ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, E. G. Perkins, T. H. Smouse, J. A. Thompson and R. W. Walker

• Fats and Oils

PROCESS FOR RECOVERY OF PURIFIED SATURATED HIGHER FATTY ACIDS FROM FATTY ACID FRACTIONS. D. E. Leavens and J. M. Derfer (SCM Corp.). *U.S. 3,396,182*. A process for purifying and recovering crude fatty acids comprises: (1) recrystallization of the crude acids from liquid normal alkane solution, (2) further purifying the recrystallized acids, in liquid normal alkane solution, with an acidic reagent such as boron trifluoride, (3) removing the acidic reagent, and (4) recrystallizing the purified fatty acids from the liquid normal alkane solution.

METAL SOAP FORMATION. H. Grun *et al. Erdöl & Kohle* 20, Sept. 634–7 (1967). Lauric, myristic and palmitic acids were applied to about 10 clean metal or oxide surfaces and the products formed examined by I.R. analysis. The formation of a stoichiometric metal soap was found on Cu, Zn and Pb but much less reaction occurred with Al, Ag, Fe and Ni. The presence of oxide had a great effect on the speed of the reaction. (Rev. Current Lit. Paint Allied Ind. No. 315.)

INVESTIGATIONS OF ADSORPTION OF UNSATURATED FATTY ACID METHYL ESTERS ON SILICIC ACID-SILVER NITRATE. R. A. Stein and Vida Slawson (Dept. of Biol. Chem., School of Med., Univ. of Calif., Los Angeles, Calif., 90024). *Anal. Chem.* 40, 2017–20 (1968). Silicic acid-silver nitrate adsorbent was prepared by the addition of ethyl ether to an acetonitrile solution of silver nitrate on a silicic acid chromatographic column. Partition isotherms were measured for methyl esters of *cis*-unsaturated fatty acids between the adsorbent and cyclohexene-ether-pentane mixtures, and solvents that gave 40–80% of a solute in solution eluted to solute satisfactorily from a chromatographic column. A scheme was developed that gave good separations by elution chromatography of a mixture of methyl esters of fatty acids containing from 0 to 6 methylene-interrupted *cis*-double bonds. Competition for adsorption sites between methyl oleate and methyl docosahexaenoate was dependent upon the concentration of each ester. Electron micrographs of the support suggest that the silver nitrate is distributed as small crystals within the silicic acid granules.

OCCURRENCE OF DEHYDROSQUALENE IN STAPHYLOCOCCUS AUREUS. G. Suzue, K. Tsukada and S. Tanaka (Dept. of Chem., Faculty of Science, Kyoto Univ., Kyoto, Japan). *Biochim. Biophys. Acta* 164, 88–93 (1968). A mutant of *Staphylococcus aureus* 209 P, which had lost the ability to synthesize colored carotenoids, accumulated a phytoene-like compound. By ultraviolet, infrared, nuclear magnetic resonance and mass spectra, together with chemical analyses, the structure of this compound was established to be 2,6,10,15,19,23-hexamethyl-2,6,10,12,14,18,22-tetracosaheptaene which has a 12,13-*cis* configuration (dehydrosqualene). This compound was also found in the wild strain when the cells were grown in the presence of diphenylamine.

MODIFICATION OF THE WESSON METHOD FOR THE DETERMINATION OF THE REFINING LOSS IN OILS AND FATS. L. Hartman and R. C. A. Lago. *Lab. Practice* 17, No. 2, 209–10 (1968). The 14% KOH soln. is replaced by conc. K_2CO_3 soln., which eliminates the danger of partial saponification of the oil and makes possible a more rapid separation of phases. Also, the 50% aq. ethanol is replaced by 50% aq. methanol, which reduces the number of extractions and washings of the oil. (Rev. Current Lit. Paint Allied Ind. No. 315.)

FATTY ACID COMPOSITION OF NEISSERIA SPECIES AS DETERMINED BY GAS CHROMATOGRAPHY. