abstracts

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• Biochemistry & Nutrition

BINDING OF BILE SALTS TO PANCREATIC COLIPASE AND LIPASE. B. Borgström and J. Donnér (Dept. of Physiol. Chem., Univ. of Lund, Lund, Sweden) *J. Lipid Res.* 16, 287–92 (1975). The binding of conjugated bile salts to pancreatic colipase and lipase has been studied by equilibrium dialysis and gel filtration. The results indicate that at physiological ionic strength and pH, conjugated bile salts bind as micelles to colipase: 12–15 moles/mole of colipase for the dihydroxy conjugates and 2–4 for the trihydroxy conjugates. No binding of bile salt takes place from monomeric solutions. Under the same experimental conditions, only 1–2 moles of conjugated dihydroxy bile salts bind to pancreatic lipase.

TURNOVER AND TISSUE DISTRIBUTION OF ^{125}I-LABELED LOW DENSITY LIPOPROTEIN IN SWINE AND DOGS. A.D. Sniderman, T.E. Carew and D. Steinberg (Div. of Metabolic Dis., Dept. of Med., Univ. of California, San Diego Schl. of Med., La Jolla, California 92037) *J. Lipid Res.* 16, 293–9 (1975). Swine plasma low density lipoprotein (LDL) isolated ultracentrifugally (d 1.019–1.063) was labeled with ^{125}I, dialyzed, and reisolated by centrifugation at d 1.063. Over 96% of the radioactivity was shown to be associated with the apoprotein. After reinjection into the donor animal, disappearance of ^{125}I was followed for up to 122 hr. At all time intervals examined, over 95% of the total plasm ^{125}I was recovered in LDL (d 1.006–1.063), i.e., there was apparently no transfer of radioactivity to high density or very low density lipoproteins. Tissue distribution of ^{125}I was determined in swine killed at various time intervals after [^{125}I]LDL injection with corrections for radioactivity in trapped plasma. Of the tissues examined, the liver showed by far the highest concentration. These data are consistent with the conclusion that the liver accounts for a very large fraction of the total extravascular LDL pool and that it is in fairly rapid equilibrium with the plasma pool. To what extent the liver is involved in irreversible degradation cannot be inferred from these findings.

ANALOGS OF NATURAL LIPIDS. I. SYNTHESIS AND PROPERTIES OF TRIS-HOMOACYL DERIVATIVES OF CYCLOPENTANE-1,2,3-TRIOLS. A.J. Hancock, S.M. Greenwald and H.Z. Sable (Dept. of Biochem., Case Western Reserve Univ., Cleveland, Ohio 44106) *J. Lipid Res.* 16, 300–7 (1975). A new series of analogs of triglycerides has been synthesized, in which the glycerol moiety is replaced by each of the three isomeric cyclopentanetriols. For each of the isomeric cyclopentane-1,2,3-triols (1,2,3/0; DL-1,2/3; and 1,3/2), the tris-*homo*acyl derivatives of octanoic, decanoic, lauric, myristic, palmitic, stearic, and dihydrosterculic acids were prepared by treatment of the respective triols with the appropriate acyl chloride in pyridine. The dihydrosterculates were prepared by fusing the trials with a mixture of the acyl anhydride and the corresponding potassium salt. Thin-layer chromatography on silica gel shows marked differences in apparent polarity of all the 1,2,3/0 derivatives in comparison with the other three series. In all series the dihydrosterculates show a decrease in apparent polarity, relative to the stearates, significantly greater than expected from the introduction of an additional carbon atom. The potential utility of the analogs as probes of the effects of conformation on the physical properties and enzymatic susceptibility of glycerides is discussed.

SITE OF INHIBITORY ACTION OF ISONIAZID IN THE SYNTHESIS OF MYCOLIC ACIDS IN MYCOBACTERIUM TUBERCULOSIS. K. Takayama, H.K. Schnoes, E.L. Armstrong and R.W. Boyle (Tuberculosis Res. Lab., Veterans Ad. Hos., and the Instit. for Enzyme Res., Univ. of Wisconsin, Madison, Wisconsin 53706) *J. Lipid Res.* 16, 308–17 (1975). The cellular mycolate synthetase activity of *Mycobacterium tuberculosis* H37Ra was previously shown to be very sensitive to isoniazed. We have now examined the question of how isoniazid inhibits the synthesis of mycolic acids. The saponifiable ^{14}C-labeled lipids of control and isoniazid-treated cells (1.0 μg/ml, 60 min) were compared on a Sephadex LH-20 column, and it appeared that the synthesis of the intermediate-sized fatty acids was partially inhibited. These fatty acids were fractionated as their methyl esters by Sephadex LH-20 column chromatography and gas-liquid (6% Dexsil) chromatography. Both long- and short-term exposure experiments showed that isoniazid inhibited the synthesis of saturated fatty acids greater than C_{26} and of unsaturated fatty acids greater than C_{24}. The variable-exposure experiment at low isoniazid concentration showed that the synthesis of mycolic acids and long-chain fatty acid fractions II and III were inhibited to the same extent. These fatty acids may thus be precursors of mycolic acids.

LIPOGENESIS IN RABBIT ADIPOSE TISSUE. S. Smith (Children's Hosp. Med. Ctr. of Northern Calif. and Bruce Lyon Memorial Res. Lab., Oakland, Ca. 94609) *J. Lipid Res.* 16, 324–31 (1975). Previous reports that rabbit adipose tissue does not synthesize fatty acids at significant rates led us to study in detail the pathways of lipogenesis and glyceroneogenesis in this tissue. We found that rabbit adipose tissue has a low capacity for de novo fatty acid synthesis from glucose but a high capacity for synthesis from pyruvate and acetate. The tissue can also convert pyruvate to glyceride-glycerol via the dicarboxylic acid shuttle and gluconeogenic pathways. Experiments with hydroxycitrate, a potent inhibitor of citrate cleavage enzyme, demonstrated that this is an obligatory enzyme in lipogenesis from pyruvate. The lipogenic system of rabbit adipose tissue resembles that of a ruminant in that it is adapated to utilize acetate rather than glucose. However, in contrast to ruminant tissues, the limited ability to convert glucose to fatty acid results not from a deficiency in the enzymes concerned with the transport of acetyl units out of the mitochondria but from a block prior to the level of pyruvate, most likely at the hexokinase and pyruvate kinase reactions.

SPECIFIC TRITIUM LABELING OF CEREBROSIDES AT THE 3-POSITIONS OF ERYTHRO-SPHINGOSINE AND THREO-SPHINGOSINE. M. Iwamori, H.W. Moser, and Y. Kishimoto (Eunice Kennedy Shriver Ctr. for Mental Retardation, Walter E. Fernald State Schl., Waltham, Mass. 02154) *J. Lipid Res.* 16, 332–6 (1975). Cerebrosides containing either *threo-* or *erythro*-[3-^{3}H]sphingosine were synthesized by a new procedure. Glucopyranosyl or galactopyranosyl ceramides were converted to their 3-keto derivatives with 2,3-dichloro-5,6-dicyanobenzoquinone and reduced with ^{3}H-labeled sodium borohydride. The resulting tritiated cerebrosides, which contained *erythro-* and *threo*-sphingosines in the ratio of 84:16, were deacylated with butanol-KOH, and the *erythro-* and *threo*-psychosines were separated by silica gel column chromatography and reacylated with lignoceroyl chloride.

DEVELOPMENT OF SWINE ADIPOSE TISSUE: MORPHOLOGY AND CHEMICAL COMPOSITION. H.J. Mersmann, J.R. Goodman, and L.J. Brown (Shell Development Co., Modesto, Calif. 95352) *J. Lipid Res.* 16, 269–79 (1975). Differentiation and growth of swine subcutaneous adipose tissue was assessed by chemical analysis of tissue components, cell ize measurements of isolated adipocytes, and light and electron microscopic observations. At birth all adipocytes were multilocular (contained multiple small lipid droplets), but by day 3 postpartum, many were already differentiated to the unilocular state (one major, central lipid droplet). Microscopic observations of fixed tissue, cell size determinations on isolated adipocytes, and chemical analysis of tissue composition indicated a marked increase in adipocyte size accompanied by an increase in the size of the central lipid droplet with age. Small cells were observed at all ages (in both fixed tissue and isolated cell preparations), yielding biphasic size distributions. Although the adipocyte stem cell was not discerned, an early stage in differentiation, designated an adipoblast, was observed.

IDENTIFICATION OF PENTAHYDROXY BILE ALCOHOLS IN CEREBROTENDINOUS XANTHOMATOSIS: CHARACTERIZATION OF 5β-CHOLESTANE-3α,7α,12α,24ξ,25-PENTOL AND 5β-CHOLESTANE-3α,7α,12α,23ξ,25-PENTOL. S. Shefer, B. Dayal, G.S. Tint, G. Salen and E.H. Mosbach (The Public Hlth. Res. Inst. of the City of N.Y., Inc., N.Y. 10016) *J. Lipid Res.* 16, 280–6 (1975). This paper describes studies dealing with the nature of the C_{27} pentahydroxy bile alcohols present in the bile and feces of

(Continued on page 195A)

• **Abstracts** . . . . . (Continued from page 194A)

two patients with cerebrotendinous xanthomatosis (CTX). The presence of a bile alcohol having the structure 5β-cholestane-3α,7α,12α,24α,25-pentol was confirmed by separation of the two 24-hydroxy epimers of 5β-cholestane-3α,7α,12α,24,25-pentol and characterization of the epimers by gas-liquid chromatography and infrared and mass spectrometry. Tentative assignment of the 24α and 24β configuration was made on the basis of molecular rotation differences. A second major bile alcohol excreted by the CTX subjects was 5β-cholestane-3α,7α,12α,23ξ,25-pentol. Its structure was determined by infrared spectrometry, proton magnetic resonance spectrometry, and mass spectrometry because a reference compound was not available.

TOXIC CHARACTER OF RANCID OIL. XVII. INFLUENCE OF TOCOPHEROL ON LIPID COMPONENT AND TRGLYCERIDE COMPOSITION OF RAT TISSUES FED THERMALLY OXIDIZED OIL. H. Yoshida, A. Shibahara and G. Kajimoto (Faculty of Nutrition, Kobe-Gakuin University, Arise, Ikawadani, Tarumi-ku, Kobe) *Yukagaku* 24, 575–81 (1975). It is known that natural antioxidants are usually contained in vegetable oil and fats, and tocopherol (Toc) is the more abundant substance in those oils. Toc decomposes on heating, so it may be conceivable that the toxic effect of thermally oxidized oil (TO) is enhanced by the decrease of Toc. In the previous papers, the authors reported that Toc reduces the toxicity of TO in rats. The present paper deals with the influence of Toc on lipid oil (FO) or TO. Toc-free FO was prepared by aluminum oxide column chromatography from fresh soybean oil and TO was prepared from the same oil by heating at 180° C for 50 hr. Rats were fed on the diets containing FO and TO with or without Toc. The total lipids extracted from each tissue of rats were separated into neutral lipid (NL) and phospholipid fractions by column chromatography and triglyceride (TG) was isolated from (NL) fraction by thin-layer chromatography. Fatty acid distribution in TG was investigated by pancreatic lipase hydrolysis. The results indicated that total lipids and percentage of their phospholipids in liver, kidney and testicle of rats fed Toc-free TO decreased markedly compared with those fed on FO or Toc-free FO. TG in tissues of rats fed on Toc-free TO decreased, but cholesterol increased. Significant difference on component fatty acids and 2-position of TG was observed. TG in each tissue (except kidney-TG after 30 days feeding) of rats fed FO or Toc-free FO showed higher proportion of $C_{18:2}$ than $C_{18:1}$. On the contrary, $C_{18:2}$ content in TG of rats fed on Toc-free TO was lower. The percentage of unsaturated fatty acids at the 2-position in each tissue TG was high compared to saturated fatty acids at the same position and/or component fatty acids in TG. Percentage of $C_{18:1}$ and $C_{18:2}$ at 2-position of TG was about 80 mole % in each tissue. $C_{16:0}$, $C_{18:0}$ and $C_{18:1}$ at this position in TG of rats fed Toc-free TO increased while $C_{18:2}$ decreased compared with those of FO or Toc-free FO groups. Toc was effective for prevention of toxicity induced by TO as described above, but no significant effect was observed for FO. These results suggest that Toc has some biological antioxidative and protective activities against the toxicity induced by TO.

EFFECTS OF FEEDING OXIDIZED OR HEATED SOYBEAN OIL ON TISSUE COMPOSITION AND HEMATOLOGICAL STATUS OF RATS. J. Miller and D.R. Landes (Dept. of Food Sci., Univ. of Ga., Georgia Station, Experiment, GA 30212). *J. Food Sci.* 40, 545–8 (1975). Rats were fed diets containing 40% soybean oil that was either aerated at room temperature, heated in the presence of carbon dioxide or air, or supplied as the fresh product. When the protein in the diet was comprised of 20% casein, both growth and feed efficiency were depressed by the damaged oils. Feeding the oil that was aerated during heating reduced the number of hepatic cells and increased the quantity of protein per cell. Liver lipid, especially triglyceride, was decreased by the damaged oils. The number of red blood cells formed and their hemoglobin content and absorption of iron were also curtailed by the heated oil. Studies indicated that the effects were not due solely to reduced food intake. Increasing the protein in the diet containing heated oil reduced but did not eliminate the extrahepatic effects while further increasing the protein content of the liver cells. There is evidence that damaged oil could aggravate the nutritional quality of diets having marginal protein sufficiency.

LIPID COMPOSITION OF LIMULUS PHOTORECEPTOR MEMBRANES. R.M. Benolken, R.E. Anderson and M.B. Maude (Grad. Schl. of Biomed. Sci., The Univ. of Tx. Hlth. Sci. Ctr., Houston, Texas 77025) *Biochim. Biophys. Acta* 413, 234–42 (1975). The lipid composition has been determined for rhabdomeric photoreceptor membranes of *Limulus*, and these data are compared with those from photoreceptor membranes of albino rats. The comparison is of interest because the membranes of these two photoreceptor cells regulate ionic transport differently during the response to illumination. Phospholipid class composition of *Limulus* is similar, but not identical, to that of rats. The major differences are a greater percentage of sphingomyelin in *Limulus* and a greater percentage of phosphatidylethanolamine in the rat. Ethanolamine plasmalogens, not observed in rat photoreceptor membranes, are present in *Limulus* photoreceptor fractions. The level of cholesterol in *Limulus* is higher than that usually reported for vertebrate rod outer segments. The predominant polyunsaturated fatty acids of *Limulus* photoreceptor membrane phospholipids are 20: 4(*n*-6) and 20: 5(*n*-3) with only traces of 22: 6(*n*-3). This is in sharp contrast with the large percentages of 22: 6(*n*-3) found in rat photoreceptors. The fatty acid distributions of both membrane systems are highly unsaturated, but the ratio of (*n*-3) to (*n*-6) polyunsaturates is only 1.7 for *Limulus* as compared to 4.6 for rat.

SUBCELLULAR DISTRIBUTION AND PROPERTIES OF PROGESTERONE (Δ^4-STEROID) 5α-REDUCTASE IN RAT MEDIAL BASAL HYPOTHALAMUS. Y. Cheng and H.J. Karavolas (Dept. of Physiol. Chem. and The Waisman Center on Mental Retardation, Univ. of Wisc., Madison, Wisc. 53706) *J. Biol. Chem.* 250, 7997–8003 (1975). The subcellular distribution and properties of rat hypothalamic progesterone 5α-reductase, which accelerates the conversion of progesterone to 5α-pregnane-3,20-dione, have been investigated by utilizing ^{3}H-labeled substrate and a reverse isotopic dilution assay system. The enzymic activity was associated primarily with a cell debris-membranes fraction derived from the 1000 × *g* pellet. This fraction contained mainly membrane-like particulates and was free of nuclei. Little or no activity was associated with the purified nuclei. The hypothalamic 5α-reductase was stimulated by NADPH but not by NADH. The inhibition studies indicate that 20α-hydroxypregn-4-en-3-one and 17β-estradiol are competitive and noncompetitive inhibitors, respectively, of the 5α reduction of progesterone with K_i of $6.0 \pm 3.0 \times 10^{-8}$ M for 20α-hydroxypregn-4-en-3-one and K_{ii} (intercept inhibition constant) of $2.6 \pm 0.7 \times 10^{-5}$ M and K_{is} (slope inhibition constant) of $3.6 \pm 0.6 \times 10^{-5}$ M for 17β-estradiol. Testosterone is a poor competitive inhibitor of the reaction.

