

# ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: R. Aguilar B., J. G. Endres, Kazuo Fukuzumi, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, Louise R. Morrow, E. G. Perkins, T. H. Smouse and J. A. Thompson

## • Fats and Oils

PROCESS FOR INHIBITING BREAKDOWN IN HEATED COOKING OILS. L. A. VanAkkeren (Armour and Co.). *U.S. 3,284,213*. A process for treating triglyceride cooking oils to inhibit breakdown during heating and to prevent foaming consists of the following steps: adding 0.05–3.5% of concentrated phosphoric acid to the oil, heating the oil slowly to a temperature of about 100C while stirring slowly to prevent the formation of free acid in the oil, adding bleaching clay to the oil when the temperature has reached 100C and heating the mixture to about 120C for 15–30 minutes, cooling and filtering the oil to remove the clay and phosphoric acid material, and then heating the oil filtrate to 220–225C under reduced pressure.

THE RAPID DETERMINATION OF FAT IN MEAT PRODUCTS IN ROUTINE INDUSTRIAL CONTROL. Mahmood-Ul-Hassan and D. Pearson (National College of Food Technol., Weybridge, Surrey). *J. Sci. Food Agr.* 17, 421–4 (1966). Rapid methods for the determination of fat in meat products are discussed. Those relating to changes in the refractive index and specific gravity due to dissolving the fat in appropriate solvents were found to be suitable for industrial control purposes.

FATTY ACID COMPOSITION OF MILK. III. VARIATION WITH STAGE OF LACTATION. J. W. Stull, W. H. Brown, C. Valdez (Dept. of Dairy Sci.) and Henry Tucker (Numerical Analysis Lab, Univ. of Arizona, Tucson, Ariz.). *J. Dairy Sci.* 49, 1401–1405 (1966). Variations in component fatty acids in milk of four Holstein cows were measured during their entire lactation (43–50 wk.). Least-squares fits of the measured values were then made to a succession of polynomials. Linear regression equations best describe the proportions of 6:0, 8:0, 16:0, and 16:1, with only 16:0 having a negative slope. The proportion of 10:0, 12:0, 16:iso, 17:0, 18:0, 18:1, 18:iso, and 18:2 were best described by quadratic regression equations. There were wide variations throughout the progress of lactation in the slopes of the curves in these latter cases. Cubic regression equations adequately described the proportions of 10:1, 12:1, 14:0, 14:1, 15:0 and 18:3 fatty acids.

RELATION BETWEEN THERMAL PROPERTIES OF BUTTER AND ITS HARDNESS. J. W. Sherbon and S. T. Coulter (Dept. of Dairy Industries, Univ. of Minnesota, St. Paul, Minn.). *J. Dairy Sci.* 49, 1336–1380 (1966). The heat capacity of commercial and experimental butter as a function of temperature was measured in an electrical input calorimeter. Hardness of the samples was measured either as secitility and viscosity at 10C, or as lubricity value at 22C. Plots of the heat capacity curves of commercial butter showed major phase changes centering at –24, –11, 5, 12, 20, and 30C. Curves for experimental butter were similar, except that the peak at –24C was missing. Comparison to curves for butteroil showed that the changes at –24 and –11C were associated with the aqueous phase of butter. The change at –11C represents the melting of a salt solution, the exact melting point being related to the salt content of the butter. Summer butter contained more liquid fat between –8 and 12C, and was less secitile and less viscous. Liquid fat contents at 10C were 41% in the summer and 35% in the winter. Printing reduced butter hardness, but did not affect the liquid fat content. Experimental butter made according to the winter method or by vat processing of the cream was softer and had higher liquid fat contents, especially at 20C.

FRACTIONATION OF GEOMETRIC ISOMERS OF METHYL LINOLENATE BY ARGENTATION COUNTERCURRENT DISTRIBUTION. C. R. Scholfield, R. O. Butterfield and H. J. Dutton (Northern Regional Res. Lab., Peoria, Ill.). *Anal. Chem.* 38, 1694–1697 (1966). Geometric isomers of methyl linolenate were fractionated by countercurrent distribution between 0.2N AgNO<sub>3</sub> in 90% methanol and hexane. Infrared analyses, capillary gas chromatography, and oxidative cleavage of monoenes produced by partial reduction with hydrazine showed that these trienoic esters were partially separated into the following six classes: (1) all-*trans*; (2) *trans, cis, trans*; (3) *trans, trans, cis* and *cis, trans, trans*; (4) *cis, cis, trans* and *trans, cis, cis*; (5) *cis, trans, cis*; and (6) all-*cis*. Positions of the various double bonds of isomerized methyl linolenate were determined by capillary gas chromatography with Apiezon L or cyanoethyl silicone columns.

STUDIES OF THE MECHANISM OF THE BREAD-IMPROVING EFFECT OF LIPIDS. Y. Pomeranz, G. L. Rubenthaler and K. F. Finney (Crops Res. Div., Agr. Res. Service, U. S. Dept. of Agr.,

Kansas State Univ., Manhattan 66502). *Food Technol.* 20(11), 105–8 (1966). Adding mineral oil or petroleum jelly to wheat flour improved loaf volume and crumb grain somewhat. Mineral waxes had no effect on gassing power, proof height, water absorption at the mixing stage, or amylograph characteristics. Waxes with a melting point around 50C were highly deleterious, probably as a result of adverse effects on oven spring. High-melting-point waxes (96–99C) increased loaf volume little. Waxes with a melting point between 61C and 85C substantially improved loaf volume, crumb grain and freshness retention. The improvement was affected little by adding mineral oil, was positively correlated with increase in wax level up to 3.0 g per 100 g flour, and with some waxes equaled the improvement that resulted from adding 3.0 g vegetable shortening. The non-nutritive character of the mineral components makes the results presently of theoretical interest only. The data point to the possibility of increasing loaf volume by addition of high-melting unreactive compounds.

IMPROVEMENT OF KEEPING QUALITY OF BUTTEROIL BY SELECTIVE TRACE HYDROGENATION AND WINTERIZATION. R. N. Mukherjee, J. G. Leeder and S. S. Chang (Dept. of Food Science, Rutgers—The State Univ., New Brunswick, N.J.). *J. Dairy Sci.* 49, 1381–1385 (1966). The effect of very slight hydrogenation on the keeping quality of butteroil has been studied. Under selective conditions of low pressure, low catalyst concentration, and at 140C, such trace hydrogenation proceeded at a controllable and moderately rapid rate. Samples of deodorized hydrogenated butteroil having iodine values reduced by 1.4, 2.5, 3.5 and 6.0 units were compared against deodorized unhydrogenated butteroil after storing at 60C. Both organoleptic evaluation and peroxide number determinations showed hydrogenated samples to have much improved keeping quality. A significant improvement was achieved by reducing the iodine value by only 1.4 units, whereas a reduction greater than 2.5 units did not offer any further improvement. Hence, it has been shown that butteroil of greatly improved keeping quality may be obtained by very slight hydrogenation with little loss of unsaturation. The level of unsaturation may be restored conveniently by winterization from a solvent such as n-hexane. Analysis of fatty acid composition of the hydrogenated and unhydrogenated butter oils indicated that the improvement of keeping quality by selective trace-hydrogenation is due to the diminishing of the highly unsaturated fatty acids such as linolenic and arachidonic acids.

PHOTOMETRIC DETERMINATION OF FAT IN MILK. G. Haugaard (Dept. of Dairy and Food Science, Cornell University, Ithaca, N.Y.). *J. Dairy Sci.* 49, 1185–89 (1966). A photometric method for determination of fat in unhomogenized milk was developed. It is based on an indirect measurement of the total amount of light scattered by fat globules. This method has been proved theoretically and experimentally correct. The wave length of light which gave the maximum value of light scattering was determined by a scanning procedure. From this wave length,  $\lambda_{max}$ , the slope of the standard curve was found. If the same standard curve for all milk is preferred, the correct optical path length of an adjustable cuvette may be used. Fat contents of unhomogenized milk from individual cows, herds and from mixtures of these milks were measured representing wide globule size distribution curves. Precision of the photometric method is between that of the Babeock and Mojonnier methods.

A RAPID APPROXIMATE ANALYTICAL METHOD FOR SIMULTANEOUS DETERMINATION OF MOISTURE AND FAT IN MEAT AND MEAT PRODUCTS. C. E. Davis, H. W. Oekerman and V. R. Cahill (Ohio State Univ., Columbus, Ohio). *Food Technol.* 20(11), 95–7 (1966). The SI-MO-FAT method of moisture and fat analysis was compared with an air oven moisture determination followed by Soxhlet fat extraction. Highly significant positive correlation coefficients between the two methods of 0.995, 0.996, 0.996, and 0.995 were obtained for per cent moisture, fat (wet basis), fat (dry basis), and residue, respectively. Reliable results for a sample were easily obtained within 2–2½ hr with the SI-MO-FAT method of analysis.

COUNTING AND SIZING FAT GLOBULES ELECTRONICALLY. G. D. Cornell and M. J. Pallansch (Dairy Products Lab, Eastern Util. Res. and Dev. Div. ARS, USDA, Washington, D.C.). *J. Dairy Sci.* 49, 1371–1375 (1966). The particle volume and number of fat globules in milk has been successfully determined

using the electrical sensing-zone principle employed in the Coulter Counter. Changes occurring in the size distribution of these fat globules, as affected by the various steps in the production of cream, skim, homogenized milk, and milk concentrate have also been determined. Using raw milk, over 95% by weight of the fat was accounted for by globules with the diameters ranging from 1 to 10  $\mu$ . Accuracy of the results is attested to by the fact that the fat content of the raw whole milk samples, as calculated from results obtained with the Coulter Counter agreed with the standard Mojonnier analysis, with a relative error of less than 3%. The globules of raw milk, cream, HTST-pasteurized milk, and milk concentrate were counted with a 30- $\mu$  aperture. The skim and monogenized milks contained numerous small globules requiring the use of a 12- $\mu$  aperture. Milk samples homogenized at high pressures contained a significant number of globules too small to be counted.

PHYSICAL STUDIES OF PHOSPHOLIPIDS. IV. HIGH RESOLUTION NUCLEAR MAGNETIC RESONANCE SPECTRA OF PHOSPHOLIPIDS AND RELATED SUBSTANCES. D. Chapman and A. Morrison (Molecular Biophys. Unit, Unilever Res. Lab., The Frythe, Welwyn, Herts, England). *J. Biol. Chem.* 241, 5044-5052 (1966). The nuclear magnetic resonance spectra of phosphatidylethanolamines, phosphatidylcholines, phosphatidylserines, and sphingomyelin are discussed in terms of molecular structure. The factors influencing the band width of the protons of the polar head of phosphatidylcholines are surveyed. It is found that the band widths vary with solvent and that this variation can perhaps be correlated with the micellar properties of the phospholipid. The dipolar ionic structure for phosphatidylethanolamines in solution is discussed in terms of nuclear magnetic resonance and infrared evidence.

ANTARCTIC WHALE OILS BY GAS-LIQUID CHROMATOGRAPHY USING A HYDROGEN FLAME IONIZATION DETECTOR. V. IDENTIFICATION OF 3,7,11,15-TETRAMETHYLHEXADECANOIC ACID AS A CONSTITUENT OF WHALE OIL. Yoshihiko Sano (Miyoshi Oil & Fat Co., Tokyo). *Yukagaku* 15, 456-60 (1966). This acid was synthesized from phytol for comparison with the naturally occurring multi-branched chain fatty acids. The acid was present also in minor amounts in the blubber oils from sei whale and sperm whale oil.

