

# 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

COMPLETE SYNTHESIS OF THE GLYCERIDE BASES OF VEGETABLE OILS AND ANIMAL FATS. T. K. Mitrofanova *et al.* *Doklady Akad. Nauk* 160, No. 1, 133-6 (1965). Triglycerides of higher fatty acids with even numbers of C atoms, both saturated and unsaturated, form the basis of animal fats and vegetable oils. Ways of synthesizing these acids were developed and the physicochemical properties of more than 80 of the triglyceride components of different oils and fats were examined. Synthetic mixtures with properties identical to those of natural oils and fats were also prepared. (Rev. Current Lit. Paint Allied Ind. No. 284).

THE EVALUATION OF THREE INDUSTRIAL GLYCEROLYSIS CATALYSTS. N. A. Ghanem and F. F. Abd. El-Mohsen (National Res. Center, Cairo, Egypt). *Paint Tech.* 30, 14-19 (1966). The effects of the three basic catalysts (PbO, CaO and LiOH) on the glycerolysis of linseed and cottonseed oils are examined. Three catalyst concentrations, 0.02, 0.04, and 0.06%, based on the weight of the oil are used at the reaction temperatures of 220, 230, 240, and 250C. It was found that moderate elevation of the concentration of any of the catalysts at any reaction temperature increased markedly the reaction rate. Not only can very little be gained by excessive increase of the catalyst concentration, but also a product of inferior quality is obtained. The relative efficiencies of the catalysts in promoting glycerolysis is determined. LiOH is overall the most efficient catalyst. CaO is a bit more efficient at low temperatures and low catalyst concentrations.

FAT SPLITTING AND GLYCERINE PRODUCTION IN THE U.S.S.R. B. Solomon (Inst. of Fats and Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 13, 29-40 (1966). The work of the Russians for the past 15 years is reviewed. The Petrov contact process (Soviet equivalent for the Twitchell process) is still in use. It is destined to be replaced by autoclaving. The autoclaving process is similar to Western techniques. A pilot plant for the continuous splitting of fats as described by Irodov (*Mast. Zir. Prom.* 17 (1), 12-15 (1952)) is quite original and should be of interest to adepts of the Colgate-Emery process. The Russians take great pride in the quality of their glycerine. This may explain why Russia has no synthetic glycerine industry.

THE OXIDATIVE STABILITY OF SOYBEAN OIL DECOLORIZED WITH THE NATURAL BLEACHING EARTH "EXTREME ORIENT." N. K. Nadvov, *et al.* *Izv. Vuzov. Piscevaia Tehnologija* 1 (50), 64-7 (1966). The active bleaching earth obtained from the deposits of Hvalynsk and of Bicevo (Extreme Orient) are distinguished by their good decolorizing properties and by the fact that they do not oxidize the oil. The peroxide value of oil bleached with the natural earths described above rises only slightly after 20 months storage at 20-25C and 60C. On the other hand, bleaching earth activated with hydrochloric acid, in particular 20% hydrochloric acid, contributes to the formation of oxidation products. The tufa of Hvalynsk of the Oriental quarry activated with sulfuric acid has antioxidant properties. (Rev. Franc. Corps Gras).

COMPOSITION OF SUNFLOWER SEED OIL WAXES. R. Guillaumin and N. Drouhin (Lab. of the Fat and Oil Inst., Paris, Fr.). *Rev. Franc. Corps Gras* 13, 21-28 (1966). The extraction and purification of sunflower seed oil waxes are described. The wax is a microcrystalline material with a melting point of 76C. Its main constituents are long chain fatty acid esters (C-14 to C-28) and alcohols (C-12 to C-32). A small amount of hydrocarbons is also present.

PRESENT STATUS OF EDIBLE OILS AND FATS IN OUR COUNTRY. Mitsuo Uemura (Food Research Inst., Ministry of Agr. and Forestry, Tokyo). *Yukagaku* 15, 193-8 (1966). Estimated consumption of soybean oil for industrial use is 2,600 tons,

in which 200 tons is hydrogenated for use as shortening and margarine. Larger quantities of cottonseed oil are used for mayonnaise. Tallow and lard are used for making of blended shortening.

COMPOSITION OF THE SEED OIL OF PHALARIS CANARIENSIS. M. Y. Malik and W. D. Williams (University of Strathelyde, Glasgow). *J. Sci. Food Agr.* 17, 174-5 (1966). The component fatty acids of the seed oil of *Phalaris canariensis* were found to be: palmitic, 12%; stearate, 1%; oleate, 32%; linoleate, 54%; linolenate, 1%; and a trace of myristate.  $\beta$ -Sitosterol was also identified.

PROCESS FOR THE PRODUCTION OF GLYCERIDES HAVING MELTING POINTS DIFFERING FROM THE STARTING GLYCERIDE MATERIAL. W. Stein, H. Rutzen and Erich Sussner (Henkel & Cie G.m.b.H.). *U.S.* 3,232,971. Described is a process for the production of fats having melting points differing from the starting fat material by intra- and inter-molecular rearrangement of the fatty acid radicals. A fat having a triglyceride structure containing bound fatty acid radicals is contacted with 0.05-2.0% of an alkaline molecular rearrangement catalyst selected from the group consisting of alkali metal alcoholates of lower alkanols, alkaline earth metal alcoholates, alkali metals and metal alloys consisting of sodium and potassium, at a temperature of 5-20C below the melting point of the solid fat desired to be produced. The mixture is cooled to form a mixture of catalyst, solid phase fat molecules and liquid phase fat molecules. Water is added in a quantity from 1/2 to 5 times the amount of the rearrangement mixture present and sufficient to convert the alkaline catalyst into a fluid phase soap containing dispersed therein the solid and liquid phase fat fractions. The dispersion is subjected to centrifugation to separate a lighter phase comprising the liquid fat fraction and the heavier fraction.