CHANGES WITH DIET IN THE COMPOSITION OF PHOSPHATIDYL CHOLINE OF SHEEP BILE. W.W. Christie, J.H. Moore, R.C. Noble, R.G. Vernon (The Hannah Res. Inst., Ayr, Scotland KA6 5HL) *Lipids* 10, 645–8 (1975). Bile phosphatidyl choline from sheep, in contrast to that from nonruminants, contains low levels of the normal range of polyunsaturated fatty acids. A comparison has been made of the composition of bile phosphatidyl cholines from sheep receiving either a control diet, a control diet supplemented with unprotected maize oil, or a control diet supplemented with soybean oil or tallow that had been protected against hydrolysis and hydrogenation in the rumen. The composition of bile phosphatidyl choline from sheep receiving protected soybean oil supplement was virtually indistinguishable from that from nonruminants.

DISTRIBUTION OF CHOLESTERYL ESTERS AND OTHER LIPIDS IN SUBCELLULAR FRACTIONS OF THE ADRENAL GLAND OF THE PIG. S.H.W. Cmelik and H. Ley (Dept. of Biochem., Univ. of Rhodesia, Salisbury, Rhodesia) *Lipids* 10, 707–13 (1975). Total lipids from whole pig adrenal glands as well as from their mitochondria, microsomes, liposomes, and cell sap were extracted and fractionated first into neutral lipids and phospholipids. The highest percentage of neutral lipids was found in the cell sap, and the lowest in the microsomal fraction. Neutral lipids were subfractionated into cholesteryl esters, free cholesterol, triglycerides, and free fatty acids. Cholesteryl esters were distributed throughout the liposomes. Free fatty acids represented a substantial part of cell sap lipids, but were present also in the mitochondria, microsomes, and liposomes. Fatty acids of all fractions were analyzed by gas liquid chromatography. Phosphatidyl choline and phosphatidyl ethanolamine from mitochondria, microsomes, and cell sap were very similar in respect of their fatty acid composition. Sphingomyelin plus phosphatidyl inositol was characterized by a high content of $C_{22:2}\omega6$. Diphosphatidyl glycerol was present in mitochondria and in the cell sap.

PHOSPHOMONOESTERASE HYDROLYSIS OF POLYPHOSPHOINOSITIDES IN RAT KIDNEY. PROPERTIES AND SUBCELLULAR LOCALIZATION OF THE ENZYME SYSTEM. P.H. Cooper and J.N. Hawthorne (Dept.

of Chem., Univ. of Calgary, Alberta T2N 1NA, Canada) *Biochem. J.* 150, 537–51 (1975). The properties of diphosphoinositide and triphosphoinositide phosphatases from rat kidney homogenate were studied in an assay system in which non-specific phosphatase activity was eliminated. The enzymes were not completely metal-ion dependent and were activated by Mg^{2+}. The detergents sodium deoxycholate, Triton X-100 and Cutscum inhibited the reaction; cetyltrimethylammonium bromide only activated when added with the substrate and in the presence of Mg^{2+}. Both enzymes had a pH optimum of 7.5. Ca^{2+} and Li^{+} both activated triphosphoinositide phosphatase, but Ca^{2+} inhibited and Li^{+} had little effect on diphosphoinositide phosphatase. Cyclic AMP had no effect on either enzyme. The enzymes were three times more active in kidney cortex than in the medulla. On subcellular fractionation of kidney-cortex homogenates by differential and density-gradient centrifugation, the distribution of the enzymes resembled that of thiamin pyrophosphatase (assayed in the absence of ATP), suggesting localization in the Golgi complex. However, the distribution differed from that of the liver Golgi marker galactosyltransferase. Activities of both diphosphoinositide and triphosphoinositide phosphatases and thiamin pyrophosphatase were low in purified brush-border fragments. Further experiments indicate that at least part of the phosphatase activity is soluble.

INFLUENCE OF DIET ON QUALITY, FATTY ACIDS AND ACCEPTABILITY OF PORK. G.C. Skelley, R.F. Borgman, D.L. Handlin, J.C. Acton, J.C. McConnell, F.B. Wardlaw and E.J. Evans (Clemson Univ., Clemson, S.C. 29631) *J. Animal Sci.* 41, 1298–1304 (1975). Four treatments with 14 swine per treatment were conducted during the growth period. Treatment 1 was a typical corn-soybean meal ration, whereas treatments 2, 3 and 4 employed barley in combination with 14, 22 and 30% roasted soybeans, respectively. Dressing percentages, musceling, backfat and final grade were similar among treatment groups. The carcasses from treatment 1 produced a slightly firmer type of fat and lean. There were no significant differences in *longissimus* muscle area or percentages of cuts. The linoleic acid content of the meat and backfat increased in direct proportion to the amount of whole soybeans in the ration. The percentage of linoleic acid ranged from 5.1 to 10.6% of total fat in raw lean meat. An increase in linoleic acid from 11.2 to 21.3% was noted in the backfat. A greater percentage of unsaturated fat has not been proven to be desirable; however, it should be known that such a product can be adequately produced, processed, stored and consumed.

LIPOXYGENASE ISOZYMES OF PEANUT. T.H. Sanders, H.E. Pattee, and J.A. Singleton (Depts. of Biol. and Agr. Engineering and Botany, N.C. State Univ. and Southern Reg., ARS, USDA Raleigh, N.C. 27607) *Lipids* 10, 681–5 (1975). Lipoxygenase was isolated and partially purified from peanut seed by ammonium sulfate precipitation, gel filtration, and ion exchange column chromatography. Three isozymes of lipoxygenase were identified. Two had pH optima of 6.2, and the other an optimum of 8.3. Molecular weight of each isozyme was 7.3×10^4, as determined by gel filtration. The alkaline optimum isozyme was not inhibited by NaCN and was inhibited by $CaCl_2$ except at very low concentrations. The acid optimum isozymes were inhibited by NaCN and were stimulated by $CaCl_2$ concentrations up to ca. 0.7 mM.

EFFECT OF THE NATURE AND AMOUNT OF DIETARY ENERGY ON LIPID COMPOSITION OF RAT BONE MARROW. S.K. Das, M.T. Scott and P.K. Adhikary (Dept. of Biochem. and Nutr., Meharry Med. Col., Nashville, Tenn. 37208) *Lipids* 10, 584–90 (1975). The effect of the nature and amount of dietary calories on the lipid composition of bone marrow of rats was studied. Male weanling rats were fed 3 isocaloric diets, containing high carbohydrate, normal protein, and high protein, and a fourth high fat diet for 49 days. Feeding of the high carbohydrate, high protein, and high fat diets caused a significant increase in the level of total lipids compared to the normal protein diet. This increase of total lipids was due primarily to the increase in the level of triglycerides. There was no significant difference in fatty acid composition of either nonpolar or polar lipids of bone marrow among rats fed high carbohydrate diet and those fed normal protein diet. A comparison of fatty acid compositions between bone marrow lipids of rats fed high protein diet and the other 2 isocaloric diets revealed that the proportion of palmitic acid was higher and the proportion of oleic acid was lower in animals fed high protein diet than in animals fed the other 2 diets. Compared to the 3 isocaloric low fat diets, dietary feeding of high fat diet caused a decrease in the proportion of palmitic and palmitoleic acids and an increase in the proportion of oleic and linoleic acids in total fatty acids of both nonpolar and polar lipids.

INFLUENCE OF CHOLESTEROL FEEDING ON LIVER MICROSOMAL METABOLISM OF STEROIDS AND BILE ACIDS IN CONVENTIONAL AND GERM-FREE RATS. B.E. Gustafsson, K. Einarsson and Jan-Ake Gustafsson (Dept. of Germ-free Res., Karolinska Inst., Dept. of Med., Serafimerlasarettet, and Dept. of Chem., Karolinska Inst., Stockholm, Sweden) *J. Biol. Chem.* 250, 8496–502 (1975). The present investigation has aimed at defining the factor responsible for the differences in microsomal metabolism of steroids between germ-free and conventional rats. Cholesterol, cholic acid, taurocholic acid, and chenodeoxycholic acid were fed to conventional and germ-free male rats and the effects on liver microsomal metabolism of 4-[4-^{14}C]androstene-3,17-dione, 5α-[4-^{14}C]androstane-3α,17β-diol, [4-^{14}C]-cholesterol, 7α-hydroxy-4-[6β-^{3}H]cholesten-3-one, and [24-^{14}C]lithocholic acid were studied. Cholesterol feeding led to a pronounced increase in the intestinal concentration of β-muricholic acid in conventional rats. Conventionalization of germ-free rats for a period of up to 56 days led only to a partial normalization of the liver microsomal metabolism of 5α-[4-^{14}C]androstane-3α,17β-diol and 7α-hydroxy-4-[6β-^{3}H]cholesten-3-one and of the liver microsomal concentration of cytochrome P-450. The concentration of cholesterol was higher in both total liver homogenate and liver microsomal fraction of germ-free rats than in corresponding preparations from conventional rats.

ROLE OF LYSOSOMAL ACID LIPASE IN THE METABOLISM OF PLASMA LOW DENSITY LIPOPROTEIN. OBSERVATIONS IN CULTURED FIBROBLASTS FROM A PATIENT WITH CHOLESTERYL ESTER. J.L. Goldstein, S.E. Dana, J.R. Faust, A.L. Beaudet and M.S. Brown (Dept. of Internal Med., Univ. of Tx. Hlth. Sci. Ctr. at Dallas, Dallas, Tx. 75235) *J. Biol. Chem.* 250, 8487–95 (1975). The hydrolysis of cholesteryl esters contained in plasma low density lipoprotein was reduced in cultured fibroblasts derived from a patient with cholesteryl ester storage disease, an inborn error of metabolism in which lysosomal acid lipase activity is deficient. While these mutant cells showed a normal ability to bind low density lipoprotein at its high affinity cell surface receptor site, to take up the bound lipoprotein through endocytosis, and to hydrolyze the protein component of the lipoprotein in lysosomes, their defective lysosomal hydrolysis of the cholesteryl ester component of the lipoprotein led to the accumulation within the cell of unhydrolyzed cholesteryl esters, the fatty acid distribution of which resembled that of plasma lipoprotein. These data lend support to the concept that in cultured human fibroblasts cholesteryl esters entering the cell bound to low density lipoprotein are hydrolyzed within the lysosome and that one of the functions of this intracellular organelle is to supply the cell with free cholesterol.

BIOSYNTHESIS OF CHOLIC ACID IN RAT LIVER. 24-HYDROXYLATION OF 3α,7α,12α-TRIHYDROXY-5β-CHOLESTANOIC ACID. J. Gustafsson (Dept. of Chem., Karolinska Inst., Stockholm, Sweden) *J. Biol. Chem.* 250, 8243–7 (1975). Conversion of 3α,7α,12α-trihydroxy-5β-[7β-^{3}H]cholestanoic acid into 3α,7α,12α,24-tetrahydroxy-5β-cholestanoic acid in rat liver was catalyzed either by the mitochondrial fraction fortified with the 100,000 $\times$ *g* supernatant fluid or the microsomal fraction fortified with 100,000 $\times$ *g* supernatant fluid and ATP. The microsomal system was more active than the mitochondrial system. With the microsomal system the rate of reaction was considerably faster with free 3α,7α,12α-trihydroxy-5β-cholestanoic acid as substrate than with the corresponding coenzyme A ester. Addition of coenzyme A inhibited the activity. Addition of cofactors other than ATP and coenzyme A did not markedly influence the reaction. In contrast to the microsomal system, the mitochondrial system was not stimulated by the addition of ATP and was not inhibited by coenzyme A. The coenzyme A ester of 3α,7α,12α-trihydroxy-5β-cholestanoic acid was 24-hydroxylated more efficiently than the free acid.

INHIBITION OF HEPATIC LIPOGENESIS BY ADENINE NUCLEOTIDES. R.A. Harris and R.A. Yount (Dept. of Biochem., Indiana Univ. Schl. of Med., Indianapolis, Ind. 46202) *Lipids* 10, 673–80 (1975). Incubation of liver slices and isolated liver cells with adenosine cyclic-3′,5′-monophosphate at concentrations which inhibit lipogenesis was found to expand the pool size of the noncyclic adenine nucleotides in the intact cells of the preparations. This observation led to studies which demonstrated that adenosine and adenosine-5′-monophosphate also inhibited lipogenesis and expanded the adenine nucleotide pool size. Low concentrations of N^2,$O^{2'}$-dibutyryl adenosine cyclic-3′,5′-monophosphate were found to inhibit lipogenesis without increasing the intracellular adenine nucleotide content of either liver slices or isolated liver cells. It is concluded that studies on the mechanism of glucagon regulation of

lipogenesis should be carried out with glucagon or low concentrations of $N^6,O^{2'}$-dibutyryl adenosine cyclic-3',5'-monophosphate.

EXAMINATION OF ACETOLYSIS PRODUCTS OF PHOSPHATIDYLCHOLINE BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY. K. Hasegawa and T. Suzuki (Res. Inst. for Food Sci., Kyoto Univ., Godasho, Uji, Kyoto, Japan 611) *Lipids* **10**, 667–72 (1975). A comparison of monoacetyldiglycerides obtained from authentic phosphatidylcholines by acetolysis with those obtained by phospholipase C-acetylation was made to examine the intermolecular acyl migration, the intramolecular acyl migration between C-1 and C-2, and the formation of 1,3-isomer in the acetolysis reaction. Egg yolk phosphatidylcholine also was used. It was revealed that in acetolysis, the intermolecular acyl migration and selective degradation of polyunsaturated fatty acids did not take place at all. The intramolecular acyl migration, including the formation of 1,3-isomer, occurred to a small extent. Appreciable difference was not found in comparison of molecular species compositions of monoacetyldiglycerides derived by both methods from egg yolk phosphatidylcholine, except small differences found in the contents of two kinds of molecular species.

EFFECTS OF HYPERLIPOPROTEINEMIC SERUM AND EXOGENOUS PROLINE CONCENTRATION ON COLLAGEN SYNTHESIS BY ISOLATED RABBIT AORTAS. D. Holderbaum, L.A. Ehrhart and K.G. McCullagh (Res Div., The Cleveland Clinic Foundation, Cleveland, Oh. 44106) *Proc. Soc. Exp. Biol. Med.* **150**, 363–7 (1975). Collagen synthesis was measured in segments of normal rabbit aorta, incubated *in vitro*, by monitoring the formation of peptidyl-^{14}C-hydroxyproline from [U-^{14}C]-L-proline added to the incubation medium. The effect of hyperlipoproteinemic rabbit serum on the rate of collagen synthesis was compared with the effect of normal rabbit serum. No differences in the rates of synthesis were detected between the two batches of serum, despite a 60-fold difference in serum cholesterol concentration. Increases in free proline concentration in the incubation medium resulted in changes in proline flux between medium and tissue pools of free proline, but medium proline concentration had no effect on the rate of collagen synthesis.

EFFECT OF DIET ON THE COMPOSITION OF CHOLESTERYL ESTERS OF SHEEP ADRENALS. W.W. Christie, M.L. Hunter, J.H. Moore, R.C. Noble and R.G. Vernon (The Hannah Res. Inst., Ayr, Scotland KA 6 5HL) *Lipids* **10**, 649–51 (1975). Fatty acid components of cholesteryl esters from the adrenals of sheep, like those of nonruminants, were characterized by significant amounts of the longer chain metabolites of linoleic acid. Administration to sheep of diets rich in linoleic acid and protected against biohydrogenation did not alter the concentration of these components significantly. Although 18:2 levels were elevated, this was largely at the expense of *cis*-monoenoic fatty acids.

EFFECT OF CHOLESTEROL FEEDING ON CIRCADIAN RHYTHM OF HEPATIC AND INTESTINAL CHOLESTEROL BIOSYNTHESIS IN HAMSTERS (39018). K.J. Ho (Dept. of Pathol., Univ. of Alabama in Birmingham, Med. Ctr., Birmingham, Ala. 35294) *Proc. Soc. Exper. Biol. Med.* **150**, 271–7 (1975). Forty-eight adult hamsters were divided equally into two groups fed a control diet and a 2% cholesterol diet, respectively, under a rigid lighting (6 PM–6 AM) and feeding (6 PM–8 AM) schedule for three weeks. The cholesterol synthetic activity of the liver, stomach, small intestine, cecum, colon and kidney was measured by *in vivo* conversion of acetate-1-^{14}C to cholesterol in four animals each time at 4 hour intervals. A remarkable circadian rhythm with the peak at midnight and the nadir at noon was found in the liver of the control hamsters, but was completely abolished in the cholesterol-fed animals since the activity was nearly totally suppressed at all times. The small intestine exhibited a similar rhythm with the peak at midnight but maintained a high baseline activity from 8 AM to 6 PM. Cholesterol feeding did not alter the baseline activity but reduced 17% of the peak activity. Other organs failed to show such a circadian rhythm.

ENZYMATIC CONVERSION OF 5α-CHOLESTA-7,14-DIEN-3β-OL TO 5α-CHOLESTA-8,14-DIEN-3β-OL. H.M. Hsiung, T.E. Spike and G.J. Schroepfer, Jr. (Univ. of Ill., Urbana, Ill. 61801) *Lipids* **10**, 623–6 (1975). 5α-Cholesta-7,14-dien-3β-ol, previously shown to be efficiently converted to cholesterol upon incubation with rat liver homogenate preparations under aerobic conditions, has been studied as to its possible conversion to 5α-cholesta-8,14-dien-3β-ol. Efficient conversion was observed upon incubation in the presence of washed microsomes of rat liver under anaerobic conditions. This observation is of importance in consideration of possible metabolic pathways in the biosynthesis of cholesterol.

COMPARISON OF PHOSPHOLIPID COMPOSITION OF AEDES AEGYPTI AND AEDES ALBOPICTUS CELLS OBTAINED FROM LOGARITHMIC AND STATIONARY PHASES OF GROWTH. H.M. Jenkin, E. McMeans, L.E. Anderson, and T.K. Yang (The Hormel Inst., Univ. of Minn., Austin, Minn. 55912) *Lipids* **10**, 686–94 (1975). *Aedes aegypti* and *Aedes albopictus* cells were grown in tissue culture and harvested at logarithmic and stationary phases of development. The phospholipids were extracted, separated into lipid classes, and fatty acid composition of each fraction determined. The phosphatidylethanolamine fraction was the major lipid (42–54%). With aging, the *A. aegypti* cells showed an increase in polyenes in the phosphatidylcholine and phosphatidylethanolamine fractions and in monoenes and polyenes in the phosphatidylinositol fraction. The lysophosphatidylcholine fraction had an increase in chain length of the fatty acids with aging of the *A. aegypti* cells. The *A. albopictus* cells, with aging, showed increases in chain length and in the relative percentage of polyenes in the lysophosphatidylcholine, phosphatidylcholine, and phosphatidylserine fractions. In the phosphatidylinositol fraction, chain elongation of fatty acids occurred as the cells aged. In the ceramide phosphorylcholine fraction, there were increases in saturation and chain elongation of the fatty acids from the logarithmic to the stationary phase of the *A. albopictus* cells. An increase in polyenes was observed with aging of the cells in the phosphatidylethanolamine fraction.

BRAIN CHOLESTEROL XVII: EFFECT OF METHYLPHENIDATE (RITALIN) ON [U-^{14}C]GLUCOSE AND [2-^{3}H]ACETATE INCORPORATION. J.J. Kabara (Dept. of Biomechanics, Mich. State Univ., Lansing, Mich. 48823) *Proc. Soc. Exp. Biol. Med.* **150**, 525–8 (1975). The effect of a single injection of methylphenidate (Ritalin, 4 mg/kg) on precursor ([2-^{3}H]acetate and [U-^{14}C] glucose) incorporation into brain cholesterol was studied. The drug caused a steady decrease in the concentration of brain cholesterol during the 24-hr period examined. Incorporation studies during this time with [U-^{14}C]glucose indicated higher than normal incorporation for all time periods studied. The most significant incorporation increases took place 2 and 4 hr after drug injection. Experiments using [2-^{3}H]acetate as the sterol precursor gave incorporation values which tended (not significantly) to be lower than control values at 2 and 4 h. The values after 12 hr were less than normal, while the 24-hr group indicated an increase to or slightly higher than normal values. These data suggest that the pharmacological effect of methylphenidate may be due to lowering of brain cholesterol levels directly or on some more basic metabolic process leading to a decreased level of membrane sterols.

FAILURE TO DEMONSTRATE DEGRADATION OF [4-^{14}C]CHOLESTEROL TO VOLATILE HYDROCARBONS IN RATS AND IN HUMAN FECAL HOMOGENATES. M.D. Levitt, R.F. Hanson, J.H. Bond and R.R. Engel (Depts. of Med. and Ped., Univ. of Minn. and Minneapolis Vet. Admin. Hosp., Minneapolis, Minn. 55455) *Lipids* **10**, 662–6 (1975). The inability of previous workers to recover completely the radioactivity from ingested [4-^{14}C] cholesterol has led to the hypothesis that the colonic flora of some individuals degrade the sterol nucleus to volatile hydrocarbons, particularly CH_4. In the present investigation, the production of radioactive volatiles was measured following incubation of [4-^{14}C]cholesterol with 8 human fecal homogenates or after instillation of the labeled sterol into the cecum of 3 rats housed in a closed rebreathing system. Three of the 8 homogenates and each of the 3 rats produced copious CH_4. However, analysis by combustion demonstrated no radioactivity above background in the volatile headspace of the homogenates or the gas space of the closed system housing the rats, indicating that $<0.001\%$ of the number 4 carbon of [4-^{14}C]cholesterol could have been converted to volatile hydrocarbons. This study, therefore, provides no support for the concept that volatile products account for the incomplete recovery of ingested sterols observed in certain subjects. However, this hypothesis can not be excluded entirely until similar results are obtained with subjects who can be shown to degrade cholesterol.

SN-GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE ACTIVITY IN PARTICULATE PREPARATIONS FROM ANAEROBIC, LIGHT-GROWN CELLS OF RHODOPSEUDOMONAS SPHEROIDES. INVOLVEMENT OF ACYL THIOLESTER DERIVATIVES OF ACYL CARRIER PROTEIN IN THE SYNTHESIS OF COMPLEX LIPIDS. D.R Lueking and H. Goldfine (Dept. of Microbiol., Schl. of Med., Univ. of Pennsylvania, Philadelphia, Pa. 19174) *J. Biol. Chem.* **250**, 8530–5 (1975). Crude particulate preparations obtained from anaerobic, light-

grown cells of *Rhodopseudomonas spheroides* have been shown to possess a significant level of *sn*-glycerol-3-phosphate acyltransferase (EC 2.3.1.15) activity. In contrast to the enzyme from *Escherichia coli*, the *R. spheroides* glycerophosphate acyltransferase has a high specificity for acyl thiolester derivatives of acyl carrier protein (ACP) as acyl donors for the reaction. Only limited, nonlinear glycerophosphate incorporation into lipid occurs when acyl coenzyme A(CoA) derivatives are employed as acyl substrate. With oleyl-ACP as substrate, maximal enzyme activity was observed at 40° over a broad pH range (6.0 to 8.5) and did not require a divalent metal cation. The presence of dithiothreitol stimulated enzyme activity 15 to 20%. When oleyl-ACP or palmityl-ACP was employed as sole acyl group donor, the major products recoverable from the reaction mixtures were lysophosphatidic acid, phosphatidic acid, and monoglyceride. Although oleyl-ACP and palmityl-ACP gave comparable maximal velocities in the initial acylation of glycerophosphate, the formation of phosphatidic acid occurred preferentially with the unsaturated acyl-ACP derivative.

AN IMMUNOCHEMICAL STUDY OF THE HUMAN BLOOD GROUP P_1, P, AND P^k GLYCOSPHINGOLIPID ANTIGENS. M. Naiki and D.M. Marcus (Depts. of Microbiol. and Immunol., and Med., the Albert Einstein Col. of Med., Bronx, N.Y. 10461) *Biochemistry* **14**, 4837–41 (1975). The erythrocyte P^k and P blood group antigens have been identified as ceramide trihexoside (CTH), Gal(α,1 → 4)Gal(β,1 → 4)Glc-Cer, and globoside, GalNAc (β,1 → 3)Gal(α,1 → 4)Gal(β,1 → 4)Glc-Cer, respectively, and the following structure has been proposed for the P_1 antigen: Gal(α,1 → 4)Gal(β,1 → 4)GlcNAc(β,1 → 3)Gal(β,1 → 4)Glc-Cer. Although the P_1 and P^k determinants have identical terminal disaccharides, CTH did not inhibit anti-P_1. The P_1 glycolipid and hydatid cyst glycoprotein inhibited the agglutination of $P_1{}^k$ erythrocytes by anti-P_1 and unabsorbed anti-P_1PP^k sera, but neither antigen inhibited a specific anti-P^k serum. The P_1 and P^k glycolipids were equally effective in inhibiting the hemagglutinating activity of a lectin with α-galactosyl specificity obtained from ova of *Salmo trutta*. Anti-P sera were inhibited most effectively by human erythrocyte globoside, and to a lesser extent by Forssman glycolipid and rat kidney globoside. In the latter glycolipid the linkage between the internal galactosyl residues is α,1 → 3, rather than α,1 → 4, as in erythrocyte globoside. No cross-reactions between P and P_1 or P^k antigens were detected. New hypotheses are offered to explain the genetic regulation and biosynthesis of the P_1, P, and P^k antigens.

STUDIES ON TOCOPHEROL DERIVATIVES: V. INTESTINAL ABSORPTION OF SEVERAL D, L-3,4-$^3H_2$-α-TOCOPHERYL ESTERS IN THE RAT. T. Nakamura, Y. Aoyama, T. Fujita and G. Katsui (Dept. of Drug Metab., Sect. of Exper. Therapeutics Res., Eisai Co., Ltd., Koishikawa, Bunkyo-ku, Tokyo 112, Japan) *Lipids* **10**, 627–33 (1975). Twelve d,l-3,4-$^3H_2$-α-tocopheryl esters were synthesized from d,l-3,4-$^3H_2$-α-tocopherol. They were acetate, propionate, butyrate, isobutyrate, caprylate, palmitate, acid succinate, benzoate, nicotinate, o-hydroxybenzoate, o-acetoxybenzoate, and pivalate. The hydrolysis of these esters with bile-pancreatic juice and with 9,000 × g supernatant of small intestine and liver homogenates of rats was examined. When these esters were incubated in small intestine or liver supernatants, hydrolysis occurred at a similar rate. In *in vivo* experiments, the lymphatic absorption rate of 6 esters, acetate, palmitate, acid succinate, nicotinate, o-hydroxybenzoate, and pivalate, was measured on thoracic duct fistula rats. Easily hydrolyzable esters were recovered mostly in lymph as α-tocopherol, whereas, an ester which strongly resisted hydrolysis, such as pivalate, appeared mainly unchanged. The percentage of absorption of slowly hydrolyzed esters in lymph was relatively lower than that of moderately or easily hydrolyzable esters.

SPECIFICITY OF DIGESTIVE LIPASES IN HYDROLYSIS OF WAX ESTERS AND TRIGLYCERIDES STUDIED IN ANCHOVY AND OTHER SELECTED FISH. J.S. Patton, J.C. Nevenzel and A.A. Benson (Scripps Inst. of Oceanography, Univ. of Calif., San Diego, La Jolla, Calif. 92037) *Lipids* **10**, 575–83 (1975). The physiological specificity of fat digestion in several species of marine fish was studied by incubating a variety of synthetic and natural lipid substrates in fish intestinal fluid. Wax ester and triglyceride hydrolyses were studied in vivo and in vitro. In vivo feeding studies showed triglyceride hydrolysis and reesterification in the gut occurred 4 times faster than wax ester metabolism. In vitro comparisons of wax and triglyceride lipolysis always showed triglycerides to be hydrolyzed faster than wax esters; however, wide variation in the ratio occurred among different batches of intestinal juice. Ca. 50% of the 2-monoglycerides formed in the lipolytic sequence were hydrolyzed. Esters of lipase resistant fatty acids (20:4 and 20:5) were cleaved faster than normal fatty acid esters (18:2 and 18:3). Two of the species studied, the northern anchovy, *Engraulis mordax* and the jack mackerel, *Trachurus symmetricus*, empty lipase(s) into their gall bladders and produce phospholipid-free bile.

A STUDY OF THE INTERRELATIONSHIP BETWEEN THE TRIACYLGLYCEROL AND PROTEIN COMPONENTS OF VERY-LOW-DENSITY LIPOPROTEINS USING THE PERFUSED RAT LIVER. S.J. Petersburg, A. Madeley and D.S. Robinson (Dept. of Biochem., Univ. of Leeds, Leeds LS2 9LS, U.K.) *Biochem. J.* **150**, 315–21 (1975). High and low rates of very-low-density-lipoprotein triacylglycerol release from the perfused rat liver were achieved by using livers taken respectively from animals that had been given fructose for 48 h or from animals that had been starved for 18 h. The higher rates of very-low-density-lipoprotein triacylglycerol release by the livers of the fructose-fed rats were associated with higher rates of very-low-density-lipoprotein protein release. When the livers were perfused in the presence of [^{3}H]leucine, radioactivity was incorporated into the very-low-density-lipoprotein apoproteins. The higher rates of very-low-density-lipoprotein triacylglycerol and protein release by the livers of fructose-fed rats were associated with a greater total incorporation of radioactivity into those apoproteins that entered the running gel during polyacrylamide-gel electrophoresis. However, the distribution of radioactivity among the various apoproteins was not significantly changed by the dietary treatments used.

DIETARY ALTERATION OF FATTY ACID COMPOSITION OF LIPID CLASSES IN MOUSE MAMMARY ADENOCARCINOMA. G.A. Rao and S. Abraham (Veterans Admin. Hosp., Martinez, Calif. 94553) *Lipids* **10**, 641–2 (1975). The composition of total fatty acids in serially transplanted mammary adenocarcinomas of C_3H mice which were fed a fat free diet or a stock diet containing 4% fat for 8 weeks were significantly different, although fatty acid amounts were similar. The difference in composition was manifested in the triglyceride, phosphatidyl choline, and phosphatidyl ethanolamine fractions. Tumors of mice fed fat free diet had appreciable amount of eicosatrienoic acid, whereas neoplasms of stock diet fed animals had none. In addition, higher levels of oleic acid and lower contents of linoleic acid were found in tumors from mice fed fat free diet than in those from mice fed the stock diet. Thus, mechanisms which maintained the triglyceride fatty acid composition in some tumors, such as 7288CTC hepatoma, were not observed in mouse mammary adenocarcinomas, and, therefore, were not a general phenomena associated with carcinogenesis.

OBSERVATIONS ON THE PASSAGE OF APOPROTEINS FROM PLASMA LIPOPROTEINS INTO PERIPHERAL LYMPH IN TWO MEN. D. Reichl, A. Postiglione, N.B. Myant, J.J. Pflug and M. Press (Med. Res. Council Lipid Metab. Unit, Hammersmith Hosp., London) *Clin. Sci. Molec. Med.* **49**, 419–26 (1975). The passage of radioactive apolipoproteins into lymph draining the foot was investigated in two men, each given a single intravenous injection of low-density lipoprotein containing ^{131}I-labelled apoprotein B and of very-low-density lipoprotein containing ^{125}I-labelled apoprotein A and apoprotein C. Protein-bound ^{125}I and ^{131}I appeared in the lymph of both subjects. Immunoelectrophoresis of lymph lipoproteins against anti-(high-density lipoprotein) and anti-(low-density lipoprotein) and anti-(low-density lipoprotein) showed the presence of apo-high-density lipoprotein and apo-low-density lipoprotein with faster mobilities than plasma high-density and low-density lipoprotein respectively. Most of the protein-bound ^{131}I in lymph was recovered in the precipitin line formed by the apoprotein B-containing lipoprotein after immunoelectrophoresis. Polyacrylamide gel electrophoresis of the lymph lipoprotein fraction showed the presence of ^{125}I-containing bands with mobilities similar to those of the apoprotein A of high-density lipoprotein and of three of the fast-moving C apoproteins. These results suggest that most, if not all, of the apoproteins of plasma lipoproteins reach the interstitial fluids and that some lipoproteins undergo modification during their passage into peripheral lymph.

LIPOGENESIS BY INTACT HEPATOCYTES FROM NORMAL AND DIABETIC RATS. E. Raghupathy, C. Orthlieb and S. Abraham (Bruce Lyon Memorial Res. Lab., Children's Hosp. Med. Ctr. of Northern Calif., Fifty-First & Grove Streets, Oakland, Calif. 94609) *Lipids* **10**, 653–5 (1975). Intact hepatocytes isolated from livers of diabetic rats demonstrate the characteristic decreased lipogenic capacities as compared to normal. Administration of insulin to diabetic rats restores these

capacities to near normal levels. The results emphasize the potential that the hepatocyte system has for the study of hormonal regulation of lipogenesis.

