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, and T. H. Smouse

• Fats and Oils

DISTRIBUTION OF FATTY ACIDS IN MILK FAT FRACTIONS. L. M. Smith, C. P. Freeman, and E. L. Jack (Dept. of Food Science, and Tech., Univ. of California, Davis). *J. Dairy Sci.* **48**, 531–536 (1965). Cow milk fat triglycerides were fractionated by low-temperature crystallization from pentane, and the −60C filtrate was separated further by countercurrent distribution (CCD). Representative fractions were analyzed for fatty acid composition by gas chromatography. Long-chain triglycerides migrated early in CCD and contained comparatively large amounts of $C_{18:1}$ acid, which was associated predominantly with $C_{16:0}$ and $C_{18:0}$ acids in the glycerides. Short-chain triglycerides migrated later in CCD and, as their short-chain acid content increased, there was a concurrent decrease in $C_{18:1}$. Fractions representative of the short- and long-chain triglyceride groups were studied by lipase hydrolysis, and the proportion of the total amount of each fatty acid esterified at the 2-position was calculated. The results confirmed the nonrandom distribution of most of the major fatty acids in milk fat. Improved methods of separation and analysis are needed to elucidate the structure of the individual triglycerides present.

PHYSICO-CHEMICAL ANALYSIS OF THE SYSTEM GLYCEROL-WATER. V. B. Chernogorenko and P. L. Velikodnyi (Inst. of General and Inorganic Chemistry, Acad. Sci. Ukr. S.S.R. and Kiev Technological Inst. for the Food Industry). *Zhur. Obshch. Khim.* **35** (2), 205–9 (1965). Studies were made to determine the form of the interaction between water and glycerol, two liquids with hydrogen bonds. The electrical conductivity and structural stability were studied. The cavitation threshold was determined. The glycerol used had the following properties: (1) absence of chlorides, (2) sulfate content < 0.001 g./l., (3) absence of heavy metals, (4) sucrose and glucose not detected, (5) fatty acid esters calculated on the basis of $C_3H_7COOC_2H_5$ less than 0.1%, (6) substances charred by H_2SO_4 absent, (7) substances reduced by an ammoniacal solution of silver not detected, and (8) index of refraction at 20C of 1.4738, d_{20}^{20} 1.261. Water distilled twice was used. The conductivity measurements were made using a Wheatstone bridge with an electronic oscillograph as the null instrument. To determine the amount of stable structure in the glycerol-water system an ultrasonic method of rupturing the liquid with formation in it of cavitation bubbles was used. The studies showed that in the glycerol-water system the interaction between the glycerol and water was associated with the rupture of the hydrogen bonds between molecules of the initial components and formation of new hydrogen bonds between glycerol and water. This interaction proceeds with time. The maximum in electrical conductivity coincides with minimum stability of the structures formed in the system at the expense of the hydrogen bonds.

COMPLETE SYNTHESIS OF THE GLYCERIDE BASES OF VEGETABLE OILS AND ANIMAL FATS. T. K. Mitrofanova, A. A. Kraevskii, G. A. Serebrennikova, V. N. Klykov, E. N. Evonka, G. G. Zapesochnaya, I. K. Sarycheva, and N. A. Preobrazhenskii (M. V. Lomonosov Moscow Inst. of Fine Chem. Technol.). *Doklady Akad. Nauk S.S.S.R.* **160** (1), 133–36 (1965). The fatty acids comprising the bases of common vegetable oils and animal fats were synthesized. The authors developed a method for the synthesis, and obtained and studied the physico-chemical properties of more than 80 triglyceride components of the oils. In addition, they prepared a synthetic mixture identical in properties and in glyceride composition to natural fats and oils. Studies of cocoa butter and milk fat were presented as examples. For cocoa butter, a total of 40 theoretically possible triglyceride components was synthesized. Mixed acid and monoacid triglycerides were obtained by direct synthesis from the higher fatty acid chlorides and glycerol by benzylidene and isopropylidene protection. The interesterification of the glycerol esters of lower fatty acids by higher fatty acid esters was also employed as was the direct esterification of glycerol by acids derived from the methyl esters or acid chlorides. The resulting triglycerides were purified by adsorption chromatography on silica gel. Control of the purity of the compounds was accomplished by paper chromatography, thin-layer chromatography, infrared and ultra-violet spectroscopy and x-ray analysis. The following characteristics are tabulated for cocoa butter: density, index of refraction, iodine value (calcd. and observed), and melting points of the polymorphic forms. About 60 different acids were found in milk fat. On the basis of the molar proportions of the triglycerides found in the natural fats, mixtures of the synthetic triglycerides were prepared. After interesterification of this mixture, a preparation was obtained which had characteristics close to those of milk fat.

EFFECT OF SEASONAL CONDITIONS ON THE FATTY ACID COMPOSITION OF LINSEED OIL IN SUCCESSIVE GENERATIONS. G. V. Novitskaya, A. V. Kaverina and A. G. Vereshchagin (K. A. Timiryazev Inst. of Plant Physiology, Acad. Sci. U.S.S.R.). *Doklady Akad. Nauk S.S.S.R.* **160** 230–31 (1965). A study was made of the changes in fatty acid composition of linseed oil with the growth of the plants under different environmental conditions.

THE DETERMINATION OF FREE AND PLASMALOGEN-BOUND ALDEHYDES IN LIPID FRACTIONS. C. Pries and C. J. F. Böttcher (Gaubius Inst. of the State Univ., Leiden, The Netherlands). *Biochim. Biophys. Acta* **98**, 329–334 (1965). The p-nitrophenylhydrazine method for the determination of the sum of free and plasmalogen-bound aldehydes in lipid fraction has been improved by increasing the rate of reaction and by reducing the blank value. By combined determinations in acid and in neutral medium, the method can be used for the individual determination for free and plasmalogen-bound aldehydes in mixtures.

THE "SINOLEA" SYSTEM FOR OLIVE OIL RECOVERY. II. J. Albaiges. *Lipidos* **24**, 157–161 (1964). The yields of olive oil obtained in several European countries using the "Sinolea" extraction system and a "Sinolea-press" combination are compared to the classic system using compression alone. The average oil content (wet basis) of the cake by the "Sinolea-press" system was of 4–5%, as compared to 7–12% with classic methods.

ARGENTINIAN PEANUT OIL. II. PRECIPITATION TEMPERATURES AND FATTY ACIDS COMPOSITION. P. Cattaneo, R. Gimenez and A. L. Colombo. *Informaciones sobre Grasas y Aceites (Instituto Argentino de Grasas y Aceites)* **10**, 13–22 (1964). The Bellier test to determine the genuinity of olive oil has been modified by Lüers and by Evers. The IRAM (Argentine Inst. for Standardization of Materials) uses the Lüers modification, whereas the AOAC uses the Evers modification. The methods IRAM and AOAC for determining the precipitation temperature of the fatty acids derived from peanut oils (Bellier test) have been analyzed, specially in relation to the fatty acids composition of these oils. It has been established that the main factors affecting these temperatures are: a) the saturated fatty acids (C_{20} to C_{24}) content, b) the relative proportions of arachidic, behenic and lignoceric acids, c) the iodine value of the oils. The quantitative value of these methods in regard to the mixture of olive and peanut oils is discussed.

NOTES ON OIL DEODORIZATION. III. F. Bengoechea. *Lipidos* **24**, 162–164 (1964). A brief description is given of the process and machinery used for oil deodorization. The oil losses, which occur during distillation and by mechanical carry-over vary between 0.3–0.8% by weight in modern installations. Formulas to determine the heat losses in the deodorizer and the amount of water to be used in the barometric condenser are given.

A STUDY OF THE UNSAPONIFIABLES IN PEANUT OIL. III. SEPARATION BY CHROMATOGRAPHIC FRACTIONATION. M. Walbecq. *Rev. Franc. Corps Gras* **2**, 41–45 (1965). The author has studied the fractionation of the unsaponifiables in peanut oil by column and thin-layer chromatography. Aluminum oxide column chromatography separates the hydrocarbons into three groups: paraffins and olefins, squalene, and beta carotene and similar pigments. Aluminum oxide (not silica gel) thin-layer preparative chromatography, using pentane-ethyl ether (80/20) as the developing solvent, gave good separations of xanthophylls, sterols, triterpenoid alcohols, alcohols and tocopherols. Both chromatographic methods work in the presence of free fatty acids which are not eluted.