PREPARING A PUMPABLE SHORTENING COMPOSITION. C. F. Bruce (Procter & Gamble). *U.S.* 3,234,029. The described process comprises forming a mixture consisting of the following ingredients (1) at least one triglyceride fat selected from the group consisting of hydrogenated marine oil and hydrogenated and unhydrogenated vegetable and animal fats, (2) 3-6%, by weight of the composition, of at least one normally solid triglyceride of substantially saturated fatty acid, (3) 0.5-8% of one ester selected from the group consisting of propylene glycol monoesters of substantially saturated fatty acid and lactic acid esters of monoglycerides of saturated fatty acid and (4) 0.05-5% of at least one partial glyceride ester of saturated fatty acid. All of the saturated fatty acids have from 16 to 22 carbon atoms per molecule. Ingredients (1) and (2) are so selected that a mixture of them has solids content index in the ranges 15-25 at 60F, 10-16 at 80F, and 6-10 at 92F. The temperature of the mixture is adjusted so that all the ingredients are liquid and then the mixture is chilled in less than 10 minutes to a temperature of 88-95F so as to produce a cloud of crystal nuclei. The resulting nucleated mixture is slowly cooled with agitation for a period of 1.6 to 12.5 hours to a temperature of 70-80F, the rate of the slow cooling being controlled from 2-5F per hour.

PROCESS FOR THE SOLVENT SEPARATION OF FATTY ACIDS. K. T. Zilch and R. H. Plantholt (Emery Industries). *U.S.* 3,235,578. A method is disclosed for conditioning a solution of a higher fatty acid mixture in a polar solvent to promote the formation of a readily filterable crystalline phase on cooling the solution in order to selectively crystallize a fraction of the fatty acid mixture. The method comprises incorporating into the solution a residue left on distilling the fatty acids from a fatty acid fraction separated from a mixture of fatty acids by crystallization from a cooled solution.

LIQUID SHORTENING. J. B. Martin (Procter & Gamble Co.). *U.S.* 3,243,227. A liquid shortening comprises a normally liquid glyceride base oil containing, by weight of the shortening, from 0.1 to 4% alkenyl substituted cyclic dicarboxylic acid anhydride having from 4 to 5 carbon atoms in the dicarboxylic acid anhydride portion of the molecule and from 12 to 22 carbons in the alkenyl radical and from 1.5-24% alpha-phase crystal-tending emulsifier containing at least one higher fatty acid radical having from 12 to 22 carbon atoms and at least one free and unesterified hydroxyl group. The volume of cakes can be improved by incorporating in the cake such a liquid shortening.

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PROCESS FOR DEODORIZING FATS AND OILS BY DISTILLATION WITH STEAM UNDER VACUUM CONDITIONS. D. J. Brion and R. J. Fiala (A. E. Staley Mfg. Co.). *U.S. 3,239,547*. In the process of deodorizing fats and oils by distillation with steam and under vacuum wherein the organic distillates are condensed in a scrubber in recirculating water in which floes from that are emulsions of the distillates in water, the floes decrease the fluidity of the condenser water as the concentration of distillates increases toward a value in the range of 2%. The improvement for suppressing the effect of the floes comprises incorporating and maintaining in the condenser water a concentration of water-soluble protein in the range of 0.50-0.5% and permitting the concentration of distillates in the recirculating water to build up to values several times greater than 2%.

MARGARINE OIL AND METHOD OF MAKING. W. H. Schmidt, J. P. McNaught and K. S. Baker (Lever Bros. Co.). *U.S. 3,240,608*. A margarine is described in which the total oil phase consists of an edible vegetable oil having a melting point of 94-100F, a dilatation at 20C of 400-550, a dilatation at 36C of 75-0, and a dilatation at 42C of 0. About 50% of the vegetable oil consists of a liquid, unhydrogenated vegetable oil, at least 70% of which is liquid unhydrogenated safflower oil. The other 50% of this vegetable oil consists of a selectively hydrogenated vegetable oil hard stock, the hard stock containing selectively hydrogenated peanut oil in a weight ratio to the liquid safflower oil present in the finished margarine of at least 1:2.

HYDROXY NAPHTHYLMETHYLAMINO BIS PROPIONIC ACID DERIVATIVES AS ANTIOXIDANTS FOR EDIBLE FATS AND OILS. M. F. Zienty (Miles Laboratories, Inc.). *U.S. 3,240,609*. The following compounds are suitable for use as antioxidants for edible fats and oils subject to oxidative deterioration: 1-hydroxy-2-naphthylmethylamino-N-bis propionitrile, 2-hydroxy-1-naphthylmethylamino-N-bis propionitrile, 1-hydroxy-2-naphthylmethylamino-N-bis propionic acid, and 2-hydroxy-1-naphthylmethylamino-N-bis propionic acid.

BROMINATING HIGHER FATTY ACIDS AND ESTERS. M. Bornfleth (Swift & Co.). *U.S. 3,240,794*. A method for brominating liquid, ethylenically unsaturated organic material selected from the group consisting of higher fatty acids and esters of higher fatty acids and avoiding the development of color in the material comprises: reacting bromine with the organic material in the presence of 25-100% water (based on organic material) and a nonpolar solvent selected from the group consisting of petroleum ether, diethyl ether and hexane.

HIGHER FATTY ACID ESTERS OF TETRAHYDROXYLATED CYCLOOCTADIENE AND THEIR USE IN SALAD OILS. H. B. Sinclair (Procter & Gamble Co.). *U.S. 3,241,979*. The described esters contain fatty acid groups having from 14 to 22 carbon atoms.

HIGHER FATTY ACID ESTERS OF HEXAHYDROXYLATED CYCLODECATRIENE AND THEIR USE IN SALAD OILS. H. F. Drew and W. A. Lange (Procter & Gamble Co.). *U.S. 3,241,980*. The described esters contain fatty acid groups having from 14 to 22 carbon atoms.

HIGH FAT FOOD PRODUCTS AND METHODS OF PREPARING SAME. D. Melnick (Corn Products Co.). *U.S. 3,243,302*. In a salted food product which contains at least 15% fat, the improvement comprises having present food grade sodium chloride which has been obtained by evaporation of up to 95% by weight of the water in a brine and containing 50-5,000 p.p.m. of an alkylenediaminetetracarboxylic acid compound. Such residual pro-oxidant trace metals as remain in the sodium chloride are in chelated form, and the sodium chloride is free of the uncombined alkylenediaminetetracarboxylic acid compound.

