

# ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: J. G. Endres, J. Iavicoli,

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## • Fats and Oils

EXPERIMENTAL RESULTS ON THE AUTOXIDATION OF FATS AND OILS. I. AUTOXIDATION OF PURE ESTERS. C. Paquot and J. Mercier (Lab. of Lipochemistry of C.N.R.S., Bellevue, France). *Rev. Franc. Corps Gras* 9, 275-282 (1962). Autoxidation is a difficult phenomenon to study and interpret because of the diverse mechanisms and unstable intermediates. Nevertheless it has been possible to confirm the presence of two forms of peroxides, a hydroperoxide formed at low temperatures and an epoxyperoxide which is formed in small quantities at elevated temperatures. It has been confirmed that two factors are important, the nature of the unsaturated fatty acid and the temperature of the reaction.

CONCENTRATION OF POLYUNSATURATES IN FATS: STUDY OF DIFFERENT METHODS. R. Guillaumin and N. Drouhin (Lab. of Inst. of Fats and Oils, Paris, France). *Rev. Franc. Corps Gras* 9, 415-36 (1962). In the present article, a comparison between different methods for the determination of polyunsaturates in fats and oils was made. The following three methods were used, gas chromatography, isomerization by soya lipoxidase and alkaline isomerization. Gas chromatography can be used to determine the concentration of linoleic and linolenic acid, but it is difficult to determine *cis-trans* isomers. Alkaline isomerization is used to determine the concentration of linoleic and linolenic acids, but the method loses accuracy if the *trans* content is high. Isomerization by soya lipoxidase is given the total concentration of polyunsaturates as the *cis* isomer. The results are given as per cent linoleic. Taken together, the three methods offer comparable results. However, gas chromatography is the easiest technique to use, more practical than alkaline isomerization but in certain cases less sensitive. Isomerization by soya lipoxidase can be used with very small quantities of sample. The disadvantage of this method is that no distinction is made between the per cent linoleic and linolenic, but is the method to use to determine the per cent *cis* in a complex mixture of isomers.

APPLICATIONS OF DIFFERENTIAL THERMAL ANALYSIS TO THE STUDY OF FATS AND OILS. II. TERTIARY MIXTURES OF MONO-1, DI-1-3, AND TRISTEARINS. R. Perron, J. Petit, and C. Paquot (Lab. of Lipochemistry of C.N.R.S., Bellevue, France). *Rev. Franc. Corps Gras* 9, 341-48 (1962). The authors have studied by differential thermal analysis tertiary mixtures of mono-1, di-1-3, and tristearin, and established triangular diagrams corresponding to the changes observed as a function of temperature.

PHYSICAL CHEMICAL STUDIES ON GROUND OLIVE PASTES. XIV. THE MECHANISM OF ACTION OF SURFACTANTS ON THE PASTES. J. M. Martinez, C. Gomez, C. Janer, and R. Caravaca (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 111-123 (1962). The addition of certain surfactants to ground olive pastes was found to increase the oil yields obtained by mechanical pressing. The authors attribute this better yield to breakdown of cellular colloid material in the fruit by the surfactant.

NATURAL ANTIOXIDANTS IN OLIVE OIL LEAVES. II. F. Mazuelos and A. Vasquez (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 124-127 (1962). A phenolic compound showing antioxidant activity has been extracted and purified from leaves of the olive tree. Physical and chemical characteristics of the material were determined, but its molecular structure was not completely established.

THE FLUORESCENCE OF OLIVE OIL AND SULFUR OLIVE OIL IN ULTRAVIOLET LIGHT. I. ORIGIN OF COMPOUNDS RESPONSIBLE FOR BLUE FLUORESCENCE. J. Gracian and J. Martel (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 128-133 (1962). A fluorescent material was isolated from sulfur olive oil using thin layer chromatography. The same substance was isolated from the lipids of a fungus that grows in olive press cake awaiting solvent extraction. The fluorescent material was not found in olive oils or olives which had not come in contact with this fungus.

DIATOMACEOUS EARTHS. R. de Castro (Instituto de la Grasa y sus Derivados, Seville, Spain). *Grasas y Aceites* 13, 134-138 (1962). A review.

COMPOSITION OF MODERN MARGARINES. E. E. Rice, T. J. Weiss, and K. F. Mattil (Swift & Co.). *J. Am. Dietet. Assoc.* 41, 319-22 (1962). Samples of 26 major brands of margarines

(representing over 90% of the margarine sold in the U. S.) were analyzed for polyunsaturated, oleic, and saturated fatty acids and *trans* isomers. The polyunsaturated acid content varied from less than 10 to more than 40%. Also reported are possible contributions to the national dietary by hypothetical use of different types of fats.

PROCESS FOR THE MANUFACTURE OF HARD WAXES. J. Kaupp, G. Konig, G. von Rosenberg, H. Trager, and A. Thalhofer (Farbwerke Hoechst Aktiengesellschaft). *U. S.* 3,053,681. The described product is a wax-like ester of fatty acids of more than 18 carbon atoms as the acid component and as the alcohol component, a mixture of (1) up to 80 mol % of at least one alcohol having 2 to 3 alcoholic hydroxyl groups and (2) 100-20 mol % of a compound selected from the group consisting of 2,2-(4,4'-dihydroxy-diphenyl)-propane, resorcinol, pyrocatechol, hydroquinone, 4,4'-diamino-dicyclohexylmethane, benzidine, p-aminophenol, and piperazine. The alcohol component is present in an amount of 0.7 to 1.5 equivalents for each equivalent of the acid component.

PROCESS FOR MAKING BAKED PRODUCTS CONTAINING FATTY FILLINGS. K. Pentzlin. *U. S.* 3,056,678. A fat which is solid at room temperature is melted and mixed with a pastry filling containing flour, sugar, and flavoring. The mixture is then supercooled to a temperature below the solidification point of the fat. The supercooled mixture, while still liquid, is poured onto a strip of baked pastry so as to form a coating. The assembly is then further cooled to cause the mixture to set on the baked pastry.

PROCESS FOR MAKING TABLE SYRUP AND PRODUCT THEREOF. M. Pader (Lever Bros. Co.). *U. S.* 3,057,734. A table syrup in the form of a stable, pourable, translucent, oil-in-water emulsion contains a pleasant-tasting flavoring ingredient, at least 65% sugar in the aqueous phase, about 1-40% by weight of fat based on the total weight of the composition and an additive such as water-dispersible proteins, gum arabic, or an edible algin derivative. The additive is present in an amount sufficient to stabilize the emulsion against separation of the oil and water phases but insufficient to render the emulsion unpourable. The refractive indices of the oil and water phases of the emulsion are approximately the same.

## • Fatty Acid Derivatives

FLUOROMETRIC MICRODETERMINATION OF ALPHA-KETO ACIDS. J. E. Spikner and J. C. Towne (Veterans Administration Research Hospital and Dept. of Biochemistry, Northwestern University Medical School, Chicago, Ill.). *Anal. Chem.* 34, 1468-1471 (1962). The quantitative conversion of submicrogram quantities of alpha-keto acids to corresponding substituted quinoxalines by reaction with o-phenylenediamine (OPD) is described. By taking advantage of the fluorescent properties of these quinoxalines, a method has been evolved for the estimation of some alpha-keto acids. Reaction conditions, kinetics of fluorescent derivative formation, and linearity of results are described. This somewhat specific, nonreversible reaction is most useful for the determination of a single alpha-keto acid in very dilute solution. Other features include stability, reproducibility, sensitivity (range 0.05 to 0.50  $\mu\text{g./ml.}$ ) and the use of small reaction volumes.

SOLIDIFICATION POINT OF BINARY MIXTURES OF FATTY ALCOHOLS. C. Paquot, J. Petit, and C. Madelmont (Lab. of Lipochemistry of C.N.R.S., Bellevue, France). *Oleagineux* 6, 555-56 (1962). The solidification points of binary mixtures of dodecanol-tetradecanol, tetradecanol-hexadecanol, hexadecanol-octadecanol, and dodecanol-octadecanol are tabulated. The concentration range studied is broad.

GREASES THICKENED WITH LITHIUM SOAPS OF ETHYL HEXANOIC ACID, FATTY MATERIALS, AND ESTERS OF 12-HYDROXYSTEARIC ACID. D. F. Hollowell, Jr. (Richfield Oil Corp.). *U. S.* 3,053,767. The described composition consists of a mineral base lubricating oil thickened to grease consistency with lithium soaps of saponifiables consisting of 0.1 to 25% of ethyl hexoic acid, 0 to 84.9% of fatty materials containing from 12 to 24 carbon atoms per acid radical, and 15-99.9% of an ester of 12-hydroxy stearic acid.

PROCESS FOR PREPARING CARBOHYDRATE MONO-ESTERS. V. R. Gaertner (Monsanto Chemical Co.). *U. S.* 3,053,830. Sucrose is mixed and reacted with about an equimolar amount of a

monovalent aliphatic radical-containing succinic anhydride in the presence of a solvent (dialkylacylamides or dialkylsulf-oxides having from 1 to 6 carbon atoms in the alkyl groups) and a tertiary amine catalyst at a temperature of from 50 to 120°C. The anhydride has a monovalent aliphatic radical side chain of from 60 to 20 carbon atoms.