RECENT TRENDS OF THE QUALITIES AND SPECIFICATIONS OF FATS AND OILS. Shuichiro Kimoto and Tatsuo Yamashita (Yoshiwara Oil Mill, Ltd., Nishinomiya, Japan). *Yukagaku* 15, 501-9 (1966)—A review with 30 references.

SEPARATION OF ISOMERS OF METHYL OCTADECENOATE AND METHYL OCTADECADIENATE BY SILICIC ACID-SILVER NITRATE COLUMN CHROMATOGRAPHY. Toru Tagagi (Nagoya Univ., Japan). *Yukagaku* 15, 465-9 (1966). *Cis* and *trans* isomers of octadecenoate and octadecadienoate were chromatographed on the silicic acid-silver nitrate column. Gas chromatographic and spectrophotometric analysis of the eluate permitted separation of the components into 6 groups: (1) *trans*-9; 10- and 11-octadecenoate; (2) *trans*, *trans*-(9,11) and (10,12)-conjugated octadecadienoates, (3) *cis*, *trans*-(9,11) and (10,12) and (11,13)-conjugated octadecadienoates and *cis*-13-octadecenoate, (4) *cis*, *cis*-9,11-conjugated octadecadienoate, *trans*, *trans*-9,12-octadecadienoate and *cis*-9-octadecenoate, (5) *cis*, *trans*-9,12-octadecadienoate, and (6) *cis*, *cis*-9,12-octadecadienoate. The components belonged to the same group and could not be separated further.

PAN-FRYING. I. FUNDAMENTAL FACTORS FROM THE VIEWPOINT OF COOKING. Shizuyuki Ohta, Ayako Mega and Teruko Shibue (Ajinomoto Co., Kawasaki, Japan). *Yukagaku* 15, 533-7 (1966). Several foods such as cabbage, bean-sprouts, egg, rice, meat and fish were pan-fried with different amounts of vegetable oil, lard, butter or margarine. The proper amount of oil to cook the foods was 5-10% of the foods and this was the same for any kind of oil. The temperatures during cooking were measured from 4 points, namely the bottom of frying pan, the surface of frying-pan, the surface of food and the center of food. The weight loss during pan-frying was about 10% in general, but about 20% for watery foods such as cabbage and bean-sprout. In order to determine the extent of deterioration of oils during pan-frying, acid values, iodine values and TBA values of soybean oils heated at 100C and 180C, and of oils used for pan-frying of rice and bean-sprouts were measured. The fatty acid contents of these oils were also determined by gas chromatography. Oils used for pan-frying deteriorated in a short time.

## • Fatty Acid Derivatives

POLYMERIZATION OF OLEIC ACID AND ETHYL OLEATE BY ACTIVATED CLAY CATALYST. Akira Misono (Univ. Tokyo). *Yukagaku* 15, 310-14 (1966). The effects of amounts of catalyst and reaction temperature on the yield of dimer and polymer, properties and structures of the products were studied. Besides the polymerization, side reactions such as decarboxylation, lactone formation and isomerization were observed.

FATTY AMIDES. I. MELTING POINT AND THERMAL STABILITY OF SIMPLE AMIDES AND N,N'-METHYLENEBISAMIDES OF FATTY ACIDS. Masakazu Oguro, Yoshiro Tsutsui and Shoichi Muto (Nihon Suiso Kogyo Co., Tokyo). *Yukagaku* 15, 325-9 (1966). Fatty amides (saturated C<sub>6</sub>,<sub>8</sub>,<sub>10</sub>,<sub>12</sub>,<sub>14</sub>,<sub>16</sub>,<sub>18</sub> and C<sub>22</sub>; *cis* and *trans* forms  $\Delta_{18}$ ,  $\Delta_{11-20}$  and  $\Delta_{13-C_{22}}$ ) and N,N'-methylenebisamides (saturated C<sub>8</sub>,<sub>8</sub>,<sub>10</sub>,<sub>12</sub>,<sub>14</sub>,<sub>16</sub>,<sub>18</sub> and C<sub>22</sub>; *cis*-form  $\Delta_8$ -C<sub>18</sub>,  $\Delta_{11}$ -C<sub>20</sub> and  $\Delta_{13}$ -C<sub>22</sub>, *trans*-form  $\Delta_8$ -C<sub>18</sub>) were prepared and the melting point and thermal stability measured. The stability was measured with thermobalance. The purity of each compound was higher than 99% by gas chromatography. The results are tabulated.

PRESENT SITUATION AND PROBLEM IN FATTY ACID INDUSTRY. Shigeyoshi Yamate (Nippon Oils & Fats Co., Tokyo). *Yukagaku* 15, 344-52 (1966). Fatty acid production alone is not profitable enough and many manufacturers are operating the plant on the profit from synthetic detergents, surfactants and others.

SYNTHETIC FATTY ACIDS ESPECIALLY BY KOCH PROCESS. Yoshio Ishii (Nagoya Univ., Nagoya, Japan). *Yukagaku* 15, 353-62 (1966). A review with 26 references.

RECENT PROBLEMS REGARDING FATTY AMINES. Shunzo Otsuka (Kao Soap Co., Yakayama, Japan). *Yukagaku* 15, 416-22 (1966). A review with 56 references.

DIBASIC ACIDS AND OTHER BIFUNCTIONAL COMPOUNDS DERIVED FROM UNSATURATED FATTY ACIDS. Goro Kimura (Toyo Koatsu Inds. Inc., Yokohama). *Yukagaku* 15, 369-84 (1966). A review with 107 references.

PROPERTIES AND APPLICATION OF FATTY AMIDES. Masakazu Oguro and Yoshiro Tsutsui (Nihon Suiso Kogyo Co., Tokyo). *Yukagaku* 15, 406-15 (1966). A review with 132 references.

DERIVATIVES OF FATTY ACIDS FOR PLASTICIZERS. Hazime Tokuno and Kiyoo Hirota (Asahi Electro-Chemical Co., Tokyo). *Yukagaku* 15, 385-92 (1966). A review with 57 references.

DIMER ACIDS. Akira Misono and Yasuzo Uchida (Univ. Tokyo). *Yukagaku* 15, 363-8 (1966). A review with 40 references.

SURFACE MODIFICATION OF HIGH POLYMERS WITH FATTY ACID DERIVATIVES. Hideo Marumo (Lion Fat & Oil Co., Tokyo). *Yukagaku* 15, 422-9 (1966). A review with 35 references.

MONOGLYCERIDE OF FATTY ACID PREPARATION AND METHOD OF PREPARING SAME. F. F. Hansen. *U.S.* 3,282,705. A white creamy paste consists of distilled monoglyceride of a fat-forming fatty acid, the monoglyceride being one which is solid at room temperature, hydroxylated lecithin in the range of 10-30% of the weight of the monoglyceride, 0-3% bicarbonate, and water in an amount sufficient to disperse the other constituents but insufficient to form a flowable liquid.

FATTY ACID ESTERS OF POLYHYDRIC ALCOHOLS. S. J. Metro, Elaine M. Hoffman, and A. H. Matuszak (Esso Research and Eng. Co.). *U.S.* 3,282,971. A fully esterified ester of a polyhydric alcohol represented by the general formula: RC(CH<sub>2</sub>OH)<sub>n</sub>, in which R is a member selected from the group consisting of C<sub>1</sub> to C<sub>6</sub> alkyl groups and CH<sub>2</sub>OH groups is esterified with 1 to 2 molecular proportions of a non aliphatic hydrogen carboxylic acid of the general formula: RR'R'COOH in which R is an aliphatic saturated hydrocarbon group of 3-12 carbon atoms and R' is a C<sub>1</sub> to C<sub>6</sub> alkyl group and is further esterified with a C<sub>1</sub> to C<sub>14</sub> fatty acid.

## • Biochemistry and Nutrition

PITFALLS IN CONSTRUCTING A FAT-CONTROLLED DIET. Helen B. Brown and Marilyn E. Farrand (Cleveland Clinic Found., Cleveland, Ohio). *J. Am. Dietet. Assoc.* 49, 303-8 (1966). The key to an adequate diet for serum cholesterol reduction is the proper selection of fat-containing products. Cooked lean meats should have an average of 5% fat or 2 g/oz; vegetable oils should contain at least 50% polyunsaturated fatty acids; special margarines should have at least 30-40% polyunsaturated fatty acids. Up to 4 eggs a week may be used in such a diet.

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**THERAPY AND CONTROL OF ATHEROSCLEROTIC DISEASES.** K-I Kanazawa, T. Matsukawa and Y. A. Suita (Takeda Chemical Ind., Ltd., Osaka, Japan). *U.S. 3,271,250*. A method of controlling atherosclerosis in a patient subject to high blood cholesterol levels consists of administering to the patient an effective amount of a member selected from the group consisting of cholestane-3,5,6-triol, cholestane-3,5,6-triol-3,6-diformate cholestane-3,5,6-triol-3-hemisuccinate and alkaline salts thereof

**DIAGNOSTIC REAGENT.** K. Lou (Hyland Laboratories.). *U.S. 3,274,062*. A method for the manufacture of a high cholesterol control standard for diagnostic use comprises the steps of: (a) adding calcium ions to a serum of non-elevated cholesterol content; (b) adding further to the serum a water soluble salt of a sulfated poly-galacturonic acid methyl ester methyl glycoside; (c) collecting the resultant precipitate of beta-lipoprotein and purifying the precipitate by dialysis; (d) dissolving the precipitate in a serum of non-elevated cholesterol content to thereby form a physiologic serum of high cholesterol content.

**EFFECT OF DIETARY FATS ON INFECTION BY ESCHERICHIA COLI IN CHICKS.** F. M. Boyd and H. M. Edwards, Jr. (Poultry Disease Res. Ctr. and Poultry Science Dept., Univ. of Georgia, Athens). *Proc. Soc. Exp. Biol. and Med.* 122, 218-20 (1966). Chicks that have received an essential fatty acid deficient diet for 2 to 4 weeks are more susceptible to mortality on infection with *E. coli* than chicks fed a corn oil-supplemented diet. The extent of protection afforded by various supplemental oils can not be quantitatively correlated with their linoleic acid content.

**RELATIONSHIPS BETWEEN BLOOD AND LIVER STORAGE OF VITAMIN A.** J. G. Wilson and R. A. Teekell (Dept. of Poultry Sci., Louisiana State Univ., Baton Rouge, La.). *Poultry Sci.* 45, 980-5 (1966). Trials were conducted to determine if there was a relationship between dietary vitamin A and circulating blood levels and liver storage of vitamin A. In one trial the effect of vitamin E on the utilization of vitamin A was studied. Samples of blood and liver were taken weekly during a vitamin supplementation period and twice weekly during the depletion period. Statistical analyses indicated that liver storage of vitamin A is cumulative and bears a marked relationship with the dietary level of this vitamin. The data also indicated that although there is a small correlation between blood levels and liver storage, the blood levels would be a poor criterion for predicting liver storage of vitamin A. No significant differences in growth rates were found in birds receiving from 500 I.U./lb to 6,500 I.U./lb. of vitamin A, although there appeared to be negligible liver storage of vitamin A at the lower range. Vitamin E had no apparent effect on the utilization of vitamin A under the conditions of this experiment.

**A MICROANALYTICAL TECHNIQUE FOR THE QUANTITATIVE DETERMINATION OF TWENTY-FOUR CLASSES OF BRAIN LIPIDS.** M. A. Wells and J. C. Dittmer (Inst. of General Med. Sci., U.S.P.H. Service Dept. of Biochem., Univ. of Wash., Seattle, Wash.). *Biochemistry* 5, 3405-18 (1966). Selective mild alkaline and acid hydrolyses are used to obtain water-soluble phosphate esters characteristic of the diacyl phosphoglycerides and plasmalogens of brain. These phosphate esters are separated by anion-exchange chromatography and quantitatively assayed. Phospholipids stable to hydrolysis are assayed after fractionation on silicic acid. The gangliosides, neutral lipids and glycosphingolipids are measured by specific spectrophotometric determination of characteristic components after an initial solvent fractionation and chromatography on Florisil. Complete analysis of 24 classes of lipids can be carried out on as little as 150 mg of brain tissue. Evidence for the occurrence in rat brain of plasmalogenic acid, choline plasmalogen, inositol plasmalogen, and phosphatidylglycerol is presented. Serine plasmalogen is absent.

