ibid.*, 26–27, (1969). (Rev. Franc. Corps Gras)

SPERM WHALE HEAD OIL. PART I. THE ESTER FRACTION. C. J. Challinor, R. J. Hamilton and K. Simpson (Dept. of Chem. and Biol., Regional College of Technol., Liverpool). *Chem. Phys. Lipids* 3, 145–51 (1969). The wax esters of sperm whale head oil have been isolated and shown to range from C-25 to C-38 in chain length. The total wax esters were then fractionated according to the degree of unsaturation and the observed compositions have been compared to the values calculated assuming synthesis in a random fashion.

E. S. R. STUDIES ON NITROXIDE PROBES IN LECITHIN-WATER SYSTEMS. M. D. Barratt, D. K. Green and D. Chapman (Unilever Res. Lab., The Frythe, Welwyn, Herts, Great Britain). *Chem. Phys. Lipids* 3, 140–4 (1969). The molecular motion of a nitroxide free-radical probe in lecithin and lecithin-water systems has been studied as a function of temperature. In the lecithin-water system a significant decrease in the motion of the probe is observed on crystallisation of the hydrocarbon chains. At temperatures above the chain-melting point, an increase in the water content, up to about 25% water, produces an increase in the tumbling rate of the probe. At higher water content the probe motion remains approximately constant. Addition of cholesterol to the lecithin-water systems decreases the motion of the probe and decreases its solubility in the lipid.

HYDROGENATED MILK FAT AS AN INHIBITOR OF THE FAT BLOOM DEFECT IN DARK CHOCOLATE. L. B. Campbell, D. A. Andersen and P. G. Keeney (Div. of Food Sci., Pa. State Univ., Univ. Park 16802). *J. Dairy Sci.* 53, 976–9 (1969). The effectiveness of hydrogenated milk fat as an inhibitor of the fat bloom defect in dark chocolate was compared to unhydrogenated milk fat. Under accelerated test conditions involving controlled cycling of temperature during storage, coatings with 2.5% of hydrogenated milk fat remained free of fat bloom two to four times longer than did chocolate containing an equal amount of unhydrogenated milk fat, a recognized bloom inhibitor. Fully hydrogenated milk fat was more effective than partially hydrogenated milk fat. Trials in which concentrations of hydrogenated milk fat were varied up to 3% by weight showed that as the amount of additive in the coating increased, a corresponding decrease occurred in bloom susceptibility. As measured by a compression testing instrument, adding hydrogenated milk fat had a slight softening effect on chocolate in excess of that attributable to the higher fat content. However, the coating was firmer than chocolate containing an equal amount of unhydrogenated milk fat.

ISOMERIZATION OF MONO- AND DIGLYCERIDE TRIMETHYLSILYL ETHERS. R. Watts and R. Dils (Dept. of Biochem., Univ. of Birmingham, England). *Chem. Phys. Lipids* 3, 168–75 (1969). Gas-liquid chromatography and nuclear magnetic resonance data have been correlated to show that, on silylation with hexamethyldisilizine plus trimethylchlorosilane, 1-monoglycerides partially isomerise to the trimethylsilyl ethers of 2-monoglycerides. This isomerisation does not occur when bis(trimethylsilyl)acetamide is used as silylating reagent. Though GLC data alone could not be used to determine whether diglycerides isomerise on silylation with hexamethyldisilazine plus trimethylchlorosilane, this was excluded by nuclear magnetic resonance data.

AUTOMATIC SAMPLE LOADER FOR COLUMN CHROMATOGRAPHY. A. R. Thomson and J. W. Eveleigh (Wantage Res. Lab. (A.E.R.E.), Wantage, Berks, England). *Anal. Chem.* 41, 1073–6 (1969). The apparatus to be described enable a number of samples to be loaded automatically at preselected times on a single chromatographic column. The samples to be analyzed—e.g. protein hydrolysates—are first adsorbed on short tubes filled with a suitable adsorbent. These tubes are introduced in turn between the chromatographic column and the eluant feed. The device is generally applicable to analytical systems based on column separation. In conjunction with a suitable valve system, cycles of sample loading, analysis and column regeneration can be carried out completely automatically.

DONOR-ACCEPTOR COMPLEXES AND THE SEMICONDUCTIVITY OF LIPIDS. B. Rosenberg and B. B. Bhowmik (Biophys. Dept., Mich. State Univ., East Lansing, Michigan 48823). *Chem. Phys. Lipids* 3, 109–24 (1969). The 1:1 electron donor-acceptor complexes of 2,4-dinitrophenol with lipids such as egg lecithin, synthetic lecithin and oxidized cholesterol have been studied spectrophotometrically in carbon tetrachloride solution. The charge-transfer absorption band has been found in the near ultraviolet for each complex. The equilibrium constants of these complexes have been estimated from their charge transfer bands and are in the order egg lecithin > synthetic lecithin > oxidized cholesterol. The increase of electrical conductivity with decreasing activation energy of oxidized cholesterol bimolecular lipid membranes in the presence of different acceptors supports the suggestion of donor-acceptor complex formation. The strength of the acceptors are in the order iodine > picric acid > 2,4-dinitrophenol > trinitrobenzene. In the solid state, the activation energies of fully hydrated oxidized cholesterol crystals have been measured in the presence of iodine and 2,4-dinitrophenol. The values are in good agreement with those obtained for the bimolecular lipid membranes and suggest that the same mechanism of semiconduction appears in both cases.

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and W. L. McCracken. Apparatus for extraction. U.S. Patent 2,264,390. Dec. 2, 1941.

277. ———, and R. J. Dent. Apparatus for extraction. U.S. Patent 2,321,923. June 15, 1943.

278. McBride, G. W. Chemical engineering advances in soybean processing. Chem. Met. Eng. *47,* 614–618 (1940); C.A. *34,* 7471 (1940).

279. Mashino, M. Purification of soy-bean protein. J. Soc. Chem. Ind. (Japan) *30,* 610–617 (1927); C.A. *22,* 1602 (1928).

280. ———. The purification of soy-bean protein: II. Influence of water on the purification by lower alcohols. J. Soc. Chem. Ind. (Japan) Suppl. Binding *32,* 312–313 (1929); C.A. *24,* 2152 (1930).

281. ———. Purification of soy-bean protein: III. Influence of acid or alkali on the purification by dilute lower alcohols. J. Soc. Chem. Ind. (Japan) Suppl. Binding *33,* 55–56 (1930); C.A. *24,* 3025 (1930).

282. ———. Soybean proteins. J. Soc. Chem. Ind. (Japan) *54,* 236–238T (1935); C.A. *29,* 6326 (1935).

283. Meinl, J. Simultaneous extraction of high-grade, undeteriorated fat and powdered protein from oil-bearing leguminous seeds. Belgian Patent 449,500. April 1943; C.A. *41,* 6739 (1947).

284. Milner, R. T. Recent progress of the U.S. Regional Soybean Industrial Products Laboratory. Am. Soybean Assoc., Proc. Ann. Meet. *19,* 56–60 (1939); C.A. *34,* 7638 (1940).

285. Miyoshi, S., and K. Takai. Soybean protein glue: I. The denaturation of soybean protein by methanol. J. Soc. Chem. Ind. (Japan) *46,* 794–796 (1943); C.A. *43,* 1603 (1949).

286. Nagel, R. H., H. C. Becker and R. T. Milner. The solubility of some constituents of soybean meal in alcohol-water solutions. Cereal Chem. *15,* 766–774 (1938).

287. Neustadt, M. H. Improved Soxhlet extractor. Ind. Eng. Chem., Anal. Ed. *14,* 431 (1942).

288. Okano, K., and I. Beppu. Coloring matters in soybean: I. Isolation of four kinds of isoflavone from soybean. J. Agr. Chem. Soc. Jap. *15,* 645–652; Bull. Agr. Chem. Soc. Jap. *15,* 110 (1939); C.A. *34,* 429 (1940).

289. ———, and I. Beppu. Coloring matters of soybean: II. Three kinds of flavones and resene. J. Agr. Chem. Soc. Jap. *16,* 369–372 (1940); C.A. *35,* 1786 (1941).

290. Pallauf, F. Determination of fats in the treatment of oil seeds. Fette Seifen Anstrichm. *48,* 549–552 (1941); Chem. Zent. 1942, I, 1199; C.A. *37,* 2950 (1943).

291. Ramseyer, D. R. Ford develops soybean upholstery fiber. Soybean Dig. *1*(11), 12, 18 (1941).

292. Rewald, B. Phosphatides from oil seeds. Biochem. J. *36,* 822–824 (1942).

293. Schultz, A. S., and C. N. Frey. Flour from beans and seeds. Canadian Patent 378,122. Dec. 6, 1938; C.A. *33,* 2242 (1939).

294. Schwarze, P. Further investigation on the simplification of fat determinations. Fette Seifen Anstrichm. *49,* 774–779 (1942); C.A. *38,* 1653 (1944).

295. Tasiro, S., and T. Ikeda. Treatment of soybean cake to be used for making adhesive. Japanese Patent 134,130. Jan. 11, 1940; C.A. *35,* 5218 (1941).

296. Taylor, J. J. Report on the determination of crude fat or ether extract in oil-bearing meals. J. Assoc. Offic. Agr. Chem. *26,* 74–77 (1943).

297. Walter, E. D. Genistin (an isoflavone glucoside) and its aglucon, genistein, from soybeans. J. Amer. Chem. Soc. *63,* 3273–3276 (1941).