THE FORMATION OF ISOOLEIC ACID DURING HYDROGENATION USING NICKEL AS A CATALYST. A. P. Necaev and J. I. Denisenko. *Piscev. Technol.* **6** (43), 74–5 (1964). The formation of isooleic acid increased as the temperature of hydrogenation increased. Nickel catalyst formed more isomers than a copper-nickel catalyst. (Rev. Franc. Corps Gras).

THE EXAMINATION OF FAT BEARING SEEDS USING GAMMA RAYS. V. G. Scerbakov and P. I. Kudinov. *Piscev. Technol.* **6** (43), 144–6 (1964). A method using gamma rays permits determination of a quantitative characteristic which defines the degree

of deterioration of the seed and establishes the percentage of kernels that are void or deteriorated. (Rev. Franc. Corps Gras).

AUTOXIDATION. XXX. SOME CONCEPTS ON THE MECHANISMS OF HYDROPEROXIDATION REACTIONS OF METHYL STEAROLATE. N. A. Kahn (E. R. Lab. Dacca, East Pakistan). *Oleagineux* **29**, 25 (1965). The processes of autoxidation in the olefinic systems have been compared with those in acetylenic ones. Methyl stearolate followed the same autoxidation pattern. The total oxygen absorption curves at temperatures 45, 60 and 70C exhibited S-shaped features with four stages of autoxidation: induction, hydroperoxidation, main autoxidation and decline. The main autoxidation of methyl stearolate is rapid due to concentration of electrons in the triple bond. Pure monomeric hydroperoxides of methyl stearolate, with triple bond intact, have been isolated from seven samples autoxidized under different conditions, proving the similar nature of hydroperoxidation reactions. The physical and chemical analyses of the hydroperoxides, their derivatives, and their degradation products, have established that only two isomeric hydroperoxides are formed during autoxidation with the shift of triple bond, as in the case of olefinic systems.

APPLICATION OF NUCLEAR MAGNETIC RESONANCE TO THE STUDY OF LIPIDS. S. Kuzdzal-Savoie (Central Station of Milk Res., Jouy-en-Josas, Fr.). *Rev. Franc. Corps Gras* **12**, 90 (1965). Nuclear magnetic resonance spectroscopy allows the study of molecular structures. The theoretical principles which lead directly to analytical applications are presented in a simplified manner. The application of nuclear magnetic resonance spectroscopy to the study of lipids depends solely on the behaviour of the hydrogen nucleus. The spectra obtained yield information regarding the number, the nature and relative positions of functional groups containing hydrogen atoms present in a lipid compound. A detailed descriptive study of the characteristic spectra of different fatty acids, simple esters, glycerides and natural fats shows the very great possibilities of nuclear magnetic resonance spectroscopy in identifying lipids. Examples of application to the quantitative analysis of lipids are also presented.

SEPARATION OF SOME LIPID COMPONENTS AND UNSATURATED FATTY ACID ISOMERS BY COMPLEXING WITH SILVER SALTS. J. P. Carreau and J. Raulin (Center of Res. on Nutr., of C.N.R.S., Bellevue, Fr.). *Rev. Franc. Corps Gras* **12**, 87 (1965). The principle of the formation of complexes between silver nitrate and olefins is described as is its adaptation to thin-layer and column chromatography of various lipids. The principal applications described deal with separation of triglycerides, saturated or unsaturated fatty acids methyl esters, geometrical and positional isomers, cholesterol and sterol esters.

ON THE DEVELOPMENT OF OIL ACIDITY DURING THE STORAGE OF PEANUTS. J. Vizern and E. Vizern (Marseille, Fr.). *Rev. Franc. Corps. Gras* **12**, 83 (1965). The increase of oil acidity during storage of peanuts is produced by the enzymatic action of microorganisms concentrated in dust. The nuts themselves are free of lipases. Three types of samples were studied: (1) an autoclaved peanut paste, (2) the paste seed with the dust of nuts whose molds have been previously activated, and (3) the autoclaved paste blended with aseptically ground paste. In the latter case lipases present in the original peanuts would not be destroyed. Acidities of the oils extracted from (1) and (3) were not modified, while the acidity of the oil from (2) increased very rapidly.

MUSTARD OIL. I. FRACTIONATION OF FATTY ACIDS THROUGH UREA COMPLEXES AND PREPARATION OF ERUCIC, OLEIC AND LINOLEIC ACIDS. N. A. Khan, *Oleagineaux* **26**, 101 (1965). The distribution pattern of mustard oil fatty acids has been established with the aid of fractions obtained by urea complex formation under controlled conditions. The methods of preparing pure samples of erucic, oleic and linoleic acids, their methyl esters and glycerides have been described. Prospects of preparing them in bulk appear to be feasible.

MEASUREMENT AND PREVENTION OF OXIDATIVE DETERIORATION IN COSMETICS AND PHARMACEUTICALS. J. P. Ostendorf (N. V. Chem. Fabriek, Bussum, Holland). *J. Soc. Cosmetic Chemists* **16**, 203 (1965). The mechanism of oxidation and the factors that are responsible for the initiation of oxidation are reviewed. The various methods with which the oxidation can be detected are mentioned. With this knowledge in mind the prevention of oxidation is reviewed; first the mechanism, then the various general precautions to be taken, and the use of antioxidants.

DETECTION OF ADULTERANT CASTOR OIL IN OTHER VEGETABLE OILS BY THIN-LAYER CHROMATOGRAPHY. G. Lakshminarayana and V. V. S. Mani (Reg. Res. Lab. Hyderabad 9, India). *Oils Oilseeds J. (Bombay)* **17**, 16 (1965). Thin-layer chromatography on silica gel G with a petroleum ether-ethyl ether-acetic acid (60:40:2) mixture as developer and iodine vapor as indicator permitted detection of adulteration of vegetable oils with castor oil down to 1% level. The time taken for each run is 1 to 2 hours. Free fatty acids and autoxidation products do not interfere.

SEPARATION OF THE STEROLS OBTAINED FROM DEODORIZER DISTILLATES. *Piscev. Technol.* 1, 89–91 (1965). The unsaponifiable fraction of deodorizer distillates from hydrogenated fats contains 3–5 times less sterols than the deodorizer distillates from sunflower seed oil (10–12%). (Rev. Franc. Corps Gras).

PROCESS OF PREPARING STABLE TRIGLYCERIDES OF FAT FORMING ACIDS. R. O. Feuge and W. Landmann (Sec'y. of Agr., U.S.A.). *U.S. 3,170,799.* A process for producing the thermodynamically stable polymorphic form of solid triglyceride mixtures in which at least 20 weight per cent consists of closely related triglyceride types and in which the triglyceride component fatty acids contain at least 12 carbon atoms, consists of forcing the triglyceride mixture at a temperature below the melting point and at a pressure of at least 100 pounds/square inch through an orifice about 0.01 inch in diameter.

THE REVERSION OF THE ODOR OF FISH AS A FUNCTION OF ISOMERIZATION AND POLYMERIZATION OF THE FATTY ACIDS IN WHALE OIL. T. A. Horin. *Piscev. Technol.* 1, 114–17 (1965). Undeodorized whale oil is not subject to flavor reversion if it contains at least 10–13% polymers made from fatty acids having three or more double bonds. (Rev. Franc. Corps Gras).