STRUCTURE OF HUMAN HIGH DENSITY LIPOPROTEIN REASSEMBLED IN VITRO. RADIOIMMUNOASSAY STUDIES. G. Schonfeld, B. Pfleger and R. Roy (Lipid Res. Ctr., Depts. of Preventive Med. and Med., Washington Univ. Schl. of Med., St. Louis, Mo. 63110) *J. Biol. Chem.* 250, 7943–50 (1975). Immunologic approaches to studying lipoprotein structure have been limited because the methods have not been quantitative enough. Recently we reported a radioimmunoassay for human apoprotein A-I (ApoA-I). Only 8% of the ApoA-I of high density lipoprotein (HDL) reacted in the radioimmunoassay system consisting of rabbit anti-human ApoA-I, ^{125}I-ApoA-I, and unlabeled ApoA-I. To test this, "lipoproteins" were reconstituted from lipids and apoproteins and assayed for their reactivity in the radioimmunoassay. Apoprotein compositions were determined by polyacrylamide disc gel electrophoresis. ApoA-I content by radioimmunoassay than was compared with the ApoA-I content obtained by disc gel electrophoresis. The identification of the determinants involved awaits the development of radioimmunoassays for specific regions of ApoA-I.

THYROXINE DEIODINATION ASSOCIATED WITH NADPH-DEPENDENT LIPID PEROXIDATION IN A SUBMICROSOMAL SYSTEM. K. Suwa and M. Nakano (Dept. of Biochem., Schl. of Med., Gunma Univ., Maebashi, 371 Gunma, Japan) *Proc. Soc. Exp. Biol. Med.* 150, 401–6 (1975). A lipoprotein present in trypsin-treated microsomes can be oxidized with formation of malondialdehyde in a system which contains NADPH, ferric ion-ADP complex, NADPH-cytochrome *c* reductase and a factor. This factor, a mixture of peptides, can be isolated from hepatic microsomes by trypsin digestion and successive gel filtration through Sephadex G-100 and G-25 columns. Lipid peroxidation in this system catalyzes the deiodination of thyroxine, as does NADPH-dependent lipid peroxidation in fresh hepatic microsomes. Thyroxine inhibits lipid peroxidation as it is deiodinated in this system.

EFFECT OF VARYING RATIOS OF FAT AND PROTEIN IN FIBER-FREE SEMISYNTHETIC DIETS ON FECAL OUTPUT OF PIG-TAILED MONKEYS (MACACA NEMESTRINA). G.A. Spiller, E. Averkin, D.E. Bidlack and R.J. Amen (Syntex Res., 3401 Hillview Ave., Palo Alto, Calif. 94304) *Amer. J. Clin. Nutr.* 28, 1237–41 (1975). The effect of varying the ratios of dietary fat, protein and carbohydrate on the amount and composition of fecal output was studied in adult, male pig-tailed monkeys *(Macaca nemestrina)* fed liquid, fiber-free semisynthetic diets. The dietary nitrogen was supplied as an enzymatic protein hydrolyzate (biological value = 86%), the fat as corn oil, and the carbohydrate as corn syrup solids. Vitamins and minerals were added to meet the nutritional requirements of this monkey. Nine diets were fed for 2 weeks, and fecal excreta collected daily after a 4-day adaptation to a new diet. The levels of protein/day were 40, 80, and 160 kcal/animal and the levels of fat/day were 4.4, 22.5, and 112.5 kcal/animal. These fecal output differences were related to changes in fecal moisture but not in dry fecal matter. Increased nitrogen loss in the feces was noted for all 160 kcal protein diets, and especially so when the fat level was 4.5 kcal. The 112.5 kcal fat diet produced feces higher in total lipids.

COMPOSITION OF LIVER LIPIDS OF THE RAT DURING PREGNANCY AND LACTATION. R.W. Smith and A. Walsh (Natl. Inst. for Res. in Dairying, Shinfield, Reading, RG2 9AT, England) *Lipids* 10, 643–5 (1975). Triglyceride concentrations in rat liver rose during late pregnancy, declined at peak lactation, and then rose again during involution. The percentage of oleate in the triglycerides rose at peak lactation, but that of linoleate fell. Although phospholipid concentrations were unchanged, the percentage of palmitate in this fraction rose, and those of stearate and arachindonate fell during pregnancy and lactation. These changes may be related to the changes in lipogenesis and fat mobilization that occur during pregnancy and lactation.

LOWERING OF PLASMA CHOLESTEROL LEVELS IN FREE-LIVING ADOLESCENT MALES; USE OF NATURAL AND SYNTHETIC POLYUNSATURATED FOODS TO PROVIDE BALANCED FAT DIETS. E.A. Stein, D. Mendelsohn, M. Fleming, G.D. Barnard, K.J. Carter, P.S. du Toit, J.D.L. Hansen and I. Bersohn (Cardiovas. Res. Unit, South African Inst. for Med. Res., Johannesburg) *Amer. J. Clin. Nutr.* 28, 1204–16 (1975). Two hundred and twenty-nine adolescent male pupils, attending two boarding schools, participated in a study, under free-living dietary conditions, designed to assess the effects on plasma lipids of altering only the type and not the amount of dietary fat. The students were monitored for 6 weeks on three different diets. During the first study period, dietary changes comprised substituting a polyunsaturated dried "filled" milk and products derived therefrom for conventional dairy products (diet A). The second dietary phase involved replacing all meat and dairy products with equivalent polyunsaturated ruminant fat products (diet B). The third period consisted of a control diet of conventional dairy and meat products. A palatability survey showed that both the dried filled milk and the polyunsaturated ruminant fat products could, if introduced to the general population, play an important part in plasma cholesterol suppression in the hope that this would significantly reduce the incidence of coronary artery disease.

GAS CHROMATOGRAPHIC MASS SPECTROMETRIC STUDIES OF ETHOXYQUIN IN SOME ORGANIC SOLVENTS. I. J.U. Skaare and H.K. Dahle (Dept. of Pharmacol. and Toxicol. and the Dept. of Food Hygiene, Veter. Col. of Norway, Oslo-Dep., Oslo 1, Norway) *J. Agric. Food Chem.* 23, 1091–3 (1975). The stability of 6-ethoxy-1,2-dihydo-2,2,4-trimethylquinoline (ethoxyquin, EMQ) was studied in *n*-hexane and chloroform with emphasis on the color changes of the solutions and the quantitative changes during 1 month of storage in the absence of light. Visual observations, gas-liquid chromatography (GLC), and GLC combined with mass spectrometry (MS) were used as the methods of analysis. The antioxidant was found to be extremely labile on exposure to light, and in chloroform solutions an increase of color intensity was observed together with a 35–70% loss of GLC measurable EMQ, the tenfold dilute solutions (0.1 mg/ml) being the least stable. The ethoxyquin dissolved in *n*-hexane, however, was found to remain unchanged even after the storage period. In conclusion, *n*-hexane is therefore recommended as the solvent for use in analytical work and for extractions from biological systems containing ethoxyquin. GLC using a 3% SE-30 column operated at 160° has been found to be suitable for quantitation of EMQ when residues are to be determined in food products for example. The mass spectra of the GLC peaks were examined for characteristic fragmentation patterns.

BIOSYNTHESIS OF FATTY ACIDS FROM ACETATE IN SOYBEAN SUSPENSION CULTURES. E.M. Stearns, Jr. and W.T. Morton (The Hormel Inst., Univ. of Minn., Austin, Minn. 55912) *Lipids* 10, 597–601 (1975). Suspension cultures of finely divided soybean cells established from callus were incubated with sodium [1-^{14}C]acetate for periods up to 86 hr. Lipids and fatty acids were analyzed for radioactivity in samples harvested at logarithmic time periods. Incorporation of acetate into cell lipid was directly proportional to the logarithm of time up to 32 hr, after an initial lag of 4–6 hr. Most of the lipid radioactivity was found in the phospholipid fraction, and all common soybean fatty acids became labeled within 6 hr. The order of labeling and distribution of radioactivity with time were essentially the same as in tissues from intact growing plants. These results support the concept of sequential desaturation of oleic acid in the cells. It was concluded that valid studies of the biosynthesis of common lipids in the soybean can be carried out for extended periods of time by use of undifferentiated cells in suspension cultures.

INHIBITIVE EFFECTS OF STRUCTURALLY MODIFIED AZASTEROIDS AND RELATED NITROGEN CONTAINING STEROIDS ON INSECT GROWTH AND DEVELOPMENT. M.J. Thompson, N.N. Serban, W.E. Robbins, J.A. Svoboda, T.J. Shortino, S.R. Dutky and C.F. Cohen (Insect Physiol. Lab., Plant Protection Inst., ARS, USDA, Beltsville, Md. 20705) *Lipids* 10, 615–22 (1975). A number of azasteroids and other nitrogen containing steroids with a modified nucleus or side chain were prepared and tested for their inhibitory effects on the growth and development of several species of insects. Structure-activity studies showed that compounds with a structurally related steroid nucleus and side chain were approximately equal in inhibitory activity for a particular species. The replacement of the tertiary amino group in the side chain of the 5β-steroid with other nitrogen substituents, such as nitro, cyano, acetylamino, or a quaternary ammonium salt, resulted in a considerable loss of inhibitive activity in the tobacco hornworm or the yellowfever mosquito. However, certain modifications of the azasteroid nucleus resulted in compounds that still retained high biological activity. As a result, a compound was synthesized that lacked the A and B rings of the steroid nucleus and that inhibited insect growth, molting and metamorphosis and the Δ^{24}-sterol reductase enzyme system of the tobacco hornworm.

FLUORESCENT PRODUCTS AND POLYUNSATURATED FATTY ACIDS OF HUMAN TESTES. R. Trombly, A.L. Tappel, J.G. Coniglio, W.M. Grogan, Jr., and R.K. Rhamy (Dept. of Food Sci. and Technol., Univ. of Calif., Davis, Calif. 95616) *Lipids* 10, 591–6 (1975). Lipid soluble fluorescent pigments from human testis were fractionated by silicic acid column chromatography and silica gel thin layer chromatography. Fluorescence analyses revealed a family of at least 3 compounds with similar fluorescence properties, including excitation and emission maxima, reversible fluorescence quenching by alkaline pH, and fluorescence quenching by heavy metal chelation. These fluorescence characteristics strongly indicated the presence of the conjugated Schiff base fluorophore -N=C-C=C-N-. The chromatographic separations employed enabled a more definitive fluorescence characterization of the lipid soluble pigments known to accumulate in tissues with age and as a result of lipid peroxidation. Total lipids and fatty acid composition of the total lipids were determined. Polyenoic acids constituted about 40% of the total fatty acids. Histological examination of the tissues revealed some degeneration and edema, but significant spermatogenesis and normal complement of Leydig cells.

METABOLISM OF NEUTRAL GLYCOSPHINGOLIPIDS IN PLASMA OF A NORMAL HUMAN AND A PATIENT WITH FABRY'S DISEASE. D.E. Vance, W. Krivit and C.C. Sweeley (Dept. of Biochem. and Nutr., Univ. of Pittsburgh, Pittsburgh, Pennsylvania 15213) *J. Biol. Chem.* 250, 8119–25 (1975). [6,6-$^2H_2$]Glucose was used as a tracer for a comparative study on the metabolism of the neutral glycosylceramides in plasma of a control subject and a patient with Fabry's disease. The incorporation of the tracer into the glucosyl and galactosyl moieties of the glycosphingolipids was measured by gas chromatography-mass spectrometry of the tetra-*O*-acetyl methyl glycoside derivatives. Experiments on the precision and accuracy for measurements of [6,6-$^2H_2$]hexose in a sample demonstrated that incorporation of 0.2% or more of [6,6-$^2H_2$]glucose could be detected with a 95% confidence limit of ±0 16%. The trihexosylceramide (galactosyl-(α1 → 4)-galactosyl-(β1 → 4)-glucosylceramide, GL-3a) from plasma of the control reached a maximum of 0.4% [6,6-$^2H_2$]hexose in both the glucosyl and galactosyl moieties whereas the GL-3a from the Fabry patient was not significantly labeled. The maximal labeling of the GL-4a fraction (*N*-acetyl-galactosaminyl-galactosyl-galactosyl-glucosylceramide) was slightly depressed in the Fabry patient (0.4%) as compared to the control (0.7%). Turnover times for the glycosphingolipids of plasma were calculated to be from 4 to 8 days and the turnover rates were from 1 to 6 μmol/day.

ACTION OF THE HIGHLY PURIFIED, MEMBRANE-BOUND ENZYME PHOSPHATIDYLSERINE DECARBOXYLASE ESCHERICHIA COLI TOWARD PHOSPHATIDYLSERINE IN MIXED MICELLES AND ERYTHROCYTE GHOSTS IN THE PRESENCE OF SURFACTANT. T.G. Warner and E.A. Dennis (Dept. of Chem., Univ. of California at San Diego, La Jolla, California 92037) *J. Biol. Chem.* 250, 8004–9 (1975). Phosphatidylserine decarboxylase, *Escherichia coli*, was purified to near-homogeneity by the procedure of Dowhan, W., Wickner, W.T., and Kennedy, E.P. and assayed by following the production of CO_2 using gas chromatography. The purified enzyme has an absolute requirement for the surfactant Triton X-100. The function of Triton in the assay is evaluated and a kinetic scheme describing the action of this membrane-bound enzyme in the micellar system provided by the surfactant is presented. According to this scheme, the enzyme first binds to a mixed micelle, composed of phosphatidylserine and Triton, where the dissociation constant is K_S^A. The amount of phosphatidylserine converted to phosphatidylethanolamine and CO_2 was found to be related to the amount of phosphatidylserine solubilized from the membrane by Triton X-100. In the absence of Triton, no significant activity of the enzyme toward the ghosts was detected even after subjecting the ghosts to lyophilization, homogenization, or sonication.

AMOUNT AND RATE OF DISAPPEARANCE OF LIVER FAT IN MALNOURISHED INFANTS IN JAMAICA. J.C. Waterlow (London Schl. of Hygiene and Tropical Med., Keppel St. (Gower Street), London WC1E 7HT, Great Britain) *Amer. J. Clin. Nutr.* 28, 1330–6 (1975). The fat content of the liver has been measured in 163 biopsy specimens taken from 95 malnourished children in Jamaica within a few days of admission to hospital and at various stages of recovery. The fat content was also measured in 38 samples from children who died. Severe degrees of fatty infiltration, up to 50% of the wet weight, were found. Fatty liver of this degree of severity may be a cause of death. The increase in fat was accompanied by an increase in water content. This may be the result of breakdown in the energy-dependent regulation of water content. Repeat biopsies were done within 6 weeks of admission in 26 children. The average rate of clearance of fat expressed as a fraction of the amount present at any time was 5.5% per day. An attempt was made by more frequent biopsies to determine whether the rate of decrease was influenced by the protein content of the diet, but the results were inconclusive.

INFLUENCE OF DIETARY SAFFLOWER OIL AND TALLOW ON GROWTH, PLASMA LIPIDS AND LIPOGENESIS IN RATS, PIGS AND CHICKS. R.A. Waterman, D.R. Romsos, A.C. Tsai, E.R. Miller and G.A. Leveille (Dept. of Food Sci. and Human Nutr. and Dept. of Animal Husbandry, Mich. State Univ., East Lansing, Mich. 48824) *Proc. Soc. Exp. Biol. Med.* 150, 347–51 (1975). Rats, chicks and pigs were fed diets containing safflower oil or tallow. Plasma triglyceride levels were elevated when tallow, rather than safflower oil was added to the diet of rats, unchanged in chicks and lowered when tallow, rather than safflower oil was fed to pigs. The rate of fatty acid synthesis in rat and chick liver was higher, whereas the rate of lipogenesis in adipose tissue preparations from rats and pigs was lower when tallow, rather than safflower oil was fed. These results indicate that there are species-specific, as well as organ-specific, metabolic responses to various dietary fats.

DECREASED CITRATE SYNTHESIS: POSSIBLE INDICATION OF EARLY DEGENERATIVE CHANGES IN TESTES OF VITAMIN E-DEFICIENT RATS. R. Younoszai, P.K. Dixit and G.T. Vatassery (Dept. of Anatomy, Univ. of Minnesota, Schl of Med., Minneapolis, Minn. 55455) *Proc. Soc. Exp. Biol. Med.* 150, 441–5 (1975). We have shown that intravenously administered glucose disappears from the blood of E-deficient rats at different rates compared to that of the control rats and that this difference could possibly be explained by membrane permeability changes in E-deficiency. We have also shown that the ability of E-deficient rat testis tissue to synthesize citrate is decreased, and that this decrease is probably an early manifestation of testicular degeneration.