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ABSTRACTS: FATS AND OILS

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6-TRANS-NONENAL: AN OFF-FLAVOR COMPONENT OF FOAM-SPRAY-DRIED MILKS. O. W. Parks, N. P. Wong, C. A. Allen and D. P. Schwartz (Dairy Prod. Lab., Eastern Utilization Res. and Dev. Div., USDA, Washington, D.C. 20250). *J. Dairy Sci.* **52**, 953–6 (1969). 6-*trans* Nonenal has been identified as the compound responsible for the off-flavor which frequently appears in fresh, foam-spray-dried milk manufactured during the warm summer months in urban areas. The flavor threshold of this compound was found to be less than 0.07 part per billion in fresh, whole milk. Evidence suggests that 6-*trans*-nonenal originates by trace ozonolysis of minor lipid components on the surface of the dried product.

CHEMISTRY AND BIOLOGY OF PHOSPHOLIPIDS FROM AN UNCLASSIFIED MYCOBACTERIA, P6. M. Motomiya, A. Mayama, F. Fujimoto, H. Sato and S. Oka (The Res. Inst. for Tuberculosis, Leprosy and Cancer, Tohoku Univ., Sendai, Japan). *Chem. Phys. Lipids* **3**, 159–67 (1969). Crude phospholipid fraction from P6(Scotochromogen) prepared by extraction with chloroform:methanol (2:1), followed by removal of non-lipid contaminants by Folch's procedure and extraction with acetone, yielded three fractions by column chromatography with silicic acid. These fractions were designated as fractions I, II and III in the decreasing order of their Rf's on thin-layer plates of silica gel. Fraction I was identified as diphosphatidyl glycerol (cardiolipin) and was antigenic in flocculation test for syphilis, and in latex agglutination test for lepromatous leprosy. Fraction II was identified as phosphatidyl ethanolamine and Fraction III as phosphatidyl inositol monomannoside.

EFFECTS OF STRUCTURAL CHANGES OF THE PRETREATING AGENT ON ADSORPTION BY MODIFIED SILICA ADSORBENTS. R. E. Majors and L. B. Rogers (Dept. of Chem., Purdue Univ., Lafayette, Ind. 47907). *Anal. Chem.* **41**, 1058–65 (1969). Because more selective adsorbents permit faster separations to be made, factors were studied which enhance the selectivity of silica gels prepared by the pretreatment of silicic acid hydrogels with various azo dyes, related to methyl orange, and with amines. The effects of systematically varying the structure of the pretreating agent on changes in selectivity and capacity for azo dye adsorbates were investigated. As the structure of the pretreating agent increasingly deviated from that of the adsorbate, the selectivity of the gel for the adsorbate decreased and approached that of an untreated (control) gel. An increase in hydrophilic character of ring substituted groups of the dye present during gelation appeared to increase selectivity. For relatively simple structurally-related pretreating agents, such as substituted anilines and p-aminobenzenes, there was a linear relationship between the selectivity and the basicity of the amino nitrogen. However, there was no obvious relationship between the structure of the pretreating agent and the adsorbent capacity.

THE PALLADIUM TRANSMODULATOR: A NEW COMPONENT FOR THE GAS CHROMATOGRAPH. J. E. Lovelock, K. W. Charlton, and P. G. Simmonds (Jet Propulsion Lab., Calif. Inst. of Tech. 4800 Oak Grove Drive, Pasadena, Calif. 91103). *Anal. Chem.* **41**, 1048–52 (1969). This paper introduces a new component for the gas chromatograph, the "gas transmodulator"; this component functions by transferring the separated components from the column carrier gas to a second carrier gas which is chosen to provide optimum performance from the detector. The construction and use of a practical gas transmodulator is described. It consists of a palladium silver alloy tube, and with it a gain in sensitivity of at least 40-fold is demonstrated in analyses using thermal conductivity and ionization cross section detectors. In addition, the device enables these detectors to be used under conditions where the column carrier gas flow is changing—such as in analysis with flow programming—which are otherwise difficult to conduct without loss of accuracy or performance.

NUCLEAR MAGNETIC RESONANCE STUDIES OF SERUM LOW DENSITY LIPOPROTEINS (LDL$_2$). R. B. Leslie and D. Chapman (Molecular Biophys. Unit, Unilever Res. Lab., The Frythe, Welwyn, Hertfordshire, Great Britain). *Chem. Phys. Lipids* **3**, 152–8 (1969). The NMR results indicate that in LDL$_2$ the polar head group of the phospholipid is quite free and probably in an aqueous environment, but that the non-polar aromatic amino acid residues of the protein are somehow immobilized probably by apolar interactions with lipids. On the other

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appeared during continued treatment over 3 years. Repeat turnover studies in two of the subjects, after 3 years' clofibrate therapy, showed that the sustained reduction in serum low-density lipoprotein levels was associated with a maintained reduction in absolute turnover rates and extravascular levels of S_f0-20 LDL.

STUDIES ON THE MECHANISM OF THE ENZYMATIC CONVERSION OF Δ^8-CHOLESTEN-3β-OL TO Δ^7-CHOLESTEN-3β-OL. W.-H. Lee, R. Kammereck, B. N. Lutsky, J. A. McCloskey and G. J. Schroepfer, Jr. (Dept. of Chem. and Chem. Engin., 430 East Chem. Bldg., Univ. Ill., Urbana, Ill. 61801). *J. Biol. Chem.* **244**, 2033–40 (1969). (3β-^{3}H)-Δ^8-Cholesten-3β-ol has been prepared by chemical synthesis. With this labeled substrate, the conversion of Δ^8-cholesten-3β-ol to Δ^7-cholesten-3β-ol by rat liver microsomes has been studied in deuterated medium. The results of experiments with combined gas-liquid chromatography-mass spectrometry indicate that the reaction proceeds with the uptake of 1 atom of solvent hydrogen and therefore provides no evidence in support of a mechanism involving an intramolecular shift of hydride from carbon atom 7 to carbon atom 9. A method for the separation of the acetate derivatives of a number of sterols on columns of neutral alumina-Super Cel-silver nitrate has been described. With this method the amount of endogenous Δ^7-cholesten-3β-ol in rat liver microsomes has been estimated.

INFLUENCE OF INTESTINAL BACTERIA ON BILE ACID METABOLISM AND FAT ABSORPTION. CONTRIBUTIONS FROM STUDIES OF BLIND-LOOP SYNDROME. I. H. Rosenberg (Thorndike Memorial Lab., (Harvard) Med. Services, Boston City Hosp., Boston, Mass.). *Amer. J. Clin. Nutr.* 22, 284–91 (1969). Normal fat adsorption is dependent upon normal metabolism of bile salts. Normal bile acid metabolism is, in turn, strongly influenced by intestinal bacteria. It is not surprising, therefore, that considerable investigative interest has centered about the syndrome of bacterial overgrowth of the small intestine, for in this situation the normal interrelations between intestinal bacteria, bile acids, and ingested fats are altered with prominent physiological consequence. Through study of the altered bile acid metabolism, in particular, many of the current concepts of bile acid physiology and fat absorption have been tested and knowledge of both normal and abnormal physiology has been enhanced.

HEPATIC LIPID METABOLISM IN EXPERIMENTAL DIABETES. V. THE EFFECT OF CONCENTRATION OF OLEATE ON METABOLISM OF TRIGLYCERIDES AND ON KETOGENESIS. D. R. VanHarken, C. W. Dixon and M. Heimberg (Dept. of Pharm., Vanderbilt Univ. School of Med., Nashville, Tenn. 37203). *J. Biol. Chem.* **244**, 2278–2285 (1969). Livers from normal and alloxan diabetic rats were perfused *in vitro* with a medium in which the concentration of free fatty acid was maintained at relatively constant levels by the infusion of a complex of oleic acid and bovine serum albumin. Concentrations of free fatty acid up to 3.5 mM in the cell-free perfusate were attained. Throughout the range of concentration of free fatty acid which might be expected in the blood under normal and pathological conditions *in vivo*, the uptake of free fatty acid by the liver *in vitro* was proportional to the concentration in the medium; rates of uptake of free fatty acid approaches saturation only at concentrations of free fatty acid in excess of those encountered *in vivo*.

MICROSOMAL ESTERASE OF RAT LIVER. K. Hayase and A. L. Tappel (Dept. of Food Sci. and Tech., Univ. of Cal., Davis, Cal. 95616). *J. Biol. Chem.* **244**, 2269–2274 (1969). Rat liver microsomal esterase has been purified 254-fold by a combination of solubilization in a mechanical cell homogenizer, acetone and ammonium sulfate precipitations and hydroxylapatite column chromatography. The enzyme hydrolyzed glyceryl 1-monodecanoate at a rapid rate; the K_m is 1.61×10^{-3}M. The hydrolysis rates of corresponding di- and triglycerides were one-third and one-hundredth of that of glycerol 1-monodecanoate, respectively. The enzyme showed little hydrolytic activity on long chain mono-, and di- and triglycerides. p-Nitrophenyl esters of short chain fatty acids were hydrolyzed at appreciable rates. Diethyl p-nitrophenyl phosphate, at a concentration of 1×10^{-4}M, inhibited the enzyme activity completely; thus the enzyme was tentatively classified as the B-type described by Aldridge.

