ABSTRACTS

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

• Fats and Oils

PHYSICAL PROPERTIES OF MILK FAT. J. M. DeMan (Dept. of Dairy Science, Univ. of Alberta, Edmonton, Canada). *J. Dairy Sci.* **47**, 1194–1200 (1964). At temperatures between those at which it is completely liquid (about 37C) and completely solid (about −40C) milk fat is a mixture of solid and liquid phases. Because of the great complexity of milk fat, both in terms of fatty acid composition and glyceride structure, the crystallization of milk fat is an involved process that may lead to end products differing in physical properties.

ON THE UNSAPONIFIABLE MATTER. II. EXTRACTION. M. Walhecq. *Rev. Franc. Corps Gras* 11, 465–68 (1964). Methods for the extraction of unsaponifiables other than those described in Standard and Official Methods are described. The best results were obtained by extraction with light petroleum ether followed by an ethyl ether extraction. The potassium soaps were converted into barium soaps which were extracted with acetone in a Soxhlet. No result was obtained by direct examination of barium soaps, whatever the solvent was. An improved extractor is described giving comparable results to a liquid-liquid extractor. The improved extractor reduces extraction time from 8 to 1 hour.

SOME DERIVATIVES OF FATS UTILIZABLE IN FOOD INDUSTRIES. A Uzzan and F. Ailloud (Inst. Fats & Oils, Paris, Fr.). *Rev. Franc. Corps Gras* 11, 453–63 (1964). A review of the major lipo-chemical derivatives of fats used as additives in food industries. The preparation, specific properties, use in food and feed and legal status presented.

THE ISOLATION AND IDENTIFICATION OF 2,6,10,14-TETRAMETHYLPENTADECANOIC ACID FROM BUTTERFAT. R. P. Hansen (Fats Research Lab., Wellington, New Zealand). *Biochem. J.* **93**, 225–8 (1964). 2,6,10,14-Tetramethylpentadecanoic acid has been isolated from butterfat and identified by mass and infrared spectrometry and gas-liquid chromatography. It was present to the extent of approximately 0.01% of the total weight of fatty acids.

REVERSED PHASE PARTITION COLUMN CHROMATOGRAPHY (R.P.C.): A METHOD FOR THE QUANTITATIVE ANALYSIS OF FATTY ACIDS. R. C. Badami (Brunel College, London). *Chem. & Ind. (London)* **1964**, 1920–1. Described is a procedure for the separation and estimation of milligram quantities of fatty acids. It can be used for the quantitative analysis of saturated, unsaturated and oxygenated fatty acids from seed oils when used in conjunction with gas liquid chromatography and spectroscopy.

SALAD OILS AND METHOD OF MAKING THEM. F. J. Baur (Procter & Gamble Co.). *U.S. 3,158,489.* A clear glyceride salad oil having superior resistance to deposition of high-melting solids consists of a base salad oil having dissolved in it at least 0.001% by weight of fatty acid ester of dextrin. The dextrin is esterified with an average, per glucose unit, of from ½ to 2 mols of saturated fatty acid having from 14 to 22 carbon atoms, the balance of the fatty acids being selected from the group consisting of fatty acids having from 2 to 12 carbon atoms and unsaturated fatty acids having from 14 to 22 carbon atoms. The ester has an average of not more than 1 and ½ unesterified hydroxyl groups per glucose unit.

SALAD OILS AND METHOD OF MAKING THEM. F. J. Baur and E. S. Lutton (Procter & Gamble Co.). *U.S. 3,158,490.* A clear glyceride salad oil having superior resistance to deposition of high-melting solids consists of a base salad oil having dissolved in it about 0.001% by weight of disaccharide fatty acid ester. The disaccharide is esterified with an average of 15 to 85% by weight on the total fatty acid in the ester, of saturated fatty acid having from 14 to 22 carbon atoms, the balance of the fatty acid being selected from the group consisting of fatty acids having from 2 to 12 carbon atoms and unsaturated fatty acids having from 14 to 22 carbon atoms. The ester has an average of not more than 5 unesterified hydroxyl groups per molecule.

PRODUCTION OF MONOGLYCERIDES. W. Stein and J. Kretschmann (Henkel & Cie G.m.b.H.). *U.S. 3,160,646.* In the process for the production of glycerides in which a member selected from the group consisting of fatty acids, fatty acid esters and mixtures thereof is reacted with glycerol, the improvement for the production of a glyceride mixture with a high content or monoglycerides comprises maintaining a reaction medium containing at least 50-mol per cent of glycerol, 10–35 mol per cent of monoglycerides, and not more than 15 mol per cent of higher glycerides at a temperature between 260–300C while adding the reactants at a rate not in excess of 0.5 part by weight per hour per part by weight of the reaction medium. The added reactants should contain at least 2 mols of glycerol radicals per mol of fatty acid radicals.

• Fatty Acid Derivatives

VOLATILE ESTERS OF BARTLETT PEAR. IV. ESTERS OF TRANS: 2-CIS: 4-DECADIENOIC ACID. W. G. Jennings, R. K. Creveling and D. E. Heinz (University of California). *J. Food Sci.* **29**, 730–34 (1964). Ethyl *trans*-2,*cis*-4-decadienoate was identified as a flavor component of Bartlett pear. The acid moiety was synthesized and found to be identical with that isolated from Bartlett pear. Quantities of this acid sufficient for sensory evaluations have been isolated from the seed oil of *Sapium sebiferum*. This latter source has been used to synthesize a series of esters whose odors are remarkably pear-like.