**STRUCTURE AND FUNCTION OF THE ACYL CARRIER PROTEIN.** P. R. Vagelos, P. W. Majerus, A. W. Alberts, A. R. Larrabee and G. P. Ailhaud (Section on Comparative Biochem., Lab. of Biochem., Natl. Heart Inst., Bethesda, Maryland.). *Federation*

*Proceedings* 25 1485-94 (1966). Acyl carrier protein has been isolated from *E. coli*, where it has been shown to function as a specific acyl group carrier in fatty acid synthesis. The mechanism of the involvement of ACP in fatty acid synthesis has been explained. Studies of the structure of ACP disclosed that it contains a prosthetic group, 4'-phosphopantetheine, which is linked as a phosphodiester to a hydroxyl group of a serine residue of the protein. Additional details of ACP structure were discussed.

**LIPID ANALYSES OF BOVINE TEAT CANAL KERATIN.** J. M. Treece, G. E. Morse and Carol Levy (Univ. of Penn., School of Vet. Med., New Bolton Center, Kennett Square, Penna.). *J. Dairy Sci.* 49, 1240-44 (1966). The lipids of teat canal keratin collected from Holstein cows classified as to susceptibility to experimental changes of *Streptococcus agalactiae* were analyzed, to determine a possible relationship to mastitis. The lipids were extracted from dried keratin and separated into component classes: hydrocarbons, sterol esters, triglycerides, sterols and phospholipids. The isolated lipid classes were analyzed for C<sub>12</sub> to C<sub>18</sub> fatty acids by gas-liquid chromatography. To obtain enough keratin for study, 12 to 16 collections per cow and teat were pooled. In this study the average of fresh material per collection was 7.8 mg. The average of the total lipid content of dry keratin was 36.6% versus 90.9%, reported previously. No relationship between amount of lipids in the individual class or individual fatty acids (C<sub>12</sub> to C<sub>18</sub>) present in these classes to the degree of susceptibility was noted.

**INFLUENCE OF VEHICLE OF ADMINISTRATION OF INTESTINAL ABSORPTION, FAT STORAGE AND BIOLOGICAL ACTIVITY OF ETHYNYL-ESTRADIOL (EE) AND ITS 3-CYCLOPENTYL ETHER (EECE) IN RATS.** B. G. Steinetz, A. Meli, V. L. Beach and T. Giannina (Dept. of Physiology, Warner-Lambert Res. Inst., Morris Plains, N.J.). *Proc. Soc. Exp. Biol. Med.* 123, 163-70 (1966). When introduced directly into the small intestine of the rat, as oil solutions, ethynylestradiol (EE) or its 3-cyclopentyl ether (EECE) were absorbed much more slowly than when administered as aqueous suspensions. These findings are in agreement with data in the literature on other steroidal compounds. Hydrolysis of the components of sesame oil (dependent upon the presence of bile and pancreatic secretions) seems to be necessary for release and subsequent absorption of EECE but not EE from the lipid vehicle. Storage in body fat and brain of the unaltered EECE is increased by its administration as an oily solution instead of an aqueous suspension. The nature of the vehicle of administration, however, had no influence on the degree of biological activity of EECE as well as EE.

**DEPRESSION OF PLASMA FFA LEVELS IN UNANESTHETIZED DOGS BY SINGLE INTRAVENOUS DOSES OF PROSTAGLANDIN E<sub>1</sub>.** D. Steinberg and R. Pittman (Lab. of Metabolism, Nat'l Heart Institute, Nat'l Inst. of Health, Bethesda, Md.). *Proc. Soc. Exp. Biol. Med.* 123, 192-6 (1966). Intravenous injection of large doses of PGE<sub>1</sub> into unanesthetized dogs caused marked decreases in plasma FFA levels lasting up to 40 minutes. On the other hand, vasodepression produced by injection of similar doses of PGE<sub>1</sub>-217 or by injection of nitroglycerin produced no fall in FFA levels, but instead a slight rise. This is interpreted as a response to sympathetic discharge induced by vasodepressor agents that do not share the ability of PGE<sub>1</sub> to block the lipolytic action of epinephrine on adipose tissue. Simultaneous intravenous injection of PGE<sub>1</sub> and epinephrine diminished or abolished the lipid-mobilizing action of the latter, but glucose response was unaffected.

**EFFECT OF VITAMIN D<sub>3</sub> ON MILK YIELD OF THYROPARATHYROIDECTOMIZED RATS.** L. S. Srivastava and C. W. Tuner (Dept. of Dairy Husbandry, Univ. of Missouri, Columbia, Mo.). *J. Dairy Sci.* 49, 1459-1460 (1966). In a previous study it was shown that normal lactation could be maintained in thyroparathyroidectomized rats when 3 µg L-thyroxine/100 g body weight was administered in conjunction with vitamin D<sub>3</sub> (calciferol) at a level of 0.2 mg/100 g b.w./day. In the present study it was shown that vitamin D<sub>3</sub> at the same level (8,000 IU or 0.2 mg) per day was equally effective in maintaining normal milk yield on days 14, 16, 18, and 20 in conjunction with L-thyroxine.

**MITOCHONDRIAL INVOLVEMENT IN LIPID VACUOLE FORMATION IN CULTURED AORTIC CELLS FROM WHITE CARNEAU PIGEONS.** S. C. Smith, R. G. Strout, W. R. Dunlop and E. C. Smith (Biomolecular Hygiene Sec., Univ. of New Hampshire, Durham, N.H.). *J. Atheroscler. Res.* 6, 489-96 (1966). White Carneau pigeons are susceptible to spontaneous atherosclerosis which closely resembles the human disease. Intimal cells derived from embryonic White Carneau aortas, in addition to being deficient in arachidonate, often contain more vacuoles than similar cells from atherosclerosis-resistant Show Racer pigeons.

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EFFECT OF CARBON TETRACHLORIDE ON INCORPORATION OF LINOLEIC-1-<sup>14</sup>C ACID INTO LIVER LIPIDS IN RATS IN VIVO. D. S. Sgoutas and F. A. Kummerow (Burnsides Res. Lab., Univ. of Ill., Urbana). *Proc. Soc. Exp. Med.* 123, 279-82 (1966). Linoleic-1-<sup>14</sup>C acid was rapidly incorporated into the liver lipids of both control and carbon tetrachloride treated rats. Twenty minutes after the injection, a pronounced fall in incorporation into phosphatidyl ethanolamine with a concurrent rise in incorporation into cardiolipin and phosphatidyl choline fractions was observed in the degenerating liver. The increased incorporation of radioactivity into cardiolipin and phosphatidyl choline was reflected in an increased content of linoleic acid in these phospholipids but not in phosphatidyl ethanolamine. These results suggested the existence of separate pools of linoleic acid for incorporation into individual phospholipids.

ROLE OF PHOSPHOLIPIDS IN THE ENZYMATIC SYNTHESIS OF THE BACTERIAL CELL ENVELOPE. L. Rothfield, M. Takeshita, M. Pearlman and R. W. Horne (Dept. of Molecular Bio., Albert Einstein College of Med., Yeshiva U., New York City). *Federation Proceedings* 25, 1495-1502 (1966). The cell membranes and cell walls of bacteria and higher organisms contain significant amounts of phospholipid as well as proteins and other macromolecules. The biochemical role of these phospholipids has been obscure, but it is now apparent that phospholipids are intimately involved in enzyme reactions leading to biosynthesis of several of the macromolecular components of the bacterial cell envelope.

SOME FACTORS AFFECTING FREE FATTY ACID DISTRIBUTION IN LIPASE-HYDROLYZED MILK FAT. J. A. Robertson, W. J. Harper and I. A. Gould (Dept. of Dairy Tech., The Ohio Agricultural Expt. Station, Columbus, Ohio). *J. Dairy Sci.* 49, 1395-1400 (1966). A gas chromatographic study of the methyl esters of free fatty acids revealed that the relative concentration of free fatty acids hydrolyzed by milk lipase from milk fat at pH 7.0 and pH 8.6 was affected by milk fat substrate concentration, incubation temperature, and inhibitors. Eighteen methyl esters were separated and 11 were identified. Generally, the unidentified esters were present in higher concentrations in the free fatty acid mixture following lipolysis than in the saponified substrate fat. At both pH 7.0 and 8.6, the substrate concentration was inversely related to the relative concentration of the free short-chain fatty acids (C-6 to C-12). The pH had a slight effect on the relative concentration of free fatty acids resulting from lipase action. Short chain acids were in greater concentrations when the assay was at pH 8.6 than at 7.0, whereas concentrations of several of unknown acids displayed an opposite pH relationship. In comparison to the control, ferric chloride was found to have no effect on the relative concentration of free fatty acid methyl esters at pH 7.0, but caused a marked increase in the relative concentration of both known and unidentified long-chain esters at pH 8.6. Changes in distribution of free fatty acids caused by the presence of cupric chloride and diisopropyl fluorophosphate during lipolysis did not exceed 10% of the control.

IN VITRO STUDIES OF PHOSPHOLIPID SYNTHESIS IN EXPERIMENTAL ATHEROSCLEROSIS. POSSIBLE ROLE OF MYO-INTIMAL CELLS. F. Parker, J. W. Ormsby, N. F. Peterson, G. F. Odland and R. H. Williams (Dept. of Med., Univ. of Washington, School of Med., Seattle, Wash.). *Circulation Res.* 19, 700-10 (1966). Using *in vitro* techniques and labeled linoleic acid and glucose, alterations in phospholipid synthesis in the aorta were correlated with electron microscopic studies at various intervals of time after feeding rabbits cholesterol. After 4 to 8 weeks of feeding, more phospholipid precursors were incorporated into the phospholipids of atherosclerotic blood vessels than of normal vessels. Concomitant with the metabolic alterations, the following ultrastructural changes occur. Smooth muscle cells of the plaque (myointimal cells) evolve into highly vacuolated cells containing a profusion of cytoplasmic organelles. The increase in membranous organelles suggests that the increase in phospholipid synthesis may be the result of a cellular requirement for increased intracytoplasmic structural phospholipid.

BONE MARROW COMPOSITION OF CHOLESTEROL-FED GUINEA PIGS. R. Ostwald, O. Darwish, D. Irwin, and Ruth Okey (Dept. of Nutr. Sciences, Univ. of Calif., Berkeley). *Proc. Soc. Exp. Biol. Med.* 123, 220-4 (1966). The anemia produced in guinea pigs by dietary cholesterol led to a stimulation of erythropoietic activity with a proliferation of marrow cells which displaced the fat globules normally occupying the femoral marrow cavity. The triglyceride content decreased to half of its original level while the relative proportion of PL and cholesterol, on a dry,

(Continued on page 32A)

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## Symposium on Pharmacology of Hormonal Polypeptides, Milan, 1967

An International Symposium entitled "Pharmacology of Hormonal Polypeptides: Metabolic and Molecular Aspects" will be held in Milan, Italy on Sept. 14-16, 1967, under the co-sponsorship of the University of Milan, Institute of Pharmacology and Therapy, Italy, and The State University of New York at Buffalo Department of Biochemical Pharmacology, School of Pharmacy, Buffalo, N. Y., and under the auspices of the International Society of Biochemical Pharmacology.