PROCESS FOR PREPARING FATTY COMPOSITIONS. J. van der Kulk (Lever Bros. Co.). *U.S. 3,245,801*. A process for the production of a normally solid fat composition of the margarine and shortening type comprises providing a fat composition in molten form, rapidly cooling the molten fat composition to a temperature of -5 to +6C by passing it, in a time of 1-10 seconds, through a narrow annular space defined by 2 concentric cylindrical surfaces spaced 0.5 to 3 mm apart; refrigerating one of the surfaces; and scraping the refrigerated surface to an extent just adequate to keep the surface free from crystal layer, the scraping being accomplished by the relative rotation of the 2 surfaces, the speeds of rotation differing by 60 to 100 r.p.m.; positively urging the cooled composition through a crystallization zone without substantial working for at least 5 minutes until crystallization is substantially completed; and thereafter working the crystallized composition to impart the desired plasticity.

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When some enterprising Hittite decided five or six thousand years ago that iron was a pretty good material out of which to fashion any of a number of articles, he didn't realize that he was going to cause a lot of grief for 20th century food chemists concerned with the pro-oxidant properties of this element.

Chemists in Eastman's Food Technology Laboratories try to do their part expiating for this ancient technologist's act. We have already reported some of our efforts to use phytic acid as an iron scavenger, for example. Now we want to note briefly a little work using phosphoric acid for the same purpose.

Samples of lard and inedible grease containing 1 ppm iron as ferric oleate were made up with 0.01% TENOX BHA or with 0.01% TENOX BHT, and with either citric acid or phosphoric acid in amounts ranging from 0.0025% to 0.02%. Treated and control samples were tested by the AOM, and the times required for the samples to reach 20 meq. peroxide content were determined.

Here are the results:

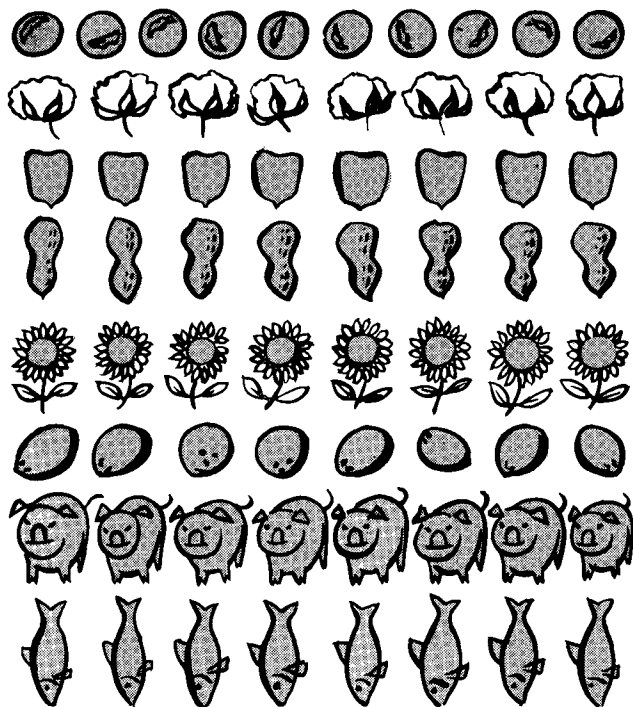
In lard, citric acid and phosphoric acid seem to be equally effective, within the experimental error of the test. In the low grade grease the same is the case for very low concentrations of chelating agent, but at higher concentrations phosphoric acid is the better scavenger of the two.

That's it. We hope the information is of interest.

In closing, we wish to call attention to the fact that the expert advice of Eastman's Food Laboratory personnel is available to all users of TENOX antioxidants. Highly trained, with a broad knowledge of antioxidants plus invaluable practical experience, these technologists are well equipped to help solve your oxidative rancidity problems.

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## • Fatty Acid Derivatives

HIGHER ALCOHOLS. V. THIN-LAYER CHROMATOGRAPHIC SEPARATION OF MONOENOIC, DIENOIC AND TRIENOIC FATTY ALCOHOLS. Akira Hashimoto, Aiko Hirotsu and Katsunori Mukai (Univ. Osaka Pref.). *Yukagaku* 15, 206-9 (1966). A mixture of fatty alcohol acetates were separated into saturated, monoenoic, dienoic and trienoic components by the thin-layer chromatography using mercuric acetate adduct and silver nitrate adduct methods. Petroleum ether:ethyl ether (80:20) was better developer than other solvents by the silver nitrate-silicic acid method. Propyl alcohol:acetic acid:pyridine (150:1:1), diisobutyl ketone:acetic acid (40:10) were better developers in case by mercuric acetate method. Silica gel G was suitable adsorbent.

THERMAL ADDITION OF FORMALDEHYDE TO  $\alpha$ - AND  $\beta$ -DIISOBUTYLENE. Choichiro Hirai, Yasuyuki Sasaki and Taro Matsumoto (Nihon Univ., Tokyo). *Yukagaku* 15, 210-14 (1966). Acetates of unsaturated primary alcohols were prepared by heating of a mixture of unsaturated hydrocarbons, formaldehyde and acetic anhydride in autoclave. Saponification of these acetates yielded the corresponding alcohols.  $\alpha$ -Diisobutylene gave a mixture of acetate of 3,5,5-trimethyl-3-hexene-1-ol and 3-methylene-5,5-dimethyl-1-hexanol. Similarly,  $\beta$ -diisobutylene gave a mixture of acetates of 2,4,4-trimethyl-3-hydroxymethyl-1-pentene and 3-methylene-5,5-dimethyl-1-hexanol. Acetic anhydride was a more effective solvent than acetic acid.