BASIC STUDIES ON THE MECHANISM OF ACTION OF VITAMIN D. A. W. Norman, M. R. Haussler, T. H. Adams, J. F. Myrtle, Patricia Roberts and K. A. Hibberd (Dept. of Biochem., Univ. of Cal., Riverside, Cal. 92502). *Am. J. Clin. Nutr.* 22, 396–411 (1969). Studies on the cellular and subcellular localization of vitamin D and its metabolites have led to the suggestion that the vitamin is first metabolized to an as yet uncharacterized more polar compound that then associated stereospecifically with a receptor in the chromatin or DNA-containing portion of the mucosal cells. This in turn activates the biochemical expression of genetic information, which ultimately results in the physiological responses characteristic of vitamin D.

THE COMPOSITION OF THE GLYCOLIPIDS IN DOG INTESTINE. J. M. McKibbin (Dept. of Biochem., Univ. of Alabama Med. Cen., Birmingham, Ala.). *Biochemistry* **8**, 679–85 (1969). Whole lipid extracts of dog small intestine were chromatographed on silicic acid yielding all the glycolipids in three major fractions. Five classes of glycolipid were isolated in high yield from the fractions by column chromatography with Florisil, DEAE-cellulose and silicic acid and by thin-layer chromatography. Cerebrosides, ceramide di-, tri-, and pentahexosides and gangliosides were isolated in amounts of 0.162, 0.098, 0.041, 0.070, and 0.171 μmoles per g of fresh tissue, respectively, and 0.026 μmoles/g of sulfatide was found by direct analysis. A minor glycolipid fraction, estimated at 0.014 μmole/g, contained longer oligosaccharide chains. This fraction was separated from all other lipids and appeared to be a mixture of ceramide hexahexosides containing glucose, galactose, hexosamine, and fucose. These seven classes of lipids accounted for 82% of the original whole lipid hexose, and the remaining 18% was distributed among unresolved side fractions. All the isolated lipids were glycosides of glucosylceramide with long-chain fatty acids. The intestine glycolipids are distinguished from those of several other tissues by the absence of ceramide tetrahexosides and presence of penta- and hexahexosides.

ERYTHRO-DIOLS OF WAX FROM THE UROPYGIAL GLAND OF THE TURKEY. I. A. Hansen, B. K. Tang and E. Edkins (Dept. of Biochem., Univ. of Western Australia, Nedlands 6009). *J. Lipid Res.* **10**, 267–270 (1969). The uropygial (preen) gland secretion of the domestic turkey resembles that of the chicken in consisting mainly of a diester wax. The esterified fatty acids are saturated; they include all members of the n-C_{10}–C_{20} homologous series, the C_{17}–C_{19} acids together accounting for 60% of the total. There are four major 2,3-n-alkanediols, C_{19}-C_{23}, all having the *erythro* configuration as determined by *thin-layer chromatography on boric* acid-silica gel and by gas-liquid chromotography. The chicken uropygiols, by contrast, contain *erythro* and *threo* diols. It is suggested that the chicken possesses two biosynthetic enzyme systems for the diols, the turkey only one.

RELATIVE RATES OF HYDROLYSIS BY RAT PANCREATIC LIPASE OF ESTERS OF C_2–C_{18} FATTY ACIDS WITH C_1–C_{18} PRIMARY N-ALCOHOLS. F. H. Mattson and R. A. Volpenhein (Procter & Gamble Co., Miami Valley Lab., Cincinnati, Ohio 45239). *J. Lipid Res.* **10**, 271–276 (1969). The rate at which rat pancreatic lipase (glycerol-ester hydrolase, EC 3.1.1.3) hydrolyzes the esters of primary n-alcohols containing from 1 to 18 carbon atoms with fatty acids containing from 2 to 18 carbon atoms was determined. The speed of hydrolysis was influenced, apparently independently, by both the acyl and the alkyl chains. With respect to the fatty acid moiety, the esters of dodecanoic acid were usually split at the most rapid rate. Esters of butyric acid were the next most susceptible. In the case of the alcohol moiety, esters of heptyl alcohol were hydrolyzed most rapidly. On the basis of the pattern of the relative rates of hydrolysis, it is proposed that the influence of the alcohol component is a result of its orienting the ester molecule at the oil/water interface. The fatty acid effect is attributed to enzyme-substrate specificity.

DIFFERENTIAL RESPONSES TO FASTING AND SUBSEQUENT FEEDING BY MICROSOMAL SYSTEMS OF RAT LIVER: 6- AND 9-DESATURATION OF FATTY ACIDS. Carol A. Inkpen, R. A. Harris and F. W. Quackenbush (Dept. of Biochem., Purdue Univ. Lafayette, Ind. 47907). *J. Lipid Res.* **10**, 277–282 (1969). Hepatic microsomal preparations from non-fasted, fasted and fasted-fed rats were employed, together with cofactors, in studies of 9-desaturation of stearate-1-^{14}C and 6-desaturation of linolenate-1-^{14}C. Prior fasting sharply reduced 9-desaturation but did not affect 6-desaturation; feeding restored 9-desaturation. Position of desaturation was determined by permanganate-periodate oxidation and separation of the dicarboxylic acids. Feeding after fasting stimulated both desaturase systems but either DL-ethionine or actinomycin D prevented this. Dietary carbohydrate or saturated fat in-

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• *New Books . . .*

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Ignoring, for the moment, the propriety of entitling the proceedings of a 1967 symposium "Sugar Esters 1968," one is forced to ask why was it published at all?

Only two papers in this volume (by Rader and Schwartz) have any scientific merit, and they have been published previously in "Detergent Age" and in JAOCS respectively. The so-called Nebraska-Snell process (which is new) has been the subject of a paper by Osipow and Rosenblatt in JAOCS *44,* 307–309 (1967), although the process was reported at the symposium by the Assistant Attorney General, State of Nebraska!

The paper on the Nebraska-Snell process, incidentally, quotes an estimated factory cost for sucrose tallowate, based on a 10 million pound per annum production, although it is made clear in the discussion that the process has not been developed beyond the laboratory scale.

The remaining papers of the symposium vary in content from collections of generalities (not always appropriate to the theme) to fairly specific accounts of applications and properties of the sugar esters, although most of these latter papers are not at all complete, in a scientific sense. An exception is the introduction to the symposium by H. B. Hass, which, although it, too, contains nothing especially new, is at least completely charming.

Reading through this collection with an unjaundiced eye, one finds that after nearly 20 years of intensive development, the sugar esters are, in general, not intrinsically more effective than the many surface-active agents already available (with the possible exception of biodegradability, where, it is generally agreed, they show marked superiority).

In addition, in spite of all the work put into development of a manufacturing process, the actual cost of the sugar esters is many times that of the presently available materials. Nothing in this symposium suggests that the frequently-estimated very low prices are realizable in the near future.

In view of the negligible content, rather unattractive format, and high price, it is difficult to recommend this book.

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Evolutionary Operation, George E. P. Box and Norman R. Draper (John Wiley & Sons, Inc., 231 pages, 1969, $11.00)

This excellent book should be on the desk of every individual who is concerned with the efficient operation of any industrial plant. Evolutionary Operation (abbreviated EVOP) is a simple but powerful statistical tool which is of wide application in industry. The philosophy of EVOP is that it is inefficient to run an industrial process solely to produce product. A process should also produce information on how to improve the product. EVOP is a simple technique to achieve this, run by process people themselves in the normal routine of production.

The basic evolutionary concept is well proven in other fields. Under the name "patterned search," it has been a powerful tool in computer programming for solving difficult mathematical problems during the last decade. It has also been used by biological evolution for many years. EVOP applies this basic concept to industry. EVOP establishes a set of rules for introducing an evolutionary force into normal plant operation which steadily moves the process toward its optimum conditions. Furthermore, this is accomplished without serious danger of loss through manufacture of unsatisfactory material.

The book is completely self-contained, with two chapters of basic statistical background, so that no previous knowledge of statistics is needed. Other chapters describe the organization of EVOP, its variations and its relation to other optimization procedures. One chapter gives answers to several questions that are frequently asked about EVOP. Two chapters present worksheets and a specific sequence of steps to be followed. There are four appendices, containing further mathematical details and seven statistical tables. A bibliography contains several references to background material, as well as reports of actual industrial experience with EVOP. Numerous drawings, graphs and tables illustrate the book. The book is well written and its principles are clearly presented.

The authors are well qualified to write about this subject. George E. P. Box is well known for his work on response surfaces, which form the foundation on which EVOP is built. Both Dr. Box and Dr. Draper are Professors of Statistics at the University of Wisconsin and are industrial consultants.

The book will be of value to industrial management, including engineers, chemists, foremen and process superintendents. EVOP has immense potential for improving productivity not only in highly industrialized societies but also in the underdeveloped countries.

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ABSTRACTS: BIOCHEMISTRY AND NUTRITION

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creased 9-desaturation and dietary protein increased 6-desaturation. Insulin treatment of nonfasted rats increased 9-desaturation but not 6-desaturation. High dietary unsaturated fat (20% safflower oil) stimulated 6-desaturation but inhibited the 9-desaturation response to feeding. The results indicate that the two desaturases are distinct and are inducible in response to different substances.