The Symposium will be divided into the following sessions: 1) Techniques in Peptide Synthesis; 2) Anterior Pituitary and Placenta; 3) Anterior Pituitary and Hypothalamus; 4) Posterior Pituitary Hormones and Factors Affecting Lipid Mobilization; 5) Insulin and Glucagon; 6) Other Hormonal Peptides. It will be composed of invited papers and a limited number of communications.

The deadline for abstracts (250 words) of the free communications is May 31, 1967.

For further information contact the secretarial office of Professors L. Martini and R. Paoletti, Institute of Pharmacology, University of Milan, Via Andrea Del Sarto 21, Milan, Italy.

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(Continued from page 31A)

fat-free basis remained unchanged. The proportion of linoleic acid in the remaining portion of TG decreased. Fractionation of the PL showed changes in their composition, particularly a decrease of the less polar components. The relationship of these changes in marrow to the changes observed in the peripheral blood requires further study.

STUDIES ON BILE ACIDS. SOME OBSERVATIONS ON THE INTRACELLULAR LOCALIZATION OF MAJOR BILE ACIDS IN RAT LIVER. T. Okishio and P. P. Nair (Biochem. Res. Div., Dept. of Med., Sinai Hospital of Baltimore, Baltimore, Md.). *Biochemistry* 5, 3662-3 (1966). The subcellular distribution of major bile acids in rat liver has been studied by the application of recently developed gas-liquid partition chromatographic methods. The relative concentrations of several bile acids in rat portal blood and liver homogenate resembled each other very closely except for chenodeoxycholic acid. The concentration of chenodeoxycholic acid in liver is significantly higher than in portal blood. The cytoplasmic compartment accounts for approximately 70% of the bile acids with more than 50% for each individual bile acid studied. The ratio of cholic/deoxycholic in each subcellular fraction revealed the existence of a relatively larger proportion of deoxycholic acid in the mitochondrial and microsomal fractions compared to that in the cytoplasmic fraction (1.7 and 1.3 vs. 5.1). Since the enzymes concerned with hydroxylation (7 $\alpha$ -hydroxylase) and conjugation are located in microsomes and partly in the mitochondria, there seems to be a relationship between localization of bile acids in these subcellular particles and their functional role.

THE INHIBITION OF STEROL BIOSYNTHESIS IN RAT LIVER HOMOGENATES BY BILE. J. W. Ogilvie and E. H. Kaplan (Dept. of Physiol. Chem., The Johns Hopkins Univ. School of Med., Baltimore, Md.). *J. Biol. Chem.* 241, 4722-30 (1966). The incorporation *in vitro* of acetate-1-<sup>14</sup>C into digitonin-precipitable sterols in rat liver homogenates is markedly inhibited by small amounts of rat bile. The incorporation *in vitro* of mevalonate-2-<sup>14</sup>C into digitonin-precipitable sterols in the same enzyme system is much less sensitive to bile, suggesting that the major site of action of bile in suppressing sterol biosynthesis from acetate is at a pre-mevalonate step in the biosynthetic pathway. Fasting, which is known to suppress the rate of hepatic cholesterol biosynthesis from acetate in the rat, results in a 2-fold increase in the inhibitory activity of bile. A major part of the inhibitory activity appears to be associated with the protein fraction of bile. This inhibitory protein fraction of bile has been partially purified and characterized. An approximate molecular weight of 19,000 has been determined for the inhibitory protein from the results of gel filtration and sucrose density gradient centrifugation experiments.

INFLUENCE OF MEAL COMPOSITION ON SERUM AMINO NITROGEN, GLUCOSE AND NONESTERIFIED FATTY ACIDS. R. G. Nadeau and E. S. Yearick (Instrument Products Div., E. I. du Pont de Nemours and Co., Wilmington, Delaware). *Am. J. Clin. Nutr.* 19, 329-34 (1966). Six isocaloric test meals providing two levels of protein and different fat:carbohydrate ratios were administered to 10 healthy young men. The amino nitrogen, glucose and nonesterified fatty acid levels in venous blood serum were determined at fasting and at intervals up to 7 hours following the ingestion of the test meals. The high protein meals produced a significantly greater increase in amino nitrogen concentration than did the moderate protein meals. Serum glucose concentrations, which declined at 1.5 hours after all meals, were in inverse relation to the amount of protein ingested. Both the amino nitrogen and the glucose responses to the high protein meals were minimized when the meals contained high fat or high carbohydrate calories. A significant negative correlation (-0.84) between serum amino nitrogen and serum glucose concentrations was found at all sampling periods. In general, nonesterified fatty acid levels decreased before exhibiting a rise following the ingestion of all meals. The nonesterified fatty acid values were directly related to the fat:carbohydrate ratios of the meals. A depressant effect of protein on serum nonesterified fatty acids was evident.

THE INFLUENCE OF 3'-METHYL-4-DIMETHYLAMINOAZOBENZENE ON THE INCORPORATION OF STEARATE-1-<sup>14</sup>C AND OLEATE-1-<sup>14</sup>C INTO MICROSOMAL PHOSPHATIDYL CHOLINE AND PHOSPHATIDYL ETHANOLAMINE. R. J. Morin (Dept. of Pathol., Los Angeles County Harbor Gen. Hosp., Torrance, Calif.). *Cancer Res.* 26, 2186-2189 (1966). Several groups of rats were fed either a fat-free or cholesterol containing diet with or without 3'-methyl-4-dimethyl-aminoazobenzene (3'-Me-DAB) for 6 weeks, after which they were given 1 dose of either stearate-1-<sup>14</sup>C or oleate-1-<sup>14</sup>C and killed at 1-, 2-, 4- and 24-hr intervals. Microsomal phosphatidyl choline and phosphatidyl ethanolamine were isolated by thin-layer chromatography and their radioactivities and fatty acid composition determined by liquid scintillation spectrometry and gas chromatography. Administration of 3'-Me-DAB to rats on the fat-free diet caused an increase in the proportion of oleic acid and a decrease in stearic acid in phosphatidyl choline. Cholesterol in the diet together with the azo dye produced an accentuation of the fatty acid alterations. With 3'-Me-DAB, there was an increased incorporation of radioactive stearate at the early time intervals, and in increased 24-hr retention of radioactive oleate, suggesting a possible increased turnover of stearate-containing phospholipids induced by the azo dye, leaving more oleate-containing phospholipids remaining in the microsomes. The combination of cholesterol with 3'-Me-DAB produced a decreased synthesis of stearate-containing phospholipids and a lesser decrease in synthesis of oleate containing phospholipids, which may explain the alteration in the proportions of these 2 fatty acids in rats fed this diet.

BIOSYNTHESIS OF LIPIDS BY KINETOPLASTID FLAGELLATES. H. Meyer and G. G. Holz, Jr. (Dept. of Microbiology, State Univ. of New York, Upstate Medical Center, Syracuse, New York). *J. Biol. Chem.* 241, 500-5007 (1966). *Crithidia fasciculata*, *Crithidia oncopelti*, *Crithidia lucilae*, *Crithidia* sp. from *Arilus crisatus*, *Crithidia acanthocephali*, *Blastocrithidia culicis*, *Leishmania tarentolae*, and *Leptomonas leptoglossi* were grown under axenic conditions in chemically defined media, and their fatty acids were determined. Palmitic, stearic, and a C<sub>18</sub> cyclopropane acid were the major saturated fatty acids. Oleic, linoleic, and  $\gamma$ -linoleic were the major unsaturated fatty acids.  $\alpha$ -Linolenic acid could not be detected in any of these organisms. Monounsaturated fatty acids were synthesized by direct oxidative desaturation of the corresponding saturated acids, and polyunsaturated fatty acids were synthesized by progressive desaturation and chain elongation of the monoenoic acids. The major lipids of *C. fasciculata* and *C. oncopelti*—triglycerides, sterol esters, phosphatidylcholine, phosphatidylinositol, and phosphatidylethanolamine—were identical. Phosphatidylethanolamine contained the bulk of the cyclopropane acid found in *C. fasciculata*. Ergosterol was the major sterol of *Crithidia*, *Blastocrithidia*, and *Leishmania* species. Methionine served as a source of methyl groups for the biosynthesis of both ergosterol and the cyclopropane acid.

RELATIONSHIP BETWEEN FOOD CONSUMPTION AND MORTALITY FROM ATHEROSCLEROTIC HEART DISEASE IN EUROPE. A. Lopez-S, W. A. Krehl, R. E. Hodges and Eleanor Good (Univ. of Iowa, College of Med., Univ. Hospitals, Iowa City, Iowa). *Am. J. Clin. Nutr.* 19, 361-9 (1966). It would be interesting to observe the mortality due to AHD over the next decades in countries in which the intake of fat and sugar is high to learn whether today's predictions are confirmed by tomorrow's findings. Even though epidemiologic and statistical studies, such as the present one, do not provide a clear answer concerning the origin and development of AHD in individual subjects or population groups, they do offer clues for more detailed investigations and, particularly, longitudinal studies which may give more clear-cut answers.

SYNOVIAL FLUID FATTY ACID COMPOSITION IN PATIENTS WITH RHEUMATOID ARTHRITIS, GOUT AND DEGENERATIVE JOINT DISEASE. I. C. Kim and A. S. Cohen (Robert Dawson Evans Dept. of Clinical Res., Univ. Hosp., Mass.). *Proc. Soc. Exp. Biol. Med.* 123, 77-80 (1966). Total fatty acid analyses of synovial fluids from patients with rheumatoid arthritis, gout, and degenerative joint disease and matching sera were carried out by gas chromatography. The relative fatty acid composition of synovial fluid was similar to that in serum. Palmitic, oleic and linoleic acids constituted the major components and myristic, palmitoleic, stearic and arachidonic acids were the minor components. The synovial fluid fatty acid concentration was roughly one-half to one-third of that of the matching serum. However, correlation between the synovial fluid fatty acid concentration and its white cell count was poor and total fatty acid analyses were not helpful in differentiating an inflammatory synovial fluid from a noninflammatory fluid.

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LONGER SURVIVAL TIME OF RATS FED OXIDIZED VEGETABLE OILS. H. Kaunitz, Ruth E. Johnson, and L. Pegus (Dept. of Pathology, College of Physicians and Surgeons, Columbia Univ., N.Y.). *Proc. Soc. Exp. Biol. Med.* 123, 204-6 (1966). Feeding of mildly heated and aerated butter and lard reduced the average span (although not statistically significantly) of male rats fed these fats at a level of 20% in their diets. With similarly treated soybean and corn oils, survival was as good as with fresh animal fats whereas feeding of fresh vegetable oils led to significantly shorter life spans. The results were in agreement with those of a previous study comparing beef and chicken fats with olive oil. Thus, fresh olive oil, soybean oil, and corn oil appeared to contain, despite processing for human consumption, materials toxic to rats. These substances were inactivated by mild heating and aeration.

AN ELECTRON MICROSCOPIC STUDY OF LIPOPROTEIN PRODUCTION AND RELEASE BY THE ISOLATED PERFUSED RAT LIVER. A. L. Jones, N. B. Ruderman and M. Guillermo Herrera (Dept. of Medicine, Elliott P. Joslin Res. Lab., Harvard Med. School, Boston, Mass.). *Proc. Soc. Exp. Biol. Med.* 123, 4-9 (1966). Dense osmiophilic bodies, 300-800 Å in diameter, appear in isolated rat livers perfused with high concentrations of linoleic acid. After 2 minutes of perfusion, these bodies are very numerous in the endoplasmic reticulum and Golgi apparatus. They are first seen in significant numbers in the space of Disse at 5 minutes. Similar granules are present in the final media of livers perfused with fatty acid and the  $d < 1.006$  fraction of human and rat sera. The data suggest that these bodies are very low density lipoprotein and indicate that the isolated perfused liver is an excellent experimental system for morphological study of lipoprotein metabolism.

