

All plates were incubated at the optimum growing-temperature for each organism. Readings were made after 24, 48, 72, and 120 hrs., respectively. Zones of inhibition were compared to those of the controls.

### Results and Discussion

Of the ricinoleic and oleic acid derivatives screened for their antimicrobial activity against several species of bacteria, yeasts, and molds under optimum growing-conditions, such as pH, nutrition, incubation temperature, and moisture, several exhibited considerable activity (Table I). In general, these compounds did not exhibit as broad a spectrum as sorbic and 10-undecenoic acids, common antimicrobial agents. Ricinoleic acid, 4-ricinoleoylmorpholine, 4-ricinelaidoylmorpholine, methyl 12-hydroxystearate, 4-(12-propionyloleoyl)morpholine, and petroselinic (iso-oleic) acid in several cases however were comparable to these positive controls as indicated by this test. In many cases, the various compounds exhibited only a slight degree of inhibition, that is, the micro-organisms merely failed to grow over the compound. Even though some of the compounds exhibited only slight activity, they should not be ruled out as antimicrobial agents. Under less favorable growing-conditions, such as that found in paint films, polymers, and copolymers, the activity might be increased considerably. They may be effective also against other types of micro-organisms.

Since there are different factors involved, such as solubility, absorption, metabolic degradation, etc., molecular structure of the compounds studied cannot be associated with antimicrobial activity. Even with this limited number of compounds and micro-organisms, observations indicate that it is impossible to make any generalization concerning the antimicrobial activity imparted by various functional groups in the molecule. The  $\beta$ -hydroxy-*cis*-ene system in ricinoleic acid and 4-ricinoleoylmorpholine appears to impart activity to the molecule whereas it appears to decrease the activity in methyl ricinoleate. The  $\beta$ -hydroxy-*trans*-ene system appears to impart activity to 4-ricinelaidoylmorpholine but very little to ricinelaidic acid or methyl ricinelaidate. On the other hand, methyl 12-hydroxystearate and petroselinic (iso-oleic) acid exhibited considerable activity even though neither

one of these compounds possesses a  $\beta$ -hydroxy-ene system.

Cyanoethylation or esterification of the hydroxyl group in 4-ricinoleoylmorpholine, 4-ricinelaidoylmorpholine, and 4-(12-hydroxystearoyl)morpholine appears to alter the activity of the molecule, reducing it in most cases, but no generalization can be made.

Similarly, converting the carboxyl of ricinoleic, ricinelaidic, and 12-hydroxystearic acids to morpholino or methyl ester groups appears to alter the antimicrobial activity of the molecule but not systematically.

Some of these compounds might be of commercial interest since they possess such broad antimicrobial spectra. For example, 4-ricinoleoylmorpholine should probably be of interest in paint films, plastics, and other polymeric materials for its antimicrobial as well as its plasticizer properties (12). In addition, some of the compounds tested may have medicinal applications.

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## A B S T R A C T S . . . . R. A. REINERS, Editor

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### • Fats and Oils

THE ISOLATION OF *CIS*- $\Delta^9$ -HEPTADECENOIC ACID FROM BUTTERFAT. R.P. Hansen, F.B. Shorland, and N. June Cooke (Fats Res. Lab., Dept. of Sci. and Ind. Res., Wellington, New Zealand). *Biochem. J.* **77**, 64-6 (1960). *cis*- $\Delta^9$ -Heptadecenoic acid was isolated from butterfat in a concentration of approximately 0.06% of the total weight of fatty acids. According to the authors, odd-numbered unsaturated fatty acids have not previously been found in butterfat.

THE CHEMICAL NATURE OF THE TOXIC COMPOUNDS CONTAINING FLUORINE IN THE SEEDS OF *DICHAPELALUM TOXICARIUM*. R.A. Peters, R.J. Hall, and P.F.V. Ward (A.R.C. Inst. of Animal

Physiol., Babraham, Cambridge) and N. Sheppard. *Biochem. J.* **77**, 17-23 (1960). Fluoro-oleic acid from the seeds of *D. toxicarium* (Sierra Leone) has been isolated in pure form and its structure proved to be  $\omega$ -fluoro-*cis*- $\Delta^9$ -octadecenoic acid. During the final stages of purification, another fluoro-fatty acid of much higher melting point was isolated in small amounts. It contained no double bond and possibly 17 carbon atoms, but behaved biochemically as a long-chain fatty acid with an even number of carbons. Both acids were found to significantly inhibit citrate metabolism in guinea pig kidney particles.

THE FATTY ACID COMPOSITION OF HUMAN DEPOT FAT. K.J. Kingsbury, S. Paul, A. Crossley, and D.M. Morgan (St. Mary's Hospital, London, W. 2). *Biochem. J.* **78**, 541-50 (1961). The fatty

acid composition of the depot fat from 12 subjects, both normal and atheromatous, has been studied by gas-liquid chromatography and alkaline isomerization. Human depot fat was found to contain 42–51% of oleic acid, 21–30% palmitic acid, 5–8.5% palmitoleic acid and stearic acid, 5–8% of linoleic acid, and less than 3% of acids with more than 2 double bonds. Significant amounts of odd-numbered and branched-chain fatty acids,  $C_8$  and  $C_{10}$  saturated acids and of tri-unsaturated acids (trienes), pentaenes and hexaenes occurred. The fatty acid composition is similar to that of the glycerides of plasma and milk; it also shows some similarities with that of the phospholipids of these sites but not with the cholesteryl esters or total plasma fatty acids. No significant differences were found between the depot fat of normal and atheromatous subjects except for an increased concentration of tri-unsaturated acids, particularly in relation to the dienes and tetraenes, in the atheromatous samples.

THE EFFECT OF METHOD OF CARE ON THE FRYING LIFE OF FAT. M. Elizabeth Rust and Dorothy L. Harrison (Kansas State Univ., Manhattan, Kan.). *Food Tech.* 14, 605–9 (1960). The effect of 4 methods of care on the frying life of a hydrogenated vegetable fat processed for food service deep fat frying was investigated. The methods of care were: I—filtered, stored in a covered metal container at 2° to 5°, and 20% (of original weight) fresh fat added each 8-hour frying period; II—filtered, stored in a cleaned fryer at 20° to 25°, and 20% fresh fat added each frying period; III—filtered, stored in a cleaned fryer at 20° to 25° and fresh fat added to replace that lost during each 8-hour frying period; IV—skimmed, stored in fryer at 20° to 25° and fresh fat added to replace that lost at each frying period. Fat cared for by Methods I and II had a frying life of more than twice that of fat cared for by Methods III and IV. Methods I and II also required approximately twice as much fat as Methods III and IV to fry 100 g. of potatoes, which would affect the cost of a serving of French fried potatoes. There was a significant negative correlation between the acid number of the fat and the acceptability of French fried potatoes. The method of care significantly affected the viscosity of the fat and the percentage weight loss of fat and potatoes during frying.

THE USE OF STARTER DISTILLATE FOR FLAVORING BUTTER. R.R. Riel and C.A. Gibson (Dairy Tech. Research Inst., Ottawa, Canada). *Food Tech.* 15, 137–40 (1961). The feasibility of flavoring Canadian butter with starter distillate and with a commercial preparation of synthetic diacetyl was investigated at various concentrations. Although official graders preferred control samples to flavored samples, one-third of the members of a taste panel had a definite preference for the flavored samples and only one-fifth preferred the control samples. The remaining panel members showed no preference. Starter distillate butters were preferred to "commercial diacetyl" butters, and 0.50 oz. of distillate per 100 lb. of fat was preferred to 0.25 oz. or 1 oz., whereas for "commercial diacetyl" the preference decreased with increasing concentration. The levels of acetylmethylcarbinol and of diacetyl in the flavored butters were respectively in the range 0.11–0.27 p.p.m. and 0.24–0.64 p.p.m. These values did not change even after 1 year of storage at –10°F. Peroxide values indicated that the keeping quality of the butter was unaffected by either flavoring.

RAPESEED OIL MEAL STUDIES. 3. EFFECTS OF VARIATIONS IN COOKING AND CONDITIONING TEMPERATURES USED DURING EXPELLER PROCESSING OF RAPESEED ON THE FAT AND LYSINE CONTENT OF RAPESEED OIL MEALS. D.R. Clandinin and E.W. Tajenar (Univ. of Alberta, Edmonton, Alberta, Canada). *Poultry Sci.* 40, 291–293 (1961). The effects of normal variations in cooking and conditioning temperatures used during expeller processing of rapeseed oil meals were studied. The results obtained indicate that: (1) The lower the cooking and conditioning temperatures, the higher the fat and lysine content of the resultant rapeseed oil meals. (2) In the extraction of oil from rapeseed by the expeller process only sufficient heat should be used in cooking and conditioning to permit reduction of the oil content to about six per cent if damage to protein quality of the meal is to be avoided.

INTERFACIAL TENSIONS OF LIPOLYZED MILK FAT-WATER SYSTEMS. A.H. Duthie, R.G. Jensen, and G.W. Gander (Dept. of Animal Indus., Storrs Agri. Expt. Sta., Storrs, Conn.). *J. Dairy Sci.*, 44, 401–406 (1961). The average interfacial tensions (in dynes per centimeter) of control and lipolyzed milk fat-water systems were, respectively: extracted fat 5.4, 4.0, after removal of free fatty acids 5.9, 2.7, after removal of acetone insoluble lipids 11.8, 5.4, and after removal of monoglycerides (as part of 80% ethanol-soluble lipid) 24.4, 22.7. It appears that monoglycerides decreased interfacial tension to some extent.

MILK POWDERS. V. EFFECTS OF THE INTERFACIAL TENSION OF BUTTER OIL IN POWDER ON THE WETTABILITY OF THE POWDER. B.E. Baker and E.R. Samuels (Dept. of Agri. Chem., Macdonald College of McGill Univ., Quebec, Canada). *J. Dairy Sci.* 44, 407–15 (1961). Milk powders were prepared from homogenized mixtures of butter oil and condensed skim milk. In one series of experiments surface active agents were added to the butter oil and in another series they were added to the condensed skim milk. Wettability measurements on the various milk powders showed that the monoglycerides (Myverol) exerted a more pronounced effect on wettability when they were incorporated in the nonfat portion of the milk, and the Span and Tween preparations exerted a more pronounced effect when they were incorporated in the fat portion of the milk. The results showed that alterations in the interfacial tension of the fat component of a milk powder does not of itself exert a marked effect on wettability.

A NEW LIQUID PHASE FOR GAS CHROMATOGRAPHIC SEPARATIONS OF STEROIDS. W.J.A. VandenHeuvel, E.O.A. Haahiti, and E.C. Horning (Lab. of Chem. of Natural Products, Nat. Heart Inst., Bethesda, Md.). *J. Am. Chem. Soc.* 83, 1513–14 (1961). A new kind of thermostable polar liquid phase for gas chromatography has been found. It is silicone polymer QF-1, a fluorinated alkyl silicone from the Dow-Corning Corp. This phase may be used in the same fashion as the non-polar silicone polymer SE-30. It has polar properties that suggest many applications in the identification, estimation and preparative separation of steroids and other natural products.

## • Fatty Acid Derivatives

GLYCEROL FATTY ACID PARTIAL ESTER GELS. G.Y. Brokaw and W.C. Lyman, Jr. (Eastman Kodak Co.). *U.S.* 2,976,251. A firm, clear gel consists of a glycerol fatty acid partial ester composition containing at least 75% by weight of monoglycerides having fatty acid radicals with at least 16 carbon atoms and water in an amount of from 10–90% by weight of partial ester composition. The partial ester composition should contain less than 10% by weight of glycerides having saturated fatty acid radicals with more than 11 carbons.

## • Biology and Nutrition

STUDIES ON THE VITAMIN K REQUIREMENT OF THE CHICK. II. EFFECT OF SULFAQUINOXALINE ON THE QUANTITATIVE REQUIREMENTS OF THE CHICK FOR VITAMIN  $K_1$ , MENADIOLONE AND MENADIOLONE SODIUM BISULFITE. T.S. Nelson and L.C. Norris (Dept. of Poultry Husbandry and Grad. School of Nutrition, Cornell Univ., Ithaca, N.Y.). *J. Nutrition* 73, 135–42 (1961). The effect of sulfaquinoxaline on the vitamin K requirement of the chick varied with age. High levels of vitamin  $K_1$ , menadiolone or menadiolone sodium bisulfite (MSB) did not overcome the hypoprothrombinemia caused by sulfaquinoxaline at two or three weeks. At 4 weeks vitamin  $K_1$  and menadiolone prevented this effect. MSB appeared to correct this effect to a certain point beyond which higher levels had no effect. Although the response of the chick was less at 2 or 3 weeks than at 4 weeks, the relative response between these three forms was approximately the same. Rating the response of the chick to vitamin  $K_1$  as 100, menadiolone was found to be only 40% as effective on a molar basis and MSB was 70% as effective. Thus, vitamin  $K_1$  was more effective than either menadiolone or menadiolone sodium bisulfite in overcoming the toxic effects of sulfaquinoxaline. At 4 weeks of age, 0.1% of sulfaquinoxaline in the diet increased the vitamin  $K_1$  requirement 4 to 7 times that found to be required when this drug was omitted from the diet.

THE REGULATION OF DEPOT FAT BY LINOLEIC ACID. H. Kaunitz, C.A. Slanetz, R.E. Johnson, and V.K. Babayan (Dept. of Path. and the Inst. of Comparative Med., Columbia Univ., N.Y.). *J. Nutrition* 73, 386–90 (1961). The composition of the neutral fat of rats fed long- and short-chain triglycerides in conjunction with various levels of linoleic acid was studied. It is concluded that linoleate regulated the type of fat deposited; it leads to a decrease in neutral fat in relation to body weight and facilitates the laying down of a depot fat more representative of that in the diet.

COMPARATIVE EFFECTS OF ESTRADIOL AND COMESTROL DIACETATE, A NONSTEROID ESTROGENIC SUBSTANCE, ON LIPID METABOLISM IN

**THE MALE RAT.** R.L. Lyman and B.J. Krueger (Dept. of Nutrition, Univ. of Calif., Berkeley, Calif.). *J. Nutrition* 73, 391-96 (1961). Increasing levels of the diacetate of coumestrol, an estrogenic substance isolated from clover, were compared with estradiol benzoate, in the normal and castrate male rat, for their effect on food intake, growth, testicle and adrenal size, and liver and plasma lipid distribution. In both normal and castrate groups, injected estradiol benzoate (15, 30, or 100  $\mu$ g. per week) produced depressed growth, testicular and adrenal changes, a rise in plasma cholesterol, and a lipotropic effect on the glyceride fraction of the cholesterol-induced fatty liver. No comparable changes were produced with the oral administration of 1, 3, 5, 10, and 15 mg. of coumestrol diacetate daily. It appears, therefore, that although coumestrol has a definite estrogenic effect on the uterus of the young female rat, the compound is inactive and apparently nontoxic for the adult male animal.

**COMPARATIVE VITAMIN K ACTIVITY OF FROZEN, IRRADIATED, AND HEAT-PROCESSED FOODS.** L.R. Richardson, Stella Wilkes, and S.J. Ritchey (Dept. of Biochem. and Nutri., Agri. and Meeh. College of Texas, Texas Agri. Exp. Sta., College Station, Tex.). *J. Nutrition* 73, 369-73 (1961). The vitamin K content of 6 foods which had been frozen, canned by conventional heat treatment, and irradiated with 2.79 and 5.58 megarads of gamma rays was obtained using the chick assay procedure. Foods assayed for vitamin K were asparagus, broccoli, cabbage, cauliflower, green beans, and spinach. The values for vitamin K activity were higher in some instances and lower in a few cases in the treated foods than in the frozen foods. Similar variations in values were obtained after the foods had been stored 15 months. These differences were attributed chiefly to variations in values obtained for different levels of food and it was concluded that there was no appreciable difference in vitamin K activity caused by the method of preservation or by storage.

**METABOLIC PATTERNS IN PREADOLESCENT CHILDREN. IV. FAT INTAKE AND EXCRETION.** L.B. Stier, Doris Taylor, June Pace, and J.N. Eisen (Human Nutri. Res. Div., U.S. Dept. of Agri., Washington, D.C.). *J. Nutrition* 73, 347-51 (1961). The amount of fat in the diets and feces was determined for 35 girls, 7 to 9 years of age, as one segment in a series of metabolic studies. The controlled diets were composed of ordinary foods with the level of protein as the chief variable and with the fat providing from 28 to 33% of the total calories. For the three series of studies, the average daily intake of fat was 66, 69, and 79 gm. and, correspondingly, the average daily fecal fat was 3.6, 2.6, and 3.2 gm. The apparent digestibility of the fat ranged from 94 to 96%. Under the conditions of these studies, the fecal fat of preadolescent girls increased 0.05 gm. as the fat intake increased 1 gm., when data were expressed on a per-kilogram-of-body-weight basis. This increase in fecal fat was statistically significant in two of the three studies.

**STATISTICAL STUDY OF THE RELATIONSHIP BETWEEN DIETARY LINOLEATE AND THE FATTY ACIDS OF HEART AND BLOOD LIPIDS.** W.O. Caster and R.T. Holman (Dept. of Physio. Chem., Univ. of Minnesota, Minneapolis, and Austin, Minn.). *J. Nutrition* 73, 337-46 (1961). A number of statistical techniques were applied to the study of tissue analysis, dermal score, and weight gain data obtained from rats maintained with controlled intakes of linoleic acid and total fat. The correlation between each of these variables and dietary linoleate as well as all other variables was presented. The correlation matrix thus generated was used for multiple regression and factor analysis studies.

**FATTY ACID COMPOSITION OF THE LIPID FRACTIONS FROM BOVINE SERUM LIPOPROTEINS.** Laura Evans, S. Patton, and R.D. McCarthy (Dept. of Dairy Sci., Pennsylvania Agri. Expt. Sta., University Park). *J. Dairy Sci.* 44, 475-82 (1961). Weights and fatty acid composition of the lipid fractions have been determined from bovine serum lipoproteins, separated ultracentrifugally at a solvent density of 1.063 g./ml. and corresponding in electrophoretic mobility to  $\alpha$ - and  $\beta$ -lipoproteins. Fatty acid distribution indicated a large concentration of linoleate in the total lipids and cholesteryl esters of the high-density lipoproteins. This concentration was dispersed in their other lipid fractions. The low-density lipoproteins contained chiefly palmitate and stearate in all lipid fractions. Triglycerides in both high- and low-density lipoproteins were notably similar in weight, saturation, and fatty acid composition.

**ANTIGENICITY OF CHOLESTEROL-INDUCED CHICKEN ATHEROMA.** R.C. Bahler and W.T. Butler (Western Reserve Univ. School of Med., and Dept. of Path., Univ. Hosp. of Cleveland, Ohio). *Proc. Soc. Exptl. Biol. Med.* 106, 383-87 (1961). Rabbit anti-

bodies were produced in response to cholesterol-induced chicken atheroma and chicken normal intima. Properties of these antisera were studied by complement fixation and described by isofixation curves. It was found that antiatheroma sera reacted best with atheroma antigen and in addition reacted well with a wide variety of other chicken tissues. Anti-normal intima sera reacted well with either intima or atheroma antigen and had a limited spectrum of reactivity with other tissues. *In vivo* activity of these antisera could not be demonstrated.

**EFFECTS OF INGESTED THERMALLY OXIDIZED CORN OIL ON FAT COMPOSITION IN THE RAT.** E.G. Perkins, J.G. Endres, and F.A. Kummerow (Dept. of Food Tech., Univ. of Illinois, Urbana, Ill.). *Proc. Soc. Exptl. Biol. Med.* 106, 370-72 (1961). Five groups of weanling rats were kept for 59 days in individual cages and fed adequate diets which contained 2% cottonseed oil and 10% of the following fats: (1) corn oil, (2) oxidized corn oil, (3) hydrogenated oxidized corn oil, (4) fatty acids from oxidized corn oil, and (5) 10% oxidized fatty acids plus 90% fresh fatty acids from corn oil. The results indicated that hydroxy acids, originating from oxidized fats, are deposited and influence the character of the normal mixed fatty acid composition of the carcass fat.

**INCORPORATION OF INFUSED PALMITIC-1-C<sup>14</sup> INTO PLASMA LIPID FRACTIONS.** R.D. Orth, M.B. Fine, and R.H. Williams (Dept. of Med., Univ. of Washington School of Med., Seattle). *Proc. Soc. Exptl. Biol. Med.* 106, 339-41 (1961). Palmitic-1-C<sup>14</sup> and linoleic-1-C<sup>14</sup> acids were infused into fasted dogs, and fractionation of the serum lipids carried out at time intervals up to 72 hours. Although many similarities were found in the metabolism of these two fatty acids, it was observed that linoleic-1-C<sup>14</sup> appeared to (1) persist longer in the plasma as the FFA, and (2) to be incorporated preferentially into cholesterol esters and phospholipids.

**DELETERIOUS EFFECTS OF HIGH FAT DIETS ON SURVIVAL TIME OF X-IRRADIATED MICE.** B.H. Ershoff (Western Biol. Lab., Culver City, Calif.). *Proc. Soc. Exptl. Biol. Med.* 106, 306-309 (1961). The effects of multiple sublethal doses of total body X-irradiation were determined on survival time of male mice fed either a purified fat-free ration or a similar diet supplemented with 2%, 10%, 20%, or 30% cottonseed oil, margarine fat or butter fat. The effects obtained were dependent on the amount and source of dietary fat. At levels of 2% or 10% of the diet, cottonseed oil and margarine fat increased survival time over that on the fat-free ration. When these fats were fed at higher levels (i.e., 20% or 30% of the diet), however, survival time was decreased below that obtained at the lower levels of supplementation. In contrast to the results obtained with the cottonseed oil or margarine fat supplements, butter fat at levels of 2% or 10% of the diet did not prolong survival over that on the fat-free ration; nor did it decrease survival time when fed at higher levels in the diet.

**COMPARISON OF LIPOPROTEIN LIPASE AND CLOTTING ACTIVITY IN LYMPH AND PLASMA AFTER HEPARIN.** W.E. Connor (Dept. of Internal Med., State Univ. of Iowa College of Med., Iowa City, Iowa). *Proc. Soc. Exptl. Biol. Med.* 106, 378-80 (1961). Lipoprotein lipase was found in the post-heparin thoracic duct lymph of the 7 dogs studied and in the post-heparin lymph aspirated from the chest in a patient with chylothorax. This enzyme reached a maximal concentration later and remained longer in lymph than in the blood. Post-heparin lymph also reflected the presence of heparin by greatly prolonged coagulation times. Evidence was given that lipoprotein lipase should be determined by measuring its lipolytic activity and not by "clearing" techniques alone.

**CONTROL OF PLASMA NON-ESTERIFIED FATTY ACIDS IN PREGNANCY AND THE PUERPERIUM.** R.L. Burt, N.H. Leake, and W.N. Dannenburg (Bowman Gray School of Med. and N. Carolina Baptist Hosp., Winston-Salem, N.C.). *Proc. Soc. Exptl. Biol. Med.* 106, 330-32 (1961). The amount and timing of glucose administered to fasting post-partum women receiving intravenous insulin determines the amount and direction of change in plasma nonesterified fatty acids (NEFA). Twenty-five grams of glucose inhibits the characteristic response of NEFA to insulin while half this dosage either enhances the insulin effect or causes secondary decrements in NEFA. These results suggest that the regulation of plasma NEFA is a complex function that may involve fatty acid synthesis, utilization and recycling as well as controlled release from fat depots.

**THE EFFECTS OF CHAIN LENGTH ON THE METABOLISM OF SATURATED FATTY ACIDS BY THE RAT.** S.L. Kirschner and R.S. Harris (Dept. of Nutri., Food Sci. and Tech., Mass. Inst. of Tech., Cambridge, Mass.). *J. Nutrition* 73, 397-402 (1961). The effects of chain length upon the rates of metabolism of four

$C^{14}$ -carboxyl-labeled saturated fatty acids (butyric, caprylic, lauric, palmitic) were studied. The rates of metabolism of butyric and caprylic acids to respired  $C^{14}O_2$  were highest and similar, that of lauric acid was intermediate, and that of palmitic acid was lowest. The rapid excretion of  $C^{14}O_2$  observed when the shorter-chain fatty acids were fed indicates that they were oxidized instead of entering the fat depots.

THE UPTAKE OF MONOCARBOXYLIC ACIDS BY RAT DIAPHRAGM. E.C. Foulkes and C.M. Paine (May Inst. for Med. Res. of the Cincinnati Jewish Hospital, and the Dept. of Physiology, College of Med., Univ. of Cincinnati, Cincinnati, Ohio). *J. Biol. Chem.* 236, 1019-22 (1961). The diffusion of organic anions into rat diaphragm *in vitro* was investigated. Results showed that specific properties of the cell membrane facilitate the uptake of anionic metabolites which rapidly diffuse into and out of muscle. Evidence obtained in kinetic studies indicates that these anions, in diffusing from medium to cells, do not pass through the main bulk of the interstitial fluid of the tissue.

METABOLIC FATE OF A SYNTHETIC CORTICOSTEROID (TRIAMCINOLONE) IN THE DOG. J.R. Florini, L.L. Smith, and D.A. Buyske (Experimental Therapeutics Research Sec. and the Chem. Process Improvement Dept., Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.). *J. Biol. Chem.* 236, 1038-42 (1961). The metabolic fate of triamcinolone- $H^3$  was studied in the dog after intravenous injection. Countercurrent distribution and paper chromatography revealed two major radioactive and blue tetrazolium-reducing components in the urine. These were identified by various chemical and physical methods as unchanged triamcinolone and 6 $\beta$ -hydroxytriamcinolone. A similar pattern of metabolites was observed in the urine of one human who received 96 mg. of unlabeled triamcinolone per day orally for 3 weeks. The results of this and previous studies on triamcinolone are inconsistent with mechanisms of corticosteroid action which involve biochemical alterations of the steroid molecule.

THE SYNTHESIS OF "CHYLOMICRON-LIKE" BODIES AND MAINTENANCE OF NORMAL BLOOD SUGAR LEVELS BY THE ISOLATED, PERFUSED RAT LIVER. R.E. Kay and C. Entenman (Biol. & Med. Sciences Div., U.S. Naval Radiological Defense Lab., San Francisco, Calif.). *J. Biol. Chem.* 236, 1006-12 (1961). Isolated, perfused liver is able to establish and maintain the blood sugar and lactic acid levels at normal values. The liver taken from a fed rat can synthesize, and release into the blood, "chylomicron-like" bodies. There is no net increase in glycerides in the perfusion system when the liver taken from a fasted rat is perfused, even when glucose is infused into the perfusate. When palmitic acid- $C^{14}$ -labeled chylomicrons are injected into the perfusate,  $C^{14}$  appears in phospholipids and cholesterol esters of plasma and liver and in carbon dioxide. A slow hydrolysis of glycerides occurred in circulating, oxygenated blood, even after the blood had been perfused through a liver and despite a careful attempt to prevent the liberation of lipoprotein lipase.

ORGANIC ACID EXCRETION, ENHANCED CALCIUM ABSORPTION AND BODY FAT OF RATS FED INCOMPLETELY DIGESTED CARBOHYDRATES. R.M. Tomarelli and F.W. Bernhart (Wyeth Inst. for Med. Research, Radnor, Pa.). *Proc. Soc. Exptl. Biol. Med.* 106, 588-92 (1961). Rats fed diets containing the incompletely digested carbohydrates, lactose, cellobiose, and raw potato starch, excreted larger amounts of organic acids and had a lower content of body fat than rats fed glucose, sucrose or galactose. The predominant urinary organic acids were identified by silica gel chromatography as citric,  $\alpha$ -ketoglutaric, fumaric, and succinic acids. Organic acid excretion could be increased by increasing the amount of dietary salt mixture or by adding  $CaCO_3$  but not  $CaCl_2$  to the diet. This latter finding, in conjunction with the results of urinary analysis of ionic constituents, indicated that the increased excretion of organic acid is not a consequence of an altered metabolism that decreases body fat deposition but is a renal acid-base mechanism for neutralization of increased urinary calcium, an increase resulting from the enhancement of gastrointestinal absorption of calcium by incompletely digested carbohydrates.

FATTY ACID COMPOSITION OF MOUSE LIPIDS AND LIPOPROTEINS. C.S. Rehnberg, A.V. Nichols, and J.K. Ashikawa (Donner Lab. of Med. Physics, Lawrence Radiation Lab., Univ. of Calif., Berkeley). *Proc. Soc. Exptl. Biol. Med.* 106, 547-49 (1961). Mouse plasma lipid and lipoprotein fatty acids were evaluated by gas chromatography. The plasma cholesteryl ester fraction contained a high percentage of polyunsaturated acids, linoleic (50.1%) and arachidonic (29.9%). Mouse fatty acid data were compared with human values. Concentration of albumin-bound nonesterified fatty acids in mouse plasma was found to be significantly higher than normally present in humans.

FIBER AND PECTIN IN THE DIET AND SERUM CHOLESTEROL CONCENTRATION IN MAN. A. Keys, F. Grande, and J.T. Anderson (Lab. of Physiological Hygiene, Univ. of Minnesota, Minneapolis, and the Hastings State Hospital, Hastings). *Proc. Soc. Exptl. Biol. Med.* 106, 555-58 (1961). Rigidly controlled experiments on middle-aged men subsisting on diets of natural foods with and without supplements of 15 g. daily of either cellulose (fiber) or pectin failed to show any significant effect on serum cholesterol concentration from the cellulose but they did consistently show an effect from the pectin. The pectin effect was apparent in 3 weeks and amounted to an average fall of about 5% below the level on the same diet without pectin supplement. It is suggested that the amount of cellulose and pectin used correspond to the upper levels of these substances provided in natural human diets.

INCREASED CONCENTRATION OF FREE FATTY ACIDS IN LIVER DISEASE. J.M. Stormont, J.E. Mackie, and C.S. Davidson (Thorn-dike Memorial Lab., Boston City Hospital, and Dept. of Medicine, Harvard Med. School, Boston). *Proc. Soc. Exptl. Biol. Med.* 106, 642-44 (1961). Fasting plasma FFA concentrations were determined in 34 subjects with cirrhosis and 28 without cirrhosis. Mean fasting FFA concentrations were elevated in subjects with cirrhosis and this was most marked in those subjects with acute hepatic failure or hepatic coma. The increased FFA concentrations were not accompanied by a rise in blood ketone concentrations.

NUTRITIONAL INVESTIGATIONS WITH TURKEY HENS. I. QUANTITATIVE REQUIREMENT FOR PROTEIN. L.S. Jensen and J. McGinnis (Dept. of Poultry Sci., Washington State Univ., Pullman). *Poultry Sci.* 40, 288-90 (1961). In experiments with large type turkey breeder hens, no demonstrable protein deficiency was observed, even though a ration containing as low as 10% protein was fed for a period of 11 weeks. It is suggested that the 15% protein level recommended by the National Research Council is more than adequate.

COMPOSITION OF CORN, ANALYSIS OF CAROTENOIDS IN CORN GRAIN. F.W. Quackenbush, J.G. Firch, W.J. Rabourn, Marilyn McQuistan, E.N. Petzold, and T. E. Kargl (Dept. of Biochem., Purdue Univ., Lafayette, Ind.). *J. Agri. Food Chem.* 9, 132-5 (1961). The unusually complex system of carotenoid polyenes in yellow corn grain has not permitted complete separation of each entity in a routine system of analysis. However, a procedure has been described for the elution of seven fractions from a magnesia chromatogram. Subsequent spectrophotometry provides values for three provitamins A and the eight predominant biologically-inactive carotenoids. In addition to *cis* isomers of the major polyenes, a number of minor components of the extract were recognized. Calculated provitamin A activity of the extracts from three corn samples agreed with bioassay results which were obtained with rats. The method shows that wide differences exist in carotenoid distribution in different inbred lines of corn.

LIPID OXIDATION IN PRE-COOKED BEEF PRESERVED BY REFRIGERATION, FREEZING, AND IRRADIATION. Pi-Yu Chang, Margaret T. Younathan, and Betty M. Watts (Dept. of Food and Nutrition, Florida State University, Tallahassee, Fla.). *Food Tech.* 15, 168-71 (1961). Oxidation of lipids in the lean tissue of roast beef slices preserved by refrigeration, freezing, or irradiation was followed by the thiobarbituric acid test and organoleptic evaluation. Oxidized products accumulate very rapidly in the refrigerator. Frozen samples maintain a somewhat lower oxidation over long storage periods. Lipid oxidation is not an important factor in irradiated beef stored at room temperature. Antioxidant combinations of ascorbate and polyphosphate, used either as dips or as cover solutions, eliminate lipid oxidation and greatly improve the odor of refrigerated and frozen beef, but do not benefit irradiated beef.

COTTONSEED MEAL IN POULTRY FEED, COLLABORATIVE STUDY OF THE AGU METHOD OF GRADING COTTONSEED MEALS FOR LAYING RATIONS. V.L. Frampton (Southern Regional Research Lab., Agr. Research Ser., U.S.D.A., New Orleans, La.), and Biagio Piccolo. *J. Agr. Food Chem.* 9, 129-31 (1961). The results of a collaborative study of the available gossypol unit (AGU) method of grading cottonseed meals for laying rations indicate that significant differences exist in AGU values among eggs, birds, and meals. The correlation between the AGU values of cottonseed meals and coloration in yolks of stored shell eggs produced by the meals is virtually zero. The AGU method may not be relied upon for grading cottonseed meals for laying rations.

THE PHOSPHOLIPIDS OF BUTTER AND THEIR EFFECT ON BLOOD COAGULATION. J.D. Billimoria, R.G. Curtis, and N.F. MacLagan (Westminster Med. School, London, S.W. 1). *Biochem. J.* 78, 185-93 (1961). The addition of butter to plasma shortened

the Stypven clotting time of human plasma by over 75%. Butter was more active than any other fat tested (margarine is the only other fat mentioned specifically). A preliminary separation of butter lipids indicated that the thromboplastic activity was confined to the phosphatides originally bound to the proteins of butter. A technique is described for the fractionation of butter phospholipids by chromatography on silicic acid columns and continuous gradient elution with methanol-chloroform mixtures.

**CARDIOLIPIN AND OTHER PHOSPHOLIPIDS IN OX LIVER.** Marjorie G. Macfarlane (Lister Inst. of Preventive Med., London, S.W. 1). *Biochem. J.* 78, 44-51 (1961). The polyglycerophosphatide of ox liver isolated by chromatography on silicic acid and by solvent fractionation of barium salts was identified as cardiolipin. Linoleic acid (70%) and linolenic acid (12-15%) were the main fatty acids of this fraction. Phosphatidylinositol isolated in yields of 64-70% of the total inositide contained stearic acid as essentially the only saturated acid (45-55%) and polyenoic acids in varying proportion as the main unsaturated components. It was considered impossible either to exclude or confirm the presence of naturally occurring phosphatidic acid.

**PREPARATION OF HYDROPHILIC COLLOIDS OF BRAIN KEPHALINS.** Y. Kimura and Y. Nagai (Univ. of Tokyo). *Biochem. J.* 77, 1-3 (1960). When a turbid water emulsion of inositol phosphatide fraction or phosphatidylserine from brain tissues is added to a solution of ethylenediaminetetraacetate at pH 10, the solution becomes transparent and remains so even after removal of the reagents added by dialysis. Such a phenomenon is not seen with phosphatidylethanolamine or with a brain lecithin fraction. Aqueous ammonia also has a clearing action at higher pH values, but the resulting clear solutions were far less stable.

**INFRA-RED SPECTRA OF BRAIN PHOSPHATIDYLSERINE.** Y. Kimura and Y. Nagai (Univ. of Tokyo). *Biochem. J.* 77, 3-4 (1960). Infrared spectra are reported for 4 forms of phosphatidylserine: the original preparation, metal-free, mono- and di-sodium derivatives.

**THE PHOSPHOLIPIDS OF OX SPLEEN WITH SPECIAL REFERENCE TO THE FATTY ACID AND FATTY ALDEHYDE COMPOSITIONS OF THE LECITHIN AND KEPHALIN FRACTIONS.** G.M. Gray (Lister Inst. of Preventive Med., Chelsea Bridge Rd., London, S.W. 1). *Biochem. J.* 77, 82-91 (1960). Phospholipids equivalent to about 600 mg. of P/kg. of fresh tissue were extracted from ox spleen with chloroform-methanol mixtures and were fractionated on silicic acid columns. Percentage composition was: cardiolipin, 3; phosphatidylethanolamine, 9; phosphatidylserine, 14; ethanolamine plasmalogen, 10; serine plasmalogen, 5; phosphatidylcholine, 35; choline plasmalogen, 4; sphingomyelin, 10; unidentified, 4; not recovered, 6. Data are given for the fatty acid and aldehyde compositions of the various fractions.

**PROCESSING FOR PREPARING POTATO CHIPS.** S.W. Arenson. *U.S.* 2,976,153. Sliced potato chips are cooked in hydrogenated oil and then evenly coated with a liquid oil in an amount such that the chips absorb the oil in an amount not exceeding 2%. The resulting chips have improved taste and texture and longer shelf life.

**TREATMENT OF EDIBLE OILS.** A. Roylance, S. Paul, and R.J. Taylor (Lever Brothers Co.). *U.S.* 2,976,156. A neutralized edible vegetable oil is dissolved in a nonpolar solvent and the solution treated with activated alumina. After removal of the solvent, the oil is steam-deodorized and an antioxidant added. The refined glyceride oil exhibits improved keeping qualities.

**THERAPEUTIC INTRAVENOUS FAT COMPOSITIONS.** C.E. Meyer, J.A. Fancher, and P.E. Schurr (Upjohn Co.). *U.S.* 2,977,283. A therapeutic fat product which is especially suitable for intravenous use in human beings consists of a metabolizable, non-toxic, fixed oil emulsified in an aqueous vehicle by a soya phosphatide fraction. The phosphatide fraction is prepared by adsorbing undesirable reactive materials found in monatomic lower molecular weight aliphatic alcohol-dissolved soya phosphatides on aluminum oxide, magnesium oxide, or activated carbon. The resulting fraction is stable, water-dispersible, and vegetable oil-soluble.

**Darby. Soap Chem. Specialties** 37(4), 51-4, 101, 103-4 (1961). A new method for the evaluation of dishwashing detergents which employs photometric apparatus is described. Through the use of a light-scattering photometer the major factors which cause spotting—fat and protein soils, detergent builders, and water hardness—can be identified. The number of test runs needed to obtain significant conclusions is markedly reduced, and the sensitivity and precision of the method make it especially useful as spotting and filming are progressively eliminated, thus providing a guide to the development of improved dishwashers and detergents.

**DETERGENT FOAM MEASUREMENT.** H.E. Reich, J.T. Patton, Jr., and C.V. Francis (Wyandotte Chemicals Corp.). *Soap Chem. Specialties* 37(4), 55-7, 104 (1961). Described are the design and use of an apparatus for measuring the foam of surfactants under dynamic conditions that closely resemble those of actual use. Although this device can be used for the measurement of surfactants ranging from extremely low foaming or non-foaming to high foaming, it is particularly suitable for accentuating the differences among the foam properties of very low foaming surfactants. The foam height and rate of foam decay can also be measured under static conditions.

**NEW DETERGENT/SANITIZERS.** C.F. Moleculeski, O.E. Libman, and Loretta Ciszak (Clintwood Chem. Co., Chicago). *Soap Chem. Specialties* 37(4), 58-9 (1961). A germicidal hard surface cleaner formula has been developed with an alkalamide which does not adversely affect the bactericidal properties of "Santophen I" for at least seven months.

**A COMPARISON OF QUATERNARIES AND AMPHOTERICIS.** D.L. Andersen (General Mills, Inc., Minneapolis). *Soap Chem. Specialties* 37(4), 61-2, 99 (1961). Basic information dealing with the structure, chemistry, and properties of quaternaries and amphotericis is presented. Applications for each type are suggested.

**NOVEL DETERGENT COMPOSITIONS.** H.B. Hass, F.D. Snell, L.I. Osipow, and W.C. York (Sugar Res. Foundation, Inc.). *U.S.* 2,970,962. A heavy-duty detergent composition consists of 10 to 40% surface active component and, as a detergent aid, from 10 to 90% by weight of an alkali metal salt of a molecularly-dehydrated phosphoric acid. The surfactant is a monoester of sucrose and raffinose and a fatty acid containing 6 to 30 carbon atoms.

**OPAQUE LIQUID DETERGENT COMPOSITION.** R.D. Walker and J. Blinka (Procter & Gamble Co.). *U.S.* 2,970,963. The described composition is an aqueous vehicle containing about 15 to 40% of a water soluble anionic nonsoap synthetic detergent sodium salt comprising in part an amount of sodium alkyl glyceryl ether sulfonate with alkyl radicals ranging in chain length from C<sub>12</sub> to C<sub>14</sub>, equivalent to at least 2% by weight of the composition. Suspended in the solution as a crystalline opacifying agent is about 1% to 9% of an alkyl glyceryl ether sulfonate sodium salt with alkyl radicals ranging from C<sub>16</sub> to C<sub>20</sub>. The solution also contains from 2% to 20% sodium nitrate to provide a graining action for the opacifying agent and thus reduce the viscosity of the composition and to increase the specific gravity of the vehicle and increase the stability of the opacifying agent against gravitational separation. A similar composition is described in *U.S.* 2,970,964.

**STABILIZED SOAP COMPOSITION.** V.C. Fusco and R.C. Harshman (Olin Mathieson Chem. Corp.). *U.S.* 2,971,917. The described composition consists of a soap of an aliphatic monocarboxylic acid containing from 12 to 18 carbon atoms and a hydrazinium salt of an organic acid in an amount sufficient to stabilize the soap against discoloration and undesirable odor formation.

**WATER SOLUBLE IODINE-PHOSPHORIC-ACID-SYNTHETIC DETERGENT COMPOSITION.** B.J. Scheib, N.E. Lazarus, and M.T. Sullivan (Lazarus Labs, Inc.). *U.S.* 2,977,315. The described composition, having detergent, germicidal, and sanitizing properties, consists of an iodine-synthetic detergent complex with phosphoric acid. Iodine is present in an amount sufficient to provide a germicidally effective amount of iodine in the intended dilution of the composition; phosphoric acid is present at a concentration of greater than 4 times the amount of iodine and sufficient to provide a pH in the range of 2.0 to 4.0 in the diluted state. The synthetic detergent may be any of the acid stable, organic nonionic or anionic surface active agents.

## • Detergents

**DISHWASHING DETERGENTS EVALUATION.** A.L. Kimmel, H.M. Gadberry (Midwest Res. Inst., Kansas City, Mo.), and D.O.