Lipid abnormalities in foam cell reticulosis of mice, an analogue of human sphingomyelin lipidosis. D. S. Fredrickson, H. R. Sloan and C. T. Hansen (Molecular Disease Branch, NIH, Bethesda, Md. 20014). *J. Lipid Res.* 10, 288–293 (1969). The lipid changes in the inheritable foam cell reticulosis of mice discovered by Lyons, Hulse and Rowe have been reexamined. The major abnormality in thymuses from homozygous-abnormal animals has been identified as an increase in the concentration (per milligram of protein) of sphingomyelin and cholesterol. This increase is associated with normal sphingomyelin-cleaving activity. The lipid compositions of the liver and spleen in the homozygous abnormal animal and of the thymus in the heterozygous abnormal mouse are normal. The disorder appears to be chemically analogous to those forms of human sphingomyelin lipidosis (Niemann-Pick disease) that are not accompanied by a decrease in tissue sphingomyelinase.

Synthesis of fatty acyl CoA and other thiol esters using N-hydroxysuccinimide esters of fatty acids. A. Al-Arif and M. Blecher (Dept. of Biochem., Georgetown Univ., Washington, D.C. 20007). *J. Lipid Res.* 10, 344–45 (1969). N-Hydroxysuccinimide esters of long-chain fatty acids have been used to synthesize the CoA and thioglycolic acid thiol esters of palmitic and 3-ketopalmitic acids in high yield and with a minimum of untoward side reactions.

Change in some indices of lipid metabolism at acute B_1-avitaminosis in rats. T. Dubina, A. Razumovich and N. Khmara (Gerontology Sector, Acad. of Sciences, Byelorussian SSR, Minsk). *Ukrainian Biochem. J.*, 40, 474–6 (1968). In experiments on young (5–6 months old) and old (24 months) female rats it was found that acute B_1-avitaminosis caused by a thrice repeated administration of oxythiamine to animals during 36 hrs is accompanied by a decrease in the content of total cholesterol (mainly at the cost of free cholesterol and phospholipids) in the liver tissue. The cholesterol level drop was more pronounced after oxythiamine administration in old rats, while the decrease of the phospholipid content was stronger in young animals. The content of ubiquinone in the mitochondria of liver and heart tissue of control animals and those under experiment of both ages was approximately the same.

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Evidence for separate monoglyceride hydrolase and triglyceride lipase in post-heparin human plasma. H. Greten, R. I. Levy and D. S. Fredrickson (Molecular Disease Branch, NIH, Bethesda 20014). *J. Lipid Res.* **10**, 326–330 (1969). Post-heparin plasma contains an enzyme or enzymes with both triglyceride lipase (TGL) and monoglyceride hydrolase (MGH) activities. A simple and reproducible radioactive assay for measurement of MGH activity was developed and used, with a previously reported assay for TGL, to study lipolysis in plasma. After the injection of heparin, enzymatic activity against both tri- and monoglycerides appeared and disappeared from plasma at approximately the same rates. However, in contrast to TGL activity, MGH activity was: much greater, considerably less heat-sensitive, unaffected by three inhibitors (NaCl, protamine, and pyrophosphate) and not influenced by radical changes in fat and carbohydrate content of the diet. The dichotomy between MGH and TGL activities in patients with genetic deficiency of TGL constitutes strong evidence that these are two different enzymes. The findings further indicate that when post-heparin lipolytic activity is measured for the purpose of detecting TGL deficiency, it may be necessary to perform the assay with a substrate free from partial glycerides.

Preparative thin-layer and column chromatography of prostaglandins. N. H. Anderson (Converse Lab., Harvard U., Cambridge, Mass. 02138). *J. Lipid Res.* **10**, 316–319 (1969). Analytical and preparative chromatographic methods for monounsaturated prostaglandins are described. The systems were developed specifically for separation of the various hydroxy epimers of prostaglandin E_1 and F_1 but also offer superior separations for some of the known natural prostaglandins.

Dehydration of prostaglandins: study by spectroscopic method. *Ibid.*, 320–325. The ultraviolet (UV) and optical rotatory dispersion (ORD) spectra of prostaglandins E_1, A_1, B_1 and their naturally derived 15-epimers are presented. The dehydration sequence E → A → B under acidic and basic conditions has been studied by UV and ORD. Conditions for quantitative conversion of PGE_1 to PGA_1 are described. The combination of ORD and UV affords a nondestructive assay which can determine the relative amounts of E-, A-, and B-type prostaglandins with as little as 1–2 μg of material. The total quantity of prostaglandins can be estimated (±15%) in this way or, more accurately, by treatment with alkali of an aliquot (200 mg is sufficient) and determination of the change in absorbance at 278 μm.

Occurrence of squalene, di- and tetrahydrosqualenes, and vitamin MK_8 in an extremely halophilic bacterium, Halobacterium cutirubrum. T. G. Tornabene, M. Kates, E. Gelpi and J. Oro (Div. of Biosciences, Univ. of Houston, Houston 77004). *J. Lipid Res.* **10**, 294–303 (1969). The nonpolar (acetone-soluble) lipids of the extremely halophilic bacterium, *Halobacterium cutirubrum* were found to consist of red carotenoid pigments (43%) and squalenes (48%) with a small amount of a vitamin K-type quinone. The squalenes were shown by n.m.r. and mass spectra to consist of the fully isoprenoid squalene ($S;C_{30}H_{50}$), dihydrosqualene ($S_2;C_{36}H_{54}$) in the ratio of 1.0:0.4:0.1. S_2 probably has one reduced internal isoprenoid group, and S_4 has one internal and one terminal reduced isoprenyl group. The vitamin K-type quinone was shown by n.m.r. and mass spectra to have a C_{40} isoprenoid side chain, and is thus identified as menaquinone-8 (MK-8).

Effects of prolonged incubation and cell concentration on lipogenesis from glucose in isolated human omental fat cells. *J. Lipid Res.* **10**, 253–259 (1969). R. B. Goldrick, B. E. Ashley and M. L. Lloyd (Dept. of Clinical Sci., Australian Nat. Univ., Canberra, A.C.T.). The behavior of human omental fat cells *in vitro* has been examined in order to define conditions under which glucose is converted to glyceride-glycerol and glyceride fatty acids. Synthesis of glyceride fatty acids from glucose reached maximal rates only after several hours of incubation in Krebs-Henselett bicarbonate buffer, with or without added bovine albumin. Conversion of glucose to glyceride fatty acids was readily demonstrable with concentrated cell suspensions and was stimulated 3- to 88-fold by insulin. With dilute cell suspensions, little fatty acid was synthesized even after prolonged incubation in the presence of insulin. Conversion of glucose to glyceride-glycerol was linear during 6-hr incubations in buffer and unaffected by the concentration of the cell suspension. In the presence of bovine albumin, glyceride-glycerol synthesis was readily demonstrable at all cell concentrations used, although synthesis was faster in dilute suspensions. Thus, different incubation conditions produce widely divergent patterns of glucose metabolism in human omental fat cells.

Determination of volatile free fatty acids of human blood. V. Mahadevan and Leslie Zieve (Radioisotope Service, Minneapolis Veterans Hosp., Minneapolis, Minn. 55417). *J. Lipid Res.* **10**, 338–41 (1969). A simple and accurate method for the extraction and quantitative estimation of individual, volatile free fatty acids of human blood is described. Values in normal serum, plasma, and red cells are given. Besides acetic and propionic, normal and isobutyric and isovaleric acids have been found.

Effects of choline on the metabolism of phospholipids under radiation lesion. *Ukrainian Biochem. J.* **40**, 527–531 (1968). E. Sopin and V. Gaiday (Dept. of Biochem. of Animals and Res. Inst. of Physiol., T. G. Shevchenko State Univ., Kiev). The content and renewal intensity were studied of total and of separate phospholipids in muscles, liver and brain of normal guinea-pigs and of those at the terminal stage of radiation sickness caused by a single total X-ray irradiation in a dose of 500 r as well as during administration of choline to the normal and irradiated animals. It is established that choline administration for 10 days results in an increase of the lipid phosphorus level in all the tissues under investigation in comparison with irradiated animals, which were not subjected to choline administration. The renewal intensity of the phosphate group of total and separate phospholipids in all tissues under investigation increases sharply, in the irradiated animals which were not subjected to choline administration it considerably decreases.

Content and intensity of phospholipid renewal in norm and radiation injury. E. F. Sopin, V. M. Gaidai (Dept. of Animal Biochem. and Res. Inst. of Physiol., T. G. Shevchenko Kiev State Univ.). *Ukrainian Biochem. J.* **40**, 297–302 (1968). The content and intensity of renewal of total phospholipids and their separate fractions were studied in the muscles, liver and brain of guinea pigs in normal animals and in animals at the terminal stage of radiation disease. It was found that the total content of phospholipids in the muscles, liver and brain definitely decreases at this stage. The intensity of renewal of total phospholipids in the muscles and brain decreases in comparison with normal and increases in the liver. A qualitative composition of phospholipids in all the tissues under investigation in radiation disease remains unchanged, though their quantitative composition undergoes some changes. The intensity of renewal of separate fractions is also liable to definite changes but differently in different tissues.

Quantification of cholesterol absorption in man by fecal analysis after the feeding of a single isotope-labeled meal. B. Borgstrom (Div. of Physiol. Chem., Univ. of Lund, Lund, Sweden). *J. Lipid Res.* **10**, 331–337 (1969). The fecal excretion of cholesterol-4-^{14}C and β-sitosterol-22,23-^{3}H has been studied in normal human subjects after they had ingested a single meal containing the radioactive substances. When 150 mg of β-sitosterol, dispersed in the butter of a standard breakfast, was fed to 20 subjects the mean recovery of isotope in the feces was 90%. When plant sterols (70% β-sitosterol, 30% campesterol) were fed together with cholesterol and used as an internal standard to correct for losses of cholesterol during intestinal transit and analytical procedures, excretion of dietary cholesterol was found to be 60–80%, irrespective of the amount fed over the range 150–1910 mg. If absorption of cholesterol is calculated from these figures, no saturation of the cholesterol absorption mechanism is indicated for the amounts of cholesterol fed in this investigation. The reason for the differences between these findings and those previously reported by other procedures is not clear, but may be related to the acute administration of a single dose of cholesterol in this study.