RADIOIODINATED LIPOPROTEINS: ABSORPTION OF ^{125}I RADIOACTIVITY BY HIGH DENSITY SOLUTIONS. S. Eisenberg, O. Stein, and Y. Stein (Dept. of Med. B, Lipid Res. Lab., Hebrew Univ.-Hadassah Med. Schl., Jerusalem, Israel) *J. Lipid Res.* 16, 468–9 (1975). Concentrations of potassium bromide commonly used for separation of lipoproteins were shown to cause absorption of ^{125}I and thus reduce the counting efficiency of the labeled lipoproteins. Chloroform was shown to cause a 50% reduction in counting efficiency of lipid from ^{125}I-labeled lipoprotein. No reduction of counting efficiency was observed in the presence of high density solutions when ^{131}I was used as label.

DETERMINATION OF B PROTEIN OF LOW DENSITY LIPOPROTEIN DIRECTLY IN PLASMA. A. Sniderman, B. Teng and M. Jerry (Dept. of Med., Royal Victoria Hosp., McGill Univ., Montreal, Quebec, Canada H3A 1A1) *J. Lipid Res.* 16, 465–7 (1975). Quantitation of the apoprotein constituents of lipoproteins has extended our knowledge of plasma lipid transport. Previously, B protein content of low density lipoprotein could be measured by radial immunodiffusion only after ultracentrifugation. However, if performed in 1.5% agarose gel with standards and measured at 18 hr rather than at equilibrium, low density lipoprotein B protein can be measured directly in plasma, eliminating the need to separate very low density lipoprotein.

EFFECTS OF AGE AND CELL SIZE ON RAT ADIPOSE TISSUE METABOLISM. G. Holm, B. Jacobsson, P. Björntorp and U. Smith (Depts. of Med. I and II, Univ. of Gothenburg, Sahlgren's Hosp., Gothenburg, Sweden) *J. Lipid Res.* 16, 461–4 (1975). In order to analyze separately the effects of cell size and age on the metabolism of rat adipose tissue, fat cells of different sizes were obtained from the same animals. The rats were 4 or 15 wk old. The results show that age as well as cell size influences the metabolic rates. At a given size, the basal lipolysis, the lipolytic effects of glucagon and noradrenaline, the rate of glucose incorporation into the triglycerides, and the effect of insulin on glucose metabolism were considerably increased in the young animals. Furthermore, irrespective of fat cell size the lipolytic action of glucagon was reduced in old animals. The data thus show that experiments with large fat cells from old rats and with small cells from young animals cannot be directly compared because both variables may influence metabolic reactions.

GENESIS OF FATTY LIVER AND HYPERLIPEMIA IN THE FETAL GUINEA PIG. T. Bøhmer and R.J. Havel (Cardiovascular Res.

Inst. and Dept. of Med., Univ. of Calif. Schl. of Med., San Francisco, Calif. 94143) *J. Lipid Res.* 16, 454–60 (1975). 10 to 20% of [1-^{14}C]-palmitate injected into pregnant guinea pigs was recovered in lipids of their fetuses. From these data and the rate of transport of palmitate in maternal blood, it appears that placental transport of free fatty acids can account for the accumulation of lipids in late gestational fetuses. About 80% of the labeled palmitate in the fetus appeared initially in lipids of the liver. Lipoprotein lipase activity in fetal adipose tissue was low, and activity of cofactor protein of lipoprotein lipase in fetal blood plasma was much lower than that observed in other mammalian species. On the basis of these and earlier observations, it is concluded that the accumulation of triglycerides in liver and blood plasma of fetal guinea pigs during late gestation is at least partly the result of the large uptake of maternally derived free fatty acids by the fetal liver accompanied by rapid synthesis and secretion of triglyceride-rich very low density lipoproteins into the blood.

HIGH-PRESSURE LIQUID CHROMATOGRAPHY: SEPARATION OF THE METABOLITES OF VITAMINS D_2 AND D_3 ON SMALL-PARTICLE SILICA COLUMNS. G. Jones and H.F. DeLuca (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wisconsin-Madison, Madison, Wisc. 53706) *J. Lipid Res.* 16, 448–53 (1975). The high-pressure liquid chromatographic separation of all of the known metabolites of vitamin D_2 and vitamin D_3 found in biological fluids has been achieved. This technique has been successfully applied to the analysis of vitamin D mixtures, purification of vitamin D metabolites, and identification of radioactive peaks. Some theoretical bases for the observed resolutions are suggested.

DIFFERENT POPULATIONS OF PIG EPIDERMAL CELLS: ISOLATION AND LIPID COMPOSITION. G.M. Gray and H.J. Yardley (MRC Unit on the Exptl. Pathol. of Skin, The Med. Schl., The Univ., Birmingham, B15 2TJ, England) *J. Lipid Res.* 16, 441–7 (1975). Preparations representing populations of basal and spinous cells, granular cells, and stratum corneum cells were obtained by successive treatments of epidermal slices from pig skin with dilute trypsin solutions. Total lipids accounted for about 8% of the cell dry weight in each of the three populations. Phospholipids, which predominated in the basal and spinous cells, accounted for only 21% of the total lipids in the granular cells and less than 0.1% in the stratum corneium. The latter cells contained more cholesterol (23% of total lipid) than either the granular cells (18%) or the basal and spinous cells (8%). The proportion of ceramide was also much higher in the stratum corneum (17%) and granular cells (9%) than in the basal and spinous cells (1%). The relative amounts of glycosphingolipid (glucosylceramide) and cholesteryl sulfate in the total lipids of stratum corneum cells were less than half those in the granular cells and basal and spinous cells. A novel phospholipid was a major component (26% of total) of the phospholipids from granular cells. The compound, which was partially characterized, contained phosphorus, fatty acids, and glycerol (molar ratio 1:3:2) and appeared to be a neutral derivative of phosphatidic acid.

LIPID COMPOSITIONS OF CELLS ISOLATED FROM PIG, HUMAN, AND RAT EPIDERMIS. G.M. Gray and H.J. Yardley (MRC Unit on the Exptl. Pathol. of Skin, The Med. Schl., The Univ., Birmingham, B15 2TJ, England) *J. Lipid Res.* 16, 434–40 (1975). Epidermal slices from pig, human, and rat skin were treated with dilute buffered trypsin solution (0.005%, w/v), and suspensions of mixed basal and spinous cells were obtained in good yield. Total lipids accounted for approximately 8% of the pig, 10% of the human, and 20% of the rat epidermal cell (dry weight). Phospholipids in pig, human, and rat cells accounted for, respectively, 62%, 53%, and 35% of the total lipids. Phosphatidylcholine (34–38%), phosphatidylethanolamine (18–23%), and sphingomyelin (17–21%) were major compounds in all species. The major neutral lipids were sterols (mostly cholesterol) and triglycerides. Free fatty acids were a major lipid class in pig and human cells, whereas wax esters were a major component in rat epidermal cells. Nearly half (45%) of the sterols in rat cells but less than 10% of those in pig and human cells were esterified. Cholest-7-ene-3β-ol accounted for 20% of the total sterols in rat cells. Cholesteryl sulfate and ceramide were minor lipids in the three species. The predominant glycosphingolipid (>99%) was glucosylceramide, which accounted for 7% and 9%, respectively, of the total lipids in pig and human cells. A significant proportion (pig, 17%; human, 11%) of the fatty acids in the glucosylceramides were $C_{26:0}$ and $C_{28:0}$.

CONVERSION OF 7α-HYDROXYCHOLESTEROL AND 7α-HYDROXY-β-SITOSTEROL TO 3α,7α-DIHYDROXY- AND 3α,7α,12α-TRIHYDROXY-5β-STEROIDS IN VITRO. L. Aringer (Dept. of Chem., Karolinska Inst., Stockholm, Sweden) *J. Lipid Res.* 16, 426–33 (1975). The metabolism of 7α-hydroxycholesterol and 7α-hydroxy-β-sitosterol (24α-ethyl-5-cholestene-3β,7α-diol) has been compared in rat liver subcellular fractions. 7α-Hydroxy-β-sitosterol was shown to be metabolized in the same manner as 7α-hydroxycholesterol. Thus, the following C_{29} metabolites have been identified: 24α-ethyl-7α-hydroxy-4-cholesten-3-one, 24α-ethyl-7α,12α-dihydroxy-4-cholesten-3-one, 24α-ethyl-7α-hydroxy-5β-cholestan-3-one, 24α-ethyl-5β-cholestane-3α,7α-diol, 24α-ethyl-7α,12α-dihydroxy-5β-cholestan-3-one, and 24α-ethyl-5β-cholestane-3α,7α,12α-triol. The C_{29} compounds were generally less efficient substrates. The most pronounced difference was noted for the Δ^4-3-oxosteroid 5β-reductase. Thus, 7α-hydroxy-4-cholesten-3-one was three to four times as efficiently reduced as the C_{29} analog. The oxidation of the 3β,7α-dihydroxy-Δ^5-steroid to the 7α-hydroxy-Δ^4-3-oxosteroid, the 12α-hydroxylation of the 7α-hydroxy-Δ^4-3-oxosteroid, and the reduction of the 7α-hydroxy-5β-3-oxosteroid to the 3α,7α-dihydroxy-5β-steroid occurred in up to two times better yields for the C_{27} steroids.

ROLE OF LAMELLAR INCLUSIONS IN SURFACTANT PRODUCTION: STUDIES ON PHOSPHOLIPID COMPOSITION AND BIOSYNTHESIS IN RAT AND RABBIT LUNG SUBCELLULAR FRACTIONS. S.A. Rooney, B.A. Page-Roberts and E.K. Motoyama (Yale Univ. Lung Res. Ctr. and Depts. of Pediatrics and Anethesiology, Yale Univ. Schl. of Med., New Haven, Conn. 06510) *J. Lipid Res.* 16, 418–25 (1975). Lamellar inclusion bodies in the type II alveolar epithelial cell are believed to be involved in pulmonary surfactant production. However, it is not clear whether their role is that of synthesis, storage, or secretion. We have examined the phospholipid composition and fatty acid content of rabbit lung wash, lamellar bodies, mitochondria, and microsomes. Phosphatidylcholine and phosphatidylglycerol, the surface-active components of pulmonary surfactant, accounted for over 80% of the total phospholipid in lung wash and lamellar bodies but for only about 50% in mitochondria and microsomes. The fatty acid composition of lamellar body phosphatidylcholine was similar to that of lung wash, but different from that of mitochondria and microsomes, in containing palmitic acid as a major component with little stearic acid and few fatty acids of chain length greater than 18 carbon atoms. The activity in the lamellar body fraction could be attributed to microsomal contamination. The activity of glycerolphosphate phosphatidyltransferase, however, was high in the lamellar body fraction, although it was highest in the mitochondria and was also active in the microsomes.

ON THE INTERACTIONS BETWEEN PANCREATIC LIPASE AND COLIPASE AND THE SUBSTRATE, AND THE IMPORTANCE OF BILE SALTS. B. Borgstrom (Dept. of Physiol. Chem., Univ. of Lund, Lund, Sweden) *J. Lipid Res.* 16, 411–7 (1975). The interactions between pancreatic lipase and colipase and the substrate and the effect of bile salts on these interactions have been investigated by the use of kinetic experiments and studies on the semiquantitative phase distribution of lipase and colipase activities. The results suggest that lipase binds to hydrophobic interfaces with partial irreversible inactivation. Bile salts in the range of micellar concentrations and above a pH of about 6.5 displace lipase from this binding, resulting in a reversible inactivation. At pH values below about 6.5, lipase binds strongly to the substrate even in the presence of bile salt, and a low activity peak is seen around pH 5.5. This is the result of the binding of lipase to the "supersubstrate" and the activity of the catalytic site. In the presence of bile salt, colipase promotes the binding of lipase to the "supersubstrate" but not to other hydrophobic interfaces, and catalytic activity is reestablished. Kinetic data indicate that the binding between colipase and lipase in the presence of substrate is strong and occurs in an approximately stoichiometric relationship.

• Fats and Oils

ANTIOXIDANT EFFECT OF PROTEIN HYDROLYZATES IN FREEZE-DRIED MODEL SYSTEMS. SYNERGISTIC ACTION WITH A SERIES OF PHENOLIC ANTIOXIDANTS. S.J. Bishov and A.S. Henick (US Army Natick Labs., Food Sci. Lab., Natick, MA 01760). *J. Food Sci.* 40, 345–8 (1975). Protein hydrolyzates derived from autolyzed yeast proteins (AYP) and hydrolyzed vegetable proteins (HVP) acted as synergists when coupled with TBHQ, BHA, BHT, alpha-tocopherol, plicatic acid, propyl gallate and caffeic acid. TBHQ, BHA and BHT were shown to be more efficient by a factor of two in these tests than were caffeic acid, plicatic acid and propyl gallate. Protein hydrolyzates at less than 1% of the lipid in model systems acted synergistically

with BE at 0.005 and 0.010%. Significant reduction in the concentra on of antioxidants to maintain stability factors equivalent to those of BHA was achieved at 0.25% AYP and 0.005% BHA. The stability factor equaled that of 0.02% BHA alone, while at slightly higher levels of AYP the stability factor exceeded that of 0.020% BHA by 50-60%. All measurements were made using oxygen-sensitive, stripped corn oil in a freeze-dried model system with carboxymethylcellulose (CMC) as emulsion support by monitoring the rate of O_2 uptake of incubated samples to the end of an induction period using a gas chromatographic technique.

EFFECT OF A PROTECTED LIPID SUPPLEMENT ON FLAVOR PROPERTIES OF SHEEP MEATS. A.L. Ford (Meat Res. Lab., CSIRO Div. of Food Res., P O. Box 12, Cannon Hill, Queensland, Australia 4170), R.J. Park & R.L. McBride. *J. Food Sci.* 40, 236–9 (1975). Lamb and yearling mutton with subcutaneous fat rich in linoleic acid were produced by supplementing feedlot rations with a formaldehyde-treated sunflower seed preparation. The flavor properties of these meats were compared with those of meat from animals fed conventional feeds in pens or at pasture Laboratory taste panel comparisons of the flavor properties demonstrated that the high linoleic meat possessed an oily (like pork or chicken) and sweet aroma (evident also in uncooked state) and flavor, which the majority of panel members found somewhat objectionable.

FREE RADICALS IN LYSOZYME REACTED WITH PEROXIDIZING METHYL LINOLEATE. K.M. Schaich, and M. Karel (Dept. of Nutrition & Food Sci., MIT, Cambridge, MA 02139). *J. Food Sci.* 40, 456–9 (1975). Production of free radicals in lysozyme due to reactions with peroxidizing methyl linoleate was studied as a function of water activity in freeze-dried emulsions. Electron spin resonance (ESR) was used to measure the free radicals, and the effects of reaction with linoleate peroxides were compared with effects of γ-irradiation of lysozyme. There were similarities as well as some differences between these two mechanisms for producing free radicals in lysozyme. Free radical concentrations in lysozyme decreased with increasing water activity probably due to radical recombination and crosslinking.

CHANGES IN THE RELATIVE CONCENTRATION OF FATTY ACIDS IN STORED SOYBEAN LEAF PROTEIN CONCENTRATE. A.A. Betschart and J.E. Kinsella (Dept. of Food Sci., Cornell Univ., Ithaca, NY 14850). *J. Food. Sci.* 40, 271–3 (1975). The stability of lipids associated with soybean leaf protein concentrate (LPC) during storage at 27C was studied for periods of up to 24 weeks. The relative concentration of fatty acids was determined at 4 week intervals. LPC lipids were relatively stable for up to 8 weeks. After 12 weeks of storage, however, linolenic acid decreased 18% and palmitic acid increased 10% over their respective controls. The deleterious changes which occurred in the lipids of freeze dried LPC stored under relatively mild conditions emphasizes the importance of prudent selection of storage conditions to preserve nutritive value and acceptability.

LIPID-PROTEIN INTERACTION DURING AQUEOUS EXTRACTION OF FISH PROTEIN: ACTIN-LIPID INTERACTION. S.Y.K. Shenouda and G.M. Pigott (Institute for Food Sci. & Technol., College of Fisheries, Univ. of Washington, Seattle, WA 98195). *J. Food Sci.* 40, 523–32 (1975). Interactions between fish actin and C-14 labeled polar and neutral fish lipid were investigated in aqueous media. The results showed that actin interacts with polar lipid (PL) or neutral lipid (NL) at room temperature or cold temperature. Actin interacts in monomer form (G-actin) or polymer form (F-actin). F-actin interacts more strongly than G-actin (2–3 times). Any treatment which induces the transformation of G-actin into F-actin (that is, Mb^{++}, Ca^{++}, temperature, etc.) increases the lipid-actin complex formation. Agitation and/or heating increased the hydrophobic interaction between actin and NL. The effect of pH and ionic strength indicates the participation of hydrophobic and electrostatic interaction between actin and lipid. The SDS and urea treatments suggest either the existence of covalent bonding or a strong electrostatic and/or hydrophobic bonding between actin and lipid in the actin-lipid complexes.