**SYNTHESIS OF GLYCIDYL ESTERS.** G. Maerker and W. S. Port (Sec'y of Agr., U.S.A.). *U. S. 3,053,855*. A reaction mixture consisting of a 10 to 20 molar excess of epichlorohydrin and an aqueous solution of an alkali metal salt of a carboxylic acid (acrylic, polyacrylic, stearic, pelargonic, azelaic, sebacic, adipic, succinic, phthalic, oleic, dimerized linoleic, trimerized linoleic) is heated in the presence of a quaternary ammonium halide to produce the glycidyl ester of the carboxylic acid.

**ANHYDROUS AMMONIUM SOAP.** T. L. Reiling (Boston Chemical Products Co.). *U. S. 3,053,867*. Stearic, palmitic, or tallow fatty acid is heated and ammonium carbonate or bicarbonate or mixtures of the two added with agitation. The fatty acid is heated to a temperature in excess of the thermode composition temperature of the ammonia salt and above the melting point of the fatty acid, but below the melting point of the ammonium salt of the fatty acid, before the ammonium salt is added to the fatty acid.

**PROCESS FOR THE PREPARATION OF PURE SUCROSE ESTERS.** V. D'Amato (Ledoga S.p.A., Milan). *U. S. 3,054,789*. Sucrose and an ester of the class consisting of monocarboxylic fatty acid lower alkyl esters and glycerides are interesterified in a solvent in the presence of a basic catalyst. At the end of the interesterification, a lower aliphatic carboxylic acid is added to the reaction mixture to neutralize the mixture. The unreacted fatty acid ester and the free fatty acid are removed by extraction with petroleum ether. The residual reaction mixture is evaporated to dryness and dissolved in a 1:1 mixture of cyclohexane and n-butanol. The cyclohexane-n-butanol solution is washed with water and then evaporated to dryness to yield the separated sucrose ester product.

**FATTY ACID SALTS.** L. G. Ginger and N. J. Kartinos (Baxter Labs., Inc.). *U. S. 3,055,923*. The described product is a salt of a physiologically acceptable organic base (lysine, arginine, ornithine) and a fatty acid such as aleuritic, sorbic, omega-hydroxyacaproic, trihydroxystearic, tetrahydroxystearic, or 10,11-dihydroxyundecanoic acid.

**ALUMINUM SOAPS AND THEIR PRODUCTION.** H. Tanabe (Takeda Pharmaceutical Ind., Ltd.). *U. S. 3,056,819*. A process for producing a water-insoluble aluminum soap comprises subjecting to double decomposition (1) a basic aluminum salt of the formula  $[Al_{2-n}(OH)_{3n}]^{+n}(X^-)_n$  in which n is a positive integer and  $X^-$  is a member selected from the group consisting of  $Cl^-$  and  $\frac{1}{2} SO_4^{2-}$ , with (2) a member selected from the group consisting of an alkali salt of a fatty acid and a mixture of an alkali salt of a fatty acid with an alkali solution in an aqueous medium, the amount of the fatty acid salt being at least equivalent to  $(X^-)_n$ . There is thus obtained a homogeneous, uniform product characterized by a definite refraction index.

## • Biology and Nutrition

**STUDIES ON THE ELECTRON TRANSFER SYSTEM. XLII. RECONSTITUTION OF THE ELECTRON TRANSFER SYSTEM.** Y. Hatefi, A. G. Haavik, L. R. Fowler, and D. E. Griffiths (Inst. for Enzyme Res., Univ. of Wisconsin, Madison 5). *J. Biol. Chem.* 237, 2661-69 (1962). It has been shown that the electron transfer system in beef heart mitochondria may be reconstituted either totally or in any desired sequential segment by appropriate combinations of two or more of the four primary complexes that have been isolated in highly purified form. The four enzyme systems that collectively comprise the complete machinery for transfer of electrons from reducing diphosphopyridine nucleotide (DPNH) and succinate to oxygen are: I, DPNH-coenzyme Q reductase; II, succinic-coenzyme Q reductase; III,  $QH_2$ -cytochrome c reductase; and IV, cytochrome c reductase. The specific inhibitors of each complex have been studied.

**THE *in vitro* INCORPORATION OF ACETATE-1-C<sup>14</sup> INTO INDIVIDUAL FATTY ACIDS OF ADIPOSE TISSUE FROM YOUNG AND OLD RATS.** A. Gellhorn, W. Benjamin, and Mary Wagner (Dept. of Med. and the Inst. of Cancer Research, College of Physicians and Surgeons, Columbia Univ., New York City). *J. Lipid Research* 3, 314-19 (1962). The pattern of *in vitro* incorporation of acetate-1-C<sup>14</sup> into the individual fatty acids of adipose tissue from young and old rats was determined. It was found that

the proportion of total incorporated radioactivity in the mono-unsaturated acids was significantly higher in tissues taken from young animals than in tissues taken from old animals. When, however, the rats were fed a fat-free diet, the proportion of monoenes increased in both age groups, and the distribution of acetate-1-C<sup>14</sup> in old animals resembled that of the young. The administration of insulin to old animals also led to an increased proportion of the fatty acid radioactivity in palmitoleic and oleic acids. The possible relationship between monoene synthesis in adipose tissue and glucose metabolism, TPNH generation, and the effects of insulin on adipose tissue, were discussed. Evidence was presented demonstrating that the short-chain fatty acids are not synthesized and stored in adipose tissue.

**BIOSYNTHESIS OF THE CEREBROSIDE ODD-NUMBERED FATTY ACIDS.** Amiya K. Hajra and N. S. Radin (Mental Health Research Inst., Univ. of Michigan, Ann Arbor). *J. Lipid Research* 3, 327-32 (1962). Rats were injected with radioactive acetate or propionate and, after four days, the saturated fatty acids were isolated from the brains and the brain cerebroside. The amounts and specific activities of the individual normal and hydroxy acids were determined. In the rats given propionate, the odd-numbered acids (15:0 to 25:0) had much higher specific activities. In the rats given acetate, the differences were much smaller, with the even numbered acids (16:0 to 26:0) showing higher specific activities. These data are consistent with earlier work, which indicated that the odd-numbered acids of other organs are derived from propionate and acetate. Comparison of the very long odd-numbered cerebroside acids with the more common ones (15:0 and 17:0) indicated that these are made by a similar synthetic route. Improved techniques are described for the isolation of the fatty acids. Comparison of the cerebroside acids and total brain fatty acids showed that most of the hydroxy acids are present in the cerebroside. Hydroxystearic acid is a minor component of the hydroxy acid fraction; most of it is not in the cerebroside. Degradation of the unsaturated acids from cerebroside of rats given labeled propionate showed that propionate is a specific precursor of these acids also.

**THE UPTAKE AND METABOLISM OF C<sup>14</sup>-LABELED FATTY ACIDS BY MACROPHAGES *in vitro*.** A. J. Day and N. H. Fidge (Dept. of Human Physiology and Pharmacology, Univ. of Adelaide, South Australia). *J. Lipid Research* 3, 333-38 (1962). Macrophages obtained from the peritoneal cavity of rabbits were incubated *in vitro* in the presence of C<sup>14</sup>-labeled sodium palmitate, and the uptake of fatty acid and its subsequent incorporation into other lipid fractions was determined. Up to 21% of the C<sup>14</sup>-labeled sodium palmitate added to the incubation medium was taken up by the macrophages. Most of this was converted to triglyceride and phospholipid, but a small amount was converted to cholesterol ester and to mono- and diglyceride.

**THE INFLUENCE OF RETICULOENDOTHELIAL STIMULATION ON THE RESPONSE OF RATS TO DIETARY CHOLESTEROL.** S. J. Riggi and N. R. Di Luzio (Dept. of Physiology, Univ. of Tenn. Med. Units, Memphis, Tenn.). *J. Lipid Research* 3, 339-43 (1962). The influence of zymosan, and of various chemical fractions obtained from the yeast cell wall, on lipid alterations induced by the feeding of a cholesterol-cholate diet to rats was studied. Glucan, and other fractions derived from zymosan that stimulated the reticuloendothelial system, significantly inhibited dietary-induced hepatic cholesterosis. The results are indicative of relationship between the functional activity of the reticuloendothelial system and cholesterol metabolism.

**POLYUNSATURATED FATTY ACIDS IN MITOCHONDRIA.** T. Richardson, A. L. Tappel, L. M. Smith, and C. R. Houle (Dept. of Food Science and Technology, Univ. of Calif., Davis, Calif.). *J. Lipid Research* 3, 344-50 (1962). Fatty acids of mitochondria from hearts and livers of fresh-water and marine fish, marine birds, fur seal, and from sweet potato have been analyzed by gas-liquid chromatography. Fatty acid patterns and degree of unsaturation were similar in mitochondria from fish and from fish-eating birds and seals. Major differences found in fatty acid patterns included: absence of detectable linoleic acid in liver mitochondria from sturgeon and flounder; absence of detectable arachidonic acid in mitochondria from sweet potato; a four-fold greater percentage of stearic acid and a four-fold greater percentage of combined linoleic-arachidonic acids in bird and seal mitochondria compared with those found in fish mitochondria; high levels of the *linolenate* family of acids in fish mitochondria and intermediate levels in marine bird and seal mitochondria as compared to the high levels of the *linoleate* family of acids that have been found in rat liver, chicken liver, and beef heart mitochondria.

EXTRACTION OF LIPIDS FROM BLOOD SERUM AND LIVER TISSUE. H. de Jongh and J. G. van Pelt (Unilever Research Laboratory, Vlaardingen, Netherlands). *J. Lipid Research* 3, 385-88 (1962). In order to arrive at a reliable method for the complete extraction of lipids from serums, free from nonlipid impurities, the results of some modern extraction methods were compared—e.g., that of Mukherjee, Achaya, Deuel, and Alfin-Slater who used Bloor's solvent mixture (ethanol-ether 3:1); that of Fillerup and Mead, who used Delsal's solvent mixture (methylal-methanol 4:1); and two procedures of Folch *et al.*, who used a chloroform-methanol mixture (2:1). These methods were compared by applying them to equal amounts of a sample of fresh pig serum. There was little difference in the amounts of lipid extracted by the three methods.

DEXTRAN SULFATE PRECIPITATION AND ULTRACENTRIFUGATION OF LIPOPROTEINS FROM HYPERCHOLESTEROLEMIC DOG SERUM. Toshio Sakagami and D. B. Zilversmit (Dept. of Physiology, Univ. of Tenn., Memphis 3, Tenn.). *J. Lipid Research* 3, 111-116 (1962). Dogs fed a diet containing butter, cholesterol, and thiouracil develop severe hypercholesterolemia. In both the  $\alpha_2$ - and  $\beta$ -lipoprotein, cholesterol and phospholipid increase whereas these lipids in the  $\alpha_1$  fraction appear to decrease. Comparison of the dextran sulfate-precipitable lipoproteins with lipoprotein fractions obtained by ultracentrifugation at densities 1.019, 1.063, and 1.21 and with paper electrophoretograms reveals that the addition of low molecular weight dextran sulfate and calcium chloride to diluted hypercholesterolemic dog serum quantitatively precipitates low-density lipoproteins. Paper electrophoresis revealed that the dextran sulfate-precipitable fraction contains both  $\alpha_2$ - and  $\beta$ -lipoproteins.

STUDIES ON THE ABSORPTION OF BETA-CAROTENE AND THE DISTRIBUTION OF TOTAL CAROTENOID IN HUMAN SERUM LIPOPROTEINS AFTER ORAL ADMINISTRATION. D. G. Cornwell, F. A. Kruger, and H. B. Robinson. *J. Lipid Research* 3, 65-70 (1962). The carotenoid increment in human serum was measured after the oral administration of aqueous dispersions and lipid dispersions of  $\beta$ -carotene with different test meal regimens.  $\beta$ -Carotene was readily absorbed in both forms. Absorption of the aqueous dispersion was similar when administered with either high lipid or protein-carbohydrate test meals. Aqueous dispersions were poorly absorbed by fasting subjects. The absorption and transport of carotenoid was compared with the absorption and transport of other lipids. Portal absorption of at least a part of the ingested carotenoid is proposed as a possible explanation for the observed carotenoid transport pattern.

METABOLISM OF DIFFERENTLY LABELED CHOLESTEROL IN NORMAL AND HYPERCHOLESTEROLEMIC RABBITS. W. M. Bortz (Queen's Hosp. Res. Lab., Honolulu, Hawaii). *Circulation Research* 11, 343-51 (1962).  $C_4$  and  $C_{26}$ -labeled cholesterols were fed via stomach tube to normal and hypercholesterolemic rabbits. The serum, liver, and aortic cholesterol levels were measured, as were the liver and intestinal content and stool nonsaponifiable and saponifiable lipid fractions. The appearance of the isotopic cholesterol in these fractions and in the exhaled  $CO_2$  was measured. The cholesterol-fed animals showed distinctly higher radioactivity in the blood and in the aorta. The  $C_{26}$ , but not the  $C_4$ , activity was detected in the exhaled  $CO_2$ . No activity was detected in the urine. Both tags were detected in the saponifiable fractions of the liver and intestinal contents. Arachidonic acid supplements to four rabbits resulted in increased excretion of activity in the saponifiable portion of the intestinal contents.

UTILIZATION OF FREE AND ESTERIFIED CHOLESTEROL-4- $C^{14}$  FOR CORTICOID BIOSYNTHESIS BY HOG ADRENAL HOMOGENATES. R. E. Dailey, L. Swell and C. R. Treadwell (V.A. Center, Martinsburg, W. Va.). *Proc. Soc. Exp. Biol. Med.* 110, 571-74 (1962). Tracer amounts of cholesterol-4- $C^{14}$  added to hog adrenal homogenates and incubated under conditions favorable for steroid synthesis were rapidly and efficiently converted to labeled steroids. Addition of cholesterol-4- $C^{14}$  esters, prepared enzymatically and incubated under the same condition, did not give  $C^{14}$ -activity in the steroids produced. Conversion of free cholesterol to cholesterol esters or of esters to free cholesterol as measured by  $C^{14}$ -activity of the sterol digitonides did not occur in this system.

THE LIPID CONTENT OF THE SUBCUTANEOUS FAT ORGANS OF THE CHICK EMBRYO. G. L. Feldman, L. M. Churchwell, T. W. Culp, F. A. Doyle, and H. T. Jonsson (Baylor Univ. Coll. of Med., Houston, Texas). *J. Poultry Science* 41, 1232-40 (1962). The deposition of lipid material in the fat organs of the developing chick embryo exhibits a definite periodicity. Lipid material is rapidly deposited in the fat organ during the period of

the 13th to the 17th day. The relatively uniform rate of deposition of almost all of the lipids during this period, particularly those involved in fat transport, indicated that yolk lipids may be transported to the fat organs by means of the serum lipoproteins. The period of the 17th and 18th day is characterized by a relatively static state in fat deposition, particularly in the case of the reserve fat components. This response reflects the occurrence of a metabolic change in the embryo. After this period, the lipid content of the fat organs reflects the increased activity of the hatching chick whose energy requirement may be partially satisfied by the metabolism of the fatty acids from fat organ triglyceride.

EFFECT OF COTTONSEED OIL ON DISCOLORATION OF COLD STORAGE EGGS. A. R. Kemmerer, B. W. Heywang, H. E. Nordby, and R. A. Phelps (Univ. of Arizona, Tucson). *J. Poultry Science* 41, 1101-03 (1962). Simultaneous feeding of crude cottonseed oil with crystalline gossypol to laying hens intensified the discoloration caused by gossypol in eggs cold stored for one to three months at 35°C. The cottonseed oil also caused pink discoloration in the eggs.

EXPERIMENTAL ATHEROSCLEROSIS AND HYPERLIPIDEMIA IN RATS AND RABBITS INFLUENCE OF SOME ALIMENTARY FATS. O. Libert and C. Rogy-Effront (Battelle Memorial Inst., Geneva, Switzerland). *J. Atherosclerosis Res.* 2, 186-98 (1962). Seventy rats and 48 rabbits were fed atherogenic diets containing various fats in two dosages; a total amount of 474 rats were autopsied after 2, 4, and 6 months of treatment; 44 rabbits were autopsied after 2 months. In the rat, after a short period in which peanut oil increased the induced hyperlipidemia more than did the other fats, a reversal of this effect was observed; after 4 months, peanut oil was less hyperlipidemic than were the other fats, and especially than was corn oil. It was never possible at any time of the experiment, to show a significant difference of the atherogenic activity of the diets containing different fats. Peanut oil gave rise to an evolution of aortic atheromatosis with time very similar to the curves shown by the animals fed corn oil. All the plant oils used gave a maximum aortic atheromatosis within 4 months; lard and margarine showed a continuous increase in the severity of the lesions. In the rabbit, atheromatosis and hypercholesterolemia induced by feeding cholesterol were both significantly increased by the presence of corn oil in the diet and not by peanut oil.

EFFECT OF DIETARY FAT ON THE FATTY ACID COMPOSITION OF EGGS AND TISSUES OF THE HEN. L. J. Machlin and R. S. Gordon (Monsanto Chemical Co., St. Louis, Mo.). *J. Poultry Sci.* 41, 1340-43 (1962). One and one-half-year-old hens were fed purified diets containing either 15% hydrogenated coconut oil or 15% safflower oil as the sole fat source for 12 weeks. Hens fed a diet containing hydrogenated coconut oil laid eggs containing considerable quantities of lauric, myristic, and myristoleic acids and significantly less arachidonic acid than hens fed safflower oil. The depot fat, liver, and heart of hens fed hydrogenated coconut oil contained significantly more lauric and myristic acid and significantly less linoleic than tissues from hens fed safflower oil. The proportion of arachidonic acid or C-20 triene in tissues was not influenced by these diets.