Esterification of injected epicoprostanol in a human subject. R. S. Rosenfeld and L. Hellman (Inst. for Steroid Res., Div. Neoplastic Med., Montefiore Hosp. and Med. Center, New York, N.Y. 10467). *J. Lipid Res.* **10**, 175–8 (1969). That a necessary requirement for *in vivo* esterification of 3-hydroxy sterols in the equatorial conformation of the hydroxyl group has been substantiated by the administration of epicoprostanol-3β-^{3}H(3-OH equatorial) to a man with a complete biliary fistula. Radioactive epicoprostanol was identified in both free and esterified sterols of plasma. The specific activity of biliary sterols was much higher than that

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of plasma sterols; this indicated a preferential removal of epicoprostanol from circulating sterols. The appearance of tritium in body water demonstrated that a portion of the labeled epicoprostanol underwent oxidation at C-3.

Acyl and alk-1-enyl group compositions of the alk-1-enyl acyl and the diacyl glycerophosphoryl ethanolamines of mouse and ox brain. G. Y. Sun and L. A. Horrocks (Lab. of Neurochem., Cleveland Psych. Inst., Cleveland, Ohio 44109). *J. Lipid Res.* 10, 153–7 (1969). The ethanolamine phosphoglycerides were prepared from lipid extracts of ox and mouse brains by preparative thin-layer chromatography. The cyclic acetal derivatives of the alk-1-enyl groups were made by treating the ethanolamine phosphoglycerides with 1,3-propanediol. The resulting monoacyl glycerophosphoryl ethanolamines were separated from the unchanged ethanolamine phosphoglycerides by preparative thin-layer chromatography. Methyl ester derivatives of the acyl groups from both of these fractions were prepared by alkaline methanolysis. The cyclic acetal and methyl ester derivatives were analyzed by gas-liquid chromatography. Substantial differences were found in the composition of the side chains when the combined alk-1-enyl and acyl side chains of the alk-1′-enyl acyl glycerophosphoryl ethanolamines were compared with the side chains of the diacyl glycerophosphoryl ethanolamines. The side chains from the 1-position of these two ethanolamine phosphoglycerides are different in chain length and unsaturation as well as in chemical bonding. The acyl groups from the 2-position of the alk-1′-enyl acyl glycerophosphoryl ethanolamines were predominantly unsaturated. Therefore, acyl group compositions of the total ethanolamine phosphoglyceride from brain are of limited value and individual types should be analyzed.

Biosynthesis of squalene and cholesterol by cell-free extracts of adult rat brain. M. T. Kelley, R. T. Aexel, B. L. Herndon, and H. J. Nicholas (Inst. of Med. Educ. and Res. and the Dept. of Biochem., St. Louis Univ. School Med., St. Louis, Mo. 63104). *J. Lipid Res.* 10, 166–74 (1969). Cell-free extracts of adult rat brain incubated with mevalonic acid-2-^{14}C synthesize ^{14}C-labeled nonsaponifiable fractions consisting largely of squalene-^{14}C. If the cofactor concentrations of the incubation medium are adjusted, much of the squalene can be induced to undergo turnover, with a resultant increase in ^{14}C-labeled digitonin-precipitable sterols, which include a small amount of cholesterol. The synthesis of labeled sterols in markedly increased in the presence of Mg^{++} and depressed by nicotinamide. ATP, NADH, GSH and glucose-6-phosphate are required for optimal synthesis of digitonin-precipitable material but, unlike Mg^{++}, are not essential. The cofactor-adjusted extracts also synthesize a complex ester mixture containing, in addition to cholesterol-^{14}C, several compounds less polar than cholesterol. The biosynthesis of cholesterol in the extracts is a slow process; at least 12 hr of incubation is required for maximal sterol biosynthesis. A complex mixture of hydrocarbons accompanies squalene in the incubated extracts.

Molecular species of lecithins from erythrocytes and plasma of man. L. Marai and A. Kuksis (Dept. of Biochem. and the Banting and Best Dept. of Med. Res., Univ. of Toronto, Toronto, Can.). *J. Lipid Res.* 10, 141–52 (1969). The lecithins of the plasma and erythrocytes of man were isolated by thin-layer chromatography, and the major molecular species were identified and qualitatively estimated by combined thin-layer and gas-liquid chromatography and specific enzymic hydrolyses. Using these techniques we could identify over 60 molecular species, accounting for some 98% of the total lecithin, in both plasma and cells, but only about 30 of them occurred in concentrations over 1%. The molecular species of lecithins in the cells and plasma were qualitatively similar; quantitatively, large differences were noted among and within the various classes of unsaturation. In the same blood, the erythrocyte lecithins contained 8–20 times as high a percentage of saturated lecithins and nearly twice as high a percentage of monounsaturated lecithins as did plasma lecithins. The differences in the relative amounts of a particular molecular species within a class of unsaturation were, however, most pronounced among the polyunsaturated lecithins. These results suggest that plasma and red cells possess distinct lecithin populations and that complete equilibration of the intact molecules between the two media is unlikely.

Concentrations of glycosyl ceramides in plasma and red cells in Fabry's disease, a glycolipid lipidosis. D. E. Vance, W. Krivit and C. C. Sweeley (Dept. of Biochem. and Nutr., Grad. School of Public Health, Univ. of Pittsburgh, Pitt., Penn. 15213). *J. Lipid Res.* 10, 188–92 (1969). Concentrations of four neutral glycosyl ceramides were determined in plasma and erythrocytes from nine hemizygous patients with Fabry's disease (a hereditary glycolipid lipidosis), from the sister of one of the patients, and from the heterozygous mother of another one. The concentration of a trihexosyl ceramide, galactosylgalactosylglucosyl ceramide, was elevated in plasma from the patients about three fold above the normal mean level, and the amount of this lipid was also increased in plasma from the two female relatives. The concentrations of glucosyl ceramide and lactosyl ceramide in plasma were slightly less than normal in the affected males, while globoside or a similar tetrahexosyl ceramide was slightly higher than normal. All but one of the Fabry patients had significantly less globoside in the red cells, as compared with the normal range, although the red cell concentration of trihexosyl ceramide was normal in all of the patients. Thus the concentration of the lipid that accumulates in the tissues in Fabry's disease is elevated in plasma but not in red cells, whereas in Gaucher's disease the accumulating lipid (glucosyl ceramide) is elevated in both plasma and red cells.

Mechanism of squalene biosynthesis: evidence against the involvement of free nerolidyl pyrophosphate. S. S. Sofer and H. C. Rilling (Dept. of Biochem., Univ. of Utah College of Med., Salt Lake City, Utah 84112). *J. Lipid Res.* 10, 183–7 (1969). Several mechanisms that utilize farnesyl pyrophosphate and nerolidyl pyrophosphate as condensing substrates have been postulated for the asymmetric condensation reaction in squalene biosynthesis. Although there is ample evidence that farnesyl pyrophosphate is a substrate for this reaction, there has been no information concerning the role of nerolidyl pyrophosphate. We have made the following observations that demonstrate that nerolidyl pyrophosphate cannot be a free intermediate in squalene biosynthesis. (a) There is no significant interconversion of farnesyl pyrophosphate and nerolidyl pyrophosphate in a squalene-synthesizing system from yeast. (b) Nerolidyl-1-$^{3}H_2$ pyrophosphate is not converted to squalene in the presence or absence of farnesyl pyrophosphate. (c) The addition of unlabeled nerolidyl pyrophosphate to incubation mixtures does not alter the relative loss of α-hydrogens from farnesyl pyrophosphate during its conversion to squalene. The synthesis of nerolidyl-1-$^{3}H_2$ pyrophosphate is described. Chromatographic methods for the separation of pyrophosphate esters of triprenols and terpenols are included.

Method for continuous intravenous infusion of large amounts of oleic acid into rats. A. Bezman-Tarcher (2300 Sutter St., San Francisco, Calif. 94115). *J. Lipid Res.* 10, 197–206 (1969). A method has been developed for the continuous intravenous infusion of large amounts of oleic acid into rats. The acid was infused in the form of an emulsion prepared by sonication and stabilized with albumin in low concentration. Fatty acid was infused at a rate equal to the turnover rate of endogenous free fatty acids and the infusion was continued for 3 hr. During this time there was no evidence of hemolysis or hemoglobinuria; only on occasion did a small clot form at the tip of the infusion catheter. The infused fatty acids became attached to the circulating albumin and were removed from the plasma and metabolized in the same way as endogenous free fatty acids. There was no evidence to indicate that the infused fatty acids lodged as emboli in the microcirculation or were phagocytized by the reticuloendothelial system. This method makes it possible to study the direct effects of an increased flux of free fatty acids upon such processes as formation and release of triglyceride by the liver, gluconeogenesis, lipogenesis, ketone body production, glucose utilization and insulin production.