PROCESS FOR REDUCING FOAMING OF LIQUIDS. F. Sagi and M. Roussos (Rhone-Poulenc S.A.). *U.S. 3,925,242.* The process comprises incorporating in the liquid, as an antifoaming agent, an emulsion consisting of water and a silicone phase and 2–50 parts by weight sucro-glyceride per 100 parts silicone.

POLYMERIZATION OF UNSATURATED FATTY MATERIALS. R.P.F. Scharrer (Arizona Chem. Co.). *U.S. 3,925,342.* The process comprises heating, in the presence of a steam blanket, a fatty material containing both a carboxylic acid group and a major amount of diene linkages in the presence of a catalyst having the structure $(OH)_n$—Aryl $(SH)_y$—R_m. n is an integer from 1 to 4, y is an integer from 1 to 3, R is a C_1–C_{10} hydrocarbon group, m is an integer from 0 to 4, and the sum of m, n, and y cannot exceed the substitutable positions on the aryl ring. The aryl ring is phenyl, naphthyl, or phenanthryl. At least one hydroxyl group and one mercaptan group are positioned *ortho* on the same aryl ring.

FEED SUPPLEMENTS FOR RUMINANTS. T.W. Scott and G.D. Loftus (Commonwealth Scientific and Industrial Research Organization). *U.S. 3,925,560.* A method for altering the composition of the body and milk lipids of ruminants comprises feeding the animals a supplement made of dietary lipid encapsulated by a reaction product of dietary protein and aldehyde. The product is insoluble at pH above 5 and soluble at pH less than 4, thereby preventing degradation in the rumen but allowing it in the abomasum and lower gut of the animal. The dietary lipid consists of globules less than 0.1 mm in diameter.

PREPARATION OF ANTIOXIDANT MIXTURE CONTAINING SILICONES. E.J. Freeman and R.R. Crawford. *Defensive Publication T941,007.* A flowable, tabletable mixture containing a silicone, an antioxidant, and an organic acid is prepared by forming a blend of the materials in a molten state and allowing the blend to cool and recrystallize while being vigorously stirred. The result is a crystalline particulate material which can be formed into tablets. These antioxidant tablets are available for addition to cooking oils and especially oils used for deep fat frying.

CLEANING COMPOSITION FOR INKS, PENCILS, AND VARIOUS SOILS. K.G. Rutherford and S. Oriel (Howick Chemical). *U.S. 3,923,701.* A cleaning composition suitable for removing markings left by inks, pencils, and the like consists of 100 parts of a carrier base material of ethoxylated tall oil fatty acid, 20 parts of dimethyl formamide, and 20 parts of tertiary butyl acetate. Proportions are parts by volume.

CONVERSION OF DISTILLATION RESIDUES TO USEFUL METAL WORKING LUBRICANTS. R.J. Sturwold, F.O. Barrett, and W.E. Utz (Emery Industries). *U.S. 3,923,702.* A process for converting residues, obtained when fatty acids produced from fat-splitting processes are distilled, to lubricants comprises contacting the residue with a hydroxylic compound containing at least one hydroxyl group and at least four carbon atoms at a temperature above 100 C while removing water from the reaction mixture until the acid value of the product is 10 or less. The equivalents ratio of the hydroxylic compound to the residue is 1:1 or higher, based on the acid value of the residue.

TREATMENT OF TALL OIL FATTY ACIDS. J.R. Powers and F.M. Miller (Westvaco Corp.). *U.S. 3,923,768.* A process for disproportionating tall oil fatty acids containing less than 5% rosin acids comprises heating the tall oil fatty acids to 250–430 F in the presence of 0.2–1.0% iodine for 30 minutes to 2.5 hours to convert the linoleic acid present to oleic acid.

METHODS OF PRODUCING COCOA BUTTER. W. Roselius, O. Vitzthum, and P. Hubert (Studiengesellschaft Kohle m.b.H.). *U.S. 3,923,847.* A method of producing cocoa butter from cocoa mass or roasted or unroasted cocoa nibs comprises contacting the cocoa product with a food-acceptable solvent gas which is supercritical in respect of temperature and pressure for extraction of the cocoa butter. The solvent gas containing the cocoa butter is removed from the residue.

COTTON-TUNG OIL DURABLE PRESS TEXTILES WITH HIGH FLEX ABRASION RESISTANCE. J.A. Harris and J C. Athur, Jr. (U.S. Secy. of Agriculture). *U.S. 3,926,550.* The process for treating the fabrics comprises (a) impregnating a cotton fabric with a 10–30% solution of tung oil in an organic solvent selected from the group consisting of N,N-dimethylformamide, methyl ethyl ketone, and mixtures of these two to a wet pickup of 80–120%, (b) drying the impregnated fabric at 140 F for 3 minutes, (c) curing the fabric at 200–300 F for 2–8 minutes, (d) washing the fabric with the same solvents, and (e) drying the treated fabric.

EMULSIFIERS OF WATER-IN-OIL CREAMS. I. Wendler and J. Malaszkiewicz (Henkel & Cie). *U.S. 3,926,840.* The emulsifier consists of vegetable sterols and an ester mixture selected from the group consisting of (1) monoesters of oleic acid with polyols, (2) monoesters of ricinoleic acid with polyols, and (3) mixtures of these two. The ratio of the ester mixture

to the vegetable sterols ranges from 90:10 to 50:50. The amount of free hydroxyl groups in the ester mixture must exceed the amount of esterified hydroxyl groups.

PROCESS FOR MANUFACTURING VALUABLE PRODUCTS FROM TALL OIL PITCH. T.P. Lehtinen (Oulo Osakeyhtio). *U.S. 3,926,936.* The process comprises (a) saponifying the pitch at 200–300 C with 5–25% of an alkaline saponification agent until a main portion of the sterols liberated from fatty and rosin acid esters have been converted to hydrocarbons by dehydration, (b) acidifying the reaction product to form an oil having an acid value of 50–150, and (c) distilling the oil to obtain a distillate 10–70% of which has an acid value of 100–190 and a residue of which the softening point (ball and ring) is not lower than 50 C.

RESEARCH ON AUTOOXIDATION AND ANTIOXIDATION—PART 2. THE SEARCH FOR AN EFFICIENT ANTIOXIDATION SYSTEM UNDER APPLICATION ON COTTONSEED ESTERS AS SUBSTRATE. M.H. El-Mallah, H.A. Karim and H.M. El-Khalafy (National Res. Center, Dokki, Cairo). *Seifen, Ole, Fette, Wachse.* 101(16), 459–64 (1975). The stability of cottonseed oil methyl esters in the presence of some antioxidant combinations was studied using the active oxygen method. The autooxidation potencies as well as the synergistic action of these combinations were also studied. On the basis of present and previous studies, the antioxidant combinations could be divided into three main groups; a group that exhibits either synergism or antagonism according to the type of substrate to be incorporated with; a group which shows the same behavior, according to the concentration ratio of the partners of each combination; and a group generally showing antagonistic action whatever the type of the substrate or the concentration ratio of the partners. A mechanistic behavior of synergism was postulated.

STRUCTURE OF THE GLYCERIDES AND PHOSPHOLIPIDS OF SOME WILDGROWING EGYPTIAN UMBILLIFERAE. S. Fiad and F. Osman (Fats and Oils Dep., Nat. Res. Center, Dokki, Cairo). *Seifen, Ole, Fette, Wachse.* 101(16), 469–71 (1975). A number of seeds related to the family Umbilliferae have found their way, after investigation, to pharmaceutical usage. This was based on the isolation, purification and identification of different active principles in the seed extracts. The well known cardiac drug "Khellin" is a product of Egyptian Ammi visnaga. The fatty matter of these seeds are, in most cases, a byproduct. Gas-liquid chromatography is universally accepted as the fastest and most reliable way to determine the fatty acid composition of fats and oils. Besides, the development of pancreatic lipase hydrolysis technic enabled the computation of the possible glycerides present in an oil or fat.

MASS SPECTROMETRIC LOCALIZATION OF METHYL BRANCHING IN FATTY ACIDS USING ACYLPYRROLIDINES. B.A. Andersson and R.T. Holman (The Hormel Inst., Univ. of Minnesota, Austin, Minnesota 55912) *Lipids* 10, 716–8 (1975). Localization of a methyl branch in a fatty acid molecule by mass spectrometry is facilitated by using the pyrrolidide rather than the methyl ester. Branched fatty acid methyl esters are converted to pyrrolidides and are then analyzed by gas chromatography and mass spectrometry. The diagnostic fragments indicate position of the methyl branch.

UNSATURATED C_{18} α-HYDROXY ACIDS IN SALVIA NILOTICA. M.B. Bohannon and R. Kleiman (Northern Regional Res. Lab., ARS, USDA, Peoria, Ill. 61604) *Lipids* 10, 703–6 (1975). The oil of *Salvia nilotica* Jacq. (Labiatae) seed contains 0.6% α-hydroxyoleic, 4.2% α-hydroxylinoleic, and 5.4% α-hydroxylinolenic acids. The first two have not been found previously in seed oils. In addition to the common fatty acids, also identified were small amounts of three unsaturated C_{17} acids and one branched chain C_{17} acid. Methyl esters of the component fatty acids were fractionated by both column and thin-layer chromatography. These esters were identified by combination of gas chromatography, GC-mass spectrometry, ozonolysis-GC, infrared, and nuclear magnetic resonance.

IDENTIFICATION AND PROPERTIES OF "PHYTATE" IN CEREAL GRAINS AND OILSEED PRODUCTS. A.R. de Boland, G.B. Garner and B.L. O'Dell (Dept. of Biochem., Univ. of Mo., Columbia, Mo. 65201) *J. Agric. Food Chem.* 23, 1186–9 (1975). The "phytate" content of selected cereal grains and oilseed products was determined by the commonly used method which involves precipitation from acid solution with ferric iron. To identify the chemical nature of the iron precipitable compounds, they were chromatographed on a Dowex-1 column and eluted with a linear ammonium formate gradient. This procedure separated the *myo*-inositol phosphate esters from the mono- through the hexaphosphates. Only the hexaphosphate was detected in extracts of mature seeds of corn, wheat, rice, soybean, and sesame. The phytate of corn germ, soybean meal, and soybean flakes was soluble in water to the extent of 70% or greater whereas that in sesame meal and isolated soybean protein was only slightly soluble. Pure inositol hexaphosphate in aqueous solution at pH 6 was readily destroyed by autoclaving but that in rice, wheat, and sesame meal was more stable, 5–25% loss in 2 hr at 115°. Approximately 70% of the phytate in isolated soybean protein was lost during a 2-hr period of autoclaving.

A NEW APPROACH TO THE STUDY OF PHOSPHOLIPID-PROTEIN INTERACTIONS IN BIOLOGICAL MEMBRANES. SYNTHESIS OF FATTY ACIDS AND PHOSPHOLIPIDS CONTAINING PHOTOSENSITIVE GROUPS. P. Chakrabarti and H.G. Khorana (Depts. of Biol. and Chem., Mass. Inst. of Technol., Cambridge, Mass. 02139) *Biochemistry* 14, 5021–33 (1975). In a general approach to the study, in vivo and in vitro, of the interactions between phospholipids and proteins in biological membranes, a variety of fatty acids containing photosensitive groups in different positions in the alkyl chains has been synthesized. The fatty acids synthesized include: 16-azidopalmitelaidic acid, 12-azidooleic acid, 6-, 9-, 11-, and 12-azidostearic acid, 12-*O*-(ethyl-2-diazomalonyl) stearic and oleic acids, 12-*O*-(4-azido-2-nitrophenyl)stearic and -oleic acids, and 12-oxo-10-octadecenoic acid. Some of the above synthetic fatty acids were also prepared in the radioactively labeled form. For in vitro studies, many of the above fatty acids were used to acylate the 2 position in the preparation of a number of mixed acylphosphatidylcholines and mixed acylphosphatidylethanolamines. On sonication, the synthetic phospholipids formed sealed vesicles. Intermolecular cross-linking of the fatty acyl chains in phospholipids was demonstrated on photolysis of the vesicles.

SYNTHESIS AND ANALYSIS OF PHYTYL AND PHYTENOYL WAX ESTERS. J.L. Gellerman, W.H. Anderson and H. Schlenk (The Hormel Inst., Univ. of Minn., Austin, Minn. 55912) *Lipids* 10, 656–61 (1975). An efficient procedure for preparing phytenic acid methyl ester, free of isomers, from phytol is reported. Phytyl phytenate and other isoprenoid wax esters were synthesized. Gas liquid chromatography of these wax esters and other compounds related to phytol and phytenic acid is described. The alkyl constituents of isoprenoid wax esters can be analyzed after alkaline methanolysis and the acyl constituents after acidic methanolysis. The applicability of these methods to natural mixtures was demonstrated with wax esters from mosses which contained both types of isoprenoids and with wax esters from healthy and frost damaged grass which contained phytol, but not phytenic acid.

SURFACE DISTRIBUTION OF THE FATTY ACID SIDE CHAINS OF PHOSPHATIDYLETHANOLAMINE IN MIXED PHOSPHOLIPID VESICLES. B.J. Litman (Dept. of Biochem., Univ. of Virginia Schl. of Med., Charlottesville, Va. 22901) *Biochim. Biophys. Acta* 413, 157–62 (1975). A method has been developed for the selective determination of the fatty acid side chain distribution associated with the amino containing phospholipids located in the inner and outer surfaces of membranes. Using sonicated phosphatidylethanolamine/phosphatidylcholine vesicles as a model, the analysis consists of selective labeling of the outer surface amino groups with the membrane impermeable reagent 2,4,6-trinitrobenzenesulfonic acid. Outer and inner surface phosphatidylethanolamine fractions are separated by thin-layer chromatography. Analysis of methyl esters derived from these two fractions, by gas-liquid chromatography, yields the fatty acid side chain distribution. Our results show that there is no mol fraction dependence of the incorporation of any specific fatty acid side chains of egg yolk phosphatidylethanolamine into the vesicle or any preferential distribution of these side chains in the inner or outer vesicle surface. The surface distribution of the egg yolk phosphatidylethanolamine molecules in these vesicles appears to be determined by head group packing requirements and not the fatty acid side chain composition.

SUBNANOGRAM DETECTION OF T-BUTYLDIMETHYLSILYL FATTY ACID ESTERS BY MASS FRAGMENTOGRAPHY. G. Phillipou, D.A. Bigham and R.F. Seamark (The Queen Elizabeth Hosp., Woodville, South Australia 5011) *Lipids* 10, 714–6 (1975). The mass spectra of *t*-butyldimethylsilyl fatty acid esters all display a pronounced $(M\text{-}C_4H_9)^+$ ion. The proportion of the total ionization carried by this fragment, particularly for saturated and mono-, di-, and tri-unsaturated acid derivatives, facilitates their qualitative analysis at the subanogram level by mass fragmentography.

GAS CHROMATOGRAPHIC DETERMINATION OF ETHOXYQUIN IN FEED

AND FOOD PRODUCTS II. H.K. Dahle and J.U. Skaare (Dept. of Food Hygiene and Dept. of Pharmacol. and Toxicol., Veter. Col. of Norway, Oslo-Dep., Oslo 1, Norway) *J. Agric. Food Chem.* 23, 1093–5 (1975). A procedure is described for the estimation of the antioxidant ethoxyquin in feed and food products. It involves homogenization of the samples, extraction with methanol, and extraction of the antioxidant from the extract using *n*-hexane. Gas-liquid chromatography (GLC) with a flame ionization detector is used for quantitative determination, and GLC combined with mass spectrometry (MS) is applied for the confirmation of identity. Only the oxidation inhibitor 6-ethoxy-1,2-dihydro-2,2,4-trimethylquinoline (EMQ), which has not been involved in the antioxidative processes, is determined gas chromatographically. Recovery studies adding ethoxyquin at levels of 100 ppm to fish meal, fish meat, and broiler meat showed that about 30% of the GLC measurable antioxidant was recovered, whereas approximately 70% was recovered from water.