CEREAL GERM LECITHIN. H. Neuman (Augsburg, W. Ger.). *Soap, Perfumery Cosmetics* **38**, 147 (1965). The composition and properties of lecithin were described. As compared with soya and egg lecithin, cereal germ lecithin has an unusually large linolenic acid content and in this respect is superior to egg lecithin. Germ lecithin oil is produced from maize and wheat germs by a particularly gentle process and has a pure lecithin content of about 15%. It is a yellow, oil-soluble product with a slight smell of cereal germs. Apart from pure germ lecithin, it contains 85% of maize and wheat germ oil with all the fat-soluble active substances of the cereal germs. Its content of essential fatty acids is about 45%; its vitamin E content is at least 0.2%. Germ lecithin oil can be used in the manufacture of all fat containing cosmetics preparations. It regulates the water economy of the skin, improves the elimination functions and turgescence, and reduces the pH value, thus creating a natural acid film. By virtue of its hydrophilic groups, germ lecithin is a good oil-in-water emulsifier and promotes the penetration of active substances into the subcutaneous cellular tissue.

FLUID SHORTENING COMPOSITION. N. B. Howard and P. M. Koren (Procter & Gamble Co.). *U.S. 3,186,851.* A fluid shortening composition, suitable for use in commercial baking and cream icing operations comprises a normally liquid glyceride oil containing from 0.5 to 8% by weight of the composition of the monoester of propylene glycol and saturated fatty acid containing 14–22 carbon atoms. The shortening composition contains in addition 0.5 to 10% saturated fatty acid having from 14–22 carbon atoms and 1–9% of a material selected from the group consisting of condensation products of saturated fatty acid having from 14–22 carbons and monohydroxymonocarboxylic acid having from 2–6 carbons and the alkali metal and alkaline earth metal salts of the condensation products.

THE HYDROGENATION OF SUNFLOWERSEED OIL WITH OUTSTANDING GAS DISPERSION. G. M. Pavlov, *et al. Piscev. Technol.* 1, 86–8 (1965). The use of a compartmented filter for the dispersion of the product during the hydrogenation of sunflowerseed oil creates an almost perfect area of hydrodynamic foaming. The use of a very efficient bubbler to create foaming accelerates the saturation of sunflowerseed oil, at 180C, 1.3 times; at 200C, 1.7 times; at 220C, 2 times. (Rev. Franc. Corps Gras).

BROMINATED OILS. J. F. Jeffries (Abbott Labs.). U.S. *3,187,019.* The process of producing a stable oil comprises the

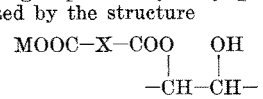
steps of: adding at least 0.3% by weight of an organic peracid to a brominated vegetable oil in which 87–97% of the initially present double bonds are saturated with bromine; mixing the components at a temperature between 0 and 40C for a period of least one hour; neutralizing the mixture; and removing the immiscible by-products from the mixture.

EDIBLE OIL BLENDS. L. H. Going (Procter & Gamble Co.). *U.S. 3,186,854.* A clear liquid glyceride oil composition characterized by substantial stability against clouding and stearin deposition (chill test of at least 5½ hours at 32F) comprises the blend of at least 2 fatty triglyceride oils. At least one of the oils is a summer oil normally having poor stability against clouding and stearin deposition and at least one other is a winter oil normally having good stability. A crystallization inhibitor is present in an amount of 0.005% to 0.5%. The blend contains from 15–85% of summer oil and has such proportions of summer to winter oil as to satisfy the condition that the relative transparency, defined as I_o/I in which I_o is the transmitted intensity of the winter oil component and I is the transmitted intensity of the uninhibited blend of summer and winter oils, should equal 0.5–1.0 when held at 33.5F for 90 minutes and photoelectrically measured with monochromatic light having a wave length of 600 mu.

COOL TASTING MARGARINE. H. B. Oakley and T. J. Guffick (Lever Brothers Co.). *U.S. 3,189,465.* A cool tasting margarine is described in which the total fat has the following dilatations: at 37C below 40, at 30C below 150, at 25C below 350 and at 15C at least 350 units higher than at 25C. The total fat consists of 0 to 10% of butter and 100 to 90% of a fat composition which is substantially free from trisaturated glycerides other than those characteristic of palm kernel oil and coconut oil, the fat composition, the lower melting moiety of a fractionated mixture of palm oil and an oil selected from the class consisting of lard and liquid oils hardened to a slip-melting point of 33–35C.

• Fatty Acid Derivatives

WATER SOLUBLE POLYMERS OF EPOXIDIZED FATS. T. W. Findley and H. E. Saewert (Swift & Co.). *U.S. 3,180,749.* A water soluble coating composition comprises a fatty acid ester containing aliphatic hydrocarbon radicals having 9–29 carbons and at least 1 unreacted oxirane group and substituted at least once and not more than 4 times along the radicals on adjacent carbons with ester groups and hydroxy groups. The substitution is characterized by the structure



where X is selected from the group consisting of alkylene radicals of 1–10 carbons, carboxyl substituted alkylene radicals of 1–10 carbons, phenylene radicals, carboxyl substituted phenylene radicals and mixtures thereof, and M is selected from the group consisting of ammonium and amino radicals of amines having a boiling point of less than about 175C.

ANTI-STICKING COMPOSITION FOR FRYING AND BAKING. J. A. McGrory (Procter & Gamble Co.). *U.S. 3,189,466.* The cooking surface of a utensil is coated with a thin film of an anti-sticking composition which consists of 20–95% by weight oxystearin and from 5–80% of diluent glyceride.

PHOSPHONATED OILS AND PHOSPHONATED ESTERS. H. B. Knight and D. Swern (Sec'y. of Agriculture, U.S.A.). *U.S. 3,189,628.* Described is a compound selected from the group consisting of the addition product of a dialkyl phosphonate to an alkyl ester of a polyunsaturated fatty acid, and the addition product of a dialkyl phosphonate to a glyceryl ester containing at least one polyunsaturated fatty acid moiety.

• Biochemistry and Nutrition

THE RELATIONSHIP OF NUTRIENT INTAKE AND EXERCISE TO SERUM CHOLESTEROL LEVELS IN WHITE MALES IN EVANS COUNTY, GEORGIA. S. C. Stulb, J. R. McDonough, B. G. Greenberg, C. G. Hames (Heart Disease Control Program, U.S. Public Health Service, Evans County, Ga.). *Am. J. Clin. Nutr.* **16,** 238–242 (1965). A study was carried out on twenty-six pairs of white men living in Evans County, Georgia, matched for age, and classified on the basis of a high or low serum cholesterol value. A repeat cholesterol determination confirmed the validity of the initial classification. Nutrient intake was assessed by means of a dietary interview during two time periods, fall and spring, for each subject. Exercise was evaluated on the basis of occupation. Significant correlations of serum cholesterol with dietary components were not found. However, a highly significant inverse relationship between exercise and cholesterol emerged. Significant seasonal differences in dietary constituents were observed which consisted essentially of a decreased caloric intake during warmer months. A possible relationship between the seasonal dietary pattern and the seasonal cholesterol pattern is noted, although present data are inadequate to test the relationship.

FATTY ACID ANALYSIS OF TWO EXPERIMENTAL TRANSMISSIBLE GLIAL TUMORS BY GAS-LIQUID CHROMATOGRAPHY. A. A. Stein, E. Opalka and I. Rosenblum (Albany Medical College, Albany, New York). *Cancer Res.* **25,** 201–205 (1965). The fatty acid analyses of two experimentally transmissible ependymomas (Perese and SK) were determined and compared. These patterns were similar to each other; furthermore, the location of the tumor, subcutaneous or intracerebral, did not appear to change the fatty acid distribution. Each major lipid of the tumor, moreover, had a characteristic fatty acid pattern. The triglycerides were the major lipids in the tumor.

PROTEIN SYNTHESIS INHIBITION: MECHANISM FOR THE PRODUCTION OF IMPAIRED FAT ABSORPTION. S. Sabesin and K. Isselbacher (Mass. General Hospital, Boston). *Science* **147,** 149–51 (1965). Treatment of rats with puromycin and acetoxycycloheximide results in a defect in intestinal lipid transport. Under these conditions rats given corn oil accumulate triglyceride within the intestinal cells and fail to develop the normal postprandial hyperlipemia. The observed interference in lipid transport appears to be a consequence of impaired chylomicron formation.

THE EFFECT OF DIETARY CHOLESTEROL AND DIFFERENT DIETARY FATS ON CHOLESTEROL CONTENT AND LIPID COMPOSITION OF EGG YOLK AND VARIOUS BODY TISSUES. R. Chung, J. Rogler and W. Stadelman (Purdue Univ., Lafayette, Ind.). *Poultry Sci.* **44,** 221–27 (1965). White Leghorn hens were fed either a low-fat (B), 10% corn oil (CO), 10% lard (L) or 10% hydrogenated coconut oil (HCO) diet, each with or without 1% cholesterol (C) in a 4 by 2 factorial experiment. The influence of the dietary treatments on total and free cholesterol, total lipid and degree of saturation of the lipids was determined in egg yolk and various body tissues. The results of these investigations were as follows: 1) Total lipid content of yolk was not affected by any of the dietary treatments. 2) The influence of the type of dietary fat on the degree of saturation of tissue lipids was more pronounced than in egg yolk lipids. 3) In the absence of C, there were no significant differences between any of the dietary fat treatments in respect to total or free cholesterol content of hen plasma or egg yolk. 4) C supplementation of the high fat diets increased the total and free cholesterol content in the liver, and the greatest increase was obtained in the esterified fraction. 5) Aorta cholesterol was not significantly influenced by any of the dietary treatments.

INFLUENCE OF DIETARY FAT ON TRIGLYCERIDE STRUCTURE IN THE RAT. O. Privett, M. Blank and B. Verdino (Hormel Institute, Univ. of Minn., Austin, Minn.). *J. Nutr.* **85,** 187–95 (1965). The structure of the triglycerides of adipose, liver and kidney tissues of rats fed a fat-free diet and diets supplemented with corn oil, lard and menhaden oil was investigated. The triglyceride composition of the tissues had no direct relationship to that of the dietary fat. Quantitative differences in the triglyceride composition of the tissues were produced by the different dietary fats as related to their fatty acid composition. Structural analysis of the triglycerides of all tissues indicated that a competitive interrelationship existed for the β-position, increasing, in order, with palmitic, oleic and linoleic acids. The higher polyunsaturated fatty acids of menhaden oil did not take precedence over other fatty acids for the β-position. The effect of switching the diets containing the different fatty supplements indicated that the normal turnover of lipid in the rat was a gradual process requiring at least 6 months.

EFFECTS OF 4-DIMETHYLAMINOAZOBENZENE ON HEPATIC MICROSOMAL PHOSPHOLIPIDS. R. Morin (U.C.L.A. School of Med., Los Angeles). *Cancer Res.* 25, 118–23 (1965). Several groups of mature male rats were maintained for 4 mo. on fat-free, hydrogenated coconut oil- or safflower oil-containing diets with or without 4-dimethylaminoazobenzene (DAB). Gross examination of liver sections revealed no evidence of tumors in any of the group. The various experimental diets produced marked differences in the fatty acid compositions of all the microsomal phospholipid classes. DAB administration resulted in no change in the total phospholipid content or proportion of any of the phospholipid classes in the microsomes, but in rats on the fat-free diet did produce an increased percentage of oleic acid and decreased stearic acid in the choline-containing phospholipid. A similar pattern was observed to a lesser degree in the lecithins of rats fed DAB with hydrogenated coconut oil, but not with safflower oil. Proposed mechanisms of action and relevance to studies by others of tumor incidence on the various types of diets are discussed.

SOME EFFECTS OF DIETARY FAT UPON STEROID AND AMINO ACID METABOLISM. S. M. Mellinkoff, M. Frankland, A. D. Schwabe, H. C. Kellner, M. Greipel, and D. McNall (School of Med., Univ. Calif., Los Angeles). *Am. J. Clin. Nutr.* 16, 232–237 (1965). Ten normal adult men were maintained on a diet relatively high in saturated fats and low in polyunsaturated fats for eleven days, and then for twenty-one days on a diet in which the ratio of saturated to unsaturated fat was reversed. The following changes were observed after the second diet, as compared with similar values after the first: a decrease in the plasma concentrations of cholesterol, total lipids, leucine and valine, and an increase in proline, cystine, arginine, 3-methylhistidine and aspartic acid; diminished urinary excretion of total neutral 17-oxosteroids as determined by acid hydrolysis and diminished urinary excretion of total 11-desoxy-17-oxosteroid fractions; diminished urinary excretion of etiocholanolone, cystine, valine, 3-methyl-histidine and β-alanine with increased urinary excretion of anserine, cystathionine and 1-methylhistidine. No consistent corresponding changes were observed in the urinary fractions of dehydroepiandrosterone, androsterone, amino acids other than those mentioned, or in the plasma levels of the dehydroepiandrosterone and androsterone conjugates or free dehydroepiandrosterone, androsterone and etiocholanolone.

LIPID FRACTIONS OF CHICKEN BROILER TISSUES AND THEIR FATTY ACID COMPOSITION. J. Marion and J. Woodroof (Ga. Experiment Station, Experiment, Ga.). *J. Food Sci.* 30, 38–43 (1965). Lipids extracted from chicken breast muscle, thigh muscle, and skin tissue were fractionated by thin-layer and column chromatography. Breast muscle lipids were highest in the proportions of phospholipids to neutral lipids, followed by thigh muscle and skin tissue lipids. Gas-liquid chromatography analysis of the fatty-acid-containing fractions showed that phospholipids contained higher levels of 18-carbon saturated and 20-24-carbon unsaturated fatty acids than triglycerides. Triglycerides contained higher levels of 18-carbon mono- and diunsaturated fatty acids than phospholipids. The minor lipids were generally between the phospholipids and triglycerides in their proportion of saturated to unsaturated fatty acids. The fatty acid composition of similar lipid fractions did not vary appreciably with tissue location: only the proportion or level of lipid fractions varied in different tissues.

EFFECT OF DIETARY PROTEIN LEVEL ON REGRESSION OF CHOLESTEROL-INDUCED HYPERCHOLESTEROLEMIA AND ATHEROSCLEROSIS OF COCKERELS. R. Jain, L. Katz and P. Johnson (Cardiovascular Inst. Michael Reese Hosp. Med. Center, Chicago). *J. Atheroscler. Res.* 5, 16–25 (1965). The influence of dietary protein levels on regression of hypercholesterolemia and aortic and coronary atherosclerosis in cockerels was studied. Aortic atherosclerosis showed no evidence of regression within the 2–3 week period studied. Coronary atherosclerosis showed significant regression when the diet contained protein levels above 15%. No significant differences were observed between various protein levels above 15%. Regression was strikingly retarded, however, when protein levels were below 15% (7.5% and 10%). It is concluded that an adequate level of dietary protein is an essential factor for the occurrence of satisfactory regression of previously induced hypercholesterolemia and atherosclerosis.

EFFECTS OF CARCINOGENIC AMINES ON AMINO ACID INCORPORATION BY LIVER SYSTEMS. III. INHIBITION BY AMINOFLUORENE TREATMENT AND ITS DEPENDENCE ON VITAMIN E. T. Hultin and E. Arrhenius (Wenner-Gren Inst. for Exp. Biol., Univ. Stockholm, Stockholm). *Cancer Res.* 25, 124–31 (1965). Isolated liver microsomes from rats treated *in vivo* with the liver carcinogen 2-amino-fluorene have a tendency toward a reduced incorporation of amino acids into protein. This inhibitory effect was found to be dependent on the level of vitamin E and was more pronounced when the animals were maintained on diets low in vitamin E. With high dietary levels of vitamin E, the inhibitory effect was masked by the previously described corticoid-dependent stimulation of amino acid incorporation under the influence of the carcinogen.