Short-term effect of nicotinic acid on plasma level and turnover of free fatty acids in sheep and man. E. R. Nye and H. Buchanan (Dept. of Med., Univ. of Otage Med. School, Dunedin, New Zealand). *J. Lipid Res.* 10, 193–6 (1969). The effects of nicotinic acid on plasma free fatty acid levels and turnover and on plasma glycerol levels were studied in the first few hours after administration to man and the sheep. In both species a fall in all parameters studied was followed by a rise above basal level, interpreted as due to an increase in lipolysis above resting level. The significance of the findings is discussed.

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Improved method for determination of the position of double bonds in polyenoic fatty acid esters. J. N. Roehm and O. S. Privett (Univ. of Minn., The Hormel Inst., Austin, Minn. 55912). *J. Lipid Res.* 10, 245–6 (1969). An improved method is described for determination of the position of double bonds in polyenoic fatty acid methyl esters. Partial reduction with hydrazine is employed without prior hydrolysis to the free fatty acid, and the resulting monoenes are identified by reductive ozonolysis.

Improved separation of sterols by reversed-phase thin-layer chromatography. N. J. DeSouza and W. R. Nes (Dept. of Biol. Sci., Drexel Inst. of Technol., Philadelphia, Penn. 19104). *J. Lipid Res.* 10, 240–243 (1969). Some closely related sterols have been separated with better resolution in a shorter period of time than has previously been reported. Separations were effected on the basis of carbon number and the number and location of double bonds through the use of paraffin-impregnated kieselguhr chromatoplates in the system (paraffin oil)/(acetone-water 4:1).

Gas-liquid chromatography-mass spectrometry of hydroxylated octadecanols derived from hydroxylated stearic acids. W. J. Esselman and C. O. Clagett (Dept. of Biochem., The Penn. State Univ., Univ. Park, Penn. 16802). *J. Lipid Res.* 10, 234–9 (1969). A gas-liquid chromatographic-mass spectrometric method of determining the position of oxygen atoms on polyfunctional fatty acids has been explored. The method consists of reduction of keto, hydroperoxy, epoxy, and carboxylic acid groups with $LiAlH_4$ to the corresponding alcohols; trimethylsilylation with bis(trimethylsilyl)acetamide; and analysis by means of the combined gas-liquid chromatograph-mass spectrometer. The following compounds were analyzed: 9-mono-, 9,10-di-, 9,10,12-tri-, and 9,10,12,13-tetrahydroxystearic acids and the corresponding derivatives of octadecan-1-ol. The reduction products of 9,10-epoxystearic acid and a mixture of linoleic acid 9- and 13-hydroperoxides were also analyzed. The position of the oxygen function in the original molecule can be deduced rapidly and accurately.

Effects of erythrocyte lipid and of glucose and galactose concentration on transport of the sugars across a water-butanol interface. T. J. Moore and B. Schlowsky (Dept. of Pediatrics, St. Luke's Hosp. Center, N.Y., N.Y. 10025). *J. Lipid Res.* 10, 215–9 (1969). A property of sugar transport into the human erythrocyte is that a sugar with a high affinity for the hypothetical "carrier" will enter the cell at low concentration more rapidly than a sugar with lower affinity for carrier. At high concentration the sequence will be reversed. This behavior is exemplified by glucose, which enters erythrocytes faster than galactose at 0.015 M and slower than galactose at 1.3 M. A physicochemical model with the same properties has been found: layers of butanol and water with erythrocyte lipid at the interface. With total lipid from the human erythrocyte incorporated into the model, glucose at low concentration enters the oil phase facter than galactose and at high concentration galactose enters more rapidly. In the absence of lipid, glucose flux exceeds galactose flux at all concentrations. The hypothetical carrier molecule has not been identified.

Lysophosphatidylcholine concentrations and metabolism in aortic intima plus inner media: effect of nutritionally induced atherosclerosis. O. W. Portman and M. Alexander (Oregon Reg. Primate Res. Center, Beaverton 97005). *J. Lipid Res.* 10, 158–165 (1969). The concentration of lysophosphatidylcholine (monoacyl sn-glycerol 3-phosphorylcholine) in intima plus inner media of atherosclerotic aorta from squirrel monkeys was nearly eight times that in comparable control tissue. Plasma levels of the same compound were somewhat elevated in the atherosclerotic group. The metabolism of fatty acyl CoA's and lysophosphatides was studied in cell-free preparations of intima plus inner media from squirrel monkey aorta. Linoleic acid was incorporated predominantly into phosphatidylcholine (as opposed to other phospholipids) when linoleoyl-1-^{14}C CoA was the substrate. The extent of this reaction was dependent on the concentration of lysophosphatidylcholine. Lysophosphatidylethanolamine (monoacyl sn-glycerol 3-phosphoryl-ethanolamine) stimulated the incorporation of linoleate into phosphatidylethanolamine. 1-Palmitoyl-1′-^{14}C sn-glycerol 3-phosphorylcholine (^{14}C-lysophosphatidylcholine) was incorporated into phosphatidylcholine only in the presence of acyl CoA's or ATP plus CoA. Incorporation of ^{14}C with ^{14}C-lysophosphatidylcholine plus linoleoyl CoA equaled that with linoleoyl-1-^{14}C CoA and lysophosphatidylcholine.

• Drying Oils and Paints

The alternating properties of aliphatic amines. IV. Fatty amines in the surface coating industry. H. Kraus (VEB Deutsches Hydrierwerk Rodleben, Rodleben, Germany). *Tenside* 6, 24–6 (1969). A study was made of the use of pure C_{10}–C_{19} fatty amines as inhibitors in the surface coating industry, in an attempt to find out whether an alternating series occurred between odd- and even-numbered members. It has been shown that the surface active properties of these amines do not depend upon the odd- or even-numbered carbon chain of the cation when used as inhibitors, so that the use of amine mixtures in the surface coating industry appears possible.

Highly branched synthetic acids and their derivatives. Applications in the surface coating field. S. Herzberg (Bataafse Interm. Chemical Maatschappij N.V., The Hague, Holland). *J. Paint Technol.* 41, 222–233 (1969). Branched chain acids and their derivatives have interesting properties resulting from their specific structures. Particular attention was devoted to the use of alpha-alpha branched synthetic acids and their glycidyl and vinyl esters. The acids are used in paint driers, while the glycidyl and vinyl esters can be used in thermosetting systems. The glycidyl and vinyl esters can be employed in water borne systems, the vinyl ester as a copolymer in paint lattices and the glycidyl ester as a base material for water soluble resins.

On the quantitative gas chromatographic determination of polyoles in alkyd resins. F. H. De La Court, N. J. P. Van Cassel and J. A. M. v.d. Valk (Verfinstituut TNO, Delft, Netherlands). *Farbe Lack* 75, 218–221 (1969). The resins are aminolized with beta-phenyl ethylamine and the polyalcohols obtained esterified with acetic anhydride. The reaction mixture is gas chromatographed on a Carbowax 20M column using temperature programming. Glycerol, trimethylal propane, trimethylal ethane and pentaerythritol were analyzed. The determination of dipentaerythritol was made by using a temperature program.

Alkyd resins. II—Interchange of vegetable oils in alkyd resin synthesis: reaction with oxygen. K. Hájek, J. Hires, J. Stanek and E. Krejcar. *Plaste u. Kautschuk* 15, 593–6 (1968). The rate of autoxidation at 40C of various oils or fatty acids (in xylene soln. and in the presence of Co drier) has been measured manometrically and the changes in viscosity, chemical characteristics and I.R. spectra followed. The oils were converted into alkyd resins and their drying and hardening rates compared. (World Surface Coat. Abs. No. 322)

Protective role of linseed oil, particularly on wood. Anon. *Trav. Peint.* 23 No. 8, P/7 (1968). (World Surface Coat. Abs. No. 322)

Alkyd resins. III—Alcoholysis of vegetable oils with glycerol. K. Hájek, J. Stanek and J. Hires. *Plaste u. Kautschuk* 15, 679–82 (1968). Under the testing conditions the time of alcoholysis of oils with glycerol depends above all on the catalyst concentration; in some oils only a minor influence is shown by temperature and type of catalyst. An increase of concentration to $> 0.02\%$ is disadvantageous because the time of alcoholysis is not reduced further. In many cases, above all at higher concentrations, a brighter mixture is obtained with CaO. For the alcoholysis of oils with glycerol, 240C is the most favourable temperature of reaction, and CaO in a concentration of 0.02% is the most favourable catalyst. (World Surface Coat. Abs. No. 323)

Molecules with permanet electric moment and catalytic ability. Polymerisation of tung oil. R. Thomas. *Oleagineux* 22, 687 (1967). A molecule in which centres of positive and negative charges do not coincide, existing, *e.g.*, as a doublet, creates in its neighbourhood an orientated electric field. This field can activate other molecules by spatial modification of their electronic clouds. Such molecules can react more quickly or differently. The author demonstrates this point by following the changes in a highly reactive drying oil such as tung oil as a function of time. Experimental conditions are described and a study of polymerisation shows that an optimum concentration of catalyst exists. (World Surface Coat. Abs. No. 323)

• Detergents

IDENTIFICATION OF CATIONIC SURFACTANTS AS REINECKATES. Shigeyoshi Miyagishi and Morie Nishida (Kanazawa Univ.). *Yukagaku* 18, 309–14 (1969). As cationic surfactants are readily precipitated as reineckates, idetification of the reineckates of 27 cationic surfactants of various types and of different chain length were examined using infrared spectroscopy and paper chromatography. An aqueous ammonium reineckate solution (1%) was added to a 2% aqueous or ethanolic solution of surfactant. Infrared spectra were obtained by the potassium bromide disc technique. The solvent system in paper chromatography was methanol:water: 35% HCl (12:12:1). Surfactants used in this experiment were separated into the following groups: group A, amines and quaternary ammonium salts, group B pyridine derivatives, and group C amphoteric surfactants having characteristic infrared absorption bands. Both the absorption bands of surfactants (700–1800 cm^{-1}) and those of reineckate ions (3000–3500 cm^{-1}) could be used in the identification of surfactants. Alkyl chain length could be differentiated by paper chromatography. In this case, surfactant reineckates were treated with silver nitrate.