CHOLESTEROLEMIA AND CARDIOVASCULAR SUDANOPHILIA IN RATS FED SARDINE MIXTURES. S. A. Miller, H. A. Dymmsza, and S. A. Goldblith (Dept. of Nutrition, Food Science and Tech., M.I.T., Cambridge, Mass.). *J. Nutrition* 77, 397-402 (1962). Young male rats, fed a low-fat diet containing cholesterol, cholic acid, casein, and lard, developed in one week severe hypercholesterolemia that was maintained for the 55-week period of the test. Animals fed a similar ration in which whole ground, drained, canned sardines replaced casein and lard did not develop severe hypercholesterolemia for the entire test period. A third group was fed the casein-lard diet for 7 weeks and the sardine diet for the remainder of the test. During the initial 7-week period, these animals also developed severe hypercholesterolemia. However, when these animals were changed to the sardine diet, serum cholesterol levels decreased rapidly and approximated the levels of the animals fed sardines from the beginning of the test. Measurements of cardiovascular sudanophilia indicated that the animals fed the casein-lard diets throughout the test developed a statistically more marked sudanophilia than did animals fed the casein-lard diets followed by the sardine diets. Animals that were fed the sardine mixture throughout the test showed a level of sudanophilia intermediate between the other two groups and not statistically different from either.

CHOLESTEROL AND FATTY ACIDS METABOLISM IN THE AORTA AND OTHER TISSUES OF HYPOTHYROID RATS. A. Perin and R. Comolli (Inst. of General Pathology, Univ. of Milan, Milan, Italy). *J. Gerontology* 17, 260-66 (1962). The turnover of cholesterol

and fatty acids in liver, plasma, lung, and aorta of 36 control and 36 thyroidectomized rats was studied by means of acetate- $^{14}C$ . The disappearance of radioactive cholesterol from tissues behaves almost exponentially while that of fatty acids is a non-exponential process involving multiple reaction rates. Liver is one of the most important organs as far as lipid synthesis is concerned, while cholesterol and fatty acids of lung and aorta seem to be primarily derived from plasma. Thyroidectomy increases blood cholesterol concentration and decreases lipid synthesis in liver. In the aorta of thyroidectomized animals a decreased turnover of fatty acids was observed. DELAY OF SEXUAL MATURITY IN CHICKENS BY STERCULIA FOETIDA OIL. D. L. Schneider, A. A. Kurnick, M. G. Vavich, and A. R. Kemmerer (Dept. of Agricultural Biochem. and Poultry Sci., Univ. of Arizona, Tucson). *J. Nutrition* **77**, 403-07 (1962). Feeding as little as 200 mg/day of *S. foetida* oil which contains a high percentage of the cyclic fatty acid, stercularic acid, to sexually developing pullets resulted in: 1) retardation of comb development; 2) enlargement of gall bladder and subsequent enlargement of liver; 3) retardation of ovary and oviduct development and consequent inhibition of egg production; and 4) change in the fatty acid composition of the depot fat from one having an iodine number of around 71 to one having an iodine number of about 41.

LECTURE ON HYPERLIPIDAEMIA AND ATHEROSCLEROSIS. W. Schrade and E. Böhle (First Medical Clinic, Univ. of Frankfurt on Main, Germany). *J. Atherosclerosis Res.*, **2**, 161-70 (1962). The correlations between serum total lipid levels and age, body build and clinical manifestation of atherosclerosis, are discussed. It is concluded that although the relationship between hyperlipidaemia and atherosclerosis is not one of cause and effect, hyperlipidaemia is a sign and to some extent a measure of metabolic defects which promote the development of atherosclerosis, and as such is of significance in atherosclerosis.

LIPID AND MINERAL MATTER IN CORONARY ARTERIES AND AORTA. I. RESULTS IN A GROUP OF MEN DYING FROM CAUSES UNRELATED TO CORONARY ARTERY DISEASE. T. P. Whitehead, M. K. Alexander, D. F. Barrowcliff, A. P. Prior, and N. Marsh (Group Pathological Lab., S. Warwickshire Hospital Group, Warwick, England). *J. Atherosclerosis Res.* **2**, 199-209 (1962). The severity of atherosclerosis in the aortas and coronary arteries of a group of men dying from various causes not directly related to coronary heart disease was assessed by a quantitative chemical method using the lipid and mineral contents of the arterial walls as indices. The results show several important differences in the lipid contents of the aorta and the coronary arteries both early in life and later after deposition of lipid. In general, however, the increase of lipid with age in both arteries is mainly due to deposition of cholesterol and cholesterol esters. Mineral matter content of both arteries is not greatly increased before the fifth decade but after this age there is a precipitous rise, particularly in the coronary arteries.

II. RESULTS IN A GROUP OF MEN DYING FROM CORONARY ARTERY DISEASE. *Ibid.*, 210-16 (1962). The results of lipid and mineral matter analyses in the aorta and coronary arteries of a group of men dying from coronary artery disease were compared with those for a group of men dying from causes unrelated to this condition. There appears to be no significant difference in the lipid or mineral matter content of those dying with a fresh occlusive thrombus and those dying without. If it is accepted that the degree of atherosclerosis can be assessed by lipid and mineral matter analysis of the arteries, this work gives quantitative confirmation to the view that is often expressed as a result of macroscopic appearance, viz. that patients dying of coronary artery disease have a higher degree of coronary atherosclerosis than those dying from other causes, whether they die with or without an occlusive thrombus.

ABSENCE OF FATTY ACID SPECIFICITY DURING LIPOLYSIS OF SOME SYNTHETIC TRIGLYCERIDES BY  $\beta$ -ESTERASE PREPARATIONS FROM MILK. R. G. Jensen, J. Sampugna, and R. M. Parry, Jr. (Dept. of Animal Industries, Univ. of Connecticut, Storrs) and T. L. Forster (Dept. of Dairy Sci., Washington State Univ., Pullman). *J. Dairy Sci.* **45**, 842-47 (1962). The specificity of  $\beta$ -esterase preparations from bovine milk for short-chain fatty acids was studied by using as substrates glyceryl 1-oleate 2,3-dicaprate (OCC) and glycerol 1-palmitate 2,3-dibutyrate (PBB). These triglycerides were emulsified into skim milk, incubated with the  $\beta$ -esterase preparations for varying lengths of time at 38C, and the products of lipolysis isolated by column and thin-layer chromatography. The fatty acid compositions of the isolated free fatty acids and mono- and diglycerides were determined by gas-liquid chromatography. Absence of specificity for short-chain acids was indicated by the release

of equimolar quantities of caproate and oleate or butyrate and palmitate during lipolysis periods of up to 1 hr. When PBB was incubated at 4C for 24 hr, there was apparent specificity for butyrate which was probably caused by the comparatively rapid lipolysis of dibutyryl in contrast to glyceryl 1-palmitate 2-butyrate at the diglyceride stage.

THE BIOSYNTHESIS OF CAROTENES. J. W. Porter and D. G. Anderson (Univ. of Wisconsin, Madison). *Arch. Biochem. Biophys.* **97**, 520-8 (1962). Recent information which has significance to the problem of carotene biosynthesis is summarized, and a detailed scheme is presented. Evidence in support of this scheme of biosynthesis, including that from species other than the tomato, is given. A detailed discussion is presented of the possible enzymic reactions which may take place and of the role of the genetic factors in the formation of these enzymes.

INITIATION OF LIPID PEROXIDATION BY A REDUCED METAL ION. G. J. Smith and W. L. Dunkley (Univ. of California, Davis). *Arch. Biochem. Biophys.* **98**, 46-8 (1962). Ferrous iron was more effective than ferric in the initiation of peroxidation of heterogeneous linoleate at 30C. The oxidation observed for ferric catalysis was autocatalytic in nature. Ferrous iron caused a linear uptake of oxygen, except in the more dilute solutions in which the reaction was first linear and subsequently autocatalytic. These results are consistent with a hypothesis that the unstable reduced form of the metal produces a free radical on oxidation to the higher state.

CONVERSION OF D- $\alpha$ -TOCOPHEROL- $C^{14}$  TO TOCOPHERYL-P-QUINONE IN VIVO. A. S. Csallany, H. H. Draper, and S. N. Shah (Univ. of Illinois, Urbana). *Arch. Biochem. Biophys.* **98**, 142-5 (1962). Following administration of d- $\alpha$ -tocopherol-5-methyl- $C^{14}$  to rats, a labeled metabolite was isolated from the liver and identified by chromatographic and carrier crystallization methods as tocopheryl quinone. Evidence also has been found for the natural occurrence of trace quantities of this compound in liver and muscle extracts of mice and pigs. No evidence has been found for the presence of animal tissues of tocopherono-lactone.