FURANOID FATTY ACIDS FROM FISH LIPIDS. R.L. Glass, T.P. Krick, D.M. Sand, C.H Rahn and H. Schlenk (Dept. of Biochem., Col. of Biol. Sci., Univ. of Minn., St. Paul, Minn. 55105) *Lipids* 10, 695–702 (1975). Fatty acids, recently reported as constituents of certain fish lipids, were identified to be derivatives of furan (furanoid fish fatty acids). 12,15-Epoxy-13,14-dimethyleicosa-12,14-dienoic acid is predominant among the furan acids and is associated with *bis*-homologs in regard to chain length. Monomethyl acids, such as 12,15-epoxy-13-methyleicosa-12,14-dienoic, are present in appreciable amounts. The structures were concluded from oxidative degradations, from mass spectrometry of methyl esters of the novel acids and fatty acids derived from them by opening the ring, and from nuclear magnetic resonance, infrared, and Raman spectra. The results from chemical procedures and from spectrometric methods were in agreement with those obtained with authentic methyl 9,12-epoxyoctadeca-9,11-dienoate. The number of substituents at the furan ring greatly influences hydrogenation, hydrogenolysis, and hydrolysis reactions of the ring.

• Drying Oils & Paints

ESTERS OF RESIN ACIDS FROM INDONESIAN COLOPHONY. G. Weissmann (Inst. for Wood Chem. and Chem. Technol. of Forest Products of the Fed. Res. Inst. for Forest and Wood Management). *Farbe Lack.* 81(11), 1012–4 (1975). Glycerol and pentaerythritol esters from Indonesian rosin of P. Merkusil have been prepared and compared with corresponding esters from Portuguese pine rosin. Softening points of the Indonesian esters are remarkably higher. By gel filtration of Sephadex LH-20 esters with higher molecular weights could be detected.

INTERACTION OF TRIAZINE-CROSSLINKED ACRYLIC FILMS AND DETERGENT SOLUTIONS. D.G. Anderson and E.J. Murphy (DeSoto, Inc., Des Plaines, Ill. 60018). *J. Paint Technol.* 47(610), 69–75 (1975). Investigation determined the changes in functional group concentrations as a function of exposure to an alkaline detergent solution. Triazine-formaldehyde crosslinked acrylic coatings were cured under several conditions and the infrared spectra of free films examined after exposure to detergent solutions. Dramatic changes in the relative concentrations of hydroxyl, ester, aliphatic, and carboxylate salt were noted in the cured films. These increases in hydrophilicity have been related to the causes for film failure in alkaline detergent solutions.

EPOXY RESINS AS VARNISH RAW MATERIALS. W. Brushwell. *Farbe Lack.* 81(11), 1028–30 (1975). A report is given on the further development of epoxy resins and their uses with 37 references.

• Edible Proteins

FORTIFICATION OF DRY SOYBEAN-BASED FOODS WITH DL-METHIONINE. G N. Bookwalter, K. Warner, R.A. Anderson, G.C. Mustakas and E.L. Griffin Jr. (USDA Northern Reg. Res. Lab., ARS, Peoria, IL 61604). *J. Food Sci.* 40, 266–70 (1975). The addition of small amounts of DL-methionine enhanced the nutritional value of soy foods as determined by protein efficiency ratios. Regular CSM (corn-soy-milk), instant CSM (both unsweetened and sweetened), soy beverage base and full-fat soy flour were formulated to contain up to 106 milligrams DL-methionine per gram nitrogen. The products were stored at 25, 37 and 49 C for up to 12 months. Fortified full-fat soy flour received slightly lower flavor scores than its unfortified control after storage for 2 months at 49 C and for 6 months at 37 C. Fortified soy beverage base received lower flavor scores than its unfortified control in some tests, but differences were slight. Although slight flavor differences occurred during storage of fortified formulations containing soy protein, all flavor scores were satisfactory. As indicated by peroxide values and levels of free fatty acids, fat stability was unaffected by the presence of DL-methionine. Retention of DL-methionine was also satisfactory under the test conditions.

PROTEIN QUALITY OF SOY PROTEIN-LIPID FILMS (YUBA) AND DERIVED FRACTIONS R.P. Bates and L.C. Wu (Food Sci. Dept., Univ. of Fla., IFAS, Gainesville, FL 32611). *J. Food Sci.* 40, 425–6 (1975). The protein quality of soy protein-lipid films (yuba) of the whey remaining after film formation from soy milk and of the insoluble residue remaining after soy milk extraction from whole soybeans was determined by rat feeding studies. PER values were as follows: (casein = 2.50), whey 1.67, insoluble residue 0.98, yuba 1.26, yuba + 1.1% methionine 1.85, yuba + 2.2% methionine 2.45. The extensive heat treatment which the soy milk receives during yuba formation, 15 minutes to 4 hours at 95–100 C, apparently does not adversely affect protein quality, except possibly in the case of cystine and the limiting amino acid methionine.

QUANTITATIVE DETERMINATION OF SOYBEAN PROTEIN IN FRESH AND COOKED MEAT-SOY BLENDS. Y.B. Lee (Basic Res. Dept., Campbell Instit. for Food Res., Camden, NJ 08101), M.L. Greaser, D.A. Rickansrud, E.C. Hagberg & E J. Briskey. *J. Food Sci.* 40, 380–3 (1975). Protein extracts from soy isolates, texturized soy protein, beef and soy-beef blends were electrophoresed on stacking SDS-acrylamide gels, followed by densitometer scanning. Soybean protein exhibited five major bands and four of them were distinctly separated and easily distinguished from meat protein bands. A linear relationship was observed between the amount of soy or meat protein applied on the gel and the peak area of a selected index band. The plotting of protein concentration ratio of soy-bean/meat protein against the peak area ratio of soybean protein band/meat protein band eliminated experimental variability and presented a reliable linear standard curve. Using the established standard curve, the soy protein content in soy-beef blends containing various levels of beef and soy isolate or texturized soy protein was quantitated within ±2% of actual content. The stacking method employed was superior to other electrophoretic methods, providing good resolution and reproducibility in the separation of meat and soy protein mixtures.

BREAD BAKING PROPERTIES OF AQUEOUS PROCESSED PEANUT PROTEIN CONCENTRATES. M.N. Khan, K.C. Rhee, L.W. Rooney and C.M. Cater (Cereal Quality Lab & Food Protein R&D Center, Texas A&M Univ., College Station, TX 77843). *J. Food Sci.* 40, 580–3 (1975). Bread baking properties of three experimental peanut protein concentrates (PPC) produced by an aqueous extraction process were compared with a commercial defatted peanut and a commercial full fat soy flour. An experimental defatted peanut flour was also included for comparative purposes. Protein and fat contents of PPC were 56 and 17%, respectively. Brabender Farinograph absorption increased with the addition of protein source compared to 100% wheat flour. Farinograph peak time was not affected due to the addition of the protein source. Bread loaf volume, crumb color, and protein content were compared among the products. Taste panel studies indicated that bread with PPC had better organoleptic qualities than that baked with the commercial defatted peanut and full fat soy flours. All three forms of PPC did not show any significant difference in their bread baking properties.

QUALITY CHARACTERISTICS OF SOY-SUBSTITUTED GROUND BEEF, PORK AND TURKEY MEAT LOAVES C.W. Williams and M.E. Zabik (Dept. of Food Sci. & Human Nutrition, Michigan State Univ., East Lansing, MI 48824). *J. Food Sci.* 40, 502–5 (1975). Ground beef, pork (50:50 mixture of ham and pork) and turkey meat loaves containing 0 or 30% soy-substitution were evaluated for sensory characteristics of flavor, juiciness, mouthfeel and overall acceptability. In addition, cooking losses, moisture content, total lipid and TBA values during short-term storage at 5 or −11 C were determined. 30% soy-substitution did not adversely affect the quality characteristics of the ground beef and turkey systems. However, the soy-substitution did lower the flavor, juiciness and overall acceptability scores of the pork meat loaves. The use of 30% soy-substitution decreased the total and drip loss, whereas it did not affect the volatile losses. Although 30% soy-substituted

meat systems appeared to have slightly lower TBA values during refrigerated and frozen storage, soy does not appear to appreciably reduce the amount of TBA reactive compounds developing in the meat systems.

FRESHLY COOKED AND COOKED, FROZEN, REHEATED BEEF AND BEEF-SOY PATTIES. J.A. Bowers and P.P. Engler (Dept. of Foods & Nut., Kansas State Univ., Manhattan, KS 66506). *J. Food Sci.* **40**, 624–5 (1975). Ground beef and beef-soy (15 and 30% soy) patties were prepared and frozen raw or cooked and then, after cooking or reheating were evaluated by a taste panel. Percentages of moisture and fat and TBA values were determined. Adding soy decreased cooking losses, and the reheating process increased cooking losses. Beef patties contained less moisture but more ether extract and had higher TBA values than beef-soy blends. Beef patties were less firm and their meaty flavor and aroma were more intense than those of beef-soy patties but their cereal-like flavor and aroma were less intense. Reheated beef-soy patties had less stale flavor and aroma than reheated beef patties.

FUNCTIONAL PROPERTIES OF ADDED PROTEINS CORRELATED WITH PROPERTIES OF MEAT SYSTEMS. EFFECT OF SALT ON WATER-BINDING PROPERTIES OF MODEL MEAT SYSTEMS. A.-M Hermansson (Chemical Centre, Div. of Food Technol, Univ. of Lund, S-220 07 Lund 7 Sweden) and C. Åkesson. *J. Food Sci.* **40**, 603–10 (1975). The effects of solubility, swelling, viscosity and gel strength properties of added proteins on moisture loss properties of raw and heat-treated model meat systems with varying salt content were studied. Proteins added were soy protein isolate, caseinate and whey protein concentrate. Quantitative inter-relationships of functional properties were calculated by a general metric hierarchical clustering technique, and correlations between functional properties and moisture loss properties by multiple regression analysis. In addition, penetration studies were made. The addition of salt decreased the moisture loss of all the meat systems tested. The functional properties of the added protein were, however, very differently affected by the addition of salt. Although complex behavior occurred due to salt addition, good statistical correlations were obtained between differences in functional properties and differences in moisture loss properties. The best statistical solutions on raw and heat-treated meat systems had correlation coefficients of 0.82 and 0.98, respectively.

FUNCTIONAL PROPERTIES OF ADDED PROTEINS CORRELATED WITH PROPERTIES OF MEAT SYSTEMS. EFFECT OF CONCENTRATION AND TEMPERATURE ON WATER-BINDING PROPERTIES OF MODEL MEAT SYSTEMS. A.-M. Hermansson (Chemical Centre, Div. of Food Technol., Univ. of Lund, S-220 07 Lund 7, Sweden) and C. Akesson. *J. Food Sci.* **40**, 595–602 (1975). The effects of some functional properties (e.g., solubility, viscosity, swelling and gel strength) of added proteins on moisture loss properties of model meat systems were studied. Besides moisture loss, some additional studies were made on penetration depth. The protein preparations soy protein isolate, caseinate and whey protein concentrate were added to pork shoulder and beef brisket systems, and changes were observed with respect to temperature and percent exchanged protein. Observed changes in moisture loss properties were correlated with the corresponding changes in functional properties by certain regression procedures. The best statistical solution from changes on raw meat systems had a correlation coefficient of 0.99, with solubility explaining 79%, swelling 10% and viscosity 10% of the variance. The best statistical solution for heat-treated systems had a correlation coefficient of 0.98, with gel strength alone explaining 94% of the variance.

FUNCTIONAL PROPERTIES OF ADDED PROTEINS CORRELATED WITH PROPERTIES OF MEAT SYSTEMS. EFFECT ON TEXTURE OF A MEAT PRODUCT. A.-M Hermansson (Chemical Centre, Div. of Food Technol., Univ. of Lund, S-220 07 Sund 7, Sweden). *J. Food Sci.* **40**, 611–4 (1975). Texture changes observed when 4% proteins were added to a commercial meatball recipe were correlated with changes in the functional properties of the added proteins. Proteins added were untreated soy protein isolate, caseinate and whey protein concentrate, preheat-treated soy protein isolate and whey protein concentrate. Good statistical correlations were found between texture changes of meatballs and moisture loss changes of model meat systems. When regression equations calculated from moisture loss studies were used on the texture changes of meatballs, correlation coefficients as high as 0.88 were obtained. Of the functional properties, swelling and gel strength were shown to be of great importance for the texture changes of meatballs.

FOOD USE OF SOYBEAN 7S AND 11S PROTEINS HEAT DENATURATION OF SOYBEAN PROTEINS AT HIGH TEMPERATURE. K. Saio, M. Terashima and T. Watanabe (National Food Res. Institute, Tokyo, Japan & Fuji Oil Co., Ltd., Osaka, Japan). *J. Food Sci.* **40**, 537–40 (1975). Qualitative changes in 7S and 11S proteins during heat treatment at 100–170 C were studied. Protein paste of 25% concentration was autoclaved and the resultant heat-induced gel was submitted to measurement of its solubility, ultra-centrifugal characteristics and disc polyacrylamide gel electrophoresis after dissolving with sodium dodecyl sulfate and 2-mercaptoethanol. The results showed: (1) heating over 100 C resulted in the formation of an insoluble gel; (2) during heating up to 140 C the gel gradually became soluble but the gross-structure of subunits remained unchanged, 11S-gel being more soluble than 7S-gel even at lower temperature; and (3) during heating at above 150 C, the gel became highly soluble, showing degradation of the gross-structure of subunits.

FOOD USE OF SOYBEAN 7S AND 11S PROTEINS. CHANGES IN BASIC GROUPS OF SOYBEAN PROTEINS BY HIGH TEMPERATURE HEATING. K. Saio, M. Terashima and T. Watanabe (National Food Res. Institute, Tokyo, Japan & Fuji Oil Co., Ltd., Osaka, Japan). *J. Food Sci.* **40**, 541–4 (1975). Protein paste of 25% concentration from cold insoluble fraction (CIF) or crude 7S was autoclaved at 100–170C to prepare heat-induced gel. After solubilization of gel, quantitative changes in Amido Black 10B bound to protein, basic amino acids and amide groups during heating, were investigated. In these experimental conditions, no significant change in basic amino acids were recognized but decreases of amide groups and the amount of Amido Black 10B bound were significant as temperature of heating increased. The decrease began from 105C in CIF-gel and from 140C in crude 7S-gel. From the results on Amido Black 10B bound to protein and on SDS-disc polyacrylamide gel electrophoresis, the gross-structure of subunits derived from gel were degraded into lower molecular substances by heating at above 150C.

ULTRASONIC EXTRACTION OF PROTEINS FROM AUTOCLAVED SOYBEAN FLAKES. L.C. Wang (USDA Northern Reg. Res. Lab, ARS, Peoria, IL 61604). *J. Food Sci.* **40**, 549–51 (1975). Amounts of proteins extracted from soybean flakes by applying ultrasonic waves and by conventional stirring were compared. Respective yields of the total proteins from unautoclaved and autoclaved flakes were 60% and 16% by conventional stirring and 88% and 58% by sonication in a single 1:10 meal-to-water extraction. From autoclaved flakes sonication in a single extraction dispersed up to 78% total proteins in water with 1:40 meal-to-water ratio. Sonication recovered a portion of proteins from autoclaved flakes ordinarily unattainable by conventional stirring extraction. Proteins obtained by either method revealed no differences in their ultracentrifuge patterns.

TEXTURIZING PROCESS FOR SINGLE CELL PROTEIN CONTAINING PROTEIN MIXTURES. S.R. Tannenbaum (Standard Oil Co.). *U.S. 3,925,562.* A process for imparting texture to a mixture of microbial cells and vegetable protein comprises the steps of: (a) heating an aqueous paste, containing 10–50% water, of microbial cell material and vegetable protein to 150–400 F for 10–300 seconds; (b) simultaneously applying to the paste a shearing force corresponding to a shear rate of 10–60 rpm and a torque of 200–2000 meter-grams; (c) extruding the heated and sheared cell paste through a die; and (d) exposing the shaped extrudate to an oxygen-containing gas stream to produce a product which is chewy, crunchy, crispy, and resists dispersion in water.

METHOD OF IMPARTING COLOR TO TEXTURIZED VEGETABLE PROTEIN. H. Herstel and G.A.M. van den Ouweland (Lever Bros. Co.). *U.S. 3,925,561.* A process for imparting a brown color, which will not be leached out with water and is not associated with any noticable odor or taste, to an extruded, texturized vegetable protein product comprises incorportating in the mixture fed to the extruder a C_5 sugar or a phosphate ester of a C_5 sugar in a quantity amounting to less than 10% of the protein. Temperatures in the extruder range between 120 and 170 C.