THE FATTY ACID COMPOSITION OF SOME SOAPMAKING FATS AND OILS. I. BEEF TALLOW. A. Allen, G. H. Padley and G. R. Whalley. *Soap, Perfumery and Cosmetics* 42, 189–193 (1969). A detailed examination of the fatty acid composition of beef tallow available in the United Kingdom was made. Gas chromatography was used to determine the fatty acid composition. There were 37 distinct fatty acids. Ninety three percent of the fatty acids were in the group C-18, C-18′, C-16, C-16′ and C-18″. Branched chain and odd numbered chain acids were demonstrated. These data demonstrate that conventional chemical analysis continues to be an acceptable method to control raw materials and to maintain uniformity of the fatty acid composition of the final product.

SOURCE MATERIALS FOR SYNTHETIC FATTY ALCOHOLS AND ACIDS. J. J. Langford and A. E. Dansbach. *Detergents and Specialties* 6, 20–22 (1969). A technical and economic review is given of the manufacture and current and potential uses for synthetic alcohols and fatty acids in the detergent and cosmetic industry.

GAS CHROMATOGRAPHIC ANALYSIS OF GLYCERIDES AND POLYGLYCOLS. G. Kresze and F. Schaeuffelhut. *Fresenius' Z. Anal. Chem.* 229, 401–6 (1967). Homologues of α-monoglycerides can be analysed by gas chromatography of their phenylboric acid esters on a 5% SE 30/Chromosorb W column with N_2 carrier gas and a flame ionisation detector. More complex glyceride mixtures are analysed by the gas chromatography of the phenylboric acid esters and of the trimethylsilyl derivatives, the latter being separated on a 10% SE 30/Chromosorb W column, with a thermal conductive detector and He carrier gas. The esters are treated with Me_3SiCl in pyridine/$CHCl_3$. Chromatograms are presented for the ester and trimethylsilyl derivatives obtained from a partial hydrolysate of coconut oil. Ethoxylation products of nonylphenols and oleyl alcohols and the polyglycols, which contain $\leqslant$ 13 ethylene oxide groups per molecule, corresponding to mol. wts. up to approx. 600, can be determined by the gas chromatography of their bis (trimethylsilyl) derivatives. Retention times are tabulated for the derivatives of polyglycols having 1–13 ethylene oxide groups per molecule. (World Surface Coat. Abs. No. 322)

THE CONTINUOUS DETERMINATION OF THE RELATIONSHIP BETWEEN SURFACE TENSION AND TIME IN SURFACTANT SOLUTIONS. J. Kloubek and A. W. Neumann (Czech. Acad. Sci., Prague, Czechoslovakia). *Tenside* 6, 4–10 (1969). A method for determining the time dependency of the surface tension of solutions of specially purified sodium dodecyl sulfate is discussed. By plotting the equilibrium surface tension vs. the logarithm of surfactant concentration a straight line is obtained below the critical micelle concentration and up to a concentration of 8×10^{-4} mol/l.

MODIFIED DROPLET WEIGHT METHOD FOR THE DETERMINATION OF THE DYNAMIC INTERFACIAL TENSION. B. Sehrt (German Acad. Sci., Berlin, Germany). *Tenside* 6, 1–3 (1969). A modified droplet weight method is described, which is suitable for measuring static as well as dynamic interfacial tension. The principles of the method, experimental details and the accuracy of the method are discussed.

DETERMINATION OF SOAP IN DETERGENTS. M. Bares (Inst. Chem. Tech., Prague, Czechoslovakia). *Tenside* 6, 21–4 (1969). A rapid method is described for the determination of alkali soap in detergents, based on acidification of the soap at slightly higher than ambient temperature and titration with a quaternary base in an acetone medium. The method is suitable for controlling the soap contents of detergents whose composition is already known. The method is accurate, precise and easily reproducible.

THE ANALYSIS OF ALKANE SULFONATES. W. Kupfer, J. Jainz and H. Kelker (Farbwerke Hoechst A. G., Frankfurt, Germany). *Tenside* 6, 15–21 (1969). The alkane sulfonates prepared from n-paraffins are extracted with pentane from a neutral to slightly alkaline solution to remove unsulfonated constituents, the alkane monosulfonic acids being separated by being shaken up in an aqueous-alcoholic solution acidified with hydrochloric acid. The disulfonates are separated from the alkali sulfates by ethanol or isopropanol extraction. TLC and gas chromatographic methods for checking the separation are also described.

A STUDY OF PRIMARY ALKYL SULFATES AND WASHING PROCESS MECHANISM. E. Götte and M. J. Schwuger (Henkel & Cie. G.m.b.H.). *Tenside* 6, 131–5 (1969). The surface active characteristics of primary cetyl sulfates containing an alkyl group substituted in the 2-position have been compared to those of the series of primary alkyl sulfates containing 9–16 C atoms in the hydrophobic radical, including odd-numbered members. Physical properties examined include micelle formation, solubility, melting points, adsorption on graphite, washing power and wetting.

THE WORLD STATUS OF DETERGENT ALKYLATE. H. A. W. Hill, T. H. Butler and J. G. Moffett, Jr. (Shell Chem. Co.). *Tenside* 6, 125–8 (1969). Current supply-demand situation and future prospects for detergent alkylate are reviewed.

THE ALTERNATING PROPERTIES OF ALIPHATIC AMINES. H. Kraus (VEB Deutsches Hydrierwerk Rodleben, Rodleben, Germany). *Tenside* 6, 139–43 (1969). Results of direct and indirect adsorption measurements of fatty amines with odd and even numbered carbon chains show that no alternating properties exist between the odd and the even numbered chains. Synthetic fatty acids from paraffin oxidation used for amine synthesis contain a considerable proportion of peroxidized

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products which are responsible for reduced adsorptive capacity. Accordingly, it is not considered of decisive importance for the use of fatty amines whether synthetic or natural fatty acids are used for their production, but the presence of branching or additional active groups in synthetic fatty acids is believed to be important.

THE ALTERNATING PROPERTIES OF ALIPHATIC AMINES, VI. ADSORPTION BEHAVIOR OF AMINES AT THE PHASE BOUNDARY MERCURY-ELECTROLYTE. H. Kraus, H. Jehring and E. Horn (German Acad. of Sci., Berlin, Germany). *Tenside* 6, 68–74 (1969). The adsorption processes at the mercury/electrolyte interface were examined, making use of polarography with superimposed alternating voltage in conjunction with adsorption determinations of high molecular weight n-alkyl amines. The object was to obtain information about the interfacially active properties of alkyl amines with even and odd numbers of C atoms in the chain. The results obtained, which are not equilibrium values, show that there is no alternating series, as far as the adsorption is concerned, between even and odd carbon chains, such as is the case in certain other physical data of alkyl amines.

THE RELATIONSHIP BETWEEN THE CONSTITUTION AND CERTAIN PROPERTIES OF SURFACE ACTIVE BENZENE SULFONATES WITH HETEROATOMS IN THE ALIPHATIC SIDE CHAIN, II. Wetting POWER, WASHING POWER AND FOAMING PROPERTIES OF SULFONATES. F. Püschel and O. Todorov (German Acad. of Sci., Berlin, Germany). *Tenside* 6, 121–5 (1969). Measurements of wetting power, foaming and washing power and the formation of black spots in foam lamellae in *p*-n-alkyl benzene sulfonates containing heteroatoms are reported. In comparison with sodium dodecylbenzene sulfonate, only the sodium and calcium salts of undecyl aminobenzene sulfonic acid have an equally good wetting power and high foam stability. Sodium undecyl mercaptobenzene sulfonate is superior to dodecylbenzene sulfonate in washing power, although it is inferior in its other properties. All other sulfonates examined were found to be poorer than the reference substance.

ABSORPTION SPECTRA AND STABILITY OF ANIONIC SURFACTANT-METHYLENE BLUE (OR -METHYL GREEN) COMPLEXES. G. W. Strohl and D. Kurzak (ICI, Modderfontein, South Africa). *Tenside* 6, 74–6 (1969). The determination of anionic surfactants in diluted solutions is based on complexing with methyl green or methylene blue. The exact position of absorption maxima of seven complexes and new λ-values for more sensitive analytical operation have been determined. The absorption maxima shift toward higher wavelengths with increasing number of π-electron orbitals. The surfactant-methyl green complexes have been found to have considerably higher color stability than the methylene blue complexes. Time limits for measurement are given.