THE EFFECT OF DIETARY CHANGES ON THE FATTY ACID COMPOSITION OF NORMAL HUMAN DEPOT FAT. K. J. Kingsbury, T. D. Heyes, D. M. Morgan, Christine Aylott, Patricia A. Burton, R. Emmerson, and P. J. A. Robinson (St. Mary's Hospital, London). *Biochem. J.* **84**, 124-33 (1962). Supplements of ethyl arachidonate, a cod-liver-oil fraction rich in  $C_{20}$  and  $C_{22}$  hexanes, corn and cod-liver oils were substituted for the equivalent amount of fat in a controlled diet and given separately over periods of 14 days to normal volunteers. The dietary polyunsaturated acids appeared rapidly in the plasma lipids but only sparsely in the depot fats. Marked individual changes occurred in the monoene and saturated fatty acids of the plasma and depot fat, apparently unrelated to the type of dietary fat. The fatty acid changes of the plasma and depot fat were often dissimilar. The fatty acid composition of the body is apparently in a continuous state of flux, often unrelated to dietary fat. Changes in the lipids of one body compartment are not reliable indications of changes in another.

THE FATTY ACIDS OF RHODOPSEUDOMONAS PARTICLES. A. R. Hands and W. Bartley (Univ. of Oxford). *Biochem. J.* **84**, 238-9 (1962). The lipids of the particulate fraction of *Rhodospseudomonas* contain largely (72-79%) octadecenoic acid under both aerobic and anaerobic conditions of growth. Of the octadecenoic acids, 90% was vaccenic and 10% was oleic acid under aerobic conditions; anaerobically the values were 97 and 3%, respectively. The fatty acids of the lipids of the anaerobically grown cell particles contained about 5% linoleic acid.

A METHOD FOR SEPARATING LIPID COMPONENTS OF LEAVES. V. H. Booth (Dunn Nutritional Lab.). *Biochem. J.* **84**, 444-8 (1962). Green leaves were extracted with acetone, and the extracted lipids were transferred to light petroleum and chromatographed on paper in two dimensions. About 40 spots were observed on the chromatograms, many being found in extracts of all species examined. The spots included well-known chloroplast pigments, quinones, and tocopherols. A new chlorophyll was found, less polar than chlorophyll *a* and having a spectral-absorption maxima at 409.5 and 662  $m\mu$  in ethanol. Three carotenoids were observed whose properties did not coincide with those of carotenoids previously reported in leaves. More than 20 other lipids still have not been identified.

THE FATE OF DIETARY FAT IN THE BODY. A. C. Frazer (University of Birmingham). *Chem. & Ind. (London)* **1962**, 1438-46. The author reviews (57 references) the effects of different dietary fats on the body and what the important properties of

(Continued on page 34)

(Continued from page 31)

a food fat may be from the health point of view. He discusses the influence of the properties of dietary fatty acids on their over-all absorption: chain length, degree of saturation, configuration, substituted fatty acids, fat oxidation products; the effect of the composition of dietary fats on digestion and the mechanism of intestinal absorption; fat in the chyle and in the blood; the effect of dietary fat, saturated and polyunsaturated, on blood lipids; fats in the portal blood; biosynthesis and interconversions of fatty acids; deposition of fat in the tissues (liver, adipose tissue, blood vessel walls); and the utilization and excretion of fat.

VITAMIN A UTILIZATION BY THE CHICK AS AFFECTED BY TYPE OF VITAMIN-A CONCENTRATE AND OTHER DIETARY FACTORS. I. Ascarelli and Miriam Senger (Hebrew University, Rehovot, Israel). *J. Sci. Food Agr.* 13, 332-8 (1962). Vitamin A utilization, as judged by liver storage and survival, is best when the vitamin is given as a gelatin-coated preparation. Utilization of vitamin is not influenced by variation of the dietary protein level within the range likely to be encountered in practical management. Supplementation of the diet with soy bean oil or acidulated soy bean oil soapstock seemed to improve the utilization of the vitamin. This effect may have been caused by the tocopherol content of the fats.

PURIFICATION OF PHOSPHATIDES. H. Pardun (Lever Bros. Co.). *U. S. 3,047,597*. A crude vegetable lecithin is subjected to the action of two liquids in admixture, one being a solvent for the phosphatide (cyclohexane, saturated aliphatic hydrocarbons containing 5 to 7 carbons, or chlorinated aliphatic hydrocarbons containing up to 2 carbons and boiling below 100C) and the other a non-solvent (acetone, methyl acetate, methyl formate or ethyl formate). Two liquid phases are formed, the solvent phase containing most of the phosphatide. The mixture contains between 2 and 6 parts by volume of non-solvent to 1 of solvent and the weight ratio of solvent + non-solvent to crude lecithin is between 1.5:1 and 10:1.

VITAMIN A ESTER COMPOSITIONS. W. E. Stieg and A. T. Nielsen (Chas. Pfizer & Co.). *U. S. 3,047,598*. A stabilized vitamin A composition consists of a vitamin A ester of an aliphatic hydrocarbon carboxylic acid having from 10 to 22 carbon atoms

and from 0.2 to 2.0% by weight of a food-grade antioxidant such as an alkylated phenol or alkylated polyhydric phenol in which the alkyl group has between 3 and 6 carbon atoms.

PROCESS FOR THE PRODUCTION OF THE REDUCTION PRODUCTS OF THE VITAMIN D<sub>2</sub>, VITAMIN D<sub>3</sub>, AND THE CORRESPONDING IRRADIATED PROVITAMINS. F. Schenck (Farbenfabriken Bayer Aktiengesellschaft). *U. S. 3,049,553*. The vitamin is reacted with sodium and a compound such as glacial acetic acid, propionic acid, ethyl malonate, phenol or boroglycerin glycerite.

EFFECTS OF UBIQUINONES AND PHYTYL-UBICHROMENOL UPON ENCEPHALOMALACIA AND MUSCULAR DYSTROPHY IN THE CHICK. E. Sondergaard, M. Scott, and H. Dam (Polytechnic Institute, Copenhagen, Denmark). *J. Nutrition* 78, 15-20 (1962). Ubiquinone-50 (coenzyme Q<sub>50</sub>) or ubiquinone-30 (Q<sub>30</sub>) supplementation of vitamin E-deficient chick diets has been shown to produce a slight delaying effect upon symptoms of encephalomalacia but no effect upon muscular dystrophy. Although dietary phytyl-ubichromenol had a slight effect in the prevention of nutritional muscular dystrophy in chicks receiving a diet low in vitamin E and sulfur amino acids, the effect of this compound in the prevention of muscular dystrophy was not as great as its effect in prevention of encephalomalacia.

THROMBOSIS IN CONNECTION WITH SERUM LIPIDIC CHANGES IN THE RAT. S. Renaud and C. Allard (Montreal Institute of Cardiology, Montreal, Canada). *Circulation Res.* 11, 388-399 (1962). Addition of either propylthiouracil or cholic acid to a natural diet (Purina Laboratory Chow), enriched in certain lipids, resulted in hypercholesteremia and hyperlipemia of about the same amplitude. However, only cholic acid could induce a high incidence of thrombosis and cardiac infarct and a regular decrease in the percentage of serum alpha lipoproteins with an electrophoretic pattern similar to that found in essential hyperlipimia or in certain nephrotic syndromes associated with thrombosis.

EFFECT OF DIETS WITH AND WITHOUT FAT AT LOW AND HIGH CALORIC LEVELS ON FATTY ACIDS IN BLOOD CELLS AND PLASMA OF DOGS. V. Patil and A. Hansen (Children's Hospital of the East Bay, Oakland, California). *J. Nutrition* 78, 167-172 (1962). In a study with 24 Beagle puppies receiving diets with and without fat (lard) for 6 to 7 months after weaning, it was found that the distribution of the fatty acids in erythrocytes and in plasma was influenced by the level of the calorie intake in the following respects. Trienoic acid levels were higher in blood cells and plasma in the absence of dietary fat. The level of this fatty acid in the fat-deficient state was proportional to the calorie intake. When fat was lacking in the diets, there was little difference in levels between the cells and plasma, whereas in the control animals receiving fat, no trienoic acid was found in the red cells.

INFLUENCE OF TRIPARANOL ON GROWTH, EGG PRODUCTION, AND CHOLESTEROL METABOLISM OF CHICKENS. E. L. Nichols, W. W. Marion, and S. L. Balloun (Iowa State Univ., Ames, Iowa). *Poultry Science* 41, 1494-1499 (1962). Feeding triparanol at 25, 50, or 100 mg. per pound of feed to chicks and hens led to retarded growth and higher mortality in the chicks, and to smaller eggs and lower egg production in the hens. Triparanol seemed to have no effect on either serum cholesterol or egg yolk cholesterol concentrations.

STUDIES ON THE EFFECT OF RAW SOYBEAN MEAL ON FAT ABSORPTION IN YOUNG CHICKS. M. Nesheim, J. Garlich, and D. Hopkins (Cornell Univ., Ithaca, New York). *J. Nutrition* 78, 89-94 (1962). A series of experiments indicated that dietary raw soybean meal depressed fat absorption in chicks of two breeds at two weeks of age but not at four weeks of age. Apparently fat absorption is affected by raw meal feeding rather than digestion since absorption of soybean oil or soybean fatty acid was equally affected. As little as 5% of protein from raw meal in a diet containing 25% of total protein was sufficient to cause nearly maximal depression of fat absorption. Changes in protein level of the diet could not influence fat absorption to the same extent as raw meal. A crystalline preparation of "Kunitz" soybean trypsin inhibitor did not affect fat absorption when fed to chicks. Chicks receiving a diet containing heated soybean meal plus the trypsin inhibitor had an enlarged pancreas, grew more slowly, and metabolized the diet slightly less than chicks fed a comparable diet containing heated meal.