PREPARATION OF TITANIUM SOAPS OF MONO-ETHENOID FATTY ACIDS. J. W. Spence and J. H. Skellon (Brunel College, London). *Chem. & Ind. (London)* **1964**, 1986–7 The preparation of titanium soaps of oleic, elaidic, erucic and brassidic acids by combining the calcium soap of the fatty acid with titanium potassium oxalate directly by heat is described. The soaps are soluble in organic solvents, in fatty acids, and in vegetable oils and have a titanium content agreeing well with theory.

EMULSIFIER AND METHOD OF MAKING SAME. E. J. Reid (Lever Brothers Co.). *U.S. 3,158,487.* A cake mix comprising flour, baking powder and sugar is intimately blended with a shortening comprising: a) 8–16% by weight of the shortening of a mixture of lactylated higher fatty acid esters of glycerol and lactylated higher fatty acid esters of propylene glycol, with 10–90% of the mixture being composed of lactylated propylene glycol fatty acid monoesters and b) and edible triglyceride.

ENHANCING THE ABSORPTION OF ORALLY ADMINISTERED MEDICAMENT WITH DISACCHARIDE FATTY ACID ESTERS. Helen E. Duell (Smith Kline & French Labs.). *U.S. 3,160,565.* The method of enhancing the adsorption of orally administered medicament (iron salts, cyanocobalamin, hydroxycobalamin and other derivatives, tetracycline and its derivatives, streptomycin, dihydrostreptomycin, kanamycin) comprises orally administering concurrently with the medicament a fatty acid ester of a disaccharide selected from the group consisting of sucrose, maltose, lactose, melibiose, trehalose, cellobiose and gentiobiose. The fatty acid should be an aliphatic carboxylic acid having from 9 to 22 carbon atoms.

• Biology and Nutrition

FATTY ACID COMPOSITION OF PLAQUE AND TISSUE LIPIDS FROM PIGEONS WITH SPONTANEOUS ATHEROSCLEROSIS. F. Young, C. C. Middleton and H. B. Lofland, Jr. (Dept. of Biochem. and Lab. Animal Medicine, Bowman Gray School of Medicine, Wake Forest College, Winston-Salem, N.C.). *Proc. Soc. Exp. Biol. Med.* **117**, 613–18 (1964). Atherosclerotic plaque, non-diseased aorta, liver and serum were collected from 5–8 year old White Carneau pigeons fed a grain diet. Lipids extracted from these tissues were fractionated into sterol esters, glycerides and phospholipids. Methyl esters of the component fatty acids of these fractions were prepared and quantified by gas-liquid chromatography. Unique fatty acid patterns of sterol esters were found in each of the various tissues. There is no difference in the fatty acid compositions of glycerides from the tissues studied. Phospholipids of plaques and non-diseased aorta exhibit similar fatty acid patterns as do those of liver and serum. However, the fatty acid compositions of phospholipids of plaque and non-diseased aorta are distinctly different from those of liver and serum. There is a remarkable resemblance between the fatty acid compositions of sterol esters and phospholipids of various tissues of pigeon and man.

EFFECTS OF DIETARY SELENIUM, METHIONINE, FAT LEVEL AND TOCOPHEROL ON RAT GROWTH. L. A. Witting and M. K. Horwitt (L. B. Mendel Res. Lab., Elgin State Hospital, Elgin, Ill.). *J. Nutr.* **84**, 351–60 (1964). It is possible to relate the tocopherol requirement of the rat to the dietary or tissue lipid fatty acids by means of growth curves when the methionine levels and other components of the diet are controlled and the environment is optimal. One of the dependent variables is the

amount of selenium available to the animal. Conversely, if the α-tocopherol content of the diet is controlled at a low level, the growth curves can be related to the levels of biologically available selenium. Such growth curves show that the selenium requirement of the tocopherol-deficient rat has a very narrow optimal range and that the toxicity of selenium may be decreased by adding methionine. The selenium content of casein is variable and, to only a moderate degree, biologically available. When rats were fed low levels of dietary fat (1 to 7.5%) in a diet essentially devoid of tocopherol, the time required for the production of creatinuria, a sign of nutritional muscular dystrophy, was inversely proportional to the dietary fat level. The tocopherol requirement also decreased markedly as the dietary fat level was lowered. The time in weeks required to produce creatinuria was correlated with the fatty acid composition of the muscle phospholipid and neutral lipids.

CONVERSION OF CHOLESTEROL TO 5α-CHOLESTAN-3β-OL IN GERMFREE GUINEA PIGS. H. Werbin, I. L. Chaikoff and B. P. Phillips (Dept. of Physiology, Univ. of Calif., Berkeley). *Biochemistry* 3, 1558–63 (1964). Germfree guinea pigs were fed for 4 days a diet containing (4β-H^3) cholesterol and (4-C^{14})-cholesterol. Cholesterol and 5α-cholestan-3β-ol (DHC) were then isolated from their adrenal glands, livers and intestines. The values for the ratio H^3/C^{14} of the cholesterols isolated from these tissues were very close to those of the cholesterols ingested. Hence, during its absorption and deposition in tissues, the H^3 of the (4β-H^3) cholesterol was not displaced, nor was discrimination discernible in the animal's use of the two labeled cholesterols. Both the H^3- labeled and the C^{14}-labeled cholesterol contained minute amounts of labeled DHC as a radiochemical contaminant that could not be removed by repeated purification. A comparison of the values for the ratio H^3/C^{14} of this DHC in the diet with those for the DHC isolated from the tissues demonstrated that DHC must have been synthesized from cholesterol in the germfree guinea pigs. The additional finding that the C^{14} content of the DHC isolated from three tissues, adrenal glands, livers and intestines, exceeded that of the DHC ingested as a radiochemical impurity supported the conclusion that the conversion took place in the tissues. A study of the distribution of the H^3 in the DHC isolated from the tissues of the germfree animals showed that 54–64% was at carbon atoms 3 and 4.