PRODUCT STABILITY, PROGNOSTICATION, PLACEMENT, PARAMETERS —PART II. Lloyd Kennon (Res. Dev. Lab., Bristol-Myers Prod. Hillside, N. J.). *J. Soc. Cosmetic Chemists* 17, 313-317 (1966). Chemical kinetics provides the basic principles which can help study the deterioration of pharmaceutical and cosmetic products. Those principles of kinetics which can be used to predict the long-term stability of finished formulations are reviewed, and techniques are described which can be used in programing stability studies. The properties of emulsions, suspensions and solids are discussed which are amenable to measurement and can be used as parameters for establishing and predicting deterioration of finished consumer goods.

ESTER REACTION COMPOSITION AND METHOD OF MAKING THE SAME. S. B. Radlove. *U.S. 3,227,559*. The described composition comprises a product prepared by the reaction of 1 mole of citric acid and 2.0 to 3.3 moles of a reactant consisting of fatty acid monoglycerides and stearyl alcohol. The reaction is carried out by heating the mixture to a temperature in the range between 145 and 165°C in an inert atmosphere under conditions to remove water vapor. The finished product has an acid number in the range of 12 to 75.

PEANUT BUTTER STABILIZER SUSPENSION. J. S. Baker, D. F. Dasher and H. C. Ince (Procter and Gamble Co.). *U.S. 3,245,803*. A peanut butter stabilizer having a fluid consistency over the range of temperatures between 60 and 100°F and substantially stable against separation for at least 4 hours comprises: (1) 40-55% by weight of an aqueous solution of a polyhydric alcohol selected from the group consisting of invert sugar, corn syrup, sucrose, glycerin, honey and sorbitol, the solution having a water vapor pressure no greater than about 20 mm Hg at 80°F and a viscosity ranging from 50-100 cp at 71°F; (2) 0.1-0.5% of a hydrophilic colloid; (3) 0.05-0.5% of an emulsifier selected from the group consisting of lecithin, polyoxyethylene sorbitan monostearate, polyoxyethylene sorbitan monolaurate; and (4) 20-60% of finely divided, high melting normally solid glycerides in the beta-prime crystalline phase. The total solids content is from 45-60% of the weight of the stabilizer, the solids being in uniform suspension in the polyhydric alcohol solution.

## • Biochemistry and Nutrition

THE PENETRATION DEPTH OF VOLATILE FATTY ACIDS INTO FRESH HAM. H. A. Hamid and R. L. Saffle (Food Science Dept., Univ. of Ga., Athens, Ga. 30601). *Food Technol.* 20, 126-7 (1966). Although the smoking process is widely used commercially for meat and fish, few studies on smoke penetration in meat have been reported. Since smoke contains volatile fatty acids (Husaini and Cooper, 1957; Hamid and Saffle, 1965), the amount of penetration of these acids into meat is of interest.

SPECIFIC SITES OF FATTY ACID AND STEROL SYNTHESIS IN ISOLATED SKIN COMPONENTS. S. C. Brooks, V. C. Godefroi and W. L. Simpson (Detroit Inst. of Cancer Res. and Depts. of Physiol. Chem. and Pathol., Wayne State Univ. School of Med., Detroit, Mich.). *J. Lipid Res.* 7, 95-102 (1966). Metabolic studies on isolated mouse skin components were undertaken to determine the specific sites of fatty acid and sterol synthesis. The concentrations of long-chain fatty acids and sterols and the incorporation of radioactivity from acetate-1-C<sup>14</sup> into these lipids are reported for various skin components and intact whole skin. Only fatty acids having chain lengths of 18 carbons or less were produced by the connective tissue cells of the dermis, while fatty acids containing 20 carbons or more, as well as the acids of 18 carbons or less, were synthesized in the upper dermis (papillary reticulum). The upper dermis also produced significant quantities of eicosenoic acid and of an octadecadienoic acid (not linoleic acid), and incorporated labeled acetate into fatty acids containing an odd number of carbons. Removal of the epidermis and adnexa diminished sterol synthesis. However, the upper region of the dermis was capable of synthesizing, from acetate, large quantities of unidentified nonsaponifiable lipids which were neither sterols nor squalene.

TEMPERATURE INDEPENDENCE OF THE COMPOSITION OF TRIGLYCERIDE FATTY ACIDS SYNTHESIZED DE NOVO BY THE MOSQUITO. E. V. Handel (Fla. State Bd. of Health, Entomological Res. Center, Vero Beach, Fla.). *J. Lipid Res.* 7, 112-5 (1966). The hypothesis that depot fat is more unsaturated when it is synthesized at lower temperatures was tested in the mosquito. Female mosquitoes (*Aedes sollicitans*) were starved until no triglycerides remained. A single dose of sugar was fed and the mosquitoes were maintained at different temperatures. Approximately the same amount of triglyceride was synthesized per mosquito at each temperature, although at different rates. Mosquitoes maintained at low temperatures did not synthesize more unsaturated triglycerides than those at higher temperatures: the fatty acid composition was essentially the same from 10 to 35C. The triglycerides synthesized from sugar contained no polyunsaturated fatty acids. Total amounts and composition of phospholipid fatty acids remained unaltered during sugar feeding. When deprived of food, the mosquitoes catabolized triglyceride fatty acids randomly; cold-exposure did not cause selective retention or utilization of any individual fatty acid.

EFFECT OF A NEW INHIBITOR OF CHOLESTEROL BIOSYNTHESIS (AY 9944) ON SERUM AND TISSUE STEROLS IN THE RAT. L. Horlick (Dept. of Med., Univ. of Saskatchewan, Univ. Hosp., Saskatoon, Saskatchewan, Canada). *J. Lipid Res.* 7, 116-21 (1966). AY 9944 is a novel inhibitor of cholesterol biosynthesis which appears to act on the conversion of 7-dehydrocholesterol to cholesterol. In all tissues studied, with the exception of the lens, there was a reduction in cholesterol and a marked accumulation of 7-dehydrocholesterol. Isotope studies showed a reduced uptake of acetate into cholesterol, and an increased uptake into 7-dehydrocholesterol, in various tissues *in vivo* and by skin samples *in vitro*. There was no apparent accumulation of lanosterol or of the methostenols in the rat skin.