THE CONVERSION OF VITAMIN A<sub>1</sub> TO RETINENE<sub>2</sub> IN A FRESH-WATER FISH. K. Naito and F. H. Wilt (Purdue Univ., Lafayette, Indiana). *J. Biol. Chem.* 237, 3060-3064 (1962). The formation of the retinene<sub>2</sub> chromophore of fish porphyropsin has been investigated by isolation of the chromophore after injection of tritiated vitamin A<sub>1</sub>. Vitamin A<sub>1</sub> is an effective

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precursor of retinene<sub>2</sub>. This conversion takes place in the isolated eye in organ culture. The liver is able to store vitamin A<sub>1</sub> but cannot convert substantial amounts of vitamin A<sub>1</sub> to vitamin A<sub>2</sub> in organ culture. Vitamin A<sub>2</sub> is a more effective precursor of retinene<sub>2</sub> than is vitamin A<sub>1</sub>. Triiodothyronine ( $1 \times 10^{-4}M$ ) reduces the conversion of vitamin A<sub>1</sub> to retinene<sub>2</sub>.

SPECIFICITY OF AN INTESTINAL LIPASE FOR MONOGLYCERIDES. J. C. McPherson, R. E. Askins, and J. L. Pope (Univ. of Texas, Southwestern Medical School, Dallas). *Proc. Soc. Exp. Biol. Med.* 110, 744-748 (1962). An enzyme present in homogenates of rat intestinal mucosa has been found to hydrolyze long chain saturated and unsaturated fatty acid monoglycerides, but little, if any, of either the di- or triglycerides. The  $\alpha$ - and  $\beta$ -forms of these monoglycerides appear to be hydrolyzed to a similar extent by this enzyme preparation. The relation of this enzyme to intestinal digestion and absorption of fat is discussed.

METABOLISM OF PROPIONIC ACID IN ANIMAL TISSUES. R. Mazumder, T. Sasakawa, Y. Kaziro, and S. Ochoa (N. Y. Univ. School of Med., N. Y. 16, N. Y.). *J. Biol. Chem.* 237, 3065-3068 (1962). Methylmalonyl coenzyme A racemase has been purified approximately 180-fold from extracts of sheep liver. A requirement of this enzyme for the conversion of succinyl coenzyme A to propionyl coenzyme A and CO<sub>2</sub> has been shown. Methylmalonyl coenzyme A racemase did not catalyze an exchange of methyl-labeled methylmalonic acid-C<sup>14</sup> with methylmalonyl coenzyme A. A small incorporation of tritium from H<sub>2</sub><sup>3</sup>O into methylmalonyl coenzyme A was stimulated by either racemase or brief heating at 100C. These results are consistent with the view that methylmalonyl coenzyme A is racemized by shift of its  $\alpha$ -hydrogen atom.

EFFECTS OF ASPARAGINE AND OTHER RELATED NUTRITIONAL SUPPLEMENTS UPON ALCOHOL-INDUCED RAT LIVER TRIGLYCERIDE ELEVATION. E. Lansford, Jr., I. Hill, and W. Shive (The Univ. of Texas, Austin, Texas). *J. Nutrition* 78, 219-222 (1962). Male white rats which had received a single oral dose of ethanol (4.8 gm/kg of rat) showed, 16 to 18 hours later, liver triglyceride levels elevated three- to four-fold over those of control animal receiving isocaloric glucose; this triglyceride elevation was almost completely prevented by the inclusion of a supplement of L-asparagine (2 gm/kg of rat) in the ethanol solution administered. Neither asparagine nor aspartate had any effect upon liver triglyceride content of control animals receiving glucose only.

EFFECT OF VITAMIN B<sub>12</sub> DEFICIENCY ON CHOLESTEROL METABOLISM. Elena Icayan and B. Chow (The Johns Hopkins Univ., Baltimore, Maryland). *J. Nutrition* 78, 109-114 (1962). The role of vitamin B<sub>12</sub> in cholesterol metabolism was investigated. It was demonstrated that vitamin B<sub>12</sub> deficiency results in (a) low levels of total cholesterol in the serum and the liver of male rats, but not in female rats; (b) an increase in the percentage of incorporation of C<sup>14</sup> acetate into cholesterol in liver which was reversed by vitamin B<sub>12</sub> administration; and (c) a higher specific activity of cholesterol in the liver after administration of tracer acetate. It was demonstrated further that the oxidation of acetate is not impaired.

DEMONSTRATION OF TWO KINDS OF FAT PARTICLES IN ALIMENTARY LIPEMIA WITH POLYVINYLPIRROLIDONE GRADIENT COLUMNS. E. Gordis (The Rockefeller Institute, New York City). *Proc. Soc. Exp. Biol. Med.* 110, 657-661 (1962). A gradient column of polyvinylpyrrolidone in 10% saline sharply divides the fat particles of alimentary lipemic plasma into 2 groups. The particles of both groups float in isotonic saline, density 1.006. During alimentary lipemia the 2 groups differ in rates of appearance and disappearance, and in fatty acid composition. Evidence is presented that one group consists of particles from thoracic duct chyle, and that the other group consists of particles originating elsewhere, possibly the liver.

STUDIES OF THE ELECTRON TRANSFER SYSTEM. S. Fleischer, G. Brierley, H. Klouwen, and D. Slautterback (Univ. of Wisconsin, Madison, Wisconsin). *J. Biol. Chem.* 237, 3264-3272 (1962). Evidence is presented that phospholipids play a vital role in electron transport in the mitochondrion. Mitochondria that have been nearly depleted of phospholipids by extraction with aqueous acetone lose nearly all of their respiratory activity. Phospholipids recombine spontaneously when mixed with phospholipid-deficient mitochondria; the lost respiratory activity is thereby recovered. Complete reactivation is achieved when the amount of rebound phospholipid is equal to or somewhat less than that originally present. Providing that binding is achieved, phospholipid fractions of vastly different composition are equally effective. The gross structural integrity of the

mitochondrion is preserved after extraction of phospholipids with aqueous acetone.

ENVIRONMENTAL TEMPERATURE AND COMPOSITION OF BODY FAT. H. Fisher, K. G. Hollands, H. S. Weiss (Rutgers, State University, New Brunswick, N.J.). *Proc. Soc. Exptl. Biol. Med.* 110, 832-833 (1962). Samples of subcutaneous body fat were analyzed for fatty acids and iodine values in hens maintained at 3 environmental temperatures. It was found that fat from hens maintained at 0C was significantly more unsaturated and contained more di- and hexanoic acid than fat from birds kept at either 21C or 32C. There were no changes in deep body temperature or temperature of the tissue at site of fat biopsy which correlated with the changes in fat composition. It is suggested that metabolic adjustments associated with cold adaptation are responsible for the changes in body fat composition.

ENZYMATIC ACTIVITY OF THE DEVELOPING SUBCUTANEOUS FAT ORGANS OF THE CHICK. G. L. Feldman, F. A. Doyle, M. R. Lawler, Jr., R. S. Rodgers, and L. M. Churchwell (Baylor Univ. College of Med., and The Methodist Hospital, Houston, Texas). *Poultry Science* 41, 1423-1428 (1962). The activities of eight selected enzymes were determined in cell-free extracts of the lateral thoracic fat organs of the developing chick embryo. All eight were found to exhibit patterns of increasing or decreasing activity near the sixteenth day, suggesting that embryonic adipose tissue becomes functional at that time. A lipoprotein lipase was found which differed from the adult avian enzyme in that it required heparin for lipolysis.

EFFECT OF NITRATE AND NITRITE ON VITAMIN A STORAGE IN THE RAT. R. Emerick and O. Olson (S. Dakota Agr. Exp. Sta., Brookings, South Dakota). *J. Nutrition* 78, 73-77 (1962). Rats receiving diets with and without 3% of sodium nitrate or 0.5% of sodium nitrite were administered vitamin A palmitate in oil solution or in a water dispersion, either orally or by subcutaneous injection, or  $\beta$ -carotene in oil solution by stomach tube. In all instances, during the brief periods allowed in these studies, the water dispersed source of vitamin A contributed to liver storage to a much greater extent than the oil solution, and the orally administered sources to a much greater extent than the injected sources. The feeding of nitrite, but not nitrate, significantly lowered liver storage of vitamin A from orally administered sources of preformed vitamin A, but not from injected sources.

EFFECT OF RESERPINE ON FATTY ACID. J. H. Edmonson and H. M. Goodman (Tufts University School of Medicine, Boston, Mass.). *Proc. Soc. Exp. Biol. Med.* 110, 761-764 (1962). Reserpine treatment diminished but did not abolish the mobilization of free fatty acids (FFA) which occurs during fasting in rats. Reserpine also did not interfere with increased production of FFA resulting from administration ovine growth hormone *in vivo*. Similarly reserpine failed to abolish this effect of corticotropin *in vitro* even when given in doses in excess of those known to deplete adipose tissue of norepinephrine. It may be concluded that the fat mobilizing actions of these hormones are not dependent on the mediation of epinephrine or norepinephrine. Because the dose of reserpine used in these experiments also produced a mild but prolonged hyperglycemia, it cannot be definitely established whether the reduced response to fasting in reserpine-treated animals was due to the depletion of norepinephrine from adipose tissue or to the hyperglycemia.