NEW, HIGH EFFICIENCY REWETTING AGENTS WITH GERMICIDAL PROPERTIES. H. Distler and F. Fuchs (B.A.S.F., Ludwigshafen, Germany). *Tenside* 6, 65–8 (1969). Through a relatively simple oxidation with hydrogen peroxide of sulfonium salts, sulfoxonium compounds were prepared having interesting application properties. A range of sulfoxonium salts prepared by this new process possess valuable properties, especially the alkyl-bis (β-hydroxy-ethyl) sulfoxonium salts. These typical cationic surfactants have a high substantitivity and a consequently good rewetting power for textile fabrics. They also exhibit outstanding bactericidal and fungicidal effects. Compounds with an alkyl chain length of 12 C atoms are the most effective.

THE SEPARATE DETERMINATION OF ANIONIC AND CATIONIC SURFACTANTS IN EFFLUENT. G. W. Strohl (Dept. of Water Affairs, Pretoria, South Africa). *Tenside* 6, 78–9 (1969). The methylene blue method for the determination of anionic surfactants in sewage is not applicable in the presence of cationic surfactants. An ion exchange method for the separation and indirect determination of the latter is described. A new method for the standardization of cationic and anionic surfactants is also introduced.

NEW CATIONIC SURFACTANTS/DYESTUFF COMPLEXES AND THEIR ABSORPTION SPECTRA. G. W. Strohl and D. Kurzak (ICI, Modderfontein, South Africa). *Tenside* 6, 76–7 (1969). The complexes formed by benzyl dimethyl alkyl ammonium chloride with nine different dyestuffs are described. The dyestuffs, which are all suitable for CMC determination, include, among others, naphthol green, acid fuchsin, sodium rhodizonate and ammonium purpurate.

NEW BIOCIDAL SURFACTANTS. H. Distler and R. Widder (B.A.S.F., Ludwigshafen, Germany). *Tenside* 6, 10–5 (1969). The Mannich reaction of mercaptans, formaldehyde and secondary amines proceeds smoothly at room temperature to form the corresponding thio Mannich bases. Alkylation with dimethyl sulfate takes place at the tertiary nitrogen rather than at the sulphur atom. The biocidal effect was tested on *S. aureus, E. coli, Aspergillus niger, Scenedesmus* and *Chlorella.* The surfactant effect may be compared to that of compounds of the Nekanil type.

EVALUATION OF HARD SURFACE CLEANING. R. R. Alder, T. B. Albin and B. M. Finger (Shell Chem. Co.). *Soap Chem. Specialties* 44(1), 66–72 (1969). A quantitative method is described for evaluating the performance of hard surface cleaners, based on mechanical cleaning of artificially soiled linoleum using the Gardner Straight Line Washability Machine. Relative cleaning efficiency is determined photometrically.

CAR WASH DETERGENT EVALUATION. J. W. Hensley (Wyandotte Chemicals Corp.). *Soap Chem. Specialties* 44(4), 52–8 (1969). Radioactive tagged clay soil and spray wash apparatus that closely simulates actual car wash units provide good discrimination in evaluating relative performances of spray wash detergents in removal of fine particulate soil from painted surfaces.

DRY LAUNDRY BLEACH FORMULATIONS BASED ON CHLORINATED ISOCYANURICS. J. S. Thompson, R. R. Keast and E. S. Roth (FMC Corp.). *Soap Chem. Specialties* 44(4), 62–4 (1969). Criteria and examples are offered for formulating dry laundry bleaches containing chlorinated isocyanurics. The advantages offered by these bleach ingredients are reviewed.

PHOSPHATE ESTER SURFACTANTS: NEWER USES. F. Krupin (GAF Corp.). *Soap Chem. Specialties* 44(5), 86–92, 129–30 (1969). Still in the early stages of commercial development, phosphate ester anionics have been established as a versatile class of surface active agents, for use in powdered, liquid and dry cleaning detergents, and in toiletries. A review is offered of several of their properties and applications.

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Classified Advertising

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Chemical Industry's High Growth Rate in OECD Countries

Consumption of chemical products in 1970 will rise to about $42 billion in Western Europe and to about $56 billion in the United States. The forecast for 1975 is $64 billion in Europe and $82 billion in the U.S. In 1967 estimated consumption reached over $34 billion in Europe and nearly $38 billion in the U.S. The chemical industry now accounts for an estimated average of 6% of the gross national product of OECD (Organization For Economic Co-operation and Development) countries.

These are among the main figures and estimates given in the OECD's latest annual report on the chemical industry in Member countries.

The average growth rate achieved by the industry in Europe and the U.S. in the first half of 1968, compared with the same period in 1967, is estimated at 10%, double that of overall industrial output for the same period. In Japan, the chemical industry increased output by 17.5%, slightly less than production in the nation's industry in general. The outlook for the second half of 1968 is promising, the report says, and the growth rate for the whole year may be substantially the same as in the first six months.

As with production, investment is larger than the average for industry in general and will continue to grow, with 10–20% of all industrial investments going into chemicals. The level of investment in the chemical industry, says the report, makes it possible to assume that provided economic growth in Member countries does not suffer a serious setback, capacity in the industry should be sufficient to allow it to maintain its current high growth in the future.

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NON-FOAMING WETTING AGENTS. J. M. Ross, Jr. and P. E. Levesque (FMC Corp.). *U.S. 3,449,261.* Non-foaming wetting agents are described, containing 50–99 parts of tri(butoxyethyl) phosphate and 1–50 parts of anionic or non-ionic detergent.

RECOVERY OF TALL OIL SOAPS FROM SULFATE PROCESS BLACK LIQUOR. J. C. Bolger and A. S. Michaels (Pulp Chemicals Assoc.). *U.S. 3,449,313.* Recovery of tall oil from black liquor is increased by adding to the liquor 0.1–5.0% by wt. of a liquid hydrocarbon solvent containing at least 10% of unsaturated cyclic compounds, the solvent being substantially immiscible in the black liquor, having a flash point of 85–155F, a specific gravity lower than 1.0 and being capable of dissolving less than 20% by wt. of tall oil soap at room temperature.

DETERGENT CONTAINING HYDROXY ALKYL AMINE OXIDE. H. F. Drew (Procter & Gamble Co.). *U.S. 3,450,637.* Hydroxy alkylamine oxide having improved hygroscopicity and thermal stability properties are employed in detergent compositions containing alkaline builders or other synthetic detergents.

SYNTHETIC THERAPEUTIC FAT. V. K. Babayan and G. Barsky (Drew Chem. Corp.). *U.S. 3,450,819.* A new composition is described, i.e. the triglycerides of a mixture of 65–95% caprylic acid, 5–35% capric acid and 0–5% caproic and lauric acids, having a setting point below about 0C. This oil may contain an amount of an essential fatty acid and is particularly useful for people who have difficulty absorbing fats.

PROCESS FOR PRODUCTION OF DETERGENT TABLETS. C. F. Fischer (Colgate-Palmolive Co.). *U.S. 3,451,928.* A strong, rapidly disintegratable, non-tacky detergent tablet containing a polyphosphate and an organic detergent is produced by treating the compressed composition with a critical amount, 0.04 to 0.2% by wt. of water and then immediately heating the tablet in less than eight seconds to a surface temperature above 850F to obtain a tablet having substantially the same moisture content as before the treatment with water.

GRANULAR ENZYME-CONTAINING LAUNDRY COMPOSITION. A. S. Roald and N. T. deOude (Procter & Gamble Co.). *U.S. 3,451,935.* Powdered enzymes, which are cleaning aids, are attached to granular carriers which comprise partially hydrated hydratable salts such as sodium tripolyphosphate, the attachment being done in the presence of water which effects the partial hydration. The granular carrier with the attached enzyme is useful in pre-wash soaking and in conjunction with detergent compositions.

SURFACTANT COMPOSITIONS FROM ACTIVE HYDROGEN ORGANIC COMPOUNDS, FATTY ACID ESTERS AND ALKYLENE OXIDES, AND RELATED MANUFACTURING PROCESS. L. Nobile, E. Condorelli, T. La Noce and A. Poma (Ledoga S.p.A.). *U.S. 3,451,936.* A 100% surfactant composition is prepared by simultaneously reacting at temperatures of 70 to 200C, at pressures generally lower than 5 atm., in the presence of an alkaline catalyst, for a maximum time of 150 minutes, an active hydrogen compound, a fatty acid ester (preferably a natural or synthetic triglyceride) and an alkylene oxide in the ratio, respectively, of 10–50:50–90:100–300 parts by weight.

PHOSPHONATE COMPOUNDS. O. T. Quimby (Procter & Gamble Co.). *U.S. 3,451,937.* A detergent composition is described, consisting essentially of (A) a water soluble organic detergent and (B) ethanehydroxy triphosphonic acid or a salt thereof having the structural formula: $X{-}CH(PO_3R_2){-}CY(PO_3R_2)_2$ where X and Y are either H or OH (and different from each other), and R_2 is H, alkali metal or C_1–C_6 alkyl radical, the proportion of (A) and (B) being in the range of from about 2:1 to about 1:10, by weight.

PROCESS FOR THE MANUFACTURE OF LIGHT COLORED SURFACE ACTIVE SULFO FATTY ACID ESTERS. W. Stein, H. Weiss and O. Koch (Henkel & Cie., G.m.b.H.). *U.S. 3,452,064.* An improved process for bleaching sulfo fatty acid esters is described. The hydrogen peroxide bleaching agent is added in an amount of 4% by wt. of the sulfonic acids which have been preheated to 45C and the bleaching of the mixture is effected at temperatures not exceeding 100C. The resulting mixture is then neutralized to a pH of 4 and additional bleaching agent is added to complete the bleaching. The two-stage bleaching procedure produces light-to-colorless product.

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