FATTY ACID SYNTHESIS BY SUBCELLULAR FRACTIONS OF LUNG TISSUE. E. G. Tombropoulos (Biology Laboratory, Hanford Lab., General Electric Co., Richland, Wash.). *Science* **146**, 1180–81 (1964). The mitochondria-rich fraction of the lung tissue is the most active subcellular fraction for the synthesis of long-chain fatty acids. This observation is contrary to what has been reported for the subcellular fractions of the liver. The high rate of fatty acid synthesis observed with the mitochondria-rich fraction of the lung may be related to the morphological transformation of mitochondria.

DDT ANTAGONISM TO DIELDRIN STORAGE IN ADIPOSE TISSUE OF RATS. J. C. Street (Dept. of Animal Husbandry, Utah State Univ., Logan). *Science* **146**, 1580–81 (1964). Storage of dieldrin in the adipose tissue of female rats was markedly depressed when DDT and dieldrin were fed simultaneously. This antagonistic effect of DDT suggests that the criteria used in predicting the pharmacological effects of combined residues of related insecticides need some revision.

STRUCTURAL COMPOSITION OF POLAR LIPID-AMINO ACID COMPLEX IN PSEUDOMONAS AERUGINOSA. D. B. Sinha and W. L. Gaby (Dept. of Microbiology, Hahnemann Medical College, Philadelphia, Pa.). *J. Biol. Chem.* 239, 3668–73 (1964). The lipids extracted from *Pseudomonas aeruginosa*, incubated with labeled alanine, have been separated into three major fraction, the nonpolar lipids, non-choline-containing phospholipids, and choline-containing phospholipids, by silicic acid column chromatography. The lipid-amino acid complex, associated with the non-choline-containing lipid fraction, was composed primarily of phosphatidylethanolamine and small amounts of phosphatidylserine. The chemical composition of these fractions differed significantly in their molar ratios of phosphorus to acyl ester to amino nitrogen from those of the reference phospholipid standards. The lipid-amino acid complex was further characterized by an absence of free glycerol hydroxyl group, by the formation of dinitrophenyl derivatives, by lability to mild alkaline hydrolysis, and by susceptibility to reduction by $LiBH_4$. Based on these findings, a chemical structure of the phospholipid-amino acid complex is presented, in which the carboxyl groups of the amino acid residue is attached to the glycerol moiety of the complex phospholipid with an 0-ester linkage. Such complexes were found to be associated with the diester-type phospholipids of *P. aeruginosa*.

FACTORS AFFECTING THE RATE OF OXIDATION OF FATTY ACIDS IN ANIMAL TISSUES. J. A. Ontko and D. Jackson (Dept. of Biochem., Univ. of Tennessee Medical Units, Memphis, Tenn.). *J. Biol. Chem.* 239, 3674–82 (1964). Palmitic acid was rapidly utilized by a rat liver homogenate system. Maximum rates of ketogenesis and esterification of palmitic acid were observed when the concentration of added palmitate was 0.65 *mM*. The palmitate-1-C^{14} level did not markedly affect $C^{14}O_2$ production except when the added fatty acid level was 1 *mM*, which produced inhibitory effects on all measured palmitate conversions probably caused by surface active properties of the long chain fatty acid. The lack of substantial increase in $C^{14}O_2$ production as the palmitate-1-C^{14} level was increased from 0.2 to 0.5 *mM* is apparently a result of Krebs cycle saturation.

EFFECT OF FEEDING COCONUT OIL MEAL ON MILK PRODUCTION AND COMPOSITION. K. Mohammed, W. H. Brown, P. W. Riley and J. W. Stull (Dept. of Dairy Science, The Univ. of Arizona, Tucson). *J. Dairy Sci.* **47**, 1208–12 (1964). Twelve Holstein cows were used in a switchback feeding trial. Sixty per cent of the ration was supplied by good-quality alfalfa hay, the remaining 40% by one of four concentrates: a) 15% cotton seed oil meal (control); b) 3.75% added coconut oil; c) 31% added coconut oil meal; d) 3.75% added coconut oil plus 31% coconut oil meal. The rations were fed individually to each cow so that the total feed consumption equalled 110% of Morrison feeding standards for maintenance and production. Observations were made on production and gross composition of milk, component fatty acids of the milk fat, digestibility of ration, and rumen volatile fatty acid (VFA) production. The following conclusions were made: a) Rations with coconut oil or coconut oil meal are equivalent to those with cotton seed oil meal for milk production; b) Rations of this type do not alter gross milk composition; c) Feeding coconut oil or coconut oil meal increased the amounts of C_{12} fatty acid in the milk; d) Digestibilities of the feed and combustible energies were greater in the rations with coconut oil meal or the meal with the oil added; e) Concentrate mixtures with coconut oil or its meal depressed the total butyrate and valerate content of the rumen fluid.