CHANGES IN SPHINGOSINE AND FATTY ACID COMPONENTS OF THE GANGLIOSIDES IN DEVELOPING RAT AND HUMAN BRAIN. A. Rosenberg and Nora Stern (Dept. of Biochem. and Med., Col. of Physicians and Surgeons, Goldwater Mem. Hosp., Welfare Island, New York, N.Y.). *J. Lipid Res.* 7, 122-31 (1966). Rat brain increases in weight after birth in three stages: (I) rapidly for the first 2 weeks, (II) at a lower rate from 2 to 5 weeks, and (III) at a still lower rate from 5 weeks to 5 months. During the succeeding period, designated IV, it maintains constant weight up to 1 year of age. Brain ganglioside content increased linearly during I and II, more slowly during III, and diminished during IV. The appearance of measurable amounts of brain sphingomyelin and cerebroside succeeded that of ganglioside. Ceramide with C<sub>18</sub>-sphingosine and C<sub>18</sub> fatty acid was found in a large proportion of all three sphingolipids upon their first appearance in measurable quantity. C<sub>18</sub> fatty acid in cerebroside rapidly declined to a negligible level, while in gangliosides and sphingomyelin it declined slowly but remained the major fatty acid component. Cerebroside and sphingomyelin contained C<sub>18</sub>-sphingosine almost exclusively at all stages of rat brain growth. Gangliosides contained C<sub>18</sub>-sphingosine almost exclusively at birth, but subsequently accumulated C<sub>20</sub>-sphingosine until they had nearly equal quantities of each base type. Changes in human brain gangliosides resemble those in rat. In Tay-Sachs disease, gangliosides have C<sub>18</sub>-sphingosine predominantly, and a high content of C<sub>18</sub> fatty acid.

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THE CHEMICAL SYNTHESIS AND BIOLOGICAL OXIDATION OF 7 $\alpha$ -HYDROXY [26-<sup>14</sup>C] CHOLESTEROL, 7-DEHYDRO [26-<sup>14</sup>C] CHOLESTEROL AND 26-HYDROXY [26-<sup>14</sup>C] CHOLESTEROL. P. D. G. Dean and M. W. Whitehouse (University of Oxford). *Biochem. J.* **98**, 410-19 (1966). 26-Hydroxycholesterol was obtained by reducing the methyl ester of ( $\pm$ )-3 $\beta$ -hydroxycholest-5-en-26-*oic* acid, which was synthesized from 25-oxonorcholesterol. Methods for preparing 7 $\alpha$ -hydroxycholesterol and 7-dehydrocholesterol were modified to allow the micro-scale preparation of these C<sup>14</sup> sterols from 26-C<sup>14</sup>-cholesterol. 26-Hydroxycholesterol was oxidized more readily than 7 $\alpha$ -hydroxycholesterol, 7-dehydrocholesterol or cholesterol by mitochondrial preparations from livers of mice, rats, guinea pigs, common toads and South American caymans. ( $\pm$ )-3 $\beta$ -hydroxy-26-C<sup>14</sup>-cholest-5-en-26-*oic* acid was oxidized very rapidly to C<sup>14</sup>O<sub>2</sub> by mouse and guinea pig without evident discrimination between the 2 optical isomers. An enzyme system that oxidizes 26-hydroxycholesterol to 3 $\beta$ -hydroxycholest-5-en-26-*oic* acid was identified in the soluble extract of rat liver mitochondria. This enzyme could use NADP in place of NAD but was not identical with liver alcohol dehydrogenase.

EFFECT OF VITAMIN A DEFICIENCY OR EXCESS ON THE OXIDATIVE PHOSPHORYLATION BY RAT LIVER MITOCHONDRIA. C. R. Seward, G. Vaughan and E. L. Hove (Div. of Nutr. Bureau of Sci. Res., Food and Drug Admin., Dept. of HEW, Washington, D. C.). *J. Biol. Chem.* **241**, 1229-32 (1966). Liver mitochondria from hypo- or hypervitaminotic A rats exhibited low efficiency for coupled oxidative phosphorylation. Supplementation *in vitro* or *in vivo* with retinyl acetate, but not with retinoic acid, restored low phosphorus to oxygen ratios to normal. Uncoupling of oxidative phosphorylation occurred with nicotinamide adenine dinucleotide-linked and non-AND-linked substrates. Serum

albumin added to mitochondrial suspensions from livers of vitamin A-deficient or toxic rats restored normal oxidative phosphorylation efficiencies. Tri-*o*-cresyl phosphate caused uncoupling which was not restored by the addition of retinyl acetate. An inherent instability of liver mitochondria from vitamin A-deficient and toxic rats is indicated because their endogenous oxidative phosphorylation is lower than that of mitochondria from normal animals. It is suggested that vitamin A is required in mitochondrial membranes at an optimum concentration; variations below or above this concentration cause these membranes to become unstable. Deviation from optimum may induce functional changes in enzymes associated with oxidative phosphorylation.

PHOSPHOLIPIDS OF BACTERIA WITH EXTENSIVE INTRACYTOPLASMIC MEMBRANES. P.O. Hagen, H. Goldfine and P. J. Le B. Williams (Dept. of Bacteriology, Harvard Med. School, Boston, Mass.). *Science* **151**, 1543-4 (1966). Examination of the lipids of three species of nonphotosynthetic bacteria with extensive internal membranes revealed phosphatidyl choline (lecithin) in two species. In one of these there was an unusual accumulation of phosphatidyl N-dimethylethanolamine. The relation between lecithin and membrane elaboration in microorganisms is discussed.