INTERACTIONS AMONG DIETARY FAT, PROTEIN, AND CHOLESTEROL IN ATHEROSCLEROSIS-SUSCEPTIBLE PIGEONS. T. Clarkson, R. Pritchard, H. Lofland, Jr., and H. Goodman (Wake Forest College, Winton-Salem, North Carolina). *Circulation Res.* 11, 400-404 (1962). Atherosclerosis-susceptible pigeons fed cholesterol developed coronary atherosclerosis much more frequently than pigeons maintained on a cholesterol-free diet. Fewer of the cholesterol-fed pigeons fed a low protein diet developed coronary atherosclerosis than did cholesterol-fed pigeons on a high protein diet. Corn oil decreased the frequency of coronary atherosclerosis in cholesterol-fed pigeons. Limited evidence suggests that the coronary arteries and aortae in non-cholesterol-fed birds are independent of each other in their susceptibility to atherosclerosis.

COMPARISON OF CHOLESTEROL UPTAKE IN NORMAL AND ATHEROSCLEROTIC INDIVIDUALS. D. A. Clark, Carrie B. Haven, and J. J. Franks (Brooks Air Force Base, Texas). *Proc. Soc. Exp. Biol. Med.* 110, 764-766 (1962). A method is described for measuring "cholesterol uptake" of serum incubated with solid cholesterol. The method has been used to measure cholesterol uptake of serum from normal young men and from older men hospitalized with cardiovascular disease. All sera

examined were found to dissolve additional cholesterol. Cholesterol uptake by serum from the hospitalized group was equal to or greater than uptake of serum from the normal group. The data indicate that the capacity of serum lipoproteins to bind cholesterol is not fully saturated in either the normal young men or in the patients with atherosclerosis.

**EFFECT OF DIPHENYLHYDANTOIN ADMINISTRATION UPON CONCENTRATION OF LIVER AND AORTIC LIPIDS.** A. C. Chung, B. Y. Duren, and J. C. Houck (Lankenau Hospital, Philadelphia, Pa., and Children's Hospital, Washington, D. C.). *Proc. Soc. Exp. Biol. Med.*, 110, 788-789 (1962). Twelve daily intraperitoneal injections of one ml suspensions of 25 mg of sodium biphenyl hydantoinate (Dilantin) in isotonic saline to rats resulted in a significant decrease in tissue concentration of neutral glycerides of both the aorta and liver when compared with the tissue from both normal and saline injected control animals.

**DETERMINATION OF LINOLEATE REQUIREMENT OF SWINE BY A NEW METHOD OF ESTIMATING NUTRITIONAL REQUIREMENT.** W. Caster, P. Ahn, E. Hill, H. Mohrhauer, and R. Holman (The Hormel Institute, Austin, Minn.). *J. Nutrition* 78, 147-154 (1962). There are 4 distinct metabolic processes related to linoleate nutrition. Two of these were found to correspond to linoleate requirements of 0.6 and 1.5% of calories, respectively. The former of these (0.6 cal./100 cal. of diet) was associated with the decrease in tissue diene and increase in tissue triene that is observed as linoleate intake decreases. The latter (1.5 cal./100 cal. of diet) was associated with tetraene metabolism in the tissues, and total body weight gain. The other two metabolic processes were not interpreted in terms of nutritional requirements. One was related to the storage of excesses. The other was associated with tissue lipid changes observed at linoleate intakes below 0.4% of calories, and might be referable to variations of linolenate in the diets used in this experiment.

**EFFECTS OF LEVELS OF CERTAIN DIETARY LIPIDS ON PLASMA CHOLESTEROL AND ATHEROSCLEROSIS IN THE CHICK.** D. Beeler, J. Rogler, and F. Quackenbush (Purdue Univ., Lafayette, Ind.). *J. Nutrition* 78, 184-188 (1962). Chicks fed a synthetic diet containing 20% of hydrogenated coconut oil (HCO) and 1% of cholesterol developed atherosclerotic lesions in 20 weeks. Cholesterol levels in the blood plasma and cholesterol esters in the aortic lipids were high in comparison with those of birds which received no dietary cholesterol. With a low-fat diet (0.5% HCO) plasma cholesterol was not elevated by cholesterol feeding. Vitamin A (167 IU/gm of diet) inhibited sharply the vascular degeneration and the increase in plasma cholesterol and aortic ester cholesterol in chicks fed the high-fat diet. Vitamin E (0.25 mg of dl- $\alpha$ -tocopherol/gm of diet) showed no such effect. Bile salt (0.3%) in the diet nullified the effect of vitamin A. Substitution of soybean oil for half of the HCO inhibited the increase in plasma cholesterol and inhibited vascular changes and ester cholesterol accumulation similar to vitamin A.

**DISTRIBUTION OF FATTY ACIDS BETWEEN THE  $\alpha'$ - AND  $\beta$ -POSITIONS OF EGG PHOSPHATIDYLCHOLINE.** J. C. Hawke (Massey College, New Zealand). *Chem & Ind. (London)* 1962, 1761. Phospholipid was prepared from freeze-dried egg yolk by acetone precipitation of the extracted lipids, and phosphatidylcholine was obtained from the mixed phospholipids by using successively cellulose, alumina and silicic acid columns. The fatty acids in the  $\beta$ -position were removed by reacting the phosphatidylcholine with snake venom followed by alkaline hydrolysis of the resulting lysolecithin. The preparation contained about 30% palmitic acid, with about 60% of the molecules having palmitic acid in the  $\alpha'$ -position. Most of the remaining molecules have either stearic or an unsaturated acid (most often oleic) in this position. Most of the phosphatidylcholine molecules have unsaturated acids in the  $\beta$ -position. The proportion of molecules containing palmitic acid is little influenced by the nature of the dietary lipids; however, the increase in average unsaturation of up to 50% when cod liver oil is fed is due to the replacement of mono-ethenoid acids by poly-ethenoid acids.

**RELATION OF DIETARY FATS TO BLOOD LIPIDS IN YOUNG MEN.** Ellen H. Morse, Elizabeth Bicknell, E. P. Lewis, Susan B. Merrow, and C. A. Newhall (Vermont Agricultural Expt. Station). *J. Am. Dietet. Assoc.* 41, 323-7 (1962). Serum cholesterol, lipid phosphorus, total fatty acids, and serum triglycerides were determined for 12 young men, all consuming the same diet except for the dietary fats. All received 37% of their total calories from fat; one group ate butter, another group received a "100% corn oil margarine," and

(Continued on page 39)



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## Distillation Products Industries

the third group "a margarine containing liquid corn oil." Average serum cholesterol levels of the two groups receiving margarine were significantly lower than those of the butter-eating group. After 3 weeks, the levels of the group receiving butter were significantly higher than at the start. There were no significant changes in serum lipid phosphorus levels or in total fatty acids with any treatment. Serum triglycerides did not change significantly with respect to the starting levels, but the levels for the two margarine groups averaged higher than the butter group.

PROCESS FOR MANUFACTURING POWDERED PREPARATIONS CONTAINING FAT-SOLUBLE VITAMINS, ESSENTIAL OILS, AND MIXTURES THEREOF. S. Ohtaki. *U. S. 3,056,723*. An oil material containing fat soluble vitamins, essential oils, and mixtures thereof, is mixed with an emulsifying agent and a substance having film forming properties. The resultant emulsion is sprayed at a temperature lower than 60C into a current of an atomized dehydrating agent such as an aliphatic polyhydric alcohol, an aromatic alcohol, or a monohydric alcohol of less than 5 carbon atoms. The dehydrating agent is separated from the oil material so that the oil material is obtained as a dry powder, particles of which are enveloped in a film.

### • Drying Oils and Paints

USE OF THE INDEX OF REFRACTION IN THE PRODUCTION OF DEHYDRATED CASTOR OIL. M. Fauve. *Oleagineux* 17, 703-705 (1962). Refractive index can be used to follow and accurately regulate the dehydration of castor oil. The hydroxyl value, iodine value, and viscosity are direct functions of the refractive index in this case. So, once the calibration curve has been drawn, a refractometer can be used to determine each of the constants at any point in the process. An accurate refractometer is necessary, readable to  $\pm 0.0002$  unit.

