ABSTRACTS

R.A. REINERS, Editor. Abstractors: N.E. Bednarcyk, J.E. Covey, J.C. Harris, S.F. Herb, F.A. Kummerow, Biserka Matijasevic, E.G. Perkins, and R.W. Walker

• Fats and Oils

ETHANE EVOLUTION: A NEW INDEX OF LIPID PEROXIDATION. C.A. Riely, G. Cohen and M. Lieberman (Coll. of Physicians and Surgeons, Columbia Univ., N.Y. 10032). *Science* **183**, 208–10 (1974). Homogenates of mouse liver and brain at 37C spontaneously formed lipid peroxides and simultaneously evolved ethane. α-Tocopherol, a lipid antioxidant, blocked ethane formation. When mice were injected with carbon tetrachloride (a liquid prooxidant for liver), the animals produced ethane. Ethane evolution in vivo was stimulated by prior administration of phenobarbital and it was diminished by prior injection of α-tocopherol. These data suggest that ethane production may be a useful index of lipid peroxidation in tissue homogenates and in intact animals.

PREPARATION OF EDIBLE FATS BY HYDROGENATION AND FRACTION. B.L. Caverly, G.J.H. Meertens and J.B. Rossell (Lever Bros.). *U.S. 3,790,608.* A hard stearine butter for confectionery is prepared from a triglyceride oil containing mono- and polyethenoic acids of which 25–85% are unsaturated C_{20}-C_{22} acids, e.g., a rapeseed or other crucifera oil, by selective hardening to an I.V. of 70–85 with isomerization to a trans index of 50–80, and fractionation to isolate a fat fraction of D_{20} at least 1400 and D_{35} below 300.

METHOD AND APPARATUS FOR DETERMINING TRIGLYCERIDE LEVEL. B.G. Finkel, A.L. Levy, and C. Keyloun (Scientific Specialties Ltd.). *U.S. 3,791,791.* Blood serum is introduced into an extraction tube filled with a premeasured extraction reagent. Triglycerides are selectively extracted from the serum and then transesterified to liberate glycerol. The triglycerides are oxidized and treated with a color producing reagent. The color can then be measured in a colorimeter to give a quantitative estimate of the amount of triglycerides.

CONTINUOUS HYDROGENATION OF FATTY MATERIALS. W.A. Coombes, R.A. Zavada, J.E. Hansen, W.A. Singleton and R.R. King (Blaw-Knox Chemical Plants, Inc.). *U.S. 3,792,067.* The process involves concurrently flowing an oil to be hydrogenated, with catalyst dispersed therein, and hydrogen through a pipeline reactor, with the hydrogen being introduced at spaced intervals over the length of the reactor. The hydrogen is introduced in a manner to provide highly turbulent two-phase flow, preferably of the bubble type, and in an amount required to provide the desired reduction in iodine number. The process provides a uniform and consistent product with high linoleic acid selectivity.

ADDING FAT ADJUVANTS TO FOODS IN AN EBULLIENT FREEZANT. K.D. Dastur (du Pont). *U.S. 3,792,180.* The process comprises contacting the surface of the food with a dispersion of the food adjuvant in a saturated fluorinated liquid chlorohydrocarbon freezant with a normal boiling point of 5 to 50C.

APPARATUS FOR THE RECOVERY OF BUTTER, OLEOMARGARINE, OR CHEESE. B.G. Caddell and H.E. Gordon (Kansas City Enterprises, Inc.). *U.S. 3,792,655.* Apparatus is presented for physically separating butter, oleomargarine, cheese or like viscous substance from sheet material containing the material as individual "reddies" in order to permit recovery and reprocessing of the substance from improperly formed or packaged reddie units. A frustoconical roller drum engages one side of a perforated separator disc and rotates synchronously with it to squeeze the reddie between them. The butter or like substance is forced through the disc perforations while the sheet material remains on one side of the disc.

AQUEOUS FAT EMULSIONS CONTAINING AMINO ACIDS. J. Schnell (B. Braun Melsungen Ag.). *U.S. 3,793,450.* Stable, nonpyrogenic, infusion compositions for intravenous administration contain essential amino acids in the form of free bases in a fat emulsion, such as of soybean oil. The emulsified compositions are stabilized with soya or egg yolk phosphatides. Methods for making the compositions are also disclosed.

METHOD OF REMOVING MELTED FATS FROM THE SURFACE OF AN EDIBLE AQUEOUS SOLUTION. M.C. Stubits (Anheuser-Busch, Inc.). *U.S. 3,794,743.* An edible carbohydrate fatty acid ester in powdered form (preferably cellulose laurate) is added to the fat and absorbs several times its own weight in fat. The fat-laden cellulose laurate is removed from the fluid and, if the fat is extracted from the cellulose laurate, it can be reused.

PROCESS FOR FRYING BUOYANT FOOD PIECES. A.L. Boertje and P.J. Philpot (Lever Bros. Co.). *U.S. 3,794,745.* A buoyant foodstuff is fried in heated oil during its downward flow through a series of successively sloping channels.

• Biochemistry and Nutrition

FAT SOLUBLE VITAMINS IN THE EIGHTH REVISION OF THE RECOMMENDED DIETARY ALLOWANCES. J.G. Bieri (Nat. Inst. of Arthritis. Metabolism, and Digestive Diseases, Bethesda, Md.). *J. Am. Dietetic Assoc.* **64**, 171–4 (1974). Changes made in the eighth revision as compared with the seventh are discussed. Vitamin A activity is now expressed in terms of both International Units (I.U.) and Retinol Equivalents (R.E.). 1 R.E. = 3.33 I.U. retinol = 10 I.U. beta carotene. Eventually the use of I.U. of vitamin A activity will be phased out. The primary advantage of the change is that the variable absorption and intestinal conversion of provitamin A carotenoids is automatically included in the term "R.E." The actual recommended allowances for vitamin A remain the same for all ages and sex groups, except for women. Here the allowances have been lowered by 20% to reflect their lower body weights. The requirement for total vitamin E activity has been lowered to 15 I.U. for men and 12 I.U. for women. The requirement is based on the dietary intake of polyunsaturated fatty acids which was found to be lower than previously estimated. With the increasing amounts of soybean oil consumed in America, it is estimated that 20% of the total vitamin E activity in the diet comes from gamma tocopherol. No changes were made in the allowances for vitamins D and K.

FATS, ESSENTIAL FATTY ACIDS, AND ASCORBIC ACID. R.B. Alfin-Slater (School of Public Health, Univ. of California, Los Angeles, Cal.). *J. Am. Dietetic Assoc.* **64**, 168–70 (1974). Dietary fat provides calories and serves as a vehicle for fat soluble vitamins and essential fatty acids. It is important too in regulating cholesterol metabolism. Low fat diets which contain polyunsaturated vegetable oils would be desirable but difficult to attain. The recommended fat allowance—35% of calories—is felt to be a practical compromise. Firm data on requirements were used in establishing the ascorbic acid allowance of 45 mg per day for adults, with an increase to 60 mg for pregnant and lactating women. For infants, the ascorbic acid allowance of 35 mg daily is based on the amount of this vitamin estimated to be in the average of 850 ml of breast milk fed per day.

RELATIVE POTENCY OF SEVERAL FORMS OF α-TOCOPHEROLS IN THE CHICK LIVER STORAGE BIOASSAY. L.D. Matterson and W.J. Pudelkiewicz (Nutr. Sci. Dept., Storrs Agr. Exper. Station, Univ. of Conn., Storrs, Conn. 06268). *J. Nutr.* **104**, 79–83 (1974). The relative potencies of different tocopherol preparations using a chick liver storage bioassay have been studied over a period of 6 years. Data pooled from 22 experiments and using 16 different tocopherol preparations show that, with this assay, the naturally occurring form (α-tocopherol) is 1.21 times more effective than the synthetic (all-rac-α-tocopherol) form. Studies also showed that 2l-α-tocopherol was deposited in the liver at levels considerably higher than would be expected from results using other criteria of measurement.

PHYSICOCHEMICAL ANALYSES OF THE BOVINE MILK FAT GLOBULE MEMBRANE. III. PROTON MAGNETIC RESONANCE SPECTROSCOPY. R.C. Chandan, J. Cullen and D. Chapman (Unilever Res. Lab. Colworth-Welwyn, The Frythe, Welwyn, Herts, Great Britain). *J. Dairy Sci.* **55**, 1232–36 (1972). High resolution nuclear magnetic resonance spectra were obtained from freeze-dried milk fat globule membranes in D_2O. The effect of increasing temperature on spectra of the acetone-extracted membrane was related to thermal behavior of its lipid components. At 33.4C the spectrum of the membrane reflected acetone-soluble lipids. At 50C the spectrum of acetone-extracted membrane was still dominated by signals from lipids, which increased in intensities at from 60 to 120C. No signals attributed to proteins were observed before and after treatment with 8 M urea and sodium deoxycholate. However, treatment with a more powerful denaturing solvent, trifluoroacetic acid, resulted in sharp

resonances attributable to amino acids. This observation indicated ordered configuration for membrane proteins. Data presented suggested little or no restriction in molecular freedom of protons of the membrane constituents. In this regard bovine milk fat globule membrane contrasted with erythrocyte membrane.