RELATIVE RATES OF OXIDATION OF PALMITATE-1-C^{14} BY WHITE BLOOD CELLS, RED CELLS AND PLATELETS OF RATS. J. Hrachovec (Sch. of Public Health, Univ. Calif., Los Angeles). *Proc. Soc. Exp. Biol. Med.* 118, 328–33 (1965). Fatty acid oxidation by blood cells *in vitro* has been studied by incubation of 10-times diluted blood of the rat with palmitate-1-C^{14}, followed by determination of $C^{14}O_2$ evolved. A modification of the method was introduced for separation of white cells, platelets and red cells by differential centrifugation, in order to increase the accuracy of the determinations. The effect of diluted plasma on rate of palmitate-1-C^{14} oxidation and action of plasma albumin were taken into consideration. Experimental data indicate that a major portion of the total palmitate-1-C^{14} oxidation *in vitro* per unit volume of blood is attributable to white cells and platelets, whereas palmitate-1-C^{14} oxidation by red cells is very limited and probably occurs only in the youngest circulating cells. On a per cell basis, white cells oxidize palmitate-1-C^{14} at a rate which is about 60 times greater than that of platelets and about 800 times greater than that of red cell with reticulocytes.

DISCOLORATIONS IN EGGS FROM LAYERS FED COTTONSEED MEALS MADE FROM GLANDLESS AND GLANDED SEED. B. Heywang and M. Vavich (Animal Husbandry Res. Div., ARS, USDA, Glendale, Arizona). *Poultry Sci.* 44, 84–89 (1965). Laying White Leghorns in individual cages were fed diets containing no cottonseed meal, or 10 or 20% of five meals made from cottonseed meal with pigment glands or two meals made from cottonseed nearly free of pigment glands. The results show that commercial hexane treatment of these cottonseed meals did not remove all components that cause pink whites. Pink whites were in eggs from layers fed four of the five meals in which hexane was used in their preparation. It is probable that these processed meals contained "bound" lipids that were not removed by hexane extraction and this contributed greater amounts of lipids to the diet than the fat values for the respective meals indicated.

INFLUENCE OF CITRUS PECTIN FEEDING ON LIPID METABOLISM AND BODY COMPOSITION OF SWINE. H. Fausch and T. Anderson (Biochem. Dept., Sch. of Med., Univ. of South Dakota, Vermillion, S. D.). *J. Nutr.* 85, 145–49 (1965). Pigs receiving 5% citrus pectin in the ration for 4 weeks had significantly higher serum cholesterol, triglyceride and phospholipid levels, more backfat and higher liver cholesterol levels than pigs receiving the control ration. The addition of 5% fat to the ration resulted in significantly higher serum and hepatic cholesterol and increased backfat. The inclusion of 5% pectin plus 5% added fat in the ration caused a highly significant increase in serum cholesterol, phospholipid and triglycerides, hepatic cholesterol and backfat thickness compared with that of the animals fed either fat or pectin alone. There appeared to be a definite synergistic effect to the addition of both fat and pectin to the ration. The increases in serum and hepatic lipid levels noted as the result of feeding pectin to swine are exactly opposite to the hypocholesterolemic activity of this compound which has been reported in man and the rat.

QUALITY OF FRYER CARCASSES AS RELATED TO PROTEIN AND FAT LEVELS IN THE DIET. E. Essary and L. Dawson (Va. Polytechnic Institute, Blacksburg and Mich. State Univ., East Lansing). *Poultry Sci.* 44, 7–14 (1965). Three experiments were conducted to study the effects of feeding different levels of added fat with different levels of protein in broiler-type rations on amount and area of fat deposition in fryers, as determined by weight differences of certain parts, and the effect of fat deposition on percentage moisture pick-up of carcasses during chilling period. The level of added fat and protein in the diet and/or their relationship to each other influenced the amount and areas of fat deposited in fryers. Protein appeared to be the controlling

factor in fat deposition. Rations with a constant level of protein in each lot but with increasing levels of added fat in each succeeding lot increased the amount of fat deposited in the abdominal area of fryers. Fat deposition in the skin, as determined by weight differences, was greater in females than males when rations contained added fat and protein at levels which gave the same C:P ratio, and when rations contained higher levels of protein in relation to the amount of fat resulting in the same number of calories of productive energy per pound of feed. Percentage moisture pick-up was negatively correlated ($r = .26$) ($P = .01$) with carcass weight and was greater in females than males.

ALTERATIONS OF LIPOGENESIS IN THE INTACT CHICK BY DIETARY MALONIC ACID. W. Donaldson (Dept. Poultry Sci., N. Carolina State College, Univ. of N. C., Raleigh). *Proc. Soc. Exp. Biol. Med.* **118**, 450–53(1965). Biotin deficiency in intact chicks resulted in lower total carcass fatty acid deposition and altered fatty acid composition as compared to normal chicks. Dietary malonic acid stimulated total fatty acid deposition in the carcass of biotin-deficient chicks but did not alter the fatty acid composition of the carcass. In normal chicks, malonic acid had no effect on total fatty acid deposition but altered fatty acid composition such that it approached the composition of deficient chicks. Growth and biotin-deficiency dermatitis were unaffected by malonic acid in deficient chicks, but malonic acid depressed the growth of normal chicks.

EFFECT OF A SERUM CHOLESTEROL-LOWERING DIET ON COMPOSITION OF DEPOT FAT IN MAN. G. J. Christakis, S. H. Rinzler, M. Archer, S. A. Hashim and T. B. Van Itallie (Bureau of Nutr., City of New York Dept. of Health, and the Dept. of Med., St. Luke's Hospital, N.Y., N.Y.). *Am. J. Clin. Nutr.* **16**, 243–251(1965). An aspiration technique was utilized to obtain subcutaneous fat samples from 87 randomly selected subjects of the City of New York Diet and Coronary Heart Disease Study Project. The subjects were studied in terms of length of time on the study diet, age, weight, coronary status and level of serum cholesterol. Gas-liquid chromatographic analysis of the depot fat of subjects consuming the study diet over a 4-year period revealed an increase in linoleic acid content from 9.7 to 18.9% of total fatty acids at the expense of both the saturated and monounsaturated fatty acids. Assessments of adherence to the study diet by diet history techniques and depot fat composition patterns of a group of nine subjects revealed that for the 9 subjects classified as non-adherers by diet history, the average depot linoleate was 9.2% of total fatty acids, while for the subjects adhering to the study diet for 37 or more months it was 18.9% of total fatty acids. The highest depot linoleate for the non-adherers was 12.5%, while the lowest for the adherers was 13.3% of total fatty acids.

ACTION OF LINOLENIC AND DOCOSAHEXAENOIC ACIDS UPON THE EICOSATRIENOIC ACID LEVEL IN RAT LIPIDS. R. Brenner and P. Jose (Catedra de bioquimica, Instituto de fisiologia, Facultad de Ciencias Medicas, La Plata, Argentina). *J. Nutr.* **85**, 196–204(1965). Weanling rats were fed a fat-free diet, and a fat-free diet supplemented with a 4-deoxypyridoxine-HCl. The fatty acid composition of the lipids of heart, liver, epididymal fat, liver phospholipids and triglycerides were analyzed after feeding linoleate, linolenate and docosahexaenoate. The structure of octadecadienoate, eicosatrienoate and eicosatetraenoate was recognized by reductive ozonolysis. The levels of eicosa-5,8,11-trienoate were markedly lowered either by linoleate, linolenate or docosahexaenoate, thus showing a reduced conversion of oleate into eicoas-5,8,11-trienoate. Docosahexaenoate was readily incorporated into the phospholipids and appeared to be a direct regulator of eicosa-5,8,11-trienoic level, whereas linolenate was very slightly incorporated and appeared to produce, at least partially, the same effect through its conversion into docosahexaenoate. This phenomenon is thought to be related not only to a competition in the desaturating and elongating step of oleic, linoleic and linolenic acids but to phospholipid synthesis.

CHOLESTEROL METABOLISM. IV. STUDIES OF INTESTINAL HYDROLYSIS OF CHOLESTEROL ACETATE. D. K. Bloomfield (Western Reserve Univ. School of Med., Cleveland, Ohio). *Am. J. Clin. Nutr.* **16**, 252–255(1965). Intestinal hydrolysis of cholesterol acetate in rats was studied by analysis of free and total sterol content in the feces. Hydrolysis increased as the concentrations of cholesterol acetate in the diet increased, but the efficiency of hydrolysis in terms of completeness diminished. When the concentration of cholesterol acetate in the diet was constant, hydrolysis increased as dietary fat increased. Finally, the paradoxical absorption of cholesterol 4-C^{14} indicates that if cholesterol ester is absorbed intact, the locus differs from that of free cholesterol absorption.