EFFECTS OF DIETARY CALCIUM UPON LIPID METABOLISM IN MATURE RATS FED BEEF TALLOW. A. I. Fleischman, H. Yacowitz, T. Hayton and M. L. Bierenbaum (Health Res. Inst., Fairleigh Dickinson Univ., Madison, N. J., and Atherosclerosis Res. Group, St. Vincent's Hosp., Montclair, N. J.). *J. Nutr.* **88**, 255-60 (1966). In an attempt to elucidate the hypocholesterolemic and hypotriglyceridemic action of dietary calcium, 24 male Holtzman strain albino rats were fed a corn-soya ration containing 18% added beef tallow and 2% added cholesterol for 21 days. Dietary calcium was varied at 0.08, 0.2 and 1.2% of diet. Blood lipids decreased with increasing dietary calcium, the major decrease occurring at the 0.2% calcium level. Some tissue lipids decreased; none increased. Fecal lipid did not significantly increase at the 0.2% calcium level, but did at the 1.2% level. Fecal acids became progressively more saturated with increasing calcium intake, but the preferential excretion of saturated fatty acids did not appear to be sufficient to alter significantly the blood fatty acids. Fecal bile acids significantly increased at 0.2% calcium level, with no additional increase at the 1.2% calcium level. These results suggest that the lowering of blood cholesterol by increase in dietary calcium is mediated in part by increased excretion of bile acids.

A PRELIMINARY STUDY OF FACTORS AFFECTING BLOOD LIPID LEVELS IN THREE GROUPS OF YEMENITE JEWS. R. A. Parkins, S. Eidelman, E. B. Perrin and C. E. Rubin (Depts. of Med. and Preventive Med., Univ. of Washington, Seattle, Wash.). *Am. J. Clin. Nutr.* **18**, 134-48 (1966). This field study in Israel was undertaken to determine whether defective intestinal lipid absorption might contribute to the low frequency of myocardial infarction in Yemenite Jews. Serum carotenoid levels were used as a screening test for absorptive ability because fat balance studies were impractical for field surveys. The relationship of serum carotenoid to serum cholesterol levels was studied in 213 Yemenites and 80 Israeli control subjects of European origin (Ashkenazim). The effect on these variables of exposure to the Israeli environment was assessed by comparing Yemenites of three main immigration waves: recent (0 to 5 years), intermediate (11 to 15 years) and veterans (21 years, native born or Sabra). These findings in Yemenite Jews warrant further study of environmental factors which may influence both carotene and cholesterol metabolism. It is conceivable that recent Yemenite immigrants have mild malabsorption which affords protection against high serum lipid levels and consequently against myocardial infarction; this effect may diminish progressively with continued exposure to the Israeli environment.

LIPID ALTERATIONS AFTER CELL WALL INHIBITION. FATTY ACID CONTENT OF STREPTOCOCCUS PYOGENES AND DERIVED L-FORM. C. Panos, M. Cohen and Geraldine Fagan (Dept. of Biochem., Albert Einstein Med. Center, Northern Div., Philadelphia, Pa.). *Biochemistry* **5**, 1461-68 (1966). The fatty acid content of whole streptococcal and derived L-form (*i.e.*, cells without rigid cell walls) cells in the mid-logarithmic phase of growth, and their respective isolated membranes, was compared by capillary column gas chromatography. Oleic acid predominated in L-form whole cells and membranes, whereas *cis*-vaccenic acid was found to predominate with the cells and membranes of the parent *Streptococcus pyogenes*. This reversal of positional isomers was not noted in the hexadecenoic acid fractions. In addition, the

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per cent of total  $C_{18}$  acids was greater than the total  $C_{18}$  acids in the L-form, whereas the reverse was found in the coccus. Control studies with the streptococcus grown in L-form medium could not account for these changes in the L-form as due solely to an osmotic effect. It was observed that permanent loss of cell wall biosynthesis (*i.e.*, L-form) could not be associated with fatty acid alterations in the relative proportions of the  $C_{18}$  positional isomers.

CLEAVAGE OF CHOLESTEROL SIDE CHAIN BY ADRENAL CORTEX. IV. EFFECT OF PHOSPHATE AND VARIOUS NUCLEOTIDES ON A SOLUBLE ENZYME SYSTEM. P. Satoh, G. Constantopoulos and T. T. Tehen (Dept. of Chem., Wayne State Univ., Detroit, Mich. 48202). *Biochemistry* 5, 1646-50 (1966). A soluble enzyme system, capable of oxidizing cholesterol to pregnenolone, has been shown to require reduced triphosphopyridine nucleotide (TPNH) or reduced diphosphopyridine nucleotide (DPNH) as cofactor. The optimal concentrations of the two cofactors are  $0.5$  to  $1 \times 10^{-5}$  mM and  $1 \times 10^{-3}$  mM, respectively, indicating that DPNH is probably not the active cofactor *in vivo*. The reactions with DPNH require, and those with TPNH are greatly stimulated by, arsenate or inorganic phosphate. 3' and 5'-Adenosine monophosphate (AMP) has no effect. With DPNH as cofactor, triphosphopyridine nucleotide (TPN<sup>+</sup>), 2'-AMP, and 3'-AMP are strong inhibitors. The reaction with TPNH is inhibited by excess TPNH or TPN<sup>+</sup> and by 2'- or 3'-AMP, but not by DPNH or diphosphopyridine nucleotide (DPNH<sup>+</sup>).

ENZYMATIC DESATURATION OF STEARYL ACYL CARRIER PROTEIN. J. Nagai and K. Bloch (J. B. Conant Lab., Harvard Univ., Cambridge, Mass. 02138). *J. Biol. Chem.* 241, 1925-7 (1966). The soluble stearyl acyl carrier-protein desaturase system from photoauxotrophic *Euglena gracilis* has been separated into three components, a reduced triphosphopyridine nucleotide oxidase, the desaturase, and a ferredoxin. All three enzymes are required for the conversion of stearyl acyl carrier protein to oleate. A similar enzyme system has been isolated from spinach.

THE INFLUENCE OF DIETARY FAT AND ENVIRONMENTAL TEMPERATURE UPON CHICK GROWTH AND CARCASS COMPOSITION. W. C. Mickelberry, J. C. Rogler and W. J. Stadelman (Animal Sci. Dept., Purdue Univ., Lafayette, Indiana). *Poultry Sci.* 45, 313-21 (1966). Four diets containing either 10% cerelese, corn oil, lard or hydrogenated coconut oil as variables were fed to broilers at two environmental temperatures (21 and 29°C) from 4-8 weeks of age. From randomly selected 8 week birds, breast, thigh, skin abdominal fat and liver samples were analyzed for moisture, ether extract, degree of saturation, and total cholesterol content. Bi-weekly growth and feed conversion data were computed. Liver and abdominal lipids were subjected to gas chromatographic separation of their component fatty acids. The elevated temperature markedly retarded growth and feed consumption but had no significant influence upon either the moisture, fat content, iodine value, total cholesterol content or the fatty acid composition. Incorporation of fat into the diet improved both growth and feed conversion in all cases. Diets exerted a marked effect upon all attributes analyzed. Liver lipids contained the greatest quantity of cholesterol, followed by the skin and thigh, with the breast and abdominal fat having minimal amounts. Cholesterol in all tissues was found present predominantly in the free form.

COMPOSITION AND STABILITY OF BROILER CARCASSES AS AFFECTED BY DIETARY PROTEIN AND FAT. J. E. Marion and J. G. Woodroof (Food Sci. Dept., Georgia Exp. Sta., Experiment, Georgia). *Poultry Sci.* 45, 241-7 (1966). Male, broiler type chicks were reared to 58 days of age on corn-soybean meal diets containing

either 16 or 24% protein, and one of the following added fats: none, coconut oil, beef tallow, safflower oil or menhaden oil. Dressing percentages were significantly, but not markedly, influenced by diet, while the proportion of meat to bones in dressed carcasses was not changed by diet. Carcass moisture levels were significantly lower when either low protein or fat supplemented diets were fed. Carcass lipid levels were inversely related to moisture levels. Feeding different fats resulted in an increased carcass deposition of the major fatty acids present in each fat. Also, birds fed high protein diets deposited less oleic and more linoleic acid in their carcasses. TBA values, determined on breast muscle and skin after storage of carcasses for 12 days at 2°C, were significantly higher in carcasses from high protein or menhaden oil diets. Diets containing coconut oil or beef tallow produced carcasses with lower TBA values, and feeding safflower oil caused slightly higher values in skin tissue only.

VITAMIN E-RESPONSIVE MACROCYTIC ANEMIA IN PROTEIN-CALORIE MALNUTRITION. MEASUREMENTS OF VITAMIN E, FOLIC ACID, VITAMIN C, VITAMIN B<sub>12</sub> AND IRON. A. S. Majaj (Dept. of Pediatrics, Augusta Victoria Hosp., Jerusalem, Hashemite Kingdom of Jordan). *Am. J. Clin. Nutr.* 18, 362-8 (1966). Six children with nutritional macrocytic anemia, all of whom had a megaloblastic bone marrow of varying degree, were treated with vitamin E. Reticulocyte response occurred in all patients, to a variable degree, but some megaloblastosis persisted which involved red cell and/or white cell precursors. Serum folate and vitamin C levels increased after vitamin E therapy. The effect on serum vitamin B<sub>12</sub> was uncertain. Serum iron levels fell in three patients and remained the same in two patients.

NOTE ON DETOXIFICATION OF THE AFLATOXINS. H. Fischback and A. D. Campbell (Div. of Food Chem., F.D.A., Washington, D.C.). *J. Assoc. Agr. Chem.* 48, 28 (1965). Since aflatoxins are regarded as potentially toxic substances to man, precautionary measures to protect personnel from contact and exposure were taken. Finding it necessary to heat to 300°C or above to bring about their thermal decomposition made inactivation by heat treatment impractical for much of the laboratory and facilities. Aflatoxin extracts treated for a few seconds with about 5% NaOCl were found to be nontoxic when subjected to the chick embryo bioassay. It was also found that a highly contaminated peanut meal when exposed overnight to 10% chlorine gas became nontoxic to the chick embryo.

TRANSPORT AND METABOLISM OF FATTY ACIDS BY ISOLATED RUMEN EPITHELIUM. F. J. R. Hird, R. B. Jackson and M. J. Weidemann (Univ. of Melbourne). *Biochem. J.* 98, 394-400 (1966). The metabolism of even-numbered saturated (acetic to stearic) and unsaturated (oleic and linolenic) fatty acids by diaphragms of isolated rumen epithelium was investigated. When fatty acids are presented to the papillae surface, ketone bodies are released from the opposite (muscle) side of the tissue. When the concentration of octanoate or decanoate is increased to a critical value which varies inversely with the chain length of the fatty acid, the respiration of the tissue is inhibited and ketone body synthesis is diminished. Under these conditions unmetabolized fatty acid crosses the tissue down a concentration gradient. The inhibitions by octanoate and decanoate are more marked when the fatty acid is presented to both surfaces of the epithelium. During the oxidation of octanoate and decanoate at non-inhibitory concentrations, small quantities of shorter chain fatty acids, including acetate, are produced.

STUDIES ON THE DETOXIFICATION OF AFLATOXIN CONTAMINATED PEANUTS INTENDED FOR OIL CRUSHING. L. J. Vorster (National Nutr. Res. Inst., Pretoria, Rep. of S. Africa). *Rev. Franc. Corps Gras* 13, 7-12 (1966). The results of a series of tests carried out with different solvent mixtures for the simultaneous removal of oil and aflatoxin from oilcake are presented. The systems used were: hexane-ethanol, hexane-methanol, hexane-acetone anhydrous or aqueous. With the latter system the aflatoxin content can be reduced in 10 hours from 5000 to 60 micrograms. The tests which were run at the laboratory level can be translated to pilot plant processes.

FORMS OF HUMAN SERUM HIGH DENSITY LIPOPROTEIN PROTEIN. A. Seanu (Dept. of Med., Univ. of Chicago School of Med., Chicago, Ill.). *J. Lipid Res.* 7, 295-306 (1966). Delipidation by ethanol-diethyl ether at -10°C of human serum high density lipoprotein (HDL, d 1.063-1.21) or of its subclasses HDL<sub>2</sub> (d 1.063-1.120) and HDL<sub>3</sub> (d 1.120-1.21), yielded proteins— $\alpha P_1$ ,  $\alpha P_2$ , and  $\alpha P_3$ —containing 3% phospholipid (largely lecithin) and 3.3% carbohydrate (glucosamine: L-fucose:D-galactose, D-mannose: sialic acid, 1.00:41:0.56:0.31). The data suggest that (a) the proteins of HDL, HDL<sub>2</sub>, and HDL<sub>3</sub> are

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## ASA Growth and Increased Crop Demand Noted at Convention

Unparalleled expansion in the soybean crop industry and a similar growth in the American Soybean Association combine to make the 46th annual convention at Des Moines and Ames, Iowa, on August 17-19 the most important in ASA history, states G. M. Strayer, the Association's vice president.