PROCESS FOR FORTIFYING FOOD AND FEED PRODUCTS WITH AMINO ACIDS. G.V. Rao and O.B. Gerrish, Sr. (Far-Mar-Co., Inc.). *U.S. 3,925,568.* A process for fortifying vegetable protein food products with amino acids comprises the steps of tempering the products in an aqueous solvent having a pH of 8–14 for a time sufficient to achieve the desired fortification and drying the tempered product. The solvent contains an alkaline catalyst and 0.05–20%, based on the weight of the untempered product, of the fortifying amino acid.

WET PROCESS FOR MAKING BLANDER HIGH PROTEIN SOYBEAN PRODUCTS. R D. Daftary (Archer Daniels Midland Co.). *U.S. 3,925,569.* The process comprises soaking a full fat soybean material in a liquid mixture at 0–70 C for a time sufficient for the liquid to penetrate all of the soybean material, separating the soaking liquid, and recovering the soybean material. The liquid mixture is an aqueous solution of an aliphatic alcohol containing 1–4 carbon atoms in a volume ratio of more than 2:1, alcohol:water. The resultant product has bland flavor, high protein content with high protein dispersibility index, high fat content, and low flatulence.

METHODS OF PRODUCING PROTEIN MATERIALS. K. Hashizume and T. Watanable (Director of National Food Research Inst., Japan). *U.S. 3,922,359.* A method of producing solid protein material with a spongy texture comprises adding an edible divalent salt to a solution of soybean protein in such an amount that the solution becomes turbid white with protein, but part still remains dissolved. The solution is frozen, held for 1–2 days, thawed, and then the resultant solid protein material is recovered.

PRODUCTION OF HIGH PROTEIN LOW CALORIE DAIRY SPREAD. O.B.S. Strinning and K.-E. Thurell (Mjolkcentralen, Ekonomisk Forening). *U.S. 3,922,376.* The method comprises the steps of (a) emulsifying at 38–50 C an aqueous phase into a fat phase, (b) flash pasteurizing the emulsion, (c) cooling the emulsion while working it as it solidifies, and (d) further cooling the solid emulsion to storage temperature. The aqueous phase is a protein concentrate obtained from buttermilk soured bacteriologically and obtained in the manufacture of butter or butteroil. It is buffered with citrate and phosphate to pH 6–7 and diluted with water to 11–18% protein. The fat phase is butter oil or a mixture of butter oil with vegetable oil. The aqueous phase constitutes 20–65% of the emulsion.

PROTEIN RECOVERY PROCESS FROM DEFATTED SOYBEANS. S.J. Circle, R.R. Fergle, L R. Watkins, and D.E. Hooten (Anderson, Clayton & Co.). *U.S. 3,926,940.* In the process for recovering solubilized soybean protein by acid precipitation in which a water-miscible organic solvent is added to remove undesirable flavor and color constituents there is claimed an improvement providing a series of zones in which the solvent-treated curd is intimately mixed with water after which the liquid and curd are passed through a separator. The zones are sufficient to reduce the amount of solvent in the curd to less than 10% of the liquid portion without appreciably denaturing the protein of the curd.

• Detergents

DETERGENT ADDITIVE COMPOSITION. A.E B. Winston (Church & Dwight Co.). *U.S. 3,925,224.* The composition consists of (1) 0.1–60% of a water insoluble surfactant system having an HLB between 2 and 11; (2) 40–99.9% of builder salts, fillers, and buffer; (3) 0–35% of bleaching agents and their stabilizers and activators; and (4) 0–5% of enzymes, corrosion inhibitors, anti-redepositing agents, optical brighteners, foam stabilizers, and foam inhibitors. The surfactant system comprises (a) a water insoluble component having a lipophilic moiety with 8–24 carbon atoms and a polar moiety and (b) a water insoluble mixture of component (a) with a water soluble surfactant.

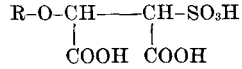
PROCESS FOR IMPROVING GRANULATED DETERGENTS. K. Takenouchi, N. Ohno, and F. Kondo (Lion Fat & Oil Co.). *U.S. 3,925,226.* The process comprises adding a lower alcohol or liquid perfume to an ordinary hollow granular detergent produced by spray drying when the temperature of the detergent is lower than the boiling point of the alcohol or perfume while tumbling the detergent grains. Then there is added a powder of a water insoluble metal soap when the surface of the grains has been given sufficient adhesive power by the addition of the alcohol or perfume.

NOVEL LAUNDERING COMPOSITIONS. G.G. Corey and B. Weinstein (American Home Products Corp.). *U.S. 3,925,227.* A liquid detergent comprises the following: triethanolamine linear dodecyl benzene sulfonate, 0.1–50%; sodium lauryl ether sulfate, 0.1–20%; dimethyl cocoamine oxide, 0.1–2%; amphoteric coconut acid derivative, 0.1–4%; coconut fatty acid diethanolamine condensate, 0 1–2%; 2,4,4′-trichloro-2′-hydroxydiphenyl ether, 0.1–1%; ethanol, 0.1–10%; and water to make 100%. The 2,4,4′-trichloro-2′-hydroxydiphenyl ether is premixed and solubilized with sodium lauryl ether sulfate. The pH of the system is 7–8.

NONCAKING LAUNDRY SOUR. F.X. Koepfle and H.E. Grote (Procter & Gamble). *U.S. 3,925,230.* The composition consists of sodium silicofluoride, sodium bifluoride, and anhydrous calcium sulfate. The ratio of sodium silicofluoride to sodium bifluoride is 3:1. Calcium sulfate is present in an amount equal to 0.3–1% of the total fluoride salt content.

DETERGENT COMPOSITION HAVING ENHANCED PARTICULATE SOIL REMOVAL PERFORMANCE. R.G. Laughlin and R.L. Stewart (Procter & Gamble). *U.S. 3,925,262.* The detergent comprises 1–99% of a quaternary ammonium salt having specific substituent groups and 99–1% of a builder selected from the group consisting of alkali metal, ammonium, and alkanolammonium polyphosphates, carbonates, bicarbonates, silicates, aluminosilicates, borates, and sulfates.

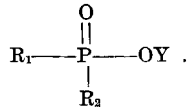
SULFOSUCCINATE DERIVATIVES AS DETERGENT BUILDERS. V. Lamberti (Lever Bros. Co.). *U.S. 3,925,375.* The builder is an α-substituted-β-sulfosuccinic acid having the formula:



and the alkali metal, ammonium, or substituted ammonium salts of the acid. R is an alkyl group containing 1–30 carbon atoms.

METHOD OF WASHING TEXTILE MATERIALS WITH SURFACE ACTIVE AGENT AND CATALYST-CONTAINING MICELLES. J.W. Willard, Sr. (Caw Industries). *U.S. 3,923,456.* The catalyst is prepared by reacting alkali metal silicate with dissolved calcium and magnesium ions to produce an aqueous colloidal suspension of particles of the reaction product. Then a micelle-forming surfactant is mixed with the aqueous medium to form the catalyst micelles.

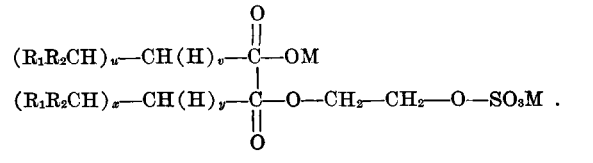
LIQUID CLEANSING AGENT CONCENTRATES. H -J. Kleiner, O. Koller, K.-H. Schneider, and G. Schneider (Hoechst Ag.). *U.S. 3,923,678.* Liquid aqueous cleansing agent concentrates based on nonionic surface active compounds contain compounds of the general formula



R_1 is a straight chain or branched alkyl or alkenyl radical having 4–16 carbon atoms. R_2 is alkyl having 1–4 carbon atoms, and Y is hydrogen or sodium or potassium ion. The content of compounds of this general formula is 1–5%.

SALTS OF TETRAHYDROFURAN POLYCARBOXYLIC ACIDS AS DETERGENT BUILDERS AND COMPLEXING AGENTS. J.N. Rapko (Monsanto Co.). *U.S. 3,923,679.* A detergent formulation comprises 0.5–05% of a water soluble surfactant and 1–95% of an alkali metal, ammonium, or alkanol ammonium salt of the claimed compound.

PHOSPHATE-FREE CARBOXYLATE-SULFATE DETERGENTS. M. Danzik and R. House (Chevron Research Co.). *U.S. 3,923,856.* There is claimed a surface active compound of the formula



R_1 and R_2 are linear alkyl groups of 3–19 carbon atoms, u, v, x, and y are 0 or 1. M is H or an alkali metal, alkaline earth metal, or ammonium cation. The sum of the carbon atoms in R_1 and R_2 is 13–21. The sums $u + v$, $x + y$, and $u + x$ all equal 1.

SULFOSUCCINATE DERIVATIVES AS DETERGENT BUILDERS. V. Lamberti (Lever Bros. Co.). *U.S. 3,922,272.* The builder is an α-alkoxypolyethyleneoxy-β-ammonium acid having the general formula: $R'O(CH_2CH_2O)_nCH_2CH_2OCH(COOH)CH(COOH)SO_3H$. R′ is an alkyl group containing 1–24 carbon atoms and n is zero or an integer from 1 to 15. Various alkali metal, ammonium, and substituted ammonium salts are also claimed.

SULFOSUCCINATE DERIVATIVES AS DETERGENT BUILDERS. V. Lamberti (Lever Bros. Co.). *U.S. 3,922,271.* The builder is

an α-hydroxyalkoxy-β-sulfosuccinic acid having the general formula: $HOCH_2(CH_2)_nO—CH(COOH)—CH(COOH)—SO_3H$. n is an integer from 1 to 7. Various alkali metal, ammonium, and substituted ammonium salts are also claimed.

SUPERFATTED SOAP. B.R. Smith and K. Tomlinson (Colgate-Palmolive Co.). *U.S. 3,926,829.* The process of producing soap characterized by a higher ratio of saturated fatty acids to unsaturated fatty acids in a neat soap phase than in a nigre phase comprises adding to an alkali metal soap consisting of sodium soap alone or containing up to 15% potassium soap just prior to the fitting stage a sufficient quantity of hydrochloric acid to produce a free fatty acid content of 4–15% and to form a salt by neutralizing any remaining sodium hydroxide; separating the acidified soap into neat soap and nigre; and working up the neat soap into bars. The soap is obtained by saponifying a mixture of 40–90% tallow and 10–16% coconut oil with sodium hydroxide and precipitating with salt.

DETERGENT COMPOSITION HAVING POLYMER BONDED INDICATOR. S.H. Hoya, M. Nakamura, K. Nakajima, and Y. Seino (Dainichiswika Color & Chemicals Mfg. Co.). *U.S. 3,926,830.* The composition consists of a synthetic organic detergent and 0.1–50% of a pH indicative polymer consisting of a pH indicator bonded to a polymer.

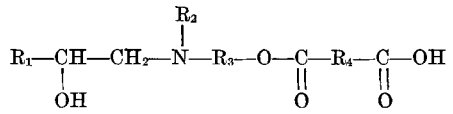
DETERGENT COMPOSITIONS CONTAINING AMINE OXIDES. J.F. Gerecht (Colgate-Palmolive Co.). *U.S. 3,926,861.* The composition consists of a water soluble organic detergent and a morpholine oxide in ratios ranging from 1:100 to 100:1.

PHOSPHATE-FREE CARBOXYLATE-SULFATE DETERGENTS. M. Danzik and R. House (Chevron Research Co.). *U.S. 3,927,061.* There is claimed a surface active compound of the formula

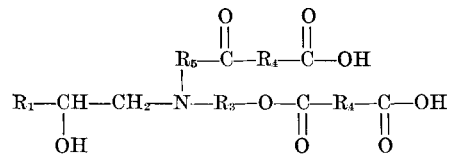
$$(R_1R_2CH)_u—CH(H)_v—C(=O)—OM$$
$$(R_1R_2CH)_x—CH(H)_y—C(=O)—O—(R_3O)_z—SO_3M.$$

R_1 and R_2 are linear alkyl or alkenyl groups of 3–19 carbon atoms; R_3 is alkylene of 2–4 carbon atoms; u, v, x, and y are 0 or 1; z is an integer 1 to 4; M is H or an alkali metal, alkaline earth metal, or ammonium cation; the sum of the carbon atoms in R_1 and R_2 is 13–21; the sum of the unsaturated sites in R_1 and R_2 is 1; and the sums $u + v$, $x + y$, and $u + x$ are all equal to 1.

ESTERS OF DICARBOXYLIC ACIDS AND POLYHYDROXY TERTIARY AMINES AS DETERGENT SOFTENER COMPOUNDS. B. Sundby (Colgate-Palmolive Co.). *U.S. 3,927,073.* A compound has in the free acid form a formula selected from the group consisting of

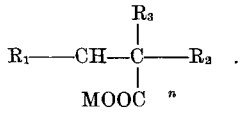


and



and mixtures of these two. R_1 is C_8–C_{24} alkyl; R_2 is C_1–C_6 alkyl or C_2–C_6 alkylol; R_3 and R_5 are alkylene of C_2–C_6; and R_4 represents the residue of a dicarboxylic acid selected from the group consisting of maleic, succinic, glutaric, tataric, malic, adipic, diphenic, and naphthalic acids.

OLIGOMERIC POLYACRYLATES AS BUILDERS IN DETERGENT COMPOSITIONS. V. Lamberti and C.R. Wills (Lever Bros. Co.). *U.S. 3,922,230.* The composition comprises a water soluble detergent and a builder salt which is an oligomeric polyacrylate having a molecular weight of 500–10,000 represented by the formula



n is a whole number integer. R_1 and R_2 are moieties which do not impair biodegradability of the molecule and are selected from the group consisting of sulfur-containing and hydroxy-containing moieties. R_3 is hydrogen or alkyl containing 1–6 carbon atoms, and M is alkali metal, ammonium, or substituted ammonium cations. The ratio of builder to detergent ranges from 1:20 to 20:1.

CARBONATE BUILT DETERGENTS. B.-D. Cheng (Colgate-Palmolive Co.). *U.S. 3,925,228.* The composition consists of 6–25% of a detergent system, 15–50% of an alkali metal sulfate or alkali metal silicate filler, 35–60% of an alkali metal carbonate, and 2–10% of an amino tri(lower alkylidene)phosphonic acid builder. The detergent system consists of a mixed nonionic, synthetic anionic surfactant, soap system, whercin the nonionic is an alkanol-poly (lower alkanoxy) formed by reaction of one mole of the alkanol with 5–25 moles of the lower alkylene oxide. The anionic is a linear alkyl benzene sulfonate, and the soap is a sodium soap. The ratio of anionic:nonionic:soap is 7–3:1:0.5–2.

COATED BLEACH ACTIVATOR. K. Hachmann, H. Saran, and G. Sperling (Henkel & Cie). *U.S. 3,925,234.* A stabilized bleaching assistant suitable for use in pulverulent washing and bleaching compositions comprises drop-shaped to globular-shaped particules at least 70% of which have an average diameter of 0.1–1 mm. The composition consists of 10–70% of an activator for active oxygen derived from compounds yielding H_2O_2 in aqueous solution. The activator is selected from the group consisting of N-acyl compounds, O-acyl compounds, carbonic acid esters, and pyrocarbonic acid esters. Surrounding the activator is 30–90% of a mixture of (a) 2–10 parts of acids having 12–24 carbon atoms selected from the group consisting of saturated fatty acids, saturated hydroxy fatty acids, and mixtures of these; and (b) 1 part of alcohols selected from the group consisting of saturated aliphatic monohydric alcohols having 10–20 carbon atoms and their ethoxylated and propyloxylated products. The alkoxylated products are water-insoluble and have 1–5 alkoxy units.

METHOD OF MAKING DETERGENT COMPOSITIONS. J.K. Mangeli (Colgate-Palmolive Co.). *U.S. 3,926,827.* The process for making a particulate detergent comprises mixing the following components into a paste capable of retaining small oxygen bubbles without substantial coalescence: 15–40% water, 2–65% organic detergent, less than 20% hydrotrope, 9–26% aqueous inorganic silicate solution, 2–20% inorganic salt filler, 10–75% of a hydratable salt selected from the group consisting of Form II pentasodium tripolyphosphate and Form I pentasodium tripolyphosphate, and 0.25–1% of an oxygen-liberating percompound. The oxygen from the percompound is liberated into the paste in an amount sufficient to bleach the paste and expand the volume twofold. The expanded paste is allowed to set to a friable mass which is then granulated. The claimed improvement comprises adding the hydratable salt prior to the addition of the filler whereby the salt is more effectively hydrated, which results in more uniform particles with less fines and a density of less than 0.32 g/cc. ■