PHOSPHOLIPID FRACTIONATION AND BLOOD CLOTTING. J. Billimoria, V. Irani and N. Maclagan (Dept. Chem. Pathology, Westminister Med. School, London). *J. Atheroscler Res.* **5**, 90–101(1965). The separation of natural and synthetic phospholipids by silicic acid column chromatography has been studied and reproducible results obtained by eluting with a linear gradient of methanol in chloroform. The nature of the phospholipids in platelets, plasma and red cells has been investigated. In blood the clotting activity in the Stypven test is confined to the cephalin fractions and the platelet cephalin had the highest activity (up to 240 units/mg). Of the synthetic phospholipids tested only the dioleyl phosphatidylethanolamine had appreciable activity (100 units/mg). Saturated phosphatidylethanolamine had negligible activity. Platelet phosphatidylethanolamine contained a high proportion of oleic acid (24%) which could account for its clotting activity.

BLOOD LIPID FRACTIONATION AND BLOOD CLOTTING IN ISCHAEMIC HEART DISEASE. *Ibid.*, 102–10. Lipids from platelet-rich plasma in cases of ischaemic heart disease have been compared with those from normal subjects and the thromboplastic activities of all fractions tested by the Stypven test. The fatty acid composition of the fractions has been determined. Total cholesterol and sphingomyelin were increased in ischaemic heart disease. Increased clotting activity in ischaemic heart disease was found both with platelet-rich and with platelet-poor plasma. Only the cephalin fractions were active in clotting tests. Although the levels of total cephalin were similar in the two groups, the patients' cephalin had uniformaly higher clotting activity and a markedly higher oleic acid content. The triglycerides also had a significantly higher oleic acid content in ischaemic heart disease.

PHOSPHONOLIPIDS. III. SYNTHESIS OF A PHOSPHONIC ACID ANALOG OF L-α(DISTEAROYL) LECITHIN. E. Baer and N. Stanacev (Banting and Best Dept. of Med. Res., Univ. of Toronto). *J. Am. Chem. Soc.* **87**, 681–82 (1965). The isolation of 2-aminoethylphosphonic acid from the hydrolysates of proteolipid-like fractions of ciliate protozoa of sheep rumen, of ethanolic extracts of the sea anemone *Anthopleura elegantissima*, and of the insoluble proteinaceous material of *Metridium dianthus* has been reported. A more extensive distribution of phosphonic acid in natural materials is indicated by the recent isolation of α-amino-β-phosphonopropionic acid from extracts of the Zoanthid, *Zoanthus sociatus*, as well as the isolation of eight other substituted phosphonic acids from *Coelenterata*. Five of these new phosphonic acids were ninhydrin positive.

STEROLS IN BRAIN AND LIVER OF YOUNG RATS FED 20,25-DIAZACHOLESTEROL. R. Ahrens, Jacqueline Dupont and M. Thompson (Human Nutr. and Entomology Res., ARS, USDA, Beltsville, Md.). *Proc. Soc. Exp. Biol. Med.* **118**, 436–38 (1965). Feeding 0.03% diazasterol in essentially cholesterol-free diets to weanling rats for 3 or 6 weeks caused a large concentration of desmosterol in the brain and liver sterols. Studies using C^{14} showed that small amounts of acetate and glucose were incorporated into brain sterol of both control and inhibitor-fed rats and a mode by which this incorporation may account for the rate of desmosterol accumulation is postulated.

THE STRUCTURES OF AFLATOXINS B AND G_1. T. Asao, G. Buchi, M. Abdel-Kader, S. Chang, Emily Wick and G. Wogan (Mass. Inst. Tech., Cambridge, Mass.). *J. Am. Chem. Soc.* **87**, 882–86 (1965). The structures of the two mold metabolites aflatoxin B_1 and aflatoxin G_1 were elucidated. Acute toxicities in White Pekin ducklings are presented.

MECHANISMS OF BILE ACID BIOSYNTHESIS STUDIED WITH 3α-H^3- AND 4β-H^3-CHOLESTEROL. K. Green and B. Samuelsson (Dept. of Chem., Karolinska Insitutet, Stockholm, Sweden). *J. Biol. Chem.* **239**, 2804–07(1964). The fate of tritium during conversion of 3α-H^3-4-C^{14}- and 4β-H^3-C^{14}-cholesterol to bile acids was investigated. The results indicate that: (a) a 3-ketosteroid is involved in the epimerization at C-3; (b) the Δ^5-double bond is isomerized to the Δ^4 position before being reduced; and (c) a stereospecific transfer of hydrogen from the 4β to the 6β position occurs during isomerization of the olefinic double bond.

THE DISPERSION OF CEREBRAL LIPIDS IN AQUEOUS MEDIA BY ULTRASONIC IRRADIATION. D. R. Gammack (Dept. of Biochem., Inst. of Psychiatry, Maudsley Hosp., Denmark Hall, London) and J. H. Perrin and L. Saunders. *Biochim. Biophys. Acta* **84**, 576–586(1964). Optically-clear sols of ox-brain cerebral lipids prepared by ultrasonic irradiation (16–24 kcycles/sec) have been examined by physiochemical methods. The myelinic figures in the lecithin sols were broken down to disc-shaped micelles with a micellar weight of about $2 \cdot 10^6$. Sedimentation of dispersions of phosphatidylethanolamine and -serine and sphin-

gomyelin indicated micellar weights similar to that of lecithin. The phospholipid sols, with exception of phosphatidylethanolamine, were stable over several days and were not flocculated by dilute salt solutions. Sulphatides, unlike cerebrosides, were readily dispersed, due to the acidic groups on the molecules. No evidence for chemical changes resulting from ultrasonic irradiation was obtained from preliminary analyses.

LIPIDS OF DEHYDRATED ALFALFA (MEDICAGO SATIVA). J. W. Van der Veen and H. S. Olcott (Inst. of Marine Resources, Dept. of Nutritional Sci., Univ. of Calif., Berkeley, Calif.). *J. Agr. Food Chem.* 12(3), 287–289 (1964). Lipids of dehydrated alfalfa (6.4%) were fractionated by silicic acid chromatography. The first fraction, accounting for 30% of the total lipids, contained 30% low molecular fatty acids, mainly C_8. The main glyceride lipids were mono- and digalactosyl-diglycerides. The galactolipids contained approximately 80% linolenic acid. Considerable amounts of unsaponifiables were also found in all fractions.

THE SIMULTANEOUS PAPER CHROMATOGRAPHIC SEPARATION OF PHOSPHATIDES, CEREBROSIDES, AND SULFATIDES. C. B. Scrignar (Tulane Univ., School of Medicine, Dept. of Medicine, New Orleans, La.). *J. Chromatog.* 14, 189–193 (1964). A paper chromatographic system utilizing silicic acid impregnated paper and a solvent system using diisobutyl ketone, pyridine and water was found to separate cerebrosides, phosphatidyl serine, phosphatidyl ethanolamine, sulfatide, lecithin, sphingomyelin, and an unknown lipid, possibly "cephalin B." Strandin remained immobile while cholesterol, cholesterol esters, and neutral lipids were located at the solvent front.

FACTORS AFFECTING OXIDATIVE STABILITY OF CAROTENOID PIGMENTS OF DURUM MILLED PRODUCTS. L. Dahle (Res. Lab., Peavey Co., Flour Mills, Minneapolis, Minn.). *J. Agr. Food Chem.* 13(1), 12–15 (1965). The combined effect of lipoxidase, tocopherols, and free fatty acids on the oxidative stability of the carotenoid pigments of durum milled products was investigated. Free unsaturated fatty acids play a significant role; tocopherols, if present in sufficient quantity, can influence oxidative pigment stability; and lipoxidase alone does not influence the pigment stability.