STYRENE MODIFIED ISOPHTHALIC ALKYDS. B. A. Bolton (Standard Oil Co.). *U. S. 3,054,763*. The described resin is prepared by the reaction of (A) (i) castor oil fatty acids (ii) tall oil fatty acids (at a ratio of 20/80 to 30/70), (iii) pentaerythritol, and (iv) benzoic acid, in which the pentaerythritol and the benzoic acid are present in amounts such that the theoretical ester product contains an average of from 2.7 to 2.9 free hydroxyl groups. The reactants are maintained at a temperature between 400 and 475F in an inert atmosphere with continuous removal of the water of reaction until cessation of the evolution of water. (B) An alkyd resin is produced by reacting the product mixture of (A) with isophthalic acid in an amount such that the oil-length of the alkyd resin is about 50% and the ester is present in an excess of between 10-20 mol %, at a temperature between 400-525F, in an inert atmosphere and with continuous withdrawal of water of reaction, until the acid number of the condensation product is between 12 and 20 and the cure time is between about 50 and 70 seconds. (C) The alkyd resin product of (B) is then reacted with an amount of styrene from 30-45 weight % based on the alkyd resin, in the presence of a peroxy catalyst in an inert atmosphere at a temperature between 275 and 350F for a time such that styrenated oil-modified alkyd resin has a cure time of from 0-15 seconds.

FLEXIBLE EPOXY RESIN COMPOSITIONS AND CURED PRODUCTS. H. A. Newey (Shell Oil Co.). *U. S. 3,057,309*. The described composition consists of: (1) 10 parts to 90 parts by weight of a glycidyl polyether of a polyhydric compound such as polyhydric phenols or alcohols and (2) 90 to 10 parts of a glycidyl ester of a polymerized long chain unsaturated fatty acid.

### • Detergents

THE SYNTHESIS OF ALIPHATIC SULFONIC ACIDS. E. Goethols. *Industrie Chimique Belge* 27, 663-68 (1962). This article gives a review of different means of synthesis of aliphatic sulfonic acids, illustrated by examples taken from the literature. The methods of synthesis are grouped into five sections—methods to introduce the sulfur containing group into the organic molecule, action of sulfuric acid and its derivatives, sulfur dioxide, sulfites, and sulfoalkylant agents.

DETERGENT COMPOSITIONS. W. G. Toland and M. J. Schlatter (California Research Corp.). *U. S. 3,053,771*. The described composition consists of 15 to 40 parts by weight of water-soluble alkylbenzene sulfonate detergent having from 12 to 15 carbon atoms in the alkyl group, 60 to 75 parts of water-soluble inorganic detergent builders and, as a foam improving

(Continued on page 43)

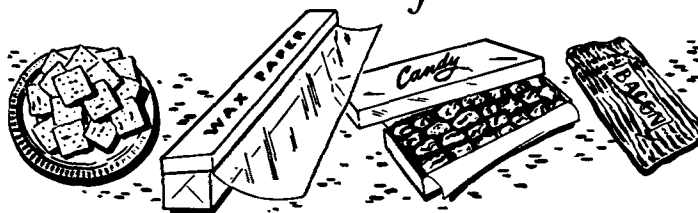
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ANTIOXIDANT	FORM	PRODUCTS PROTECTED
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Sústane 3-F	Flake	
Sústane 3	Liquid	
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agent, 1 to 20 parts of a water-soluble n-alkyl o-carboxybenzyl sulfide salt having 12 to 18 carbon atoms in the alkyl group.

**DETERGENT POWDERS.** N. A. Hurt and S. A. Mitchell (Lever Brothers Co.). *U. S. 3,054,753*. A detergent composition in powder form which has good bactericidal and storage properties consists of (1) 60-95% of at least one alkaline inorganic detergent salt selected from the group consisting of the sodium and potassium silicates, phosphates, carbonates, and borates; (2) 0.5 to 15% of a synthetic anionic or nonionic nonsoap detergent; (3) 0.1 to 15% of a solid alkali metal hypochlorite compound; and (4) an amount up to about 5% of an ortho- or para-substituted benzene sulfonamide.

**LIQUID, SURFACE-ACTIVE SALTS.** H. M. de Jong, J. G. Aalbers, and J. A. Brenkman (N. V. Chemische Fabriek "Andrelon," Bodegraven, Netherlands). *U. S. 3,054,820*. The described materials are liquid neutralization products of compounds of the formula  $C_{12}H_{25}(OCH_2CH_2)_nOSO_3OH$  in which the  $C_{12}H_{25}$  radical is derived from lauryl alcohol and n is a number having an average value from 2 to 3, with an amine such as diethylamine, isopropylamine, or butylethanolamine.

**ANHYDROUS ANION-ACTIVE DETERGENTS IN THE FORM OF AEROSOLS.** R. Charle and J. Pomot (Societe Anonyme dite: Societe Monsavon-L'Oreal, Paris). *U. S. 3,055,834*. The described composition is a true solution consisting of (a) at least one liquefied propellant gas such as butane, trichloromonofluoromethane, dichlorodifluoromethane, or trichlorotrifluoroethane and (b) a detergent product having the formula  $R(OCH_2CH_2)_nOSO_3NH_4$  in which R represents a radical selected from a group consisting of straight chains having not less than 10 nor more than 20 carbon atoms and corresponding to alcohols obtained by the "oxo" synthesis; octyl phenyl; and nonylphenyl; and n represents a number between 1 and 6. The liquefied propellant gas is present in the composition in major proportion and the detergent product is present in minor proportion.

**DRYING PROCESS FOR DETERGENTS.** J. A. Monick (Colgate-Palmolive Co.). *U. S. 3,055,835*. A process is described for drying detergents which consist of a mixture of 10-80% of sodium alkyl benzene sulfonate detergent in which the alkyl group is of 12-18 carbon atoms and 90-20% of a water soluble inorganic salt such as sodium sulfate, sodium chloride, pentasodium triphosphate, or sodium chloride. A crutcher mix is prepared which contains 40-65% of the synthetic organic detergent and inorganic salt and 60-35% water. The mix is heated to a temperature of 120-210F and sprayed at a pressure of 500-1500 p.s.i. through an orifice of diameter between 2.0 and 3.2 mm in a conical spray pattern into heated drying gas. The sprayed particles are dried to a form retaining substantially globular, particulate product of low moisture content. The particles are then cooled to a temperature at which they will be non-tacky and non-agglomerative.

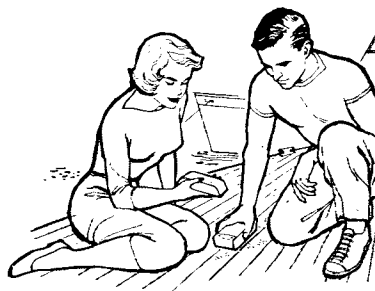
**SYNTHETIC DETERGENT CAKE AND PROCESS FOR MAKING THE SAME.** G. G. Wittwer. *U. S. 3,055,837*. A solid detergent bar consists of a homogeneous mixture of a compound taken from the class consisting of sodium lauryl isethionate and mixtures of sodium lauryl isethionate with sodium stearyl isethionate, with an alkyl aryl sulfonate which has detergent properties. The alkyl radical of the sulfonate averages at least 10 carbon atoms. The sulfonate comprises 10-90% of the bar on a dry weight basis.

**DRY-CLEANING COMPOSITION AND PROCESS.** H. Wedell (Bohme Fettchemie G.m.b.H.). *U. S. 3,057,676*. The dry-cleaning bath consists of a dry-cleaning solvent, a quantity of water not greater than 1%, cleansing intensifiers selected from the group consisting of alkyl sulfates, alkyl sulfonates, alkyl benzene sulfonates, ethylene oxide addition products of high molecular weight fatty alcohols and fatty acids, and high molecular weight acid amides, amines and mercaptans, and 0.1 to 10 gm./liter of high molecular weight alkyl monoamines having from 8 to 32 carbon atoms in the molecule. The alkyl monoamines are selected from the group consisting of those with at least 1 alkyl radical having at least 8 carbon atoms, derivatives in which the alkyl radicals are interrupted by heteroatoms (O, N, or S), and derivatives in which the alkyl radical are substituted by groups such as amino, imino, or hydroxyl groups in the form of their free bases.

**SYNTHETIC DETERGENT CAKE AND PROCESS FOR MAKING THE SAME.** G. G. Wittwer. *U. S. 3,057,805*. A solid detergent bar consists of a homogeneous mixture of 10-90% of sodium stearyl isethionate and from 90-10% of an alkylaryl sulfonate having detergent properties, and alkyl radicals of the sulfonate averaging at least 10 carbon atoms.

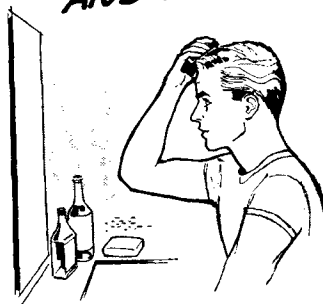
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Specification	GROCO 57 HYDROGENATED TALLOW F.A.	GROCO 2 1°-3°C. TITRE OLEIC ACID
Titre	57°-59°C.	3°C. max.
Titre	134.5°-138°F.	37.4°F. max.
Color 5¼" Lovibond Red*	2.0 max.	0.8 max.
Color 5¼" Lovibond Yellow*	10 max.	8 max.
Unsaponifiable	0.75% max.	1.5% max.
Saponification Value	204-207	198-203
Acid Value	203-206	197-202
% F.F.A. as Oleic Acid		99 min.
Iodine Value (WIJS)	4-6	95 max.
Refractive Index 50°C. (Av.)		1.4505
*1" cell for GROCO 2		

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