MECHANISM OF SUCKLING RAT HYPERCHOLESTEROLEMIA: DIETARY AND DRUG STUDIES. R. A. Harris, J. E. MacNintch and F. W. Quackenbush (Dept. of Biochem., Purdue U., Lafayette, Indiana). *J. Nutr.* 90, 40-6 (1966). The objective of this study was to determine the cause(s) of the hypercholesterolemia which is known to occur in suckling rats. A semi-purified, milk-simulating diet fed to 21-day-old rats upon weaning was found to maintain the hypercholesterolemia condition. With this diet, the mechanism of suckling rat hypercholesterolemia was investigated by testing the effect of dietary levels of lactose, bulk, polyunsaturated fatty acids, cholesterol and fat. The condition appears to be dependent upon the high fat content of rat milk but independent of the dietary bulk, polyunsaturates, and carbohydrate source. Isocaloric diets were used to establish the dependency upon the fat content of diet. Feeding experiments suggest that dietary cholesterol is not necessary for maintaining hypercholesterolemia for short periods of time, but isotopic balance studies show that the dam contributes a portion of the cholesterol found in the plasma of suckling rats. Ethyl linoleate, *p*-chlorophenoxyisobutyrate (CPIB), benzmalecene, and  $\beta$ -diethylaminoethyl diphenylpropyl acetate hydrochloride were found not to be effective as hypocholesterolemic agents in the suckling rat hypercholesterolemia. L-Thyroxine was active in lowering plasma cholesterol in this system, but it increased liver free and total cholesterol. Liver wet weight, dry weight, and protein content increased in response to CPIB.

LIPOLYSIS IN HOMOGENATES OF ADIPOSE TISSUE: AN INHIBITOR FOUND IN FAT FROM OBESE RATS. H. A. Haessler (Science and Engineer. Inst., Waltham, Mass.). *Science* 154, 909-10 (1966). The presence of a lipid-bound inhibitor in adipose tissue of rats with hypothalamic obesity may explain the failure of the tissue to release fatty acids on epinephrine stimulation. Aqueous extracts of tissue from obese animals showed no deficiency of lipase activity, but when whole homogenates of epididymal fat from lean and obese animals were mixed, 25% tissue from obese animals reduced 73 percent the release expected from tissue of lean controls.

EFFECT OF PHOSPHOLIPIDS ON INDUCED ENZYME RELEASE FROM MITOCHONDRIA. S. Estrada-O., A. Carabez T., and A. Cabeza G. (Inst. for Enzyme Res., Univ. of Wis., Madison). *Biochemistry* 5, 3432-43 (1966). When incubated in an appropriate medium, mitochondria release glutamic aspartic transaminase (GOT) and glutamic dehydrogenase activities of the supernatant solution in a temperature-dependent fashion. This phenomenon is inhibited by chromatographically pure phosphatidylethanolamine, phosphatidylserine, phosphatidylcholine, and sphingomyelin. A relationship seems to exist between the blocking activity of these molecules and the unsaturation of their constituent fatty acids, since saturated phospholipids do not prevent release of enzymes. Some free unsaturated fatty

(Continued on page 34A)

## • Names in the News

A. M. ALTSCHUL, of the USDA's Southern Utilization Research and Development Division, has become the first recipient of the Technion Achievement Award given by the Chicago Chapter of the American Society for Technion, the Israel Institute of Technology. In choosing Altschul, the society cited his work in combating protein deficiency in the underdeveloped nations of the world. Through his research on cottonseed at the Southern Division, Altschul became interested several years ago in the possibilities of cottonseed flour and other vegetable products as sources of low-cost protein to supply this need.

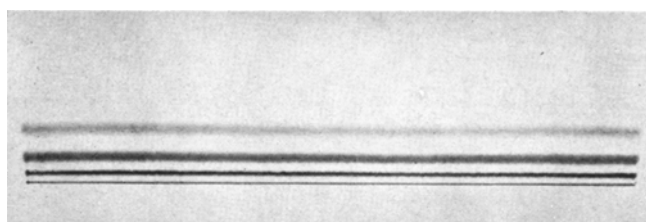
T. H. KRITCHEVSKY is now associate director of the research and product development program of the R. I. T. A. Chemical Corporation. He was formerly a research associate in steroid biochemistry at the Sloan-Kettering Institute.

J. D. MAHONEY, vice president and general manager of the organic chemicals division of the Monsanto Company, was elected president of the Synthetic Organic Chemical Manufacturers Association for 1967. T. P. TURCHAN will act as senior vice president, E. M. MAY as vice president and R. L. DUNCAN as treasurer of the Association for 1967.

JOHN PETERSON will now act in the capacity of executive vice president of Drew Chemical Corporation, in addition to his work as president of the firm's St. Louis refinery, the Drew Foods Corporation.

ALLAN BERNE-ALLEN (1965) received the Recognition Award of the National Renderers Association at their 33rd National Convention in Washington. He has just retired after eight years as a research consultant for the Association.

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(Continued from page 33A)

acids (e.g., oleic acid) induce the release of GOT activity from mitochondria, whereas some saturated fatty acids moderately protect or are ineffective in this process. Phospholipids are ineffective in preventing the oleic acid induced release of GOT. If lysolecithin or lecithinase D is added to the incubation medium, the release of enzyme activity from the mitochondria is enhanced. The significance of these findings in relation to the possible role of phospholipids and some of their derivatives in the regulation of lecithinase and lysolecithin activity in mitochondria is discussed.

**ETHANOL AND ALIMENTARY LIPEMIA.** A. C. Brewster, H. G. Lankford, M. G. Schwartz and J. F. Sullivan (Dept. of Med. and Pathology, Creighton Univ., School of Med., 2305 S. 10th St., Omaha, Neb.). *Am. J. Clin. Nutr.* 19, 255-9 (1966). It was found that following the ingestion of alcohol in an amount comparable to that commonly used by many people as an appetizer triglyceride levels were significantly higher during the postprandial period than when the same meal was ingested without alcohol. Evaluation of gastric emptying and of post-heparin lipolytic activity indicated that the alcohol-augmented alimentary lipemia did not result from alteration in either of these functions. Alcohol alone is known to elevate triglyceride levels. The increase in postprandial lipemia produced by alcohol, therefore, must represent increased hepatic triglyceride synthesis and release. This may result from increased peripheral fatty acid mobilization or by a more direct influence of alcohol on fat synthesis.

**EFFECT OF CARBOHYDRATE AND FAT INTAKES UPON THE ACTIVITIES OF SEVERAL LIVER ENZYMES IN RATS, GUINEA PIGLETS, PIGLETS AND CALVES.** R. L. Baldwin, M. Ronning, C. Radanovics and G. Plange (Dept. of Animal Husbandry, Univ. of Calif., Davis, Calif.). *J. Nutr.* 90, 47-55 (1966). The effect of 4 diets containing a wide range of carbohydrate and fat upon the activities of a number of liver enzymes in rats, guinea piglets, calves and piglets were investigated. The results indicated that large adaptive enzymatic changes occurred in rats fed high carbohydrate diets but not in guinea piglets, piglets and calves. The activities of most of the enzymes studied changed in logarithmic relationship to the ratio, carbohydrate calories-to-carbohydrate + fat calories, in the diets indicating that the enzymatic adaptations occurred in response to changes in proportions of energy contributed by carbohydrate and fat rather than to changes in the amounts of these components per se. The results indicated that calves, guinea piglets and piglets have much lower capacities for adaptation to high carbohydrate, low fat diets than rats, due either to species differences in rats of physiological development after birth or to other inherent species differences. The activities of all the enzymes whose functions have been related to fat synthesis were much lower in calves than in rats.

**EFFECT OF CHOLESTEROL-LOWERING DIET ON PRODUCTION OF ADRENAL CORTICAL HORMONES IN MAN.** F. E. Abbo and P. D. Meyer (Dept. of Internal Med., Veterans Administration Hospital, Iowa City, Iowa). *Am. J. Clin. Nutr.* 19, 232-6 (1966). Twenty-three men were placed on a cholesterol-lowering diet for a period of three months and their 17-ketosteroid (17-KS) and 17-hydroxycorticosteroid (17-OHCS) excretion rates studied before and after the diet. In the group of fifteen subjects who succeeded in lowering their serum cholesterol level, no change in 17-KS excretion rates was observed. However, there was a statistically significant decrease in the average excretion rate of 17-OHC ( $P = 0.02$ ). Also, when compared to a control group of forty-three men, a significant number in the experimental (cholesterol-lowering diet) group of 23 subjects showed an increase in their 17-KS to 17-OHCS ratio. Although an increase in the 17-KS to 17-OHCS ratio is interpreted as favorable, the magnitude of these changes observed in the present study were not large enough to be considered physiologically important. Therefore, under these conditions, lowering of the serum cholesterol level by dietary means does not appear to adversely affect human adrenal cortex function, and might possibly influence it favorably.

**REDUCTION OF CAROTENOID EPOXIDES WITH LITHIUM ALUMINUM HYDRIDE.** B. P. Schimmer and N. I. Krinsky (Dept. of Pharmacol., Tufts Univ. School of Med., Boston, Mass.). *Biochemistry* 5, 3649-57 (1966). A study of the chemical reduction of antheraxanthin and neoxanthin, the epoxide carotenoids of *Euglena gracilis*, was undertaken in an attempt to elucidate the mechanism of the enzymatic reductive deepoxidation of carotenoids. These epoxide carotenoids were treated with a large excess of  $\text{LiAlH}_4$ , and the resultant reaction mixtures

were separated into several fractions by gradient elution from silica gel G-Celite (1:1). The individual fractions were characterized by absorption spectra, relative polarity values, and dehydration reactions with acidic chloroform. The 5,6-epoxide groups of antheraxanthin and neoxanthin, upon reduction with  $\text{LiAlH}_4$ , yield, along with the expected 5-hydroxyl derivatives, equal amounts of the unexpected 5,6-olefins via a mechanism which does not involve dehydration of an hydroxylated intermediate. The mechanism of enzymatic deepoxidation may be like the  $\text{LiAlH}_4$  reaction reported here. Based on our results, we suggest that the 3-hydroxyl and 5,6-epoxide groups of antheraxanthin and neoxanthin are in a *cis* configuration on the ionone ring.

**SERUM CHOLESTEROL RESPONSE TO CHANGES IN DIETARY LIPIDS.** A. Keys and R. W. Parlin (Lab. of Physl. Hygiene, Univ. of Minn. School of Public Health, Minneapolis, Minn.). *Am. J. Clin. Nutr.* 19, 175-81 (1966). An analysis is presented of the data from 99 sets of controlled experiments, each providing average serum cholesterol response ( $\Delta$  cholesterol) in a group of men, in calorie balance, to a known change in the diet. The recently reported data of Hegsted *et al.* are in good agreement with predictions based on a formulation published earlier, the correlation between observed and predicted values being  $r = 0.92$ , and the root mean square error 14.9 mg. cholesterol per 100 ml. of serum.

**ATHEROSCLEROSIS AND LIPID METABOLISM.** Chikayuki Naito (Univ. Tokyo). *Yukagaku* 15, 439-55 (1966)—A review with 111 references.