RAT LIVER STORAGE OF VITAMIN A FROM FORTIFIED NONFAT DRIED MILK. R. A. Rasmassen, R. G. Agusto, and C. H. Massey (Peter Hand Found., Chicago, Ill.). *J. Agr. Food Chem.* 12(5), 413–414 (1964). Under the experimental conditions of this paper, vitamin A palmitate and vitamin A desoxycholate were equally effective in increasing liver stores of vitamin A. Increasing the amount of fat in the diet did not significantly increase vitamin A liver storage; however, vitamin A absorption from the lower fat diet was superior.

PHOSPHOLIPIDS OF FRESH MILK AND OF STERILE WHOLE MILK CONCENTRATE. H. W. Sprecher, F. M. Strong, and A. M. Swanson (Dept. of Biochem., College of Agric., Madison, Wis.). *J. Agr. Food Chem.* 13(1), 17–21 (1965). The phospholipids from whole milk were fractionated into cephalin, lecithin, sphingomyelin, and a minor inositol-containing component. The fatty acid composition of these various phospholipids was determined by gas chromatography. Phospholipids from milk possessing a stale flavor showed about a threefold increase in the amount of phosphorus present in the inositol-containing lipid. Close agreement between fatty acid composition with that found in the phospholipids from milk indicates that staling does not involve oxidative attack of phospholipid unsaturated fatty acids.

INCORPORATION OF TRITIUM FROM SUCCINATE-2,3-H^3 INTO LONG CHAIN FATTY ACIDS BY AORTIC MITOCHONDRIA. A. F. Whereat (Depts. of Biochem. and Med., School of Med., Univ. of Pennsylvania, Philadelphia). *Proc. Soc. Exp. Biol. Med.* 118, 888–892 (1965). The mechanism of succinate stimulation of fatty acid synthesis by aortic mitochondria was studied. Tritium, but not carbon, from succinate labeled in positions 2- and 3- is incorporated into long-chain fatty acids in this system. The relative incorporation of tritium in various fatty acids is similar to that of C^{14} from acetate. Succinate can, therefore, provide protons for the reductive steps.

STUDIES ON THE VITAMIN D_3 REQUIREMENT OF THE BROILER CHICK. P. W. Waldroup, J. E. Stearns, C. B. Ammerman and R. H. Harms (Florida Agr. Exp. Station, Gainesville, Fla.). *Poultry Sci.* 44, 543–548 (1965). Two experiments in battery brooders and one in a conventional broiler house have been conducted to gain additional information regarding the vitamin D_3 requirement of the broiler chick under laboratory and commercial conditions. In two of the experiments both calcium and phosphorus levels were varied to study their relationship to vitamin D, while in the third test only the calcium level was varied. The results of these studies indicate that levels of vitamin D above the 90 I.C.U. per pound suggested by the National Research Council should be used in broiler diets if the calcium level is lowered below the 1.0 per cent N.R.C. recommendation. The actual requirement in relation to dietary calcium and phosphorus levels is discussed.

RATES OF REACTIONS INVOLVED IN PHOSPHATIDE SYNTHESIS IN LIVER AND SMALL INTESTINE OF INTACT RATS. E. Wise and D. Elwyn (Dept. of Biological Chem., Harvard Med. School, Boston, Mass.). *J. Biol. Chem.* 240, 1537–48 (1965). L-Serine-3-C^{14} was injected into young male rats which were killed in groups at several times thereafter. Free serine, methionine, phosphoethanolamine, and phosphocholine, and lipid serine, ethanolamine, and choline were isolated from pooled small intestines and livers of each group, and their concentrations and specific activities were determined. By the use of appropriate models, rates of a number of reactions were calculated from the specific activities of the compounds involved. From a consideration of the probable sources of error it is estimated that the rates measured are accurate within a factor of 3 or less. Turnover times for liver lipid serine, ethanolamine, and choline were, respectively, 442, 127, and 72 minutes; in small intestine they were 69 minutes for lipid serine and 25 minutes for lipid ethanolamine. These are 5 to 10 times as fast as turnover times reported earlier for liver phospholipids. Synthesis *de novo* of choline in the rat, restricted largely to the liver, is about equal to dietary intake. Synthesis *de novo* of ethanolamine occurs in many, if not all, tissues.

EFFECT OF TRITON INGESTION OF FAT ABSORPTION. H. C. Tidwell, W. T. Moore, and J. C. McPherson (Dept. of Biochem., Univ. of Texas, Southwestern Med. School, Dallas). *Proc. Soc. Exp. Biol. Med.* 118, 986–988. (1965). The effect of oral ingestion of Triton on fat absorption in rats was investigated by feeding either fat or Triton alone, or a combination of fat and Triton. Serum esterified fatty acid levels were elevated after the fat feeding but not in either case after Triton ingestion. An attempt to account for this decreased fat absorption was made by determining the effect on the lipolytic activity of pancreatic lipase of Triton, alone and in the presence of a bile acid. A marked inhibition of lipolysis occurred in both cases when Triton was present. The absence of any inhibitory effect of blood serum on lipase activity after the ingestion of massive amounts of Triton indicated that the Triton was not absorbed.

METABOLISM OF N-BUTYRATE AND PROPIONATE BY THE RUMEN EPITHELIUM. T. A. Taylor and H. A. Ramsey (Dept. of Animal Science, North Carolina State of UNCR, Raleigh). *J. Dairy Sci.* 48, 505–509 (1965). In a recent study involving the intravenous injection of n-butyrate-1-C^{14} into adult goats, it was observed that the specific activity of lactate from ruminal vein blood was several times higher than that of lactate from arterial blood. Most of the C^{14} associated with lactate appeared to be in the C-1 position. These observations suggested that a portion of n-butyrate is metabolized by rumen epithelium via the citric acid cycle and that propionate is metabolized by this tissue through the fixation of CO_2 to form succinyl Co A, an intermediate of the citric acid cycle. Thus, it was postulated that the C^{14} from n-butyrate was incorporated through the common intermediate, succinyl Co A, or through the fixation of $C^{14}O_2$ arising from the oxidation of butyrate.

EFFECT OF TRIPARANOL ON SYNTHESIS OF SQUALENE AND TETRAHYMANOL BY TETRAHYMENA PYRIFORMIS. M. S. Shorb, B. E. Dunlap, and W. O. Pollard (Poultry Sci. Dept., Univ. of Maryland, College Park, Md.). *Proc. Soc. Exp. Biol. Med.* 118, 1140–1145 (1965). In triparanol-inhibited cultures of *T. pyriformis* (strains W, H, and S), squalene is greatly increased in amount and tetrahymanol is decreased. In contrast, squalene appears in low concentration in uninhibited cultures. It appears that squalene might be converted directly to the pentacyclic compound, tetrahymanol, and that the cyclization of squalene is blocked by triparanol. Cholesterol was not identified in control or inhibited cultures and appears neither to be a sterol of major importance in this organism, nor an intermediate in the synthesis of tetrahymanol. Methods of purification and identification of tetrahymanol are given.

THE RELATIONSHIPS OF TOTAL, BOUND, AND FREE WATER AND FAT CONTENT TO SUBJECTIVE SCORES FOR EATING QUALITY IN TWO BEEF MUSCLES. S. J. Ritchey (Dept. of Human Nutr. and Foods, Virginia Polytech. Inst., Blacksburg, Va.). *J. Food Sci.* 30, 375–381 (1965). Subjective scores for eating quality of two beef muscles, longissimus dorsi (LD) and biceps femoris (BF), cooked to two final internal temperatures were related to fat content and to the amount of bound and free water. Steaks from muscle were cooked to final internal temperatures

of 68 and 85C. As the temperature increased the meat was drier, harder, and more mealy, and contained less connective tissue, but the fragmentation of muscle fibers was not changed. Softness scores were associated with higher amounts of fat and decreased amounts of total water in both muscles cooked to 68C. As the amount of fat increased in raw and cooked beef, the amount of total water decreased. The amount of bound water, expressed as a percentage of total water, remained relatively constant in raw and cooked steaks. Differences between the muscles and the effects of heat were discussed.