Now the nation's No. 1 export crop, a phenomenal increase in demand for soybeans this past year has turned an expected 90-million-bushel carryover into a near deficit and has pushed market prices to among the highest levels in the past 30 years.

Growth in membership in the Association has kept pace with the growth of the crop, notes Strayer. ASA now has eight affiliated state associations: Iowa, Minnesota, Land of Lincoln (Illinois), Tennessee, South Carolina, and Mississippi. All will send delegations to Des Moines.

The state of the current market stimulates utmost interest in the two main topics on the agenda: problems of increasing soybean yield, and problems of marketing.

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made of subunits, probably identical, of an average molecular weight of 21,000; (b) the difference in antigenic behavior between HDL<sub>2</sub> and HDL<sub>3</sub> is due to the presence in the latter of a lipid-poor protein; (c) antigenic polymorphism of  $\alpha$ P is probably related to the presence in solution of monomeric and polymeric forms having different reactivity against anti-HDL and anti- $\alpha$ P sera.

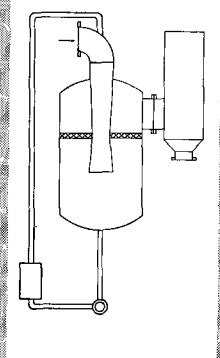
**RNA BIOSYNTHESIS IN ADIPOSE TISSUE: EFFECT OF FASTING.** W. Benjamin and A. Gellhorn (Dept. of Med. and the Inst. of Cancer Res., College of Physicians and Surgeons, Columbia Univ., New York, N.Y.). *J. Lipid Res.* 7, 285-94 (1966). RNA metabolism has been examined in intact adipose tissue and isolated fat cells from rats. The lipocyte contains three species of RNA with sedimentation rates corresponding to those of ribosomal and transfer RNA. The *de novo* biosynthesis of RNA by adipose tissue cells *in vitro* was demonstrated. The base ratios of the RNA formed indicate that it was synthesized from a DNA template. Starvation for 48-72 hr significantly depressed the synthesis of the heavy RNA components as measured by *in vitro* uridine incorporation into the individual RNA classes. Refeeding the fasted rat with glucose repaired the defect in RNA biosynthesis before the biosynthesis of monoenoic fatty acid was completely restored. Actinomycin D administered at the time of refeeding prevented the repair of monoenoic fatty acid synthesis. It is concluded that RNA metabolism is intimately involved in the control of biosynthetic reactions in adipose tissue.

**SYNTHESIS AND CHARACTERIZATION OF 1- AND 2-MONOGLYCERIDES OF ANTEISO FATTY ACIDS.** B. Serdarevich and K. K. Carroll (The Collip Med. Res. Lab., The Univ. of Western Ontario, London, Canada). *J. Lipid Res.* 7, 277-84 (1966). The branched-chain fatty acids D-(+)-12-methyltetradecanoic acid (C<sub>15</sub> anteiso) and D-(+)-14-methylhexadecanoic acid (C<sub>17</sub> anteiso) were isolated from the lipids of *Listeria monocytogenes* and their 1- and 2-monoglycerides were prepared. Reaction intermediates and products were purified without isomerization by column chromatography. Thin-layer chromatography on Florisil impregnated with boric acid and nuclear magnetic resonance were used in characterizing the 1- and 2-monoglycerides. The value of the latter method for analyzing glyceride structure is discussed.

**EFFECTS OF PROLONGED INGESTION OF GLUCOSE OR ETHANOL ON TISSUE LIPID COMPOSITION AND LIPID BIOSYNTHESIS IN RAT.** R. Scheig, N. M. Alexander and G. Klatskin (Dept. of Internal Med. and Biochem., Yale Univ. School of Med., New Haven, Conn.). *J. Lipid Res.* 7, 188-96 (1966). The effects on lipid metabolism of long-term feeding of large amounts of ethanol or glucose differed from those that have been reported in short-term experiments. Three groups of male rats were investigated. The first was fed lab chow and 15% (v/v) ethanol *ad lib.*; the second was pair-fed with the first and given isocaloric amounts of glucose in lieu of ethanol; the third was fed lab chow and water *ad lib.* All three groups consumed nearly the same number of calories, and about 30% of the calories in the first group were derived from ethanol. Ethanol decreased while glucose increased the quantity of lipid in fat depots, and each altered the fatty acid composition of the lipids in adipose tissue, kidney, liver and hepatic subcellular fractions in a different manner. The most striking of these changes was the relative increase in monounsaturated fatty acids and the decrease in essential fatty acids produced by glucose.

**USE OF CONSTANT COMPOSITION POLYVINYLPIRROLIDONE COLUMNS TO STUDY THE INTERACTION OF FAT PARTICLES WITH PLASMA.** D. D. O'Hara, D. Porte, Jr. and R. H. Williams (Dept. of Med., Univ. of Washington, Seattle, Wash.). *J. Lipid Res.* 7, 264-9 (1966). Fat particles (lipoproteins of S<sub>r</sub> > 400) have been obtained from dog and human lymph and from human post-alimentary plasma. They were flocculated by a solution of 5% polyvinylpyrrolidone (PVP) in 10% NaCl and layered at the bottom of tubes of PVP of various concentrations between 2% and 5% (w/v). As the concentration of PVP increased, a greater proportion of the particles accumulated at the top of the tube ("primary" particles). When the concentration of PVP in the tube was held constant at 3% PVP, dilution of the sample with plasma was found to produce an increased proportion of bottom particles ("secondary" particles). This observation suggests that bottom particles result from an interaction of top particles with plasma.

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