FATTY ACID SYNTHEASE AND β-HYDROXYDECANOYL COENZYME, A DEHYDRASE FROM ESCHERICHIA COLI. Anne T. Norris, S. Matsumura and K. Bloch (J. B. Conant Lab., Harvard Univ., Cambridge 38, Mass.). *J. Biol. Chem.* 239, 3653–62 (1964). A fatty acid synthetase system isolated from *Escherichia coli* strain B which produces long chain saturated and unsaturated fatty acids has been purified 10- to 15-fold by diethylaminoethyl cellulose chromatography without change in the ratio of reaction products. The instability of the purified system prevented further purification of the complex. Associated with the synthetase system is a dehydrase specific for D(−)-β-hydroxydecanoyl thioester. The dehydration reaction yields a mixture of α,β- and β,γ-decenoates. The dehydrase has been separated from the synthetase complex by mild heat treatment. The proportion of β,γ-decenoate formed by the dehydration reaction parallels the percentage of long chain unsaturated products formed by the synthetase. The heat-treated β-hydroxydecanoate dehydrase, when combined with the synthetase, ean direct the synthesis of long chain fatty acids toward the formation of either saturated or unsaturated products. The β-hydroxydecanoyl thioester dehydrase has been purified 104-fold. Both total dehydrase activity and the percentage of β,γ-decenoate formed by the dehydrase depend upon the concentration of phosphate buffer. Phosphate lowers the K_m for dehydration but does not change the V_{max} of the reaction.

EFFECTS OF ESSENTIAL FATTY ACID DEFICIENCY AND SUPPLEMENTATION OF ATHEROMA FORMATION AND REGRESSION. R. J. Morin,

S. Bernick and R. B. Alfin-Slater (School of Public Health, Univ. of Calif., Los Angeles, Calif.). *J. Atheroscler. Res.* 4, 387–96 (1964). Histological methods were utilized to study the lipids in the vascular and hepatic tissues of groups of rats prefed EFA-deficient and stock diets and subsequently fed diets containing varying amounts of cholesterol and/or hydrogenated coconut oil. Coronary atheromas were produced in EFA-deficient rats solely by the addition of 20% hydrogenated coconut oil to the diet for 10 weeks. EFA deficiency also seemed to predispose to an increased accumulation of both lipid and cholesterol in the coronary arteries and livers of rats which were subsequently fed cholesterol and/or hydrogenated coconut oil. These results support the hypothesis that the mechanisms for cholesterol transport are defective in the EFA-deficient rat. In experiments undertaken to determine whether the lipid deposition in the coronary arteries could be reversed, an atherogenic diet containing 3% cholesterol plus 20% hydrogenated coconut oil was fed to rats for 8 weeks, followed by cholesterol-free diets containing either no fat, 20% hydrogenated coconut oil, or 20% cottonseed oil for 8 weeks. Regression of lipid deposits was achieved only in the coronary arteries of the animals fed the cottonseed oil-containing diet.

COENZYME Q. LVII. SYNTHESIS OF NEW ANALOGS OF COENZYME Q_4 FOR BIOCHEMICAL MECHANISM STUDIES. H. W. Moore, D. E. Schwab and K. Folkers (Stanford Research Institute, Menlo Park, Calif.). *Biochemistry* 3, 1586–88 (1964). Coenzyme Q participates in mitochondrial electron transfer and has been proposed for a coupled role in oxidative phosphorylation. The mechanism of the latter, on the basis of an 0-quinone methine species, requires the 5-methyl group. Analogs without the 5-methyl group may permit biological differentiation of electron transfer and the phosphorylation mechanism. Further, such analogs would contribute to the knowledge of the biosynthesis of coenzyme Q, and might also furnish one with biological inhibitors. Consequently, the following compounds in the hexahydrocoenzyme Q series have been synthesized: 2,3-dimethoxy-5-phytyl-1,4-benzohydroquinone; 2,3-dimethoxy-5-phytyl-1,4-benzoquinone; 7,8-dimethoxy-2-methyl-2-(4′,8′,12′-trimethyltridecyl)-6-chromanol; 2,3-dimethoxy-6-(3′-hydroxy-3′,7′,11′,15′-tetramethylhexadecyl)-1,4-benzoquinone; 2,3-dimethoxy-6-(3′-hydroxy-3′,7′,11′,15′-tetramethylhexadecyl)-1,4-benzohydroquinone.

LIPID-BINDING CAPACITY OF INTIMAL GLOBULINS IN HUMAN AORTIC ATHEROSCLEROSIS. K. S. Mathur, R. D. Sharma, S. K. Kashyap and R. P. Sapru (Dept. of Med., Sarojini Naidu Medical College, Agra, India). *Circulation* 30, 694–97 (1964). One hundred forty-seven aortas obtained from medicolegal autopsies were studied. According to the extent of involvement of the intimal surface and the types of lesions, aortic atherosclerosis was classified as mild, moderate and severe. The globulin content of the intima and its lipid-binding, and cholesterol-binding capacity were determined in each specimen. No relation could be established between the globulin content of aortic intima and the degree of atherosclerosis. A direct correlation was observed, however, between the lipid-binding capacity and the cholesterol-binding capacity of the globulins and the severity of atherosclerosis, suggesting the possibility of a qualitative change in the globulins of the ground substance in atherosclerosis.

EFFECT OF ESSENTIAL FATTY ACID DEFICIENCY AND DIETARY CHOLESTEROL ON LIVER UBIQUINONE LEVELS IN THE RAT. D. J. Lee, Mei Chiu and H. H. Draper (Div. of Nutr. Biochem., Dept of Animal Science, Univ. of Ill., Urbana, Ill.). *J. Nutr.* 84, 401–7 (1964). The influence of feeding a fat-free diet, and of the administration of cholesterol, on the metabolism of ubiquinone in rat liver was investigated. It was observed that in advanced essential fatty acid (EFA) deficiency the concentration of ubiquinone was increased about twofold. Mevalonate-2-C^{14} incorporation experiments showed that the specific activity of liver ubiquinone was significantly reduced in EFA deficiency, but that, because of the increased amounts present, the total incorporation was similar to that in normal control animals. The biological half-life of ubiquinone in the liver of the deficient animals was approximately doubled. Administration of cholesterol in the diet resulted in a marked depression in ubiquinone concentration.

O-PHOSPHORYLETHANOLAMINE: A COMPONENT OF LIPOPOLYSACCHARIDE IN CERTAIN GRAM-NEGATIVE BACTERIA. A. P. Grollman M. J. Osborn (Dept. of Molecular Biology, Albert Einstein College of Medicine, New York City). *Biochemistry* 3, 1571–74 1964). O-Phosphorylethanolamine has been isolated from acid hydrolysates of polysaccharide prepared from the cell-wall lipopolysaccharide of a UDP-D-galactose-4-epimeraseless mutant of *Salmonella typhimurium*. The material was obtained in crystalline form and identified by melting point, elemental analysis, and infrared spectrum, and was detected by paper

chromatography in hydrolysates of the lipopolysaccharide of certain other Gram-negative bacteria.

LIPID COMPOSITION OF TRYSPANOSMA RANARUM. S. Halevy and Orna Gisry (Dept. of Biochem., Hebrew Univ., Jerusalem, Israel). *Proc. Soc. Exp. Biol. Med.* 117, 552–55 (1964). The lipid composition of *Trypanosoma ranarum* was determined. The cells contained traces of monoglycerides and about equal amounts of di- and triglycerides. Free fatty acids and "fast acting" sterols, mostly in free form, were present. The sterol was isolated and identified as ergosterol. The implications of these findings are discussed.

METABOLIC PATTERNS IN PREADOLESCENT CHILDREN XI. RESPONSE OF VITAMIN A AND CAROTENE SERUM LEVELS TO DIETARY PROTEIN AND VITAMIN A. Sarah T. Ehrlich, B. R. Farthing and Dorothy S. Moschette (School of Home Economics, Louisiana State Univ., Baton Rouge). *J. Nutr.* 84, 389–94 (1964). Thirty-six preadolescent girls were studied under controlled experimental conditions in which amount and source of dietary protein varied. The protein intake ranged from 0.6 to 3 g/kg and the protein from plant sources varied from 25 to 100% of the total protein intake. The effect of the amount and source of dietary protein and vitamin A on the vitamin A and carotene serum levels was evaluated. All of the factors studied accounted for 61% of the variation in serum vitamin A and 78% of the variation in serum carotene. Although there was no conclusive evidence that the vitamin A and carotene serum levels were influenced by the levels of protein fed in these diets, each serum level was related to a particular source of protein. Specifically, serum vitamin A was associated with plant protein, whereas serum carotene was associated with animal protein. The single factor accounting for the greatest amount of variation in serum vitamin A was serum carotene. There was no significant difference in either serum level between groups receiving 22 and 40 g of plant protein/day.

EFFECT OF FEEDING HIGH-GRAIN RESTRICTED-ROUGHAGE RATIONS WITH AND WITHOUT BICARBONATES ON THE FAT CONTENT OF MILK PRODUCED AND PROPORTIONS OF VOLATILE FATTY ACIDS IN THE RUMEN. C. L. Davis, R. E. Brown and D. C. Beitz (Dept. of Dairy Science, Univ. of Ill., Urbana.). *J. Dairy Sci.* 47, 1217–19 (1964). Two separate trials involving a total of 28 lactating dairy cows were conducted to study the effect of supplemental bicarbonates on rumen volatile fatty acids, milk production, and fat content of the milk when high-grain, low-roughage rations were fed. The bicarbonates (equal parts by weight of sodium and potassium) were incorporated into the grain mixture at two levels, 1.5 and 3.0%. All cows received grain free choice plus 5 lb of alfalfa hay per day. Cows receiving the bicarbonate in the grain mixture at a level of 3.0% did not decrease in fat test of the milk, whereas the percentage of fat in the milk of the control cows decreased from 3.51 to 1.74%. Bicarbonate feeding resulted in an increase in the acetate:propionate ratio (control—1.31; treated—2.68). At the lower level of bicarbonate feeding (1.5% of grain mixture) results showed trends similar to those for the higher level of bicarbonate feeding; however, the milk fat test for the treated cows was still below normal values.

A FURTHER STUDY OF THE SPECIFICITY OF THE VITAMIN E REQUIREMENT FOR REPRODUCTION. H. H. Draper, J. G. Bergan, Mei Chiu, A. Saari Csallany and A. V. Boaro (Division of Nutr. Biochem., Dept of Animal Science, Univ. of Ill., Urbana, Ill.). *J. Nutr.* 84, 395–400 (1964). A study was carried out to determine whether the ability of certain synthetic antioxidants to substitute for vitamin E in the diet of the female rat is due to a conservation of tocopherols in the diet or tissues, or to a direct substitution for the vitamin in its metabolic role. A highly purified basal diet was devised which was demonstrably

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free of vitamin E. When this diet was fed to rats of proven sterility, supplementation with the antioxidant DPPD (but not ethoxyquin) was observed to restore reproductivity. Under the conditions used, 0.75 mg of DPPD daily was more effective in this respect than 5 mg of dl-α-tocopheryl acetate. The results support the conclusion that DPPD is capable of direct metabolic substitution for tocopherols in metabolism, and that the function of vitamin E is entirely associated with its antioxidant properties.

PLASMA ARACHIDONIC ACID AND THE PANCREAS. R. Caren and L. Corbo (Mt. Sinai Hosp., Univ. of Calif., Los Angeles, Calif.). *J. Atheroscler. Res.* 4, 444–459 (1964). This work provides evidence in support of the presence of a factor in the exocrine pancreatic secretion of the dog which regulates the concentration of plasma arachidonic acid by its action on the cholesterol ester and phospholipid fractions. The factor is distinct from pancreatic enzymes and is heat-stable. The depression of arachidonic acid concentration resulting from removal of the exocrine secretion was not corrected by administration of purified pancreatic enzymes. However, fresh pork pancreas restored arachidonic acid levels to normal or above. Since the substances present in fresh pork pancreas and canine exocrine pancreatic secretion affected the arachidonic acid levels of the two plasma lipid fractions in the same way, it appears that the two substances may be the same.

RELATIONSHIP OF CERTAIN MILK FAT DEPRESSING DIETS TO CHANGES IN THE PROPORTIONS OF THE VOLATILE FATTY ACIDS PRODUCED IN THE RUMEN. D. C. Bietz and C. L. Davis (Dept. of Dairy Science, Univ. of Ill., Urbana). *J. Dairy Sci.* 47, 1213–16 (1964). Twelve high-producing Holstein cows were used to study the effect of feeding cod liver oil and a high-grain, restricted roughage ration on milk and fat production, fatty acid composition of the milk fat, and the proportions of volatile fatty acids in the rumen. The cod liver oil and high-grain rations did not significantly alter milk production when compared to a control diet; however, these rations did significantly lower the fat content of the milk produced. When cod liver oil was added to a normal ration of hay and grain, the proportions of the volatile fatty acids in the rumen were unaltered; whereas the high-grain diet caused a significant decrease in the proportion of acetate and a significant increase in propionate. As a results of these findings, it was concluded that cod liver oil exerts its effect on milk fat production somewhere beyond the rumen, whereas the fat depressing effect of high-grain feeding must be attributed to the significant changes occurring in the ruman fermentation.

THE CAROTENOIDS OF GREEN BELL PEPPERS. A. L. Curl (Western Reg. Res. Lab.,WURDD, Agricultural Res. Service, Albany, Calif.). *J. Agr. Food Chem.* 12, 522–24 (1964). The most abundant carotenoid in green bell peppers was lutein, with beta-carotene, violaxanthin and neoxanthin also as major pigments; minor pigments included phytoene, phytofluene, alpha-carotene and zeta-carotene. No keto carotenoids such as capsanthin or capsorubin were found, nor was capsolutein, a lutein-like pigment occurring in place of lutein in the ripe red fruit.

INFLUENCE OF FREEZING EGG YOLK PLASMA ON THE PROPERTIES OF LOW-DENSITY LIPOPROTEINS. A. Saari, W. D. Powrie and O. Fennema (Dept. of Dairy and Food Industries, Univ. of Wisconsin, Madison, Wisc.). *J. Food Sci.* 29, 762–65 (1964). After yolk plasma was held for 24 hr between −20 and −25C, the thawed mass had a pasty consistency. After freezing and thawing plasma, only 15% of the total lipoproteins were soluble in 10% NaCl. The two lipoproteins fractions, $FLPL_1$ and $FLPL_2$ isolated from the salt-soluble material had chemical and physical properties similar to those for native plasma lipoproteins LPL_1 and LPL_2. With papin treatment, heated $FLPL_2$ was degraded to the extent that all of the nitrogenous constituents were soluble in TCA solution. The influence of freezing LPL_2 solutions at various pH values on the physical properties of the thawed solutions was examined.

SOME REMARKS ABOUT THE INFLUENCE OF EXTRACTION AND TOASTING OF SOYBEAN ON THE CHANGES AND INTERACTIONS OF THE DIFFERENT COMPONETNS OF MEAL. C. Defromont, F. Douard and C. Bloch (Lab. J. Ripert, Inst. Fats & Oils, France). *Rev. Franc. Corps Gras* 11, 441–52 (1964). Pilot plant work has shown that precooking of soybeans in a moist medium will improve the solvent extraction of soya with hexane. Drying to about 4% moisture is optimum. The authors have shown that the nutritive value of the meal can be improved during toasting. The moisture level of the meal influences the content of water soluble sugars and thereby the color. The greater the percentage of reducing sugar, the darker the color of the meal. Heating destroys part of the sugars and thereby also helps to reduce

the formation of dark colored materials. The time and temperature of toasting affects the sugar content, urease activity and color of the meal. The amount of oil in the meal also influences the final color. A close parallelism was found between the Frölich test and the color of meals if the oil and sugar content are the same.