A COMPARISON OF FATTY ACID SYNTHESIS BY LIVER AND KIDNEY. E. J. Masoro and E. Porter (Dept. of Physiology, Tufts, Univ., School of Med., Boston, Mass.). *Proc. Soc. Exp. Biol. Med.* 118, 1090–1095 (1965). The lipogenic activity of liver and kidney was compared. Kidney slices synthesize fatty acids at a considerably slower rate than do liver slices; an approximate estimate would place the rate of kidney slice lipogenesis at about 10–20% that of the liver slice. Kidney tissue appears to have a lower level of fatty acid synthesizing enzymes than liver but the difference in lipogenic rate of the intact cell is probably related to other factors as well. Kidney cytoplasmic particles suppress lipogenesis in kidney particle-free supernatant while liver cytoplasmic particles stimulate kidney particle-free supernatant lipogenesis. Thus, the presence of cytoplasmic particles in the kidney that inhibit rather than stimulate fatty acid synthesis probably is also related to difference in lipogenic activity between liver and kidney slices.

FATTY ACID SYNTHESIS IN VITRO IN A SYSTEM FROM RAT LIVER. C. H. Doering and H. Tarver (Dept. of Biochem., Univ. of Calif. School of Med., San Francisco). *Proc. Soc. Exp. Biol. Med.* 118, 951–957 (1965). A preparation from rat liver containing both microsomes and soluble enzymes when supplemented with the necessary cofactors incorporates acetate-1-C^{14} preponderantly into the saponifiable fraction of the lipids. Bicarbonate has not a significant stimulating effect on the synthesis whereas citrate and malonate have pronounced and similar stimulatory effects, particularly when they are preincubated with the synthesizing system. However, at high citrate concentrations bicarbonate becomes inhibitory. Malonate stimulates fatty acid synthesis without participating as a metabolite. The same is concluded with citrate, at least with concentration up to 15 mM. An interrelationship between citrate and ATP concentrations and the stimulation of fatty acid synthesis is indicated.

• Detergents

HYDRATION BEHAVIOR OF SODIUM TRIPOLYPHOSPHATE IN DETERGENT SLURRIES. C. Y. Shen and J. S. Metcalf (Inorganic Chemicals Division, Monsanto Co., St. Louis, Mo.) *Ind. Eng. Chem. Product Res. Dev.* 4, 107–113 (1965). In preparing detergent slurries prior to spray drying, control of the amount of hydration of sodium tripolyphosphate is of prime importance. Using a differential thermal analysis technique, the effects of various forms of sodium tripolyphosphate, seed crystals, solids concentration, temperature, and the presence of tetrasodium pyrophosphate on the hydration rate of sodium tripolyphosphate in detergent slurries were quantitatively determined. Significant changes in hydration rate due to solids concentration, temperature, and slurry pH of a detergent slurry were noted. This technique should be a useful tool in optimizing methods of detergent slurry preparation.

PHYSIOLOGICAL PROPERTIES OF SELECTED NON-IONIC SURFACTANTS. J. F. Treon (Atlas Chem. Ind., Wilmington, Del.). *Soap, Perfumery Cosmetics* 38, 47 (1965). The partial esters of sorbitan fatty acids, polyoxyethylene sorbitan fatty acids and polyoxyethylene stearate are non-irritating to the rabbit skin and to the human skin, which is generally considered to be more resistant than rabbit skin. Very high single oral dosages and high dietary levels are readily tolerated by rats. The ester bond is hydrolyzed in the gastrointestinal tract with the fatty acid behaving metabolically as the fatty acids of natural fats. The polyoxyethylene portion of polyoxyethylene sorbitan fatty acid esters is excreted largely in the faeces, and the small portion absorbed is essentially eliminated in the urine. The different types of fatty acids studied, such as stearic, lauric, palmitic and oleic, play no major role in the physiological properties of these esters other than their normal role as fatty acids.

The polyoxyethylene alkyl ethers vary in irritation to the rabbit eye from practically non-irritating to mildly irritating; one of them, polyoxyethylene (4) lauryl ether, is severely to extremely irritating when tested undiluted; a 20% aqueous solution of this ether is only minimally irritating if not washed from the eye and it is non-irritating if washed. These alkyl ethers vary in irritation on rabbit skin from non-irritating to moderately irritating, with an indicated pattern in the case of two or three alcohols of reduced irritation with increased chain length of the polyoxyethylene portion. The human skin also is more resistant than rabbit skin to irritation from the ethers. With the exception of a high incidence of reactions from contact with polyoxyethylene (2) cetyl ether, these ethers were either non-irritating or produced only a small incidence of reactions among human subjects. The ethers are not as free from toxicity as the esters when ingested.

WATER-INSOLUBLE BACTERIOSTATS SOLUBILIZED IN SOAP AND DETERGENT SOLUTIONS. K. L. Russell and S. G. Hoch. *J. Soc. Cosmetic Chemists* 16, 169–184 (1965). Two water-insoluble bacteriostats, trichlorocarbanilide and mixed di- and tribromosalicylanilide, were solubilized in four surfactant solutions. The maximum percentage of each bacteriostat solubilized under specific conditions in 20% potassium coconut soap, 20% triethanolamine lauryl sulfate, 20% triethanolamine dodecyl benzene sulfonate or a mixed amphoteric-anionic solution is reported. Only the ethoxylated lanolin alcohols were found to permit simultaneous solubilization of the bacteriostats and 1% lanolin oil. The inclusion of the latter increased the amounts of the bacteriostats which could be solubilized in two of the detergent solutions. The bacteriostatic and bactericidal properties of the two antibacterials solubilized in triethanolamine lauryl sulfate are compared with those of the same agents suspended in the surfactant without the nonionic solubilizer. The bacteriological activity of the solubilized agents was as great as or greater than that of the suspended materials.

PREPARATION AND PROPERTIES OF FATTY AMINE OXIDES. B. Solomon (ITERG). *Rev. Franc. Corps Gras* 12, 112 (1965). A review of the chemistry, preparation and properties of fatty amine oxides and the analysis of detergent compounds containing fatty amine oxides.

DETERGENT TOILET BARS. W. A. Sweeney (California Res. Corp.). *U.S. 3,186,948.* A synthetic detergent toilet bar consists essentially of a compacted detergent mixture of the following ingredients: water-soluble primary n-alkyl metal sulfonates, secondary alkyl metal sulfates, and water. The alkyl groups contain 10–20 carbon atoms; the sulfonates and sulfate molecular species are present in approximately equimolecular proportions. The metal is selected from the group consisting of sodium, potassium, ammonium, calcium and magnesium. The ingredients are present in an amount ranging from 50–90% alkyl sulfonates and 10–50% alkyl sulfates based on the two, and the water 5–20% by weight based on the bar. The listed ingredients are the sole binding and plasticizing agents for the mixture.

COMPOSITION FOR CLEANING HARD SURFACES. L. McDonald (Kelite Corp.). *U.S. 3,186,947.* A cleaning composition for hard surfaces consists of 40–97% by weight of ammonium sulphate and 3–60% of an organic detergent mixture comprising approximately equal proportions by weight of diisobutyl naphthalene sodium sulphonate and dodecyl benzene sodium sulphonate. The composition may also contain a minor proportion of sodium tripolyphosphate.

HEAT-DRIED DETERGENT PROCESSES. J. S. Metcalf and C. Y. Shen (Monsanto Co.). *U.S. 3,189,551.* A process for the preparation of a heat-dried detergent composition having a predetermined fraction of sodium tripolyphosphate in the hexahydrate form comprises: first intermixing for at least 3 minutes at a temperature between 85 and 110C a first portion of sodium tripolyphosphate containing 70 weight % of Form I and more than sufficient water to hydrate the sodium tripolyphosphate; thereafter adding a second portion of sodium tripolyphosphate containing about 75 weight % of Form II, thereafter maintaining the resulting mixture at a temperature between 85 and 110C, and heat drying the mixture within about 40 minutes of the time of addition of the second portion of sodium tripolyphosphate. The predetermined fraction of sodium tripolyphosphate in the hexahydrate form is approximately equivalent by weight to the first portion of sodium tripolyphosphate, calculated as the hexahydrate.