STUDIES ON PEROXIDATIVE HEMOLYSIS AND ERYTHROCYTE FATTY ACIDS IN THE RABBIT: EFFECT OF DIETARY PUFA AND VITAMIN E. L.R. Horn, M.O. Barker, G. Reed and M. Brin (Dept. of Biochem. Nutr., Hoffmann-La Roche Inc., Nutley, N.J. 07110). *J. Nutr.* **104**, 192–201 (1974). Clinical signs of vitamin E deficiency were not manifested in the rabbit prior to the onset of dietary PUFA supplementation. PUFA consumption by vitamin E-deficient rabbits tended to promote peroxidative hemolysis by dialuric acid, as well as osmotic fragility when determined in the presence of either hydrogen peroxide or the peroxide-generating system of glucose oxidase and glucose in a continuous salt gradient. Analysis of erythrocyte fatty acids by GLC demonstrated incorporation of the administered PUFA. Peroxidation of erythrocyte PUFA was observed in vitro but not in vivo. Fatty acids of erythrocyte phospholipids were also analyzed for alterations under the experimental conditions. Possible mechanisms of the participation of vitamin E in lipid metabolism and membrane stabilization are discussed.

ACETYLENIC ANALOG OF ARACHIDONATE THAT ACTS LIKE ASPIRIN ON PLATELETS. A.L. Willis, D.C. Kuhn and H.J. Weiss (Dept. of Pharmacol., Hoffmann-La Roche, Inc., Nutley, N.J. 07110). *Science* **183**, 327–30 (1974). Development of irreversible platelet aggregation and the accompanying release of platelet-bound serotonin and production of prostaglandins is suppressed by 5,8,11,14-eicosatetraynoic acid (TYA). These findings may be explained by an ability of TYA to inhibit the enzymatic conversion of arachidonate to a newly recognized factor, labile aggregation-stimulating substance, which induces platelet aggregation, and to prostaglandins E_2 and $F_{2\alpha}$.

CARBON 14-LABELED PALMITIC ACID METABOLISM IN FASTED, LACTATING GOATS FOLLOWING NICOTINIC ACID ADMINISTRATION. R. Waterman and L.H. Schultz (Dept. of Dairy Sci., Univ. of Wis., Madison, Wis. 53706). *J. Dairy Sci.* **56**, 1569–74 (1973). Four independent infusions of carbon-labeled palmitate were performed, two in each of two goats to allow examination of fatty acid metabolism following nicotinic acid administration to fasted, lactating goats. Nicotinic acid caused an initial inhibition of lipolysis followed by a rebound period of accelerated adipose fatty acid mobilization. Fatty acid turnover rate, turnover time and contribution to ketone body carbon were, in general, positively related to circulating plasma non-esterified fatty acid concentrations. This suggests that nicotinic acid has a marked effect on fatty acid release from adipose tissue but minimal effects on subsequent fatty acid metabolism. Label incorporation was slow for glycerides with negligible incorporation into cholesterol esters and phospholipids. Low specific activities in milk fat indicated minimal direct non-esterified fatty acid contribution.

THE METABOLISM OF CYCLOPROPANE FATTY ACIDS BY TETRAHYMENA PYRIFORMIS. C.L. Tipton and N.M. Al-Shathir (Dept. of Biochem. and Biophys., Ia. State Univ., Ames, Ia. 50010). *J. Biol. Chem.* **249**, 886–9 (1974). Cyclopropane fatty acids are readidly metabolized by whole cells of *Tetrahymena pyriformis* when the fatty acids are presented either as components of intact *Escherichia coli* cells or as free fatty acids added to the medium. cis-11,12-[methylene-^{14}C]Methyleneoctadecanoic acid was degraded with the production of $^{14}CO_2$ by whole *T. pyriformis* cells or a particulate fraction derived from them. In the presence of malonate, [2-^{14}C]-acetate was formed. A pathway for degradation of the cyclopropane fatty acids, requiring only minor modification of the usual β oxidation pathway, is proposed.

RESPONSE OF THE LACTATING COW TO DIFFERENT METHODS OF INCORPORATING CASEIN AND COCONUT OIL IN THE DIET. J.E. Storry, P.E. Brumby, A.J. Hall and V.W. Johnson (Natl. Inst. for Res. in Dairying, Shinfield, Reading, RG2 9AT, England). *J. Dairy Sci.* **57**, 61–67 (1974). Effects of diets containing 10% coconut oil in various physical forms on milk fat and protein secretion, rumen fermentation and food intake of cows are reported. Coconut oil in unbound forms or as a spray-dried powder of oil and casein reduced total milk fat secretion. This was due to a decreased intramammary synthesis of fatty acids which exceeded the transfer to milk of fatty acids from the coconut oil. There were associated decreases in the ratios of acetic to propionic acid in rumen fluid. Coconut oil-casein powders treated with formaldehyde, however, did not affect volatile fatty acids in the rumen or the intramammary synthesis of fatty acids, and, therefore, the total output of milk fat was increased. Unbound coconut oil or untreated coconut oil-casein powders reduced milk protein secretion. Untreated casein alone or treated coconut oil-casein powders did not affect milk protein. Food intake was lower on diets containing unbound coconut oil or untreated coconut oil-casein powder than on diets containing no coconut oil or formaldehyde treated powders of coconut oil and casein.

RELEASE OF LIPOPROTEIN LIPASE ACTIVITY FROM ISOLATED FAT CELLS. II. EFFECT OF HEPARIN. J.E. Stewart and M.C. Schotz (Res. Dept., Veterans Admin. Wadsworth Hosp. Center, Los Angeles, Cal. 90073). *J. Biol. Chem.* **249**, 904–7 (1974). Addition of heparin to isolated fat cells incubated at 23C resulted in a 3-fold increase in release of lipoprotein lipase activity into the incubation medium. This increase in medium lipoprotein lipase activity was not due to enhancement or stabilization of lipase activity present in the medium. The maximum increase in lipoprotein lipase activity was obtained on addition of 0.1 unit of heparin per ml to the cells. The heparin-stimulated release of lipoprotein lipase was almost completely inhibited by the metabolic inhibitors, sodium cyanide and Antimycin-A. When protein synthesis was blocked with cycloheximide and heparin added to the incubation medium, neither the release of lipoprotein lipase activity nor the intracellular enzyme activity was affected for 120 min. At the end of this 120-min incubation there was approximately 5 times as much lipoprotein lipase activity in the medium as in the cells initially. These studies suggest that intracellular lipoprotein lipase undergoes activation in association with heparin-stimulated release from fat cells.

INFLUENCE OF DIETARY FAT AND DI-2-ETHYLHEXYL PHTHALATE ON TISSUE LIPIDS IN RATS. M.S. Stein, P.I. Caasi, and P.P. Nair (Biochem. Res. Div., Dept. of Med., Sinai Hosp. of Baltimore, Inc., Baltimore, Md. 21215). *J. Nutr.* **104**, 187–91 (1974). Di-2-ethylhexyl phthalate (DEHP) is known to be widely distributed in the food chain, and previous studies have identified DEHP as a constituent of heart muscle mitochondrial lipids. The present paper describes an interaction between dietary DEHP and fat on gain in body weight and on the organ weights and lipid content of liver, heart and kidney in rats. Groups of rats were fed a basal fat-free diet supplemented with either 0.1% DEHP or 4% stripped lard or both for a period of 44 days. Dietary DEHP caused an increase in liver weight irrespective of the fat content in the diet. Although, in the absence of dietary fat, DEHP did not significantly change the body weight and the weight of the epididymal fat pad, with the addition of dietary fat, DEHP potentiated the growth-promoting effect of the fat itself, indicating the existence of an interaction between the two dietary constituents. Among the three organs examined for DEHP content, the liver was the only tissue in which DEHP failed to accumulate as a result of dietary supplementation with this substance. Furthermore, dietary fat and DEHP acted synergistically in increasing the total lipid content of the liver. These observations strongly suggest the existence of an interaction between dietary DEHP and fat on lipid metabolism.

DESATURATION AND SATURATION OF FATTY ACIDS BY SHEEP RUMEN BACTERIA: OPTIMAL CONDITIONS AND COFACTOR REQUIREMENTS. D. Sklan and P. Budowski (Faculty of Agr., The Hebrew Univ., Rehovot, Israel). *J. Dairy Sci.* **57**, 56–60 (1974). Optimal conditions for aerobic formation and anaerobic biohydrogenation of linoleic acid were determined in sheep rumen fluid with added olive oil fatty acids. Both activities were highest at 38C. Formation of linoleic acid exhibited maxima at pH 5.0 and 7.5, and hydrogenating activity was highest at pH 6.0. Washed rumen bacteria suspended in phosphate buffer showed a requirement for reduced pyridine nucleotides in the acrobic formation of linoleic acid. Cysteine, quinol and sucrose enhanced anacrobic hydrogenation and induced saturation of linoleic acid even under aerobic conditions. Addition of 1-^{14}carbon labeled oleic and linoleic acid revealed a bidirectional flux of label between the monoene and diene fraction upon aerobic incubation.

EFFECT OF DIETARY 1,3-BUTANEDIOL ON IN VITRO FATTY ACID SYNTHESIS AND MALIC ENZYME ACTIVITY IN RAT LIVER AND ADIPOSE TISSUE. D.R. Romsos, C. Sasse and G.A. Leveille (Lab. of Nutr. Biochem., Dept. of Animal Sci., Univ. of Ill. at Urbana-Champaign, Urbana, Ill. 61801). *J. Nutr.* **104**, 202-9 (1974). Diets containing graded levels of 1,3-butanediol (BD) substituted for approximately equal amounts of glucose energy were fed to rats. Body weight gain was not affected by addition of 10 parts (17% of dietary energy) BD to the diet; however addition of 15 parts BD (25% of dietary energy) or more did depress weight gain. Plasma β-hydroxy-butyrate and acetoacetate levels were elevated as dietary BD was increased. Increasing the BD content of the diet decreased plasma glucose, insulin and triglyceride levels. Plasma free fatty acids were increased by addition of BD to the diet. Hematocrit was increased slightly in rats fed the BD-containing diets and may have been related to the increased rate of urination associated with elevated plasma ketones. Hepatic rates of in vitro fatty acid synthesis were markedly depressed when BD was added to the diet. The in vitro rates of fatty acid synthesis in adipose tissue were not affected by dietary BD. Malic enzyme activity was depressed in both liver and adipose tissue only when high levels of BD were added to the diets. It is suggested that dietary BD affects hepatic fatty acid synthesis in the rat by its effect on the hepatic NADH/NAD^+ ratio.

INFLUENCE OF MITOCHONDRIA ON PHOSPHOLIPID SYNTHESIS IN PREPARATIONS FROM RAT LIVER. J.B. Roberts and F.L. Bygrave (Dept. of Biochem., Faculty of Sci., Australian Natl. Univ., Canberra, A.C.T. 2600, Australia). *Biochem. J.* **136**, 467–75 (1973). The addition of mitochondria to an incubation system containing the soluble and microsomal fractions of rat liver enhances severalfold the incorporation of each of ethanolamine, phosphorylethanolamine and CDP-ethanolamine into phosphatidylethanolamine. In the presence of microsomal, mitochondrial and soluble fractions, CDP-ethanolamine exhibits the greatest initial rate of incorporation (approx. 6 nmol/h per mg of protein), being slightly faster than that of phosphorylethanolamine (approx. 5 nmol/h mg of protein). Incorporation of ethanolamine proceeds very slowly for the first 20 min and only after 30 min gives rates approaching those of the other two precursors. By using a substrate 'dilution' technique it was shown that in the reconstituted system the affinity of each of the enzymes for their respective substrates is very high. The reconstituted system exhibits an absolute requirement for Mg^{2+} (2 mM gave maximal rates) and is inhibited by very low concentrations of Ca^{2+} (100 μM-Ca^{2+} produced half-maximal inhibition with 3 mM-Mg^{2+}). Further addition of Mg^{2+} overcame the Ca^{2+} inhibition, suggesting that the inhibitory effect is readily reversible. The concept that modification of the Mg^{2+}/Ca^{2+} ratio is a means of controlling the rate of cellular phospholipid synthesis is introduced.

INFLUENCE OF FREQUENCY OF FEEDING LOW PROTEIN DIETS ON LIPID METABOLISM IN ADULT RATS RECOVERING FROM MALNUTRITION. R.D. Reeves and L. Arnrich (Dept. of Food and Nutr., Iowa State Univ., Ames, Iowa 50010). *J. Nutr.* **104**, 118-25 (1974). The influence of frequency of feeding low protein diets on lipid metabolism was studied in adult rats recovering from chronic malnutrition. Malnourished rats were refed up to 30 days either ad libitum or by the 8–16 meal pattern (8-hour + 16-hour fast). Repletion diets contained 4.5% of calories from protein and either cornstarch or cornstarch plus corn oil as the energy source. Food efficiency when the low fat diet was fed was not different for either meal pattern, but meal-fed rats fed the high fat diet had a greater food efficiency ratio than ad libitum controls. Consequently during the last 20 days of refeeding, meal-fed rats fed the corn-oil diet accumulated epididymal lipid at a rate 3 times that of ad libitum controls. The lipogenic response in epididymal tissue was accompanied by increased activity of the hexosemonophosphate shunt dehydrogenases (HMPD), malic enzyme and citrate-cleavage enzyme. Both epididymal and hepatic HMPD and malic enzyme activities decreased with time, but the rate of decrease was greater in rats fed ad libitum than in meal-fed rats. After 30 days, the activities of both epididymal enzymes were slightly greater in meal-fed rats than in ad libitum controls fed the low fat diet.

PHOSPHATIDYLINOSITOL KINASE. A COMPONENT OF THE CHROMAFFIN-GRANULE MEMBRANE. J.H. Phillips (Med. Res. Council Lab. of Molec. Biol., Hills Road, Cambridge CB2 2QH, U.K.). *Biochem. J.* **136**, 579–87 (1973). Phosphorylation of bovine chromaffin granules by ATP leads to the formation of diphosphoinositide in the granule membrane. Both phosphatidylinositol kinase and its substrate are components of this membrane, and triphosphoinositide is not formed under the conditions of the assay. The reaction is Mg^{2+}-dependent and is stimulated by Mn^{2+} and F^- ions. The initial reaction is rapid, with a broad pH profile and a 'transition' temperature for its activation energy at 27C. The apparent K_m for ATP is 5 μM. ADP, N-ethylmaleimide, Cu^{2+} ions and $NaIO_4$ are inhibitory. The phospholipids of chromaffin-granule membranes have been analyzed: 6.8% of the lipid P is found in phosphatidylinositol, and only 2–3% in phosphatidylserine. Comparison of the rate of phosphorylation of intact and lysed granules suggests that the sites for phosphorylation are on the outer (cytoplasmic) surface of the granules, and diphosphoinositide may therefore make an important contribution to the charge of the chromaffin granule in vivo.

PLASMA LIPOPROTEINS AND THE SYNTHESIS AND TURNOVER OF PLASMA TRIGLYCERIDE IN NORMAL AND GENETICALLY OBESE MICE. D. Michael, W. Salmon and D.A. Hems (Dept. of Biochem., Imperial Coll. of Sci. and Technol., London S.W.7, U.K.). *Biochem. J.* **136**, 551–63 (1973). Lipoproteins in the plasma of mice were characterized by agarose-gel chromatography and polyacrylamide-gel electrophoresis: genetically obese (ob/ob) mice exhibited hyperlipoproteinaemia (compared with lean mice), largely owing to an increase in the concentration of cholesterol in high-density lipoprotein. Plasma concentrations of triglyceride and phospholipid were not markedly increased in genetically obese mice. The formation of glycerolipids in liver and plasma was investigated with ^{14}C-labelled precursors. The synthesis of hepatic triglyceride and phospholipid from glucose or palmitate was enhanced in ob/ob mice, compared with lean mice. The rate of entry of triglyceride into plasma, calculated from the time-course of incorporation of ^{14}C from [^{14}C]palmitate into plasma triglyceride, was increased in ob/ob mice (0.5 μmol of fatty acid/min, compared with 0.2 in lean mice). The removal from plasma of murine lipoprotein triglyceride-[^{14}C]fatty acid was increased in ob/ob mice (half-time 2.2 min, compared with 7.2 min in lean mice).