**SPECULATION ON THE ROLE OF EPOXY ACIDS AS INTERMEDIATES IN THE BIOSYNTHESIS OF POLYUNSATURATED FATTY ACIDS.** F. D. Gunstone (St. Salvator's College, Univ. of St. Andrews, Scotland). *Chem. Ind. (London)* 1966, 1551-4. Two reactions of epoxides provide a basis for a series of speculative biosynthetic sequences. In the C-18 series it is proposed that oleic is converted to linoleic acid and that this serves as a precursor for a variety of other polyunsaturated acids, including those with methylene-interrupted unsaturation and those with conjugated unsaturation. These schemes proceed almost entirely through intermediates which are now known to occur naturally and provide rational routes to such unusual acids as the C10-C8 pair in stillingia oil and the prostaglandins.

**THE DETECTION OF STEROIDS ON SILICA GEL G LAYERS.** I. S. Shepherd, L. F. Ross and I. D. Morton (Unilever Research Lab., The Frythe, Welwyn, Herts.). *Chem. Ind. (London)*, 1966, 1706-7. Sterols and related compounds (steryl esters) on silica gel plates develop characteristic colors when sprayed with potassium dichromate in sulfuric acid and heated in the range of 40-90°C. After noting the position of the spots and the color changes, the plate may be rapidly heated to about 180°C when all compounds char. Thus non-steroid compounds present can be detected on the same plate. At 76°C stigmasterol and sitosterol give different colored spots.

**OCCURRENCE OF VITAMIN E IN BLACK TEA.** A. S. Tirimanna and R. L. Wichremasinghe (Tea Res. Inst. of Ceylon, St. Coombs, Talawakele, Ceylon). *Chem. Ind. (London)* 1966, 1719. Reducing compounds in black tea were first separated from the chlorophylls by column chromatography, and the fractions were subsequently analyzed by thin layer chromatography. The fractions contained a compound having an  $R_f$  value identical with that of alpha-tocopherol. The identity of the compound with vitamin E was confirmed by the following color reactions: pink with Emmerie-Engel reagent, turquoise blue with phosphomolybdic acid, bronze with Sonnenschein reagent, chocolate with Tollen's reagent, and light blue with potassium ferricyanide. The identity of 3 other compounds which also give positive Emmerie-Engel reactions is being investigated.

**OCCURRENCE OF STEAROLIC ACID IN SANTALACEAE SEED OILS.** L. J. Morris and M. O. Marshall (Unilever Res. Lab., Sharnbrook, Bedford). *Chem. Ind. (London)* 1966, 460-1. Analysis of *Exocarpus cupressiformis*, *Santalum album* and *Santalum acuminatum* oils showed the presence of the following fatty acids: 14:0, 16:0, 16:1, 18:0, 18:1, 18:2, stearolic and santalbic.

**THE OCCURRENCE OF LINOLENIC ACID AND STEAROLIC ACID IN SANTALUM ACUMINATUM SEED OIL.** F. D. Gunstone and R. Subbarao (The University, St. Andrews, Scotland). *Chem. Ind. (London)* 1966, 461-2. The seed oil contained the following acids (as methyl esters % wt) 16:0, 3.4%; 16:1, 1.2; 18:0, 2.1; 18:1, 47.2; 18:2, 2.5; 18:3, 2.0; 18:1,9a, and 2.9; and 18:2,9a,11t, 38.7.

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## • Drying Oils and Paints

CHINESE TUNG OIL. Anon. *Peint. Pig. Vernis* 41 (4), 253-4 (1965). A brief description is given of the main varieties of tung trees grown in China, of which *Aleurites Fordii* and *Aleurites montana* provide the principal sources of tung oil, and of developments in the production program. Various by-products of tung cultivation are also noted. (Rev. Current Lit. Paint Allied Ind. No. 290).

## • Detergents

APPLICATION OF AN EQUATION FOR THE ADSORPTION OF IONIC SURFACTANTS TO EMULSION CHARACTERIZATION. R. C. Groot, (Algemene Kunstzijde Unie N.V., Arnhem, The Netherlands). *Tenside* 3, 193-4 (1966). An equation for the adsorption of ionic surfactants was derived in previous work, by introducing an expression for the electrostatic component of the free energy of adsorption in the Langmuir adsorption isotherm. This equation gives a good representation of the adsorption data obtained on emulsion samples stabilized with different concentrations of surfactants in the absence or presence of NaCl. The surfactant saturation adsorption per ml. of emulsified oil can then be calculated. This characteristic quantity for an emulsion is a direct measure of the interfacial area of the emulsion, which can be calculated when the cross sectional area of the surfactant ion at the interface under conditions of saturation adsorption is known. A relatively easy method is thus available for the determination of the interfacial area of emulsions, which can be used also for determining the interfacial area of other disperse systems, e.g. latex emulsions. Examples are given, illustrating the use of the equation for determining the interfacial area of emulsions and its variation with age.

DETERMINATION OF CARBOXYMETHYL CELLULOSE IN DETERGENT POWDERS. P. Kikolski, Z. Stefaniak and M. Wegrzynowicz (Inst. Gen. Chem., Warsaw, Poland). *Tenside* 3, 225 (1966). Several different methods for determining the carboxymethyl cellulose (CMC) content of washing powders were compared to establish their usefulness for research work as well as for production control. Known amounts of CMC were added to soaps and to synthetic detergent powders and their active content was determined. The samples were examined by the spectrophotometric method due to Black, the gravimetric method due to Reutenauer and by the oxidation method due to Pollok. The most accurate results were obtained by Pollok's method (oxidation of separated cellulose glycol acid with potassium dichromate); the relative errors in this case were about 5%. Errors were frequently found when using the spectrophotometric method, due to incomplete solution of CMC in sulfuric acid. This was often evident in the analysis of soap powders since, because of the separation of fatty acids, it was not possible to see whether the CMC had completely dissolved. A systematic error occurs in the Reutenauer method, probably due to a certain solubility of the carboxylated cellulose in the diluted alcohol solutions. The oxidation method of Pollok was found to be sufficiently accurate, easily carried out and therefore generally and widely applicable.

THE FINAL CONCENTRATION OF SURFACTANTS AT THE SOLUTION/AIR INTERFACE AS A FUNCTION OF TIME. G. Schwen (Ludwigshafen am Rhein, Germany). *Tenside* 3, 69-71 (1966). The surfactant concentration at the solution/air interface was measured as a function of time on solutions of sodium dodecyl sulphate, sodium oleate and an ethylene oxide adduct of lauryl alcohol. Tests were continued up to 300 hours and repeated several times, while the natural evaporation occurring during this time was carefully measured and compensated for. For all three surfactants tested, the final surface tension was found to be independent of total surfactant concentration, of the amount of electrolyte present or of any solution aging effect. An analogy is offered between the asymptotic tendency of surface tension at the water/air interface and the concept of c.m.c. Just as an increase in total surfactant above the c.m.c. does not cause further decreases in surface tension, so do the experiments reported indicate that the final concentration at the interface is largely independent of the solution concentration, having reached the point where the surface is completely occupied by active molecules.

CORRELATION BETWEEN DETERGENCY AND COMPOSITION OF LINEAR ALKYL BENZENES. P. Peri and A. Zanella (Edison S.p.A., Milan, Italy). *Riv. Ital. Sostanze Grasse* 42, 573-83 (1965). Twenty samples of linear alkylbenzene, characterized by different distributions of their alkyl chains and different molecular weights, have been sulfonated and their detergent power tested in an Atlas Launderometer, using Empa standard soiled cloths. The results, measured by changes in cloth reflectance, were correlated statistically with several parameters defining the alkylbenzene composition, principally mean molecular weight. The statistical evaluation indicates a maximum in detergency for a molecular weight varying from 253 (at 200 ppm hardness) to 258 (at 50 ppm hardness). The optimum molecular weight also shifts upwards (by 3-5 units) as the washing temperature is increased from 25C to 75C. Hardness has a definite depressing effect on detergency while high temperatures always increase detergent power. A correlation was also shown to exist between the % of alkyl chains lower than C<sub>12</sub> and detergent power, with poorer results being obtained at the higher values of this parameter. No attempt was made to examine the effect of scatter of the alkyl chains around their mean molecular weight.

BIODEGRADABLE ALCOHOL SULFATE SURFACTANTS FROM CHLORINATED EGYPTIAN KEROSENE. B. A. Gebril and H. Abou-Zeid (Univ. of Alexandria, U.A.R.). *Tenside* 3, 150-4 (1966). An Egyptian kerosene was refined, distilled into 3 fractions (10 mm. b.p.: 60-70C, 90-100C, 120-130C), which were then chlorinated at 40C for different times to yield chlorinated products having the same percentage chlorination. These were converted to the corresponding alcohols and sulfated. Examination of the characteristics of the produced surfactants revealed that they differed in surface active properties, especially in biodegradability, the straight chain alcohol sulphates produced from the heaviest fraction (b.p. 120-130C) being the ones most rapidly degraded.

MECHANISM AND CLASSIFICATION OF ANTIFOAMING PHENOMENA. S. Okasaki and T. Sasaki (Univ. of Tokyo, Japan). *Tenside* 3, 115-8 (1966). A systematic investigation of antifoaming phenomena, including 21 different antifoaming agents and sodium dodecyl sulfate, has been conducted. An important distinction is made between defoaming and foam inhibiting agents and also between homogeneous and heterogeneous systems, depending on whether the antifoaming agent is added pure or as an aqueous solution. Good defoaming agents are not necessarily also strong foam inhibitors and their activity in homogeneous and heterogeneous systems can also be quite different. Spreading coefficient or degree of insolubility are not by themselves sufficient indices of effectiveness, the decisive factor being the ability to displace the absorbed film of foaming agent from the interface.

THE SYNTHESIS AND SURFACE ACTIVE PROPERTIES OF POSITIONAL ISOMERS OF Na AND K N-HEXADECYL-SULPHATES-(1) TO -(8) AND OF SOME Na AND K 1-(N-ALKYL)-N-DODECYL SULPHATES-(1). F. Püschel (Sci. Acad. Berlin, Germany). *Tenside* 3, 71-80 (1966). The eight positional isomers of Na and K n-hexadecyl sulphate and the Na and K 1-(n-alkyl)-n-dodecyl sulphate-(1), with alkyl radicals ranging from methyl to n-propyl, have been prepared as pure compounds by means of a synthesis in which the possibility of isomerization was excluded. Besides differences in solubility, ease of crystallization, hygroscopicity and melting point, the surface active characteristics (e.g., surface tension, wetting, foaming and detergency) are found to be characteristically dependent upon the position of the hydrophilic group in the molecule. For examples, alkyl sulphates with the sulphate group at C<sub>4</sub> or higher are hygroscopic. As the hydrophilic group is displaced towards the center of the chain, the surface activity and the cmc value of the range of hexadecyl sulphates both increase.

THE PROBLEM OF DETERMINING SMALL AMOUNTS OF NON-IONIC SURFACTANTS IN WASTE WATER AND SEWAGE. H. Heinerth (Henkel & Cie. GmbH., Düsseldorf, Germany). *Tenside* 3, 109-14 (1966). The analytical determination of non-ionic surfactants in water and sewage is a problem which has so far not been solved satisfactorily. Various methods of determining small amounts of non-ionics, especially ethoxylated compounds, are discussed, most of which are based on reactions with the ether oxygen of the ethoxylates. The main difficulties arise in separating interfering substances as well as from the necessity of knowing beforehand what type of ethoxylate is being analyzed. A thin layer chromatographic method appears promising, but it is too lengthy for routine determinations.



NEW CATIONIC SURFACTANTS FROM HEXAHYDROAZEPIN. S. Lippmann (VEB Fettechemie, Karl Marx-Stadt, Germany). *Tenside* 3, 181-2 (1966). Various methods for preparing tertiary aliphatic hexahydroazepins are discussed. A modified Leuckart-Wallach reaction is given for the synthesis of tertiary aromatic and heterocyclic hexahydroazepins. By quaternization with various aliphatic or aromatic agents one can prepare the corresponding quaternary hexahydroazepinium compounds from the tertiary amines. Optimum reaction conditions are given. These quaternary compounds were examined for their bactericidal and bacteriostatic activity. The effect of the alkyl chain and of substituents in the benzene ring was also studied.

EVALUATION OF THE TWO-PHASE TITRIMETRIC DETERMINATION OF ANIONIC SURFACTANTS. K. W. Han (Unilever Res. Lab., Vlaardingen, The Netherlands). *Tenside* 3, 265-9 (1966). A theoretical basis is presented for the usual methods of two-phase titration of anionic surfactants, of which the so-called Epton titration is probably the most widely used. Equations are given for the systematic titration errors which occur when heavy quaternary ammonium compounds are used to determine anionic surfactants. By proper choice of end-point indicator it is possible to reduce these errors to a minimum. The selective determination of individual surfactants and of anionic surfactant combinations in mixtures is discussed, with examples of the effect of various indicators on the determination of lower and higher molecular weight surfactants.

THE SYNTHESIS OF PHENYL DODECANE SULFONATES, THEIR SURFACE ACTIVE PROPERTIES AND DETERGENT POWER OF THEIR SOLUTIONS. F. W. Newolin *et al.* (Inst. Fat Res., Leningrad, U.S.S.R.). *Tenside* 3, 186-7 (1966). The secondary phenyl dodecanes with the phenyl radical in the 1,2,3,4,5 and 6 position have been synthesized and sulfonated. Surface activity, wetting and detergent power of these compounds were determined as a function of the position of the phenyl radical in the alkyl chain. Surface activity and wetting power increase as the phenyl radical migrates toward the middle of the chain, while detergent power is best for the 1-, 2- and 3-isomers.

RAPESEED OIL AS STARTING MATERIAL FOR THE PRODUCTION OF SURFACE ACTIVE AGENTS. H. Tischer and P. Hahn (VEB Deutsches Hydrierwerk, Rodleben, Germany). *Tenside* 3, 184 (1966). The fatty alcohol produced by selected hydrogenation of rapeseed oil contains a high proportion of erucyl alcohol (C-22:1). The surface active agents produced by sulfation and by ethoxylation of this material have been studied and compared to other alcohol-derived surfactants of lower molecular weight. The detergent power of derivatives of pure erucyl alcohol is lower than that of the corresponding derivatives of oleyl alcohol. Mixtures of oleyl and erucyl alcohols, as are naturally obtained from rapeseed oil, produce materials with satisfactory surface active properties and appear to be a promising raw material for commercial applications.

THE ANALYSIS OF SURFACTANTS BY MEANS OF ALTERNATING CURRENT POLAROGRAPHY. P. Dietrich (Germ. Sci. Acad., Berlin, Germany). *Tenside* 3, 188-9 (1966). Alternating current polarography is based on the adsorption and desorption of surface active compounds on a dropping mercury electrode with variable direct current voltage and superimposed, constant alternating current. The alternating current resulting from this process is recorded or measured and this provides a means for determining almost all ionic and non-ionic surfactants by a single method, which can be applied to a concentration range of about 1-30 mg/l. Results obtained by the polarographic method are in good agreement with those obtained by a chemical method, such as a two-phase titration.

SOME DERIVATIVES OF SUCROSE III. APPLICATIONAL PROPERTIES OF SUCROSE-N-N-ALKYL URETHANES. W. Gerhardt (Berlin, Germany). *Tenside* 3, 141-4 (1966). Long chain sucrose-N-n-alkyl urethanes possess good surface activity, excellent soil suspending capacity and colloid stabilization. They are suitable for use as active ingredients in heavy duty detergent formulations, comparable to current commercial products. These actives foam only moderately and are therefore well suited for washing machine products. The optimum detergent power is observed at 60-80C and its is largely unaffected by water hardness. Best results are obtained with sucrose-N-n-dodecyl urethane and its C<sub>14</sub> homologue.

INTERFACIAL AND VOLUME CHARACTERISTICS OF SURFACTANT SOLUTIONS. P. A. Rehlinger (Sci. Acad. of U.S.S.R., Moscow, U.S.S.R.). *Tenside* 3, 191-2 (1966). Several methods of char-

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*Correction:* Harold Russell, Research Section Manager, Unilever, Warrington, Lancashire, England.

## Glycerine Producer's Report

According to the U.S. Department of Commerce, production of crude glycerine (including synthetic) for November 1966 totalled 33.2 million pounds, up 2.1 million pounds from October, and up 3.3 million pounds from November last year.

At the end of November, producers' stocks of crude and refined glycerine totalled 38.2 million pounds, down 0.3 million pounds from the end of October (revised), and down 11.9 million pounds from November, 1965.

A minor revision was made in the October crude glycerine stocks figure. This figure now stands at 16.1 million pounds versus the 15.9 million pounds originally reported, thereby, raising the crude and refined stocks total from 38.3 to 38.5 million pounds.

Exports of crude and refined glycerine in November 1966 totalled 4,307,526 pounds (100% basis). When import figures become available, the regular GL-1 report will be issued.

November  
(Million Pounds)

Preliminary

	Factory Production		Producers' Stocks	
	Nov. 1966	% Change from Oct. 1966	End of Nov. 1966	% Change from Nov. 1966
Glycerine 100% basis	33.2*	+6.8	14.2	-11.8
Crude				
Refined				
All Grades	35.2	+8.6	24.0	+ 7.1
			38.2	- 0.8

\* Includes synthetic glycerine

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acterizing surface activity are described. One consists in indicating the maximum density of adsorption in mol/cm<sup>2</sup> and the equilibrium concentration in the volume phase, or by the quotient between the maximum interfacial tension decrease and the corresponding concentration in the volume phase. Surface active agents are divided into a group of "imperfect" surfactants, i.e. those whose aqueous solutions are present in molecularly dispersed form (fatty acids, fatty alcohols) and cause no great lowering of interfacial tension, as opposed to "perfect" surfactants with marked surface activity, forming thermodynamically stable colloids (micelles) above a certain concentration. Basic concepts linking micelle structure, solubilizing power and specific volume characteristics of the aqueous surfactant solutions are discussed.

THE EFFECT OF SURFACTANTS AND OTHER SUBSTANCES ON THE SEDIMENTATION OF POWDERS IN WATER. H. Lange (Henkel & Cie., Dusseldorf, Germany). *Tenside* 3, 212 (1966). Stable and unstable suspensions differ characteristically in their behavior during sedimentation and in the end value of the sediment volume. Aqueous suspensions that are unstable because of the hydrophobic character of the particles or through the action of dissolved electrolytes, may be stabilized by surfactants, although the degree of stabilization will vary according to the nature of the powder. Certain powders can also be stabilized by polymeric phosphates. In experiments dealing with the stabilization of graphite particles in water it was found that, when the surfactant concentration necessary for stabilization is exceeded, flotation of graphite particles in the foam ceases at the same time. This suggests a relationship between stabilization and wetting.

CONTINUOUS PRODUCTION OF WASHING POWDERS WITH IMPROVED STRUCTURE BY A NEW SPRAY PROCESS. K. Schaurich and G. Vasow (Germ. Sci. Acad., Berlin, Germany). *Tenside* 3, 220-1 (1966). A new process for the production of granular detergents is described. The process consists in air-blowing powdered alkaline salts and builders into a spray tower, while at the same time a sulphonic acid mix (produced from either alkyl benzene, alkanes or fatty alcohols) is atomized and brought into intimate contact with the dry builders in turbulent motion through the tower. By utilizing the released heat of neutralization for evaporating the water, plus the fact that no additional water is required, detergent powders are made by a process involving minimum energy requirements. The quality of detergent powders produced in this manner compares favorably with that of present-day commercial products.

DETERMINATION OF THE DEFATTING POWER OF SURFACTANTS. E. Oehler (VEB Fettechemie, Karl Marx-Stadt, Germany). *Tenside* 3, 223-4 (1966). The defatting power of surfactants was determined by measuring the conductivity changes on greased platinum electrodes dipped into the surfactant solution. Conductivity was determined continuously and plotted as a function of time by a compensating recording device. After examination of a large number of different surfactants by this method, several general conclusions were reached as to the suitability of different compounds as defatting agents. The hydrophobic part should contain 14 to 18, preferably 15 to 16 C atoms. The presence of a double bond, a benzene ring or methyl group has a favorable effect. The number of hydrophilic, ionogenic groups should be no higher than one. The optimum degree of ethoxylation lies in the range 1:8 to 1:12.

THE DETERMINATION OF PHOSPHATES IN DETERGENTS. H. Herold (VEB Fettechemie, Karl Marx-Stadt, Germany). *Tenside* 3, 224-5 (1966). Using a column chromatographic technique with a strongly alkaline ion exchange resin, ortho-, pyro-, trimeta-, tetrameta- as well as (with certain reservations) hexametaphosphate were separated and the phosphate content of each fraction determined colorimetrically. Both quantitative and qualitative analysis of these phosphates in industrial products can be carried out by this method. The relative error is approximately 5%.

EVALUATION OF THE EMULSIFYING PROPERTIES OF EMULSIFIERS FOR O/W EMULSIONS. M. Kaji and E. Wilinska (Inst. Gen. Chem., Warsaw, Poland). *Tenside* 3, 223 (1966). A new method for the determination of the emulsifying power of O/W emulsifiers has been developed. After an emulsion is prepared in a standardized manner, a volume of liquid equal to the total volume of oil in the emulsion is withdrawn from the top of the vessel containing the emulsion at a certain point in time. This time is predetermined as that necessary for the complete separation of an emulsion of identical composition, but containing no emulsifying agent. From the oil

content of the portion withdrawn, emulsifying power is calculated as a percentage. This method is also valuable for kinetic investigation into the breakdown of emulsions.

THE DETERMINATION OF GLYCERIDES AND SUCROSE ESTERS OF FATTY ACIDS IN SUGAR GLYCERIDES. M. Ranny (Res. Inst. Fat Ind., Rakovnik, Czech.). *Tenside* 3, 225-6 (1966). A new paper chromatographic method for analyzing fatty acid sugar glycerides has been developed. The analysis takes place in the centrifugal field of an instrument (500-1,200 rpm), the mobile phase being added centrally to chromatographic paper impregnated with silicic acid. The solvent mixture, petroleum ether + ethyl ether, was used for glycerides, while for sucrose esters solutions of propanol or isopropanol in benzene were used. The method is also suitable for the analysis of non-ionic adducts of fatty acids with ethylene oxide or polyglycols.

THE QUANTITATIVE DETERMINATION OF ETHYLENE OXIDE ADDUCTS. S. Urbanowicz (Inst. for Synth. Fibers, Lodz, Poland). *Tenside* 3, 226 (1966). A method has been developed for determining the content of ethylene oxide adducts in aqueous solutions, dispersions and solid products. The method is based on the precipitation of the adducts in acid solution, using excess potassium ferrocyanide. The excess reagent is back titrated using cerium sulphate with Ferroin as the indicator, after filtering off the precipitate. The adduct content is then determined, using a previously plotted calibration curve. The method is simple and sufficiently accurate, requires no special reagents or equipment and is therefore particularly suited for routine analysis. The method has been used on fatty acid polyglycol esters, fatty alcohol-, alkyl aryl- and fatty amine polyglycol ethers containing 2-25 mols of ethylene oxide.

FOAM PERFORMANCE OF TERNARY SURFACTANTS IN LIGHT DUTY LIQUID DETERGENTS. H. Stupel (Shell Chemical Co., New York). *Soap Chem. Specialties* 42(9), 55-7, 135 (1966). Ternary compositions of surfactants which are of practical importance in light duty liquids have been systematically studied. The foam performance in a manual dish-washing test has been related to the surfactant composition. In general, excellent performance is observed with compositions containing a high proportion of linear primary alcohol ethoxy sulfate and relatively small amounts of fatty acid diethanolamide or alkyl tertiary dimethyl amine oxide.

AMINO ACID CHELATING AGENTS IN DETERGENT APPLICATIONS. R. R. Pollard (Hampshire Chemical Div. of W. R. Grace & Co., Nashua, N.H.). *Soap Chem. Specialties* 42(9), 58-62, 130-5 (1966). The presented evidence strongly suggests that trisodium NTA (nitrilotriacetic acid), a chelating agent can be utilized as an effective, practical and safe detergent builder. All of the biological evidence accumulated to date indicates that NTA is non-toxic and does not interfere with the decomposition of normal sewage components. Brief summaries are given of results of acute oral toxicity in rats and rabbits, subacute oral toxicity in rats, topical toxicity on rabbits and humans, and toxicity to fish life.

DERIVATIVES OF EPICHLOROHYDRIN. VIII. DIRECT SYNTHETIC METHOD OF POLYGLYCERINE. Michio Yoshino and Tetsuo Ikeda (Nippon Oils & Fats Co., Amagasaki, Japan). *Yukagaku* 15, 510-15 (1966). A direct synthesis of polyglycerine (PG) by means of hydrolysis of epichlorohydrin (ECH) with caustic soda was investigated. The concentration of caustic soda solution showed marked effect on the yield and molecular weight of PG, and the higher the concentration, the lower the yield and the higher the molecular weight. The glycerine content of PG was also affected by the concentration of caustic soda and the glycerine content was increased with the decrease in the concentration. The formation of water-soluble PG and infusible PG, which was suggested to be cross-linked PG, was observed when the hydrolysis of ECH was carried out with 30% caustic soda. When ECH and caustic soda solution were mixed in an autoclave and hydrolysis was carried out under pressure, the reaction took place violently and no solid polymer was obtained. The product was dark brown and unsaturated polymer probably formed by the decomposition of some intermediates. The electrodialysis of PG was found to be the most effective methods of making PG. The PG containing only about 1% salt was obtained from the PG solution containing 15% salt. The loss of organic substance, such as PG and glycerine, was only 7% in the electrodialysis.

SODIUM ALKYL BENZENESULFONATES. VI. SULFONATION BEHAVIORS OF COMMERCIAL ALKYL BENZENES. Yasushi Kimura, Shuhei Tanimori and Terunosuke Shimo (Lion Fat & Oil Co., Tokyo). *Yukagaku* 15, 315-19 (1966). Relative sulfonation rates of

(Continued on page 40A)

Classified

Advertising

## DETERGENT TECHNOLOGIST

The services of a detergent technologist are required by March 1967 for formulation and production of household detergents by So3 generation and sulfonation in Chemithon Plant and spray-drying in Lurgi Plant, in Calcutta, India. Send complete résumé and salary requirements to Box 451, Journal of the American Oil Chemists' Society, 35 East Wacker Drive, Chicago, Ill. 60601.

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all isomers contained in soft type alkylbenzene were studied. The rates showed that during sulfonation with 20% oleum, the position of benzene ring and the length of alkyl chain had great effect, although the change of average molecular weight of unsulfonated alkylbenzene was small. In case of sulfonation with sulfur trioxide, the selectivity was smaller than that of oleum. Hard type alkylbenzene was not clearly separated by the gas chromatography of packed column and the change of composition by sulfonation was not observed clearly.

THIN-LAYER CHROMATOGRAPHY OF DETERGENTS. III. SEPARATION OF VARIOUS NONIONIC SURFACTANTS WITH POLYOXYETHYLENE CHAIN. Kaoru Yoshikawa, Teruo Nishina and Kiyoshi Takehana (Mitsuiwa Chem. Lab., Tokyo). *Yukagaku* 15, 319-24 (1966). A thin-layer chromatographic technique using a plate coated with silica-calcium sulfate containing barium acetate or sodium carbonate and a solvent system consisting of methyl ketone-benzene-ethanol-water was successfully applied to the analysis of various nonionic surfactants having polyoxyethylene chain. The experiments were carried out on various fatty alcohol polyoxyethylene ethers, alkylphenol polyoxyethylene ethers, fatty acid monoethanolamide ethoxylates, polyoxyethylene sorbitan fatty acid esters and polyoxyethylene glycols. Many spots corresponding to the distribution of ethylene oxide polymerization were found. The  $R_f$  value of these groups became similar as the degree of polymerization increased.

X-RAY SPECTROMETRIC STUDY ON ANISOTROPY OF SOAPS IN RELATION TO THE PROCESSING. Ken Saitoh and Shun Noguechi. *Yukagaku* 15, 460-5 (1966). Cooled surface of framed soap showed more intense diffraction on long spacing peaks than any of those on the perpendicular faces to the cooled surface. Thus, the anisotropy of cooled surface of framed soap was the cause of uniaxial orientation. On the other hand, the milled soap showed marked double orientation. This anisotropy may be caused by the action of shearing forces in plodder.

SYNTHESIS AND SOME SURFACE ACTIVE PROPERTIES OF FATTY DERIVATIVES OF PROPANE SULFONE. Hisao Hirai, Yoza Ishikawa, Kyoichi Suga and Shoji Watanbe (Miyoshi Oil & Fat Co., Tokyo). *Yukagaku* 15, 469-74 (1966). Surfactants having propane sulfone group were prepared from fatty alcohols, acids, amides and amines. Aqueous solutions were examined for surface tension, foaming, penetrating and emulsifying powers, resistance against hard water and CMC. Surface active properties were excellent even at lower concentrations. As to the relationship between the alkyl chain length in these derivatives and the surface active properties, lower surface tension was obtained by  $C_{14}$ - and  $C_{15}$ -derivatives, excellent emulsifying property by  $C_{18}$ -derivatives, and superior foaming and penetrating powders by  $C_{12}$  and unsaturated  $C_{18}$  derivatives.

PROSPECT OF BIOLOGICALLY DEGRADABLE DETERGENTS. Shinieli Tomiyama (Lion Fat & Oil Co., Tokyo). *Yukagaku* 15, 488-93 (1966). General trend toward biologically soft synthetic detergents and pollution of rivers are discussed.

EFFECT OF  $\gamma$ -RAY IRRADIATION ON SOAPS. Ken Satoh, Kenji Yazawa, Hirokazu Wakabayashi and Shun Noguechi (Mitsuiwa Soap Co., Tokyo). *Yukagaku* 15, 537-41 (1966). Effect of  $\gamma$ -ray ( $^{60}\text{Co}$ ) irradiation on the properties of soaps was studied by means of X-ray diffraction especially with regard to crystal form and crystallinity. Solubility by abrasion of soap was also measured. Irradiation up to  $2 \times 10^7$   $\gamma$  of total dose, on both commercial soaps and single fatty acid soaps, had a very noticeable effect on crystal form. Only a slight increase in crystallinity was observed for commercial soaps.

SYNTHESIS AND PROPERTIES OF SURFACE-ACTIVE COMPOUNDS CONTAINING SILICON ATOMS. I. SYNTHESIS AND PROPERTIES OF ETHYLENE OXIDE-ADDUCTS OF 4,4,6,6-TETRAMETHYL-4,6-DISILHEPTANOL. Ko Terada, Toshiaki Ujike, Noriyuki Yamamoto and Masahisa Kobayashi (Sunstar Dentifrice Co., Osaka). *Yukagaku* 15, 521-4 (1966). 4,4,6,6-Tetramethyl-4,6-disilheptanol was prepared by the reaction of ethylene oxide with the Grignard reagent of 4,4,6,6-tetramethyl-4,6-disilpentyl chloride. Ethylene oxide-adducts of this disilheptanol were obtained by the usual addition reaction with potassium hydroxide catalyst. Surface tension, wetting power, dispersing power on carbon black in benzene and foaming power of aqueous solution of the adduct were determined; some gave low surface tension at 0.1-1.0% solution and good foaming power, but dispersing power on carbon black in benzene and wetting ability to polyvinyl chloride were only fair. These silmethylenes-type compounds were inferior to siloxane-type compound in lowering surface tension and wetting power. Thus, siloxane bond is more efficient in lowering surface energy than silmethylenes bond and the effect of substitution of only two carbons in the alkyl chain by silicon is not evident.

METAL-CONTAINING SURFACTANTS. I. SURFACE PROPERTIES OF BINARY AQUEOUS SOLUTIONS OF DODECYL PYRIDINIUM CHLORIDE-METAL (GROUPS IA AND IIA) SOAP. I. Hiroshi Suzuki (Gov. Chem. Ind. Research Inst., Tokyo). *Yukagaku* 15, 475-85 (1966) Surface active properties of several metal (Li, Mg, Ca, Ba and Na, K reference substance) soaps in water were investigated. When an alkaline earth metal soap is added in the aqueous solution of dodecyl pyridinium chloride (DPC), it dissolves without causing precipitation or becoming cloudy, to the extent of about 1/3 molar ratio of metal soap to DPC. Ricinoleates show especially high solubilities. A remarkable synergistic effect was observed for the surface tension of the mixed solutions. In all cases, when the molar ratios of the metal soap to DPC ranged from about 1/3 to 1/10 and when the concentration of metal was about  $1 \times 10^{-2}$  to  $1 \times 10^{-5}$  mole/liter, the equilibrium or minimum values of surface tension were observed. Although there were no great differences with respect to kind of metals, barium salts showed better result.

SULFOXIDE DETERGENT. J. S. Berry and W. I. Lyness (Procter & Gamble Co.). *U.S. 3,271,318*. An alkaline detergent composition consists of a 1,1-bis-sulfoxide in which one alkyl group contains from 8-16 carbon atoms and the other two alkyl groups contains 1-2 carbons and an alkaline builder salt selected from the group consisting of water-soluble inorganic builder salts, water soluble organic alkaline sequestant builder salts and mixtures thereof. The ratio of the sulfoxide compound to the builder salt is in the range of 4:1 to 1:20.

GERMICIDAL COMPOSITIONS. W. J. Sydor (American Cyanamid Co.). *U.S. 3,274,115*. A germicidal composition comprises an anionic or nonionic detergent and from 0.1-5.0% by weight of the detergent of a germicidal compound of the formula:  $R_1\text{CH}=\text{NN}=\text{R}_2\text{C}=\text{QNR}_3\text{R}_4$  in which  $R_1$  is a halogenated ortho-hydroxyaryl radical of less than three 6-membered rings, in which the halogen has an atomic number between 16 and 36;  $R_2$  is hydrogen or a lower alkyl;  $R_3$  is hydrogen, lower alkyl, cycloalkyl, monocyclic ar(lower) alkyl or monocyclic aryl;  $R_4$  is aryl of less than three 6-membered rings; and Q is O or S. Each aryl moiety in the compound if it is substituted beyond the required substitution in  $R_1$  has the substituents chosen from the group consisting of lower alkyl, lower alkoxy, chloro, bromo and nitro.

IODINE DETERGENT SOLUTION. J. F. Mills (Dow Chemical Co.). *U.S. 3,274,116*. An aqueous germicidal solution consists of 1 part by weight of elemental iodine, 5-15 parts of a water-soluble organic anionic detergent selected from the group consisting of the alkali metal and ammonium higher alkylbenzenesulfonates, higher alkyldiphenyl ether sulfonates and higher primary alkylsulfates and which is soluble in water to the extent of at least 25 g/100 g solution, and 5-15 parts of a lower alkyl monoether of ethylene glycol.

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