CHOLESTEROL TRANSFORMATIONS IN SOLANUM TUBEROSUM. D. F. Johnson, J. A. Waters and R. D. Bennett (National Inst. of Arthritis and Metabolic Diseases, National Insts. of Health). *Arch. Biochem. Biophys.* **108**, 282–6 (1964). Cholesterol-4- C^{14} and Δ^4-cholesten-3-one-4-C^{14} were incubated with leaves from *Solanum tuberosum* in an aqueous medium. Radioactive transformation products were studied by thin-layer chromatography and microchemical reactions. One of the major transformation products of cholesterol was shown to be Δ^4-cholesten-3-one. One product of radioactive Δ^4-cholesten-3-one incubation has been identified as cholestan-3β-ol, and on the basis of chromatographic and microchemical evidence, a second product appears to be cholestan-3α-ol.

FATTY ACIDS AND INTESTINAL METABOLISM. M. Enser (University of Oxford). *Biochem. J.* **93**, 290–7 (1964). The effect of different concentrations of saturated straight-chain C_6–C_{20} fatty acids on rings of rat small intestine has been studied *in vitro*. None of the fatty acids stimulated respiration of intestinal rings incubated in phosphate-buffered saline containing glucose; many of the acids inhibited respiration. At 0.6 *mM* inhibition of respiration increased, in general, as the chain length of the fatty acid increased, reaching a maximum at myristic acid; with further increase in chain length the inhibition decreased sharply. At a concentration of 6.0 *mM* all the fatty acids except arachidic inhibited respiration. Oxidation of glucose (5 *mM*) by intestinal rings was inhibited by 0.6 and 6.0 *mM* fatty acids, the pattern of inhibition resembling that of respiration. The incorporation of glucose carbon into lipids was inhibited in a similar manner. The uptake of glucose by intestinal rings was slightly stimulated (6%) by 0.4 *mM* lauric acid, but was inhibited 13% by 2.5 *mM* lauric. Both 10 *mM* lauric and 7.8 *mM* palmitic prevented the accumulation of glucose against a concentration gradient in the fluid bathing the serosal surface of intestinal sacs. The formation of lactic acid was stimulated by 0.4 *mM* and 2.5 *mM* lauric acid by 27 and 41% respectively; the loss of lactic acid from the tissues was stimulated by 2.5 *mM* lauric acid. The inhibition of respiration by lauric appeared at a concentration of 0.01 *mM* and increased as the concentration was raised to 10 *mM*. At 10 *mM* the inhibition was 36% of that in the absence of fatty acids. In the presence of succinic acid or glutamic acid, 1.0 *mM* lauric inhibited the respiration of intestinal rings by 29%. The oxidation of the glutamic acid to carbon dioxide was inhibited by 63%.

THE APPLICATION OF A TWO-DIMENSIONAL PAPER-CHROMATOGRAPHIC TECHNIQUE TO THE ANALYSIS OF PHOSPHOLIPIDS. R. Letters (Arthur Guinness, Son and Co., Dublin, Ltd.). *Biochem. J.* **93**, 313–16 (1964). A two dimensional paper-chromatographic technique for the separation of phospholipid mixtures on formaldehyde-treated paper and on silicic acid-impregnated paper is described. Phosphorus was determined in spots located by staining by direct digestion of the silicic acid impregnated paper. Silicic acid did not interfere with the determination. Analyses of the phospholpids of ox liver, ox brain, *Bacillus cereus*, baker's yeast and soya bean are given.

A NATURALLY OCCURRING ALLENIC ACID FROM LEONOTIS NEPETAEFOLIA SEED OIL. M. O. Bagby, C. R. Smith, Jr. and I. A. Wolff (Northern Regional Res. Lab.). *Chem. Ind. (London)* **1964**, 1861–2. Evidence is presented to show that the seed oil of *Leonotis nepetaefolia* (L.) R. Br. (family Labiatae) contains a new allenic fatty acid for which they propose the name laballenic acid. They suggest that the structure of the acid is 2,3-methyleneheptadeca-4,5-dienoic acid.

A STUDY OF THE MOBILISATION OF FREE TOCOPHEROLS IN GERMINATING SEEDS. A. R. S. Kartha (Indian Agricultural Res. Inst., New Delhi). *J. Sci. Food Agr.* **15**, 759–63 (1964). Studies of the mobilization of free tocopherols in 15 varieties of germinating seeds show that, generally, the tocopherols are completely used up in the earliest stages of germination when the fat stores are still largely intact. This is consistent with the view that the tocopherols are intended, at least partially, for some unknown essential function in the growth of the embryo in addition to their possible role as *in vivo* antioxidants of depot fat.

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PROCESS FOR SEPARATING TOCOPHEROLS AND STEROLS FROM DEODORIZER SLUDGE AND THE LIKE. W. Brown (Eastman Kodak Co.). *U.S. 3,153,054.* A process for separating tocopherols and sterols from deodorizer sludge comprises: 1) effecting fractional, liquid-liquid extraction of the sludge with a polar liquid solvent and a nonpolar liquid solvent at a volumetric ratio selected so that more higher fatty acids are dissolved by the polar solvent and more tocopherols and sterols are dissolved by the nonpolar solvent; thus there are obtained a first raffinate fraction rich in higher fatty acids but poor in tocopherols and sterols and a first extract fraction poor in higher fatty acids but rich in tocopherols and sterols; 2) effecting fractional, liquid-liquid extraction of the sludge components of the first extract fraction with a polar-nonpolar solvent mixture at a volumetric ratio selected so that more tocopherols and sterols are dissolved by the polar solvent and more sterols esters are dissolved by the nonpolar solvent; thus there are obtained a second extract fraction rich in tocopherols and sterols but poor in sterol esters and a second raffiniate fraction poor in tocopherols and sterols but rich in sterol esters.