METABOLIC ADAPTATIONS DURING LACTOGENESIS. FATTY ACID AND LACTOSE SYNTHESIS IN COW MAMMARY TISSUE. R.W. Mellenberger, D.E. Bauman and D.R. Nelson (Dept. of Dairy Sci. and Schl. of Vet. Med., Univ. of Ill., Urbana, Ill. 61801). *Biochem. J.* **136**, 741–8 (1973). Mammary-tissue biopsies were obtained from multiparous cows at 30 and 7 days *pre partum* and 7 and 40 days *post partum*. Investigations of the effect of lactogenesis on fatty acid and lactose synthesis involved measurements of biosynthetic capacity (tissue-slice incubations in vitro) and activities of relevant enzymes. Results are consistent with acetyl-CoA carboxylase and perhaps acetyl-CoA synthetase representing the regulatory enzyme(s) in fatty acid synthesis, with lactose synthetase (α-lactalbumin) serving a similar function in lactose biosynthesis.

PHYSIOCHEMICAL PROPERTIES OF BOVINE MAMMARY FATTY ACID SYNTHETASE. S.K. Maitra and S. Kumar (Dept. of Chem., Georgetown Univ., Washington, D.C. 20007). *J. Biol. Chem.* **249**, 118–25 (1974). Fatty acid synthetase from lactating bovine mammary gland has an $s^0_{20,w}$ of 13.5 and a molecular weight of 530,000 as determined by sedimentation equilibrium. This enzyme is not cold-labile and can be stored at 4C with little loss in enzyme activity for up to 2 weeks in 0.25 M potassium phosphate buffer, pH 6.8, containing 1.0 mM dithiothreitol in an atmosphere of N_2. At room temperature the activity was lost in 3 days. In Tris (10 mM)-glycine (35 mM) buffer, pH 8.45, the enzyme dissociated completely in about 27 hours into obviously nonidentical, but inseparable 9 S subunits with molecular weights of 220,000 with a loss

of most of the fatty acid synthetase and crotonyl-CoA reductase activities. On filtration of these subunits through Sephadex G-50, equilibriated with 0.25 M potassium phosphate buffer, pH 6.8, containing 10^{-3} M dithiothreitol, they reassociate with partial recovery of both fatty acid synthetic and crotonyl-CoA reductase activities.

THE MECHANISM OF ACTION OF ADRENOCORTICOTROPIC HORMONE. THE ROLE OF MITOCHONDRIAL CHOLESTEROL ACCUMULATION IN THE REGULATION OF STEROIDOGENESIS. D. Mahaffee, R.C. Reitz and R.L. Ney (Depts. of Med., Physiol., and Biochem., Univ. of N.C., Chapel Hill, N.C. 27514). *J. Biol. Chem.* 249, 227–33 (1974). Adrenocorticotropic hormone (ACTH) and its mediator, cyclic adenosine 3′:5′-monophosphate (cyclic AMP), are known to stimulate steroidogenesis at a site prior to the formation of 3-β-hydroxy-pregnen-5-en-20-one (Δ^5-pregnenolone). In a study of the mechanisms of this effect, it was found that cyclic AMP added directly to isolated adrenal mitochondria failed to enhance transformation of endogenous mitochondrial cholesterol to Δ^5-pregnenolone. On the other hand, when adrenal mitochondria were isolated from hypophysectomized rats treated with either ACTH or N^6,$O^{2'}$-dibutyryl cyclic adenosine 3′,5′-monophosphate (dibutyryl cyclic AMP) in vivo, they produced significantly more Δ^5-pregnenolone in vitro than mitochondria from untreated rats. It was found that the adrenal mitochondria from the treated animals contained significantly more cholesterol than those from controls.

LIPID METABOLISM AND EXPERIMENTAL ATHEROSCLEROSIS IN BABOONS: INFLUENCE OF CHOLESTEROL-FREE, SEMI-SYNTHETIC DIETS. D. Kritchevsky, L.M. Davidson, I.L. Shapiro, H.K. Kim, M. Kitagawa, S. Malhotra, P.P. Nair, T.B. Clarkson, I. Bersohn and P.A.D. Winter (Wistar Inst. of Anatomy and Biol., Philadelphia, Pa. 19104). *Am. J. Clin. Nutr.* 27, 29-50 (1974). Four groups of six (three male, three female) baboons (*Papio ursinus*) were maintained for 1 year on a semi-synthetic diet of the formula: 40% carbohydrate, 25% casein, 14% hydrogenated coconut oil, 15% cellulose, 5% salt mix (USP XIV) and 1% vitamin mix. Four carbohydrates were used: glucose, fructose, sucrose and starch. A fifth group was fed a normal diet consisting of bread, fruit and vegetables. The data show that a semi-synthetic, cholesterol-free diet will cause hyperlipemia and aortic sudanophilia in baboons.

GANGLIOSIDE BIOSYNTHESIS. CONCENTRATION OF GLYCOSPHINGOLIPID GLYCOSYLTRANSFERASES IN GOLGI APPARATUS. T.W. Keenan, D.J. Morre and S. Basu (Depts. of Animal Sci., Bot. and Plant Pathol., and Biol. Sci., Purdue Univ., West Lafayette, Ind. 47907). *J. Biol. Chem.* 249, 310-5 (1974). Golgi apparatus fractions from rat liver contained all glycosyltransferases which catalyze the in vitro biosynthesis of N-acetylneuraminylgalactosylglucosylceramide (G_{M3}), (N-acetylneuraminyl)$_2$-galactosylglucosylceramide (G_{D3}), N-acetylgalactosaminyl-(N-acetylneuraminyl)-galactosylglucosylceramide (G_{M2}), galactosyl-N-acetylgalactosaminyl-(N-acetylneuraminyl)-galactosylglucosylceramide (G_{M1}), and N-acetylneuraminylgalactosyl-N-acetylgalactosaminyl-(N-acetylneuraminyl)-galactosylglucosylceramide (G_{D1a}) from the corresponding precursors. Relative to total particulate fractions, these transferases were enriched 22 to 27 times in Golgi apparatus. Rough endoplasmic reticulum fractions also contained a full complement of these glycolipid glycosyltransferases; specific activities with endoplasmic reticulum were 2 to 4 times those of total particulate fractions. Plasma membrane fractions displayed negligible glycolipid glycosyltransferase activities. The combined Golgi apparatus and endoplasmic reticulum fractions accounted for more than 80% of the total homogenate glycolipid glycosyltransferase activities. The results show that gangliosides are not synthesized at the surface membrane. As with membrane glycoproteins, gangliosides appear to be glycosylated in endoplasmic reticulum and Golgi apparatus during transport to the surface membrane.

VITAMIN A ECONOMY OF THE DEVELOPING CHICK EMBRYO AND OF THE FRESHLY HATCHED CHICK. P.S. Joshi, S.N. Mathur, S.K. Murthy and J. Ganguly (Dept. of Biochem., Indian Inst. of Sci., Bangalore-560012, India). *Biochem. J.* 136, 757–61 (1973). The changes in the net amounts of retinol, retinyl esters and retinal in both the developing chick embryo and the newly hatched chick were investigated. The embryo requires about 68 nmol of the vitamin for its growth, whereas the baby chick requires about 108 nmol during the first 7 days after hatching. Retinal was present in the egg in fairly high concentrations at the beginning of the incubation but it virtually disappeared from the extra-embryonic tissue after day 17 of incubation. It was not found in the liver of the embryo or of the newly hatched chick up until day 7.

CALCIUM TRANSPORT AND PHOSPHOLIPID COMPOSITION OF MICROSOMAL FRACTIONS FROM DENERVATED RAT GASTROCNEMIUS. B.P. Hughes and R. Yasin (Muscular Dystrophy Lab., Inst. of Neurology, The Natl. Hosp., Queen Square, London WC1N 3BG, U.K.). *Biochem. J.* 136, 1129–32 (1973). Total calcium uptake, but not the initial rate, and noncalcium-stimulated (basic) adenosine triphosphate activity of rat gastrocnemius microsomal fractions 3, 7, and 14 days after denervation increased compared with contralateral controls. Microsomal sphingomyelin also increased but phosphatidylcholine plus choline plasmalogen was unchanged in amount. These results are contrasted with those reported for vincristine myopathy.

PHOSPHORUS-31 NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY OF PHOSPHOLIPIDS. T.O. Henderson, T. Glonek and T.C. Myers (Dept. of Biol. Chem. and Res. Resources Lab., Univ. of Ill. at the Med. Center, Chicago, Ill. 60612). *Biochemistry* 13, 623–8 (1974). Phosphorus-31 nuclear magnetic resonance studies of a number of phopholipids and related phosphate mono- and diesters indicate that hydrogen bonding occurs in organic solutions of phospholipids. This interpretation is based primarily on the observation that phosphatidylethanolamine (PE), lysophosphatidylethanolamine (lyso-PE), phosphatidylserine (PS), lysophosphatidylserine (lyso-PS), sphingomyelin (SPH) and lysophosphatidylcholine (lyso-PC) all give rise to resonances in the same region of the ^{31}P spectrum; this region is downfield of the ^{31}P chemical shift of phosphatidylcholine (PC) by about 30 Hz. The contribution of the quaternary nitrogen function of choline to the chemical shifts of PC was assessed by determining the chemical shifts of appropriate phosphate mono- and diesters in aqueous solutions and lyso-PC and lyso-PE in organic solution. This shift contribution was found to be about 15 Hz.

LIPID METABOLISM IN PERFUSED HUMAN NONATHEROSCLEROTIC CORONARY ARTERIES AND SAPHENOUS VEINS. H. Hashimoto, H.

Tillmanns, J.S.M. Sarma, J. Mao, E. Holden and R.J. Bing (Huntington Memorial Hosp., Pasadena, Cal. and the Univ. of Southern Calif., Los Angeles, Cal.). *Atherosclerosis* **19**, 35-45 (1974). The experiments dealt with lipid synthesis and cholesterol uptake in human coronary arteries without evidence of atherosclerosis and in human saphenous veins perfused in vitro with pulsatile pressure. The results demonstrate the following. Human coronary arteries without evidence of atherosclerosis and atherosclerotic coronary arteries are unable to synthesize cholesterol from acetate. Synthesis of cholesterol esters is small in coronary arteries regardless of the presence or absence of atherosclerotic lesions. Identical uptakes of cholesterol were found in normal and atherosclerotic coronary arteries. Lipid synthesis in human saphenous veins perfused at a pressure of 45/35 mm Hg does not differ from that in nonatherosclerotic coronary arteries or saphenous veins perfused at a pressure of 139/100 mm Hg. Cholesterol uptake in saphenous veins perfused at a pressure of 45/35 mm Hg is lower than that in coronary arteries or saphenous veins perfused at arterial pressure (130/100 mm Hg).

STRUCTURAL INVESTIGATIONS OF LIPID, POLYPEPTIDE AND PROTEIN MULTILAYERS. J.P. Green, M.C. Phillips and G.G. Shipley (Biophys. Div., Unilever Res. Lab. Colworth/Welwyn, The Frythe, Welwyn, Herts, Great Britain). *Biochim. Biophys. Acta* **330**, 243-53 (1973). Langmuir-Blodgett multilayers of lipids, polypeptides and proteins have been examined by X-ray diffraction and infrared spectroscopic methods. The complex polymorphism exhibited by multilayers of glycerides and various phospholipids of different chain length mirror those shown in other three-dimensional structures and suggest that multilayers of lipids can be considered as oriented "crystals." Both the α and β types of hydrocarbon chain packing are adopted by different classes of lipids in multilayers. Stable multilayers of the synthetic polypeptide poly-γ-benzyl-L-glutamate consist of α-helical rods stacked in an hexagonal array with a rod axis separation of 1.42 Å. Poly-γ-methyl-L-glutamate behaves similarly but little structural information could be derived from potentially nonhelical or sheet-like structures formed by other homopolypeptides. The observation of a single, invariant diffraction at 9.3 Å for multilayers of a number of water-soluble proteins is consistent with the occurrence of extensive structural reorganization (uncoiling, denaturation) at the air-water interface.

EFFECT OF SIZE AND LIPID COMPOSITION OF MAMMARY GLAND FAT-PAD ON MAMMARY GLAND GROWTH. J.H. Graziano and R.P. Reece (Dept. of Animal Sci., Rutgers Univ., New Brunswick, N.J. 08903). *J. Dairy Sci.* **57**, 32-35 (1974). Pregnant rats, pair-fed diets containing either 30% corn oil or 30% coconut oil, had mammary fat pads which differed significantly in every fatty acid except 16:0 and 18:1. The corn oil diet produced adipose tissue with slightly more than 30% saturated fatty acids whereas the coconut oil diet resulted in over 60% saturated fatty acids. However, at 20 days of pregnancy, mammary gland total deoxyribonucleic acid, total ribonucleic acid and ribonucleic acid/deoxyribonucleic acid ratio were not significantly different among groups of rats with different mammary fat pad fatty acid compositions. In comparison to the contralateral side, or to animals receiving saline, the injection of 2 units of insulin into the right fat pad for 14 days prior to mating had no significant effect on mammary gland nucleic acids on the 20th day of pregnancy. However, when insulin was continued throughout pregnancy, deoxyribonucleic acid and ribonucleic acid were highly significantly increased over the saline-injected left side. Autoradiographic studies showed that the increase in deoxyribonucleic acid in response to insulin during pregnancy was not due to a stimulation of deoxyribonucleic acid synthesis in connective tissue cells.

DETERMINATION OF RATE CONSTANTS IN CARRIER-MEDIATED DIFFUSION THROUGH LIPID BILAYERS. F. Gambale, A. Gliozzi and M. Robello (Lab. di Cibernetica e Biofisica, Camolgi, Genova, Italy). *Biochim. Biophys. Acta* **330**, 325-34 (1973). In this work data are presented on the relaxation current, under a voltage step, through soybean lipid bilayers in the presence of the carrier, valinomycin. Measurements of voltage-dependent steady-state conductance have also been performed. These measurements are sufficient to calculate the full set of kinetic parameters determining the transport. The data are analyzed according to the kinetic model, based on an Eyring treatment of the carrier-mediated diffusion. Complementary measurements of conductance as a function of antibiotic concentration have also been reported. These data allow one to calculate the membrane-solution partition coefficient of the carrier and the surface charge density of the membrane. The results are compared with those previously obtained with membranes of different lipid composition.

TRIGLYCERIDE SECRETION RATES: USE OF TRITON WR 1339 IN THE RHESUS MONKEY. R.H. Fiser, Jr., J.C. Denniston, R.B. Rindsig and W.R. Beisel (Dept. of Ped., UCLA Schl. of Med., Harbor General Hosp., 1000 W. Carson St., Torrance, Cal. 90509). *J. Nutr.* **104**, 223-6 (1974). The effects of Triton WR 1339 on plasma lipids were studied in fasted and glucose-loaded rhesus monkeys. This compound produced a marked linear increase in plasma triglycerides (TG) during the first 4 hours of a 5-hour study period. Triglyceride secretion rates were determined in fasted (0.113 $\pm$ 0.016 mg TG/kg/min) (mean $\pm$ SEM) and in glucose-loaded (0.101 $\pm$ 0.019) monkeys. Free fatty acid values (FFA) were depressed, while cholesterol and phospholipid values were unchanged. No evidence of hepatocellular or other tissue damage was noted at necropsy. These studies suggest that Triton administration is valuable in assessing rates of basal hepatic TG secretion in the rhesus monkey.

EFFECT OF CLOFIBRATE ON PLASMA GLUCOSE AND SERUM IMMUNOREACTIVE INSULIN IN PATIENTS WITH HYPERLIPOPROTEINEMIA. R.W. Fenderson, Jr., I. Sekowski, N.C. Mohan, S. Deutsch, F. Benjamin and P. Samuel (Arteriosclerosis Res. Lab. and Dept. of Obstetrics and Gynec., Queens Hosp. Center Affiliation of Long Island Jewish-Hillside Med. Center, Jamaica, N.Y. 11432). *J. Clin. Nutr.* **27**, 22-28 (1974). The effects of clofibrate on plasma glucose, serum immunoreactive insulin and free fatty acid levels were studied in 31 patients. In four subjects with normal serum cholesterol and triglyceride levels, the administration of the drug (2 g daily for 21 days) resulted in a statistically significant reduction in the mean plasma glucose ($P < 0.025$) and mean serum immunoreactive insulin ($P < 0.025$) levels after 2 and 3 hr, respectively, during an oral 3-hr glucose tolerance test. In 12 hypercholesterolemic patients (type II), mean plasma glucose was reduced by the drug to statistically significant levels in the fasting state, after 0.5 hr, and after 1 hr ($P < 0.05$) during an oral 3-hr glucose tolerance test. The effect of clofibrate on mean serum free fatty acids was similar although more pronounced in the two hyperlipidemic groups.

KETONE BODIES AS PRECURSORS OF STEROLS AND FATTY ACIDS IN THE DEVELOPING RAT. J. Edmond (Dept. of Biol. Chem., UCLA Schl. of Med., Los Angeles, Cal. 90024). *J. Biol. Chem.* **249**, 72-80 (1974). Four substances, β-hydroxy [3-^{14}C]butyrate, [3-^{14}C]acetoacetate, [2-^{14}C]acetate and [2-^{14}C]mevalonate, were compared by subcutaneous injection in 9- to 12-day-old rats as precursors of lipids in the central nervous system and in other organs. Subcutaneously injected mevalonate is a poor substrate for sterol synthesis in the central nervous system as compared to the utilization by the liver and kidneys, the latter taking far the largest share of available mevalonate for sterol biosynthesis. The data obtained demonstrated that 3-hydroxybutyrate was the preferred substrate for sterol and fatty acid biosynthesis in the three organs of ectodermal origin: the brain, spinal cord and the skin. It is postulated that ketone bodies play a major role in the central nervous system during myelination not only as sources of energy, but also of carbon for lipid biosynthesis.

ISOLATION AND CHARACTERIZATION OF THE CYANOGEN BROMIDE FRAGMENTS FROM APOLIPOPROTEIN A-II OF MACACUS RHESUS SERUM HIGH DENSITY LIPOPROTEINS: COMPARISON WITH THE HUMAN PRODUCT. C. Edelstein, C. Noyes and A.M. Scanu (Dept. of Med. and Biochem., Pritzker Schl. of Med., Univ. of Chicago, and Franklin McLean Memorial Res. Inst., Chicago, Ill. 60637). *FEBS Letters* **38**, 166-70 (1974). *Macacus rhesus* and man occupy a distinct position in the phylogenetic tree; thus, a chemical comparison of their lipoprotein polypeptides may permit an assessment of the evolutionary distance of these two animal species. In this context, it is of interest that the baboon, which belongs to the same family as the rhesus monkey, has, like the latter, apo A-II monomers in its HDL class. The chimpanzee, the closest ancestor to man, in turn, exhibits apo A-II dimers.

LIMITATIONS OF ACETATE AS A SUBSTRATE FOR MEASURING CHOLESTEROL SYNTHESIS IN LIVER. J.M. Dietschy and J.D. McGarry (Depts. of Internal Med. and Biochem., Univ. of Texas Southwestern Med. Schl. at Dallas, Dallas, Tx. 75235). *J. Biol. Chem.* **249**, 52-58 (1974). In studies designed to measure rates of hepatic cholesterogenesis, rat liver slices were incubated with [^{14}C]acetate in the presence of unlabeled octanoate and with [^{14}C]octanoate in the presence of unlabeled

acetate to assess the degree of intracellular dilution and compartmentalization of the acetyl-CoA pools. It was observed that when increasing concentrations of [^{14}C]acetate were used, the incorporation rate of this substrate into cholesterol became constant under circumstances where the specific activity of the ketone bodies continued to rise. The addition of unlabeled acetate reduced the flow of radiolabeled C_2 units from [^{14}C] octanoate into cholesterol but not into ketone bodies or CO_2. Taken together, these findings indicate that [^{14}C]acetate gives rise to a cytosolic pool of acetyl-CoA that is used for cholesterol synthesis but is not in isotopic equilibrium with the mitochondrial pool of acetyl-CoA used for ketogenesis.

INFLUENCE OF FATTY ACID AND STEROL COMPOSITION ON THE LIPID PHASE TRANSITION AND ACTIVITY OF MEMBRANE-BOUND ENZYMES IN ACHOLEPLASMA LAIDLAWII. B. De Kruyff, P.W.M. Van Dijck, R.W. Goldbach, R.A. Demel and L.L.M. Van Deenen (Biochem. Lab., State Univ. Utrecht, Vondellaan 26, Utrecht, The Netherlands). *Biochim. Biophys. Acta* 330, 269–82 (1973). The temperature dependency of NADH-oxidase, p-nitrophenylphosphatase and Mg^{2+}-dependent ATPase was studied in *Acholeplasma laidlawii* cell membranes with varying fatty acid and sterol composition. In these membranes the gel → liquid crystalline phase transition of the membrane lipids was measured by differential scanning calorimetry. We conclude from these results that at these temperatures the ATPase is associated with molecular lipid species with the lowest transition temperature. Incorporation of cholesterol into the membrane decreased the temperature of the break in the ATPase activity and the temperature of the lower end of the lipid phase transition. This effect is due to the lipid-cholesterol interaction since the effect is reversed by the polyene antibiotic filipin which complexes the cholesterol.

COMPARATIVE LIPID RESPONSE OF FOUR PRIMATE SPECIES TO DIETARY CHANGES IN FAT AND CARBOHYDRATE. J.E. Corey, K.C. Hayes, B. Dorr and D.M. Hegsted (Dept. of Nutr., Harvard Schl. of Public Health, Boston, Mass. 02115). *Atherosclerosis* 19, 119–34 (1974). The serum lipid response to long-term feeding of saturated or unsaturated fat with or without dietary cholesterol was compared during three experiments using four species of juvenile monkeys (squirrel, cynomolgus, cebus and spider) born and raised in captivity. When diets containing 10% safflower oil, 10% coconut oil, or a high proportion of carbohydrate (48.6%) with or without 0.1% cholesterol were fed to cebus and squirrel monkeys for alternate 6 week periods, coconut oil was hypercholesterolemic in both species, but dietary cholesterol further enhanced the hypercholesterolemia only in squirrel monkeys. The effect of the nature of the dietary carbohydrate on serum lipids was examined by feeding these diets continuously to spider monkeys for 36 months while varying the source of the carbohydrate. The results indicated that only coconut oil with sucrose was hyperlipidemic in this species. When cynomolgus and cebus monkeys were fed coconut or safflower oil with or without 0.2% cholesterol, the cynomolgus monkey demonstrated a marked hypercholesterolemia in response to dietary cholesterol and a more moderate response to saturated fat, while the cebus again proved more sensitive to dietary saturated fat than to dietary cholesterol. These data emphasize the interspecies variation between primates with respect to their serum lipid responses to dietary saturated fat, carbohydrate and cholesterol, and identify potential models for study of control mechanisms involved in the regulation of circulating lipids.

THE VERY LOW DENSITY LIPOPROTEINS OF CHOLESTEROL-FED RABBITS. A STUDY OF THEIR STRUCTURE AND IN VIVO CHANGES IN PLASMA. G. Camejo, V. Bosch and A. Lopez (Centro de Biofis. y Bioquim., Inst. Venezolano de Invest. Cientificas, Apartodo 1827, and Catedra de Bioquim., Fac. de Med. Univ. Central de Venezuela, Caracas, Venezuela). *Atherosclerosis* 19, 139–52 (1974). The lipoproteins with density less than 1.019 g/ml (VLDL) of rabbits made hypercholesterolemic by cholesterol feeding were fractionated by gel filtration. The proportion of the two fractions obtained (VLDL-1 and VLDL-2) was found to be dependent on the degree of hypercholesterolemia. Significant differences in the percentage composition, size and flotation rate of the two fractions were found but not in their apolipoproteins. By injecting into control animals the two VLDL fractions with their cholesterol moiety labelled with radioactive carbon, it was found that their rates of disappearance from plasma were different. No radioactivity was detected in plasma one hour after the injection of the VLDL subclass made up of the larger particles (VLDL-1). At shorter times, cholesterol injected as VLDL-1 was found associated with VLDL-2. However, no radioactivity was present as VLDL-1 when labelled VLDL-2 was injected. The cholesterol moiety of VLDL-1 was more easily extracted by shaking with hexane than that of VLDL-2 or LDL. The results are discussed in terms of the possible relationships between the structural properties of the abnormal lipoproteins, their physiochemical stability and metabolic fate.

TRIGLYCERIDE METABOLISM IN PYRIDOXINE-DEFICIENT RATS. A. Audet and P.J. Lupien (Centre de recherches sur les maladies lipidiques, Dept. of Biochem., Fac. of Med., Laval Univ., Quebec City, Canada). *J. Nutr.* 104, 91–100 (1974). The ability of the liver to synthesize fatty acids and its capacity to esterify fatty acids as triglycerides and to secrete these into the plasma were studied in pyridoxine-deficient rats. The fall in liver total lipids observed in pyridoxine-deficient rats was brought about by a fall in the triglyceride levels. In each group of animals, there were no differences found in the activity of the pentose phosphate shunt. Fatty acid synthesis and the capacity to esterify fatty acids as triglycerides in the liver seemed normal. Rates of secretion of hepatic triglycerides into plasma were both similar in B_6-deficient and pair-fed rats, but significantly lower than those found in control animals. Curves obtained for the incorporation of palmitate-9,10-^{3}H into liver and plasma triglycerides suggest that liver and very low density lipoprotein triglycerides turn over faster in pyridoxine-deficient rats than in pair-fed and control animals.

RAPID TRANSPORT OF PHOSPHATIDYLCHOLINE OCCURRING SIMULTANEOUSLY WITH PROTEIN TRANSPORT IN THE FROG SCIATIC NERVE. T. Abe, T. Haga and M. Kurokawa (Dept. of Biochem., Inst. of Brain Res., Tokyo Univ. Fac. of Med., Tokyo, Japan). *Biochem. J.* 136, 731–40 (1973). Either L-[4,5-^{3}H]leucine or [Me-^{3}H]choline, or both L-[U-^{14}C]leucine and [Me-^{3}H]choline, were injected into the ninth dorsal root ganglion of the frog, and peripheral transport of labelled proteins and/or phospholipids, mostly phosphatidylcholine, was studied by analysis of consecutive segments of the sciatic nerve. At 25C, approx. 5% of the ^{3}H-labelled protein was transported at the rate of 152 mm/day. The rate was temperature-dependent with the Q_{10} value of 2.6. The flow was completely blocked by the local application of colchicine, but was unaffected by cytochalasin D. [Me-^{3}H]-Choline was incorporated into phosphatidylcholine at a comparatively slow rate, but was transported in the nerve at a rate equivalent to that for ^{3}H-labelled proteins. Specific radioactivities on a protein basis of both ^{3}H and ^{14}C labels were highest in microsomal subfractions enriched with Na^+-plus-K^+-stimulated adenosine triphosphatase and acetylcholinesterase. It is suggested that ^{3}H-labelled phosphatidylcholine and ^{14}C-labelled proteins transported in the nerve reside in the same structural entity, most probably a membrane component.

THE DYNAMIC STRUCTURE OF LIPID MEMBRANES. A ^{13}C NUCLEAR MAGNETIC RESONANCE STUDY USING SPIN LABELS. P.E. Godici and F.R. Landsberger (Dept. of Chem., Indiana Univ., Bloomington, Ind. 47401). *Biochemistry* 13, 362–8 (1974). Biological membranes possess major regions of lipid bilayer. To study the dynamic structure of lipid bilayers, the ^{13}C nuclear spin-lattice (T_1) relaxation times of sonicated aqueous dispersions of egg yolk phosphatidylcholine (EYL) were measured. It was found that the T_1 values increase away from the glycerol backbone toward the trimethylammonium group of the choline moiety and toward the terminal methyl group of the fatty acyl chains, thus indicating the presence of two mobility gradients. Information concerning the positioning of the stearic acid derivative spin labels has been obtained from T_1 measurements of phosphatidylcholine vesicles labeled with these probes. The results suggest that the carboxylic acid group of the fatty acid spin label is positioned in the vicinity of the phosphate groups of the phosphatidylcholine bilayer. The effect on T_1 due to the presence of spin label suggests that the fatty acyl chains of both EYL and the spin label swing up toward the glycerol backbone with the amplitude of the motion being larger for EYL. Thus, a "whipping" motion of the fatty acyl chains occurs as the lipids diffuse laterally in the plane of the membrane. The data also suggests that the trimethylammonium group of the choline is relatively mobile and spends some time in the vicinity of the phospholipid glycerol backbone.

INSECTICIDES IN THE TISSUE OF FOUR GENERATIONS OF RATS FED DIFFERENT DIETARY FATS CONTAINING A MIXTURE OF CHLORINATED HYDROCARBON INSECTICIDES. M. Adams, F.B. Coon and C.E. Poling (Nutr. Inst., Agr. Res. Service, U.S. Dept. of Agr., Beltsville, Md. 20705). *J. Agr. Food Chem.* 22, 69–75 (1974). From weaning, four generations of male and female rats were fed diets containing different fats and a mixture

of DDT, DDE, DDD, dieldrin, lindane, BHC, heptachlor epoxide, methoxychlor and Perthane. DDT, DDD, DDE, and dieldrin were stored in livers and carcasses of weanlings, as well as in livers and body fat in adults. Type of dietary fat exerted little influence on tissue content except for a possible interaction of cottonseed oil and dieldrin.

• Edible Proteins

FIBRILLAR SOY WHEY PROTEIN COMPLEX. E.E. Schmitt (American Cyanamid Co.). *U.S. 3,792,175.* The complex is produced by contacting soy whey with a polysaccharide solution containing carrageenan at a pH of 3.85–4.35 with stirring.

PROCESS FOR PREPARING AQUEOUS EMULSION OF PROTEINACEOUS FOOD PRODUCTS. D.T. Rusch (ICI America Inc.). *U.S. 3,793,464.* Finely divided high protein concentrate derived from such sources as casein, alkali caseinates, soy protein, and fish protein are made more palatable for human consumption by encapsulating the material with lipids derived from edible fats and oils such as tallow, lard, soybean oil, cottonseed oil and corn oil, having IV's of 1–90 and melting points above 70F.

PROTEIN FIBER FABRICATION PROCESS. R.D. Dannert and M.E. Manwaring (General Mills Inc.). *U.S. 3,794,731.* Protein fibers are prepared by forcing an alkaline protein solution through an orifice and simultaneously intimately contacting the protein stream with a fast acting acid gas traveling at a velocity greater than the protein stream. The fibers find particular use in meat analog preparations.

EXTRACTION OF PROTEIN FROM SEED. B.G. Newsom and M.P. Tombs (Lever Bros. Co.). *U.S. 3,794,735.* A process of making food-stuffs (e.g., simulated meats) comprises the steps of mixing a coprecipitate of protein and lipid in the presence of water and an edible water soluble salt, heating this mixture and, during or subsequent to setting, contacting the mixture with a lipid solvent.

• Fatty Acid Derivatives

PROCESS FOR SYNTHESIZING SUCROSE ESTERS OF FATTY ACIDS. F. Yamagishi, F. Endo, H. Ooi and Y. Kozuka (Dai-Ichi Kogyo Seiyaku Co.). *U.S. 3,792,041.* An aqueous solution of a mixture of sucrose and a fatty acid soap is prepared. To this solution is added a solution of a mixture of a fatty acid ester and a catalyst for the transesterification reaction between sucrose and the fatty acid ester. The reaction is carried out at temperatures of 110–175C, under conditions which will avoid hydrolysis of the ester and lead to the formation of a completely dehydrated, homogeneous melt composition.

PREPARATION OF ACYLATED UNSATURATED LONG CHAIN COMPOUNDS. E.S. Rothman and G.G. Moore (U.S. Secy. of Agriculture). *U.S. 3,792,066.* Long chain acyl groups are attached to isolated double bonds in fatty acid molecules with retention of the unsaturation by using an acylated enol such as isopropenyl stearate in the presence of an electron deficient catalyst, such as aluminum chloride, boron trifluoride or stannic chloride.

• Detergents

DETERGENT PERFUMING TECHNOLOGY. J.A. Palmeri (Givaudan Corp.). *Soap/Cosmetics/Chemical Specialties* **50**, 30–2 (January, 1974). The subject matter is discussed in a general manner. Factors which must be considered in perfuming cleansing agents include the type, character and odor of the raw materials, the type and end use of the detergent and the packaging. Properties, such as safety, color stability and odor stability of the perfume materials themselves must also be considered. Various chemical and physical tests as well as consumer use tests must be employed to evaluate the suitability of the perfume in the product.

ENZYME-CONTAINING DETERGENT COMPOSITIONS. J.D. Jones and E.J. Collier (Procter & Gamble). *U.S. 3,790,482.* Alkaline detergent compositions contain an organic detergent and an alkaline builder salt in a ratio of 1:30 to 4:1 and an enzymatic mixture of 0.001–10% of a *Bacillus subtilus*-derived Carlsberg subtilisin, an X-ray mutated *Bacillus subtilus*-derived subtilisin, or a mixture of the two and 0.003–3% of an α-amylase. A weight ratio of alkaline protease to α-amylase of 30:1 to 3:1 is used to provide detergent compositions having improved cleaning and stain removal properties.

FRAGRANCE IMPARTING LAUNDERING COMPOSITION. R.H. Blair (assigned to E.O. Blalock). *U.S. 3,790,484.* Residual fragrance is imparted to laundered fabric by adding during or at the start of the final rinse an aqueous composition comprising a fragrant oil, a cationic agent such as a dialkyl fatty quaternary ammonium halide, an organic amine base and a nonionic detergent.

SOFTENING AGENT. N. Okazaki and A. Mayamura (Lion Fat and Oil Co. Ltd.). *U.S. 3,793,196.* The agent comprises a quaternary ammonium salt and a higher alcohol together with 0.5–5.0% of sorbitan fatty acid ester and 0.3–6.0% of polyoxyethylene alkyl or alkenyl ether.

KETO ACID CONTAINING COMPOSITIONS. G.G. Corey (Colgate-Palmolive Co.). *U.S. 3,793,210.* Surfactant and shampoo compositions having improved solubility and foaming characteristics comprise a keto acid in combination with surfactants, brighteners, conditioners, and the like.

DETERGENT COMPOSITION. F.W. Gray and P.A. Munger (Colgate-Palmolive Co.). *U.S. 3,793,212.* A detergent composition for automatic dishwashers is prepared by hydrating an alkali metal trimetaphosphate by reaction with a sodium hydroxide solution in the presence of an anionic wetting agent selected from sodium dodecyldiphenyl ether disulfonate or sodium 2-acetamido hexadecane-1-sulfonate or mixtures of the two. The hydrated tripolyphosphate is formulated with an alkali metal silicate, a bleach composition and sodium sulfate to make the detergent.

GERMICIDAL PROCESS AND DETERGENT COMPOSITIONS. D. Taber and M. Zakaria (Armour-Dial Inc.). *U.S. 3,793,213.* The use of N-acyl-N'-(halogenated aryl) ureas as antibacterial agents and germicidal detergent containing such ureas is disclosed.

TRANSPARENT SOAP COMPOSITION. J.J. O'Neill, J.A. Komor, T.E. Babcock, R.J. Edmundson and E.G. Shay (Avon Products Inc.). *U.S. 3,793,214.* The composition, preferably in the form of a bar, will maintain its transparency and surface gloss after repeated use. It comprises an admixture of saturated fatty acids and a branched chain C_5–C_{18} saturated aliphatic monocarboxylic acid neutralized with an agent comprising a mixture of an alkaline sodium compound and an alkanolamine. The process of making the compositions comprises mixing the acids, neutralizing agent and alkanolamine as a hot melt and forming the composition in the shape desired by cooling without further working.

SOAP BARS. B.R. Smith (Colgate-Palmolive Co.). *U.S. 3,793,215.* A detergent bar includes a major amount of anhydrous, water soluble, higher fatty acid soap and a minor amount of a water soluble, synthetic detergent chosen from the group including fatty ester amides of sulphosuccinic acid.

OIL SLICK DISPERSANT AND METHOD. G.P. Canevari (Esso Res. and Eng. Co.). *U.S. 3,793,218.* Mixtures of C_{10}–C_{20} aliphatic carboxylic acids or the sorbitan monoesters thereof, sorbitan monoacylates, polyoxyalkylene addults of the sorbitan monoesters, and dialkyl sulfosuccinate salts having an HLB of 9 to 11.5, preferably 10–11, are highly efficient, nontoxic biodegradable dispersants for oil slicks. Oil slick dispersal is achieved by supplying the dispersant composition to the oil slick either alone or admixed with a suitable solvent. An advantage to these compositions is that they require little or no mixing energy in order to achieve dispersion of the slick.

ANIONIC LIQUID DETERGENT COMPOSITION. I. Kashiwa and H. Nakano (Lion Fat & Oil Co., Ltd.). *U.S. 3,793,219.* The transparent detergent composition comprises 5–30% of an anionic surface active agent having SO_3 or SO_4 radical, 5–45% of a water-softening builder and 5–25% of an alkaline inorganic salt. More than 70% of the total amount of cations in the three compounds are alkanol ammonium ions.

DETERGENT COMPOSITION. M. Danzik (Chevron Research Co.). *U.S. 3,793,226.* The composition contains, as active materials, monoamide hydrocarbyl sulfonic acid salts of hydrocarbyl succinic acid, nonphosphate builders and additives.

DETERGENT COMPOSITIONS CONTAINING BUILDERS. J. Kandler, K. Merkenich, H. Landgraber, K. Henning and A. Kohlkamp (Knapsack Ag.). *U.S. 3,793,228.* The builders comprise water

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• Abstracts. . .

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soluble salts of cotelomers or copolymers of vinyl alcohol with maleic acid.

LIQUID DETERGENT COMPOSITIONS. F.G. Rose and K.W. Theile (Procter & Gamble). *U.S. 3,793,233.* The detergents, which have excellent sudsing and mildness characteristics, consist of 8–35% of an alkyl ether sulfate obtained by sulfating and neutralizing the condensation product of 5–12 moles of ethylene oxide and 1 mole of a higher molecular weight alcohol having 10–16 carbon atoms and an alkyl sulfate. The ratio of the alkyl ether sulfate to the alkyl sulfate can range from 2:1 to 6:1, with the balance being water.

POLYAMIDES. A. Goukon, Y. Kawakatsu, W. Yano and I. Minakata (Kao Soap Co., Ltd.). *U.S. 3,793,270.* New polyamines are prepared by reacting a diamine, a fatty acid of 1–24 carbon atoms and phenolic, nucleus-cross-linked dimeric acid ester or a dimeric acid which is the hydrolysis product of the ester obtained by addition polymerization of 2 moles of an unsaturated fatty acid/lower alcohol ester and 1 mole of phenol or a phenol derivative. The nucleus-cross-linked dimer is composed of two molecules of the unsaturated fatty acid ester linked together through an aromatic nucleus of one molecule of the phenol.

PROCESS FOR SOLUBILIZING ALKOXYLATED FATTY SUBSTRATES. F.C. McCoy (Texaco Inc.). *U.S. 3,793,351.* Alkoxylated fatty substrates, which normally are insoluble in petroleum oils, are converted to soluble complexes by treatment with alkylated phenol-type solubilizing agents.

CHEMICAL COMPOSITIONS FOR GENERAL CLEANING. A. Fishman. *U.S. 3,794,589.* Soap-based cleaning compositions for use in hard or soft water are prepared by blending with soap minor quantities of other ingredients which render the natural hardness in the water harmless. In one embodiment, the composition contains 90–95% soap and 5–10% of an alkali sulfate-free higher alcohol mixture in which the free higher alcohol content of the mixture is 5–15%. Another embodiment provides a composition containing 76–94 parts soap, 5–10 parts alkali sulfate-free higher alcohol mixture, 2–4 parts of another synthetic detergent surfactant, 2–8 parts of sodium polyphosphate and 2–12 parts of an inorganic salt.

BUILT DETERGENT COMPOSITION CONTAINING WHITENESS MAINTENANCE ADDITIVE. F.L. Diehl (Procter & Gamble). *U.S. 3,794,605.* The active whiteness maintenance principle in the detergent composition is 0.1–20% of a mixture of the water soluble salts of a cellulose sulfate ester and a copolymer of a vinyl compound and maleic anhydride. The mixture of the sulfate ester and the copolymer improves the whiteness maintenance over the use of either component alone.

METHOD FOR REDUCING SURFACE CRACKING IN EXTRUDED PLASTIC MATERIAL. E.B. Bengston and L.H. Lander (Lever Bros. Co.). *U.S. 3,794,709.* A method is provided for end-shaping blanks of soap cut from extruded logs preliminary to die box pressing by subjecting the cut end surfaces of the blanks to transverse shear. As a result, the flow lines at the cut ends, which are exposed and opened by segmenting the extruded log, are bent and compressed. The transverse shear is provided by forcing the soap blank through an opening defined by spaced die surfaces separated by less than the longitudinal length of the soap blank. The die surfaces are rounded at the soap blank receiving edge and tapered divergently from that edge. ■

• President's Club . . .

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Douglas V. Okonek, chem., Harshaw Chemical Co., 1000 Harvard Ave., Cleveland, Ohio 44109.

Humberto Preti, plant eng., Productos Agro Industriales, S.A., 12-37, 7a. Avenida Zona 9, Edificio Etisa, Guatemala, Guatemala.

Eduardo Saenz, plant mgr., Compania Numar, S.A., P.O. Box 3657, San Jose, Costa Rica, C.A.

Kunito Sato, food tech., Armour Food Co., 801 W. 22nd St., Oak Brook, Ill. 60521.

Michael N. Spiro, rend. mgr., South Chicago Packing Co., 945 W. 38th St., Chicago, Ill. 60609.

Aaron Lee Summers, asst. pack. plant mgr., Archer Daniels Midland Co., 4666 Faries Pkwy., P.O. Box 1470, Decatur, Ill. 62525.

Charles Crawford Sweeley, prof., Biochemistry Department, Michigan State University, East Lansing, Mich. 48824.

Fernando Castadena Trevino, sales mgr., Pennwalt, S.A. de C.V., 445 Melchor Ocampo St., Mexico, D.F. 5.

Warren Edward Truman, chem., Casa Grande Oil Mill, P.O. Box 959, Casa Grande, Ariz. 85222.

Eduardo Weymann, plant super., Productos Agro Industriales de Guatemala, S.A., 12-37, 7a. Avenida Zona 9, Edificio Etisa, Guatemala, Guatemala. ■

Bernd Weinberg dies in Canada

Bernd Weinberg, a member of AOCS since 1961, died on March 14, after an illness of several months.

At the time of his death, Dr. Weinberg was employed by the Market Development Division, Grain Marketing Office, Department of Industry, Trade, and Commerce of the Government of Canada.

During his almost 10 years of governmental service, he became well known for his work on the development of rapeseed as an edible oil and protein crop.

He played a key role in the International Conference on the Science, Technology, and Marketing of Rapeseed and Rapeseed Products held in St. Adele, Quebec, in 1970. ■