PROCESS FOR SEPARATING TOCOPHEROLS AND STEROLS FROM DEODORIZER SLUDGE AND THE LIKE. W. Brown and F. E. Smith (Eastman Kodak Co.). *U.S. 3,153,055.* A process for separating tocopherols and sterols from a mixture consisting essentially of tocopherols, sterols, sterol esters, triglycerides and lower monohydric alcohol esters of higher fatty acids comprises: effecting fractional, liquid-liquid extraction of the mixture with a polar liquid solvent and a nonpolar liquid solvent, the volumetric ratio being selected to result in more of the tocopherols and sterols in the mixture being dissolved by the polar solvent than by the nonpolar solvent. Thus there is obtained a polar liquid solution rich in tocopherols and sterols but poor in lower monohydric alcohol esters, sterol esters and triglycerides and a nonpolar solution that is immiscible with the polar liquid solution and poor in tocopherols and sterols but rich in sterol esters, triglycerides and monohydric alcohol esters of higher fatty acids.

• Detergents

ALKYLOLAMIDES IN "SOFT" DETERGENTS. E. A. Knaggs (Stepan Chemical Co.). *Soap Chem. Specialties* 40(12), 79–82, 277 (1964). Addition of correctly selected alkylolamides improves foaming properties of linear detergents to equal or better than those of ABS based syndets. The author reviews the preparation and properties (physical form, melting point, water solubility, foaming properties, wetting properties, cotton detergency) of alkylolamides and ethoxylated alkylolamides.

α-SULFONATION OF SATURATED FATTY ACIDS AND THEIR DERIVATIVES. B. Blaser, W. Stein, H. Weiss and O. Koch (Henkel & Cia. G.m.b.H.). *U.S. 3,158,632.* In the process for the α-sulfonation of a member selected from the group consisting of fatty acids, fatty acid esters, and mixtures thereof, having a substantially saturated fatty acid radical with 6 to 28 carbon atoms and being substantially free of alcoholic hydroxyl groups, the improvement comprises initially introducing about 1.1–1.8 mols of gaseous SO_3 per mol of fatty acid radical to be sulfonated into the group member at a temperature below the temperature of effective sulfonation but not in excess of about 70C, maintaining the temperature until at least 50% of the group member has been sulfonated, and then increasing the temperature to at least 75C to complete the sulfonation.

DETERGENCY COMPOSITION. F. L. Diehl (Procter & Gamble Co.). *U.S. 3,159,581.* An improved cleansing and laundering composition consists of a water soluble trisodium salt of ethane-1-hydroxy-1,1-diphosphonate as a builder and an organic water soluble non-soap synthetic detergent surfactant having pronounced detergent power such as anionic, nonionic, zwitterionic, ampholytic surfactants or mixtures thereof. The ratio, by weight, of the diphosphonate builder to the detergent surfactant should be in the range of about 1:2 to about 10:1. The composition provides in aqueous solution a pH between 9 and 12.

PREPARATION OF LIGHT-COLORED SULFONATED FATTY ACIDS AND FATTY ACID DERIVATIVES. C. Wulff, W. Stein, O. Koch and H. Weiss (Henkel & Cie. G.m.b.H.). *U.S. 3,159,657.* Described is a process for lightening the color of dark-colored α-sulfonation products obtained by sulfonating a member selected from the group consisting of substantially saturated fatty acids containing from 6 to 28 carbon atoms, their esters which are free from alcoholic hydroxyl groups, their nitriles, and mixtures thereof with an excess of gaseous sulfur trioxide. The dark-colored sulfonation product is contacted with about 0.2–6% by weight of hydrogen peroxide at a temperature between 20–100C in the presence of an added amount of water sufficient to maintain the concentration of free SO_3 between 90% by weight and that of a 20% sulfuric acid solution.

METHOD OF PREPARING DIALKYL ESTERS OF SULFOFATTY ACIDS. E. J. Miller, Jr. (Armour & Co.). *U.S. 3,160,645.* A monosulfofatty acid having 8–22 carbon atoms is reacted with an olefin having from 2 to 16 carbon atoms in the presence of boron trifluoride or boron trifluoride diethyletherate.

Glycerine Production Report

According to the U.S. Department of Commerce, production of crude glycerine (including synthetic) for the month of December was 27.1 million lb. For the year 1964, production of crude totalled 326.3 million lb. Producers' stocks of crude and refined glycerine at the end of December totalled 61.2 million lb.

DECEMBER (Million lb.)
PRELIMINARY

Glycerine 100% Basis	Factory Production		Producers' Stocks	
	December 1964	% Change from Nov., 1964	End of Dec. 1964	% Change from Nov., 1964
Crude	27.1	+1.9	33.6	+12.4
Refined all Grades	26.2	−0.4	27.6	− 8.3
			61.2	+ 2.0

* Includes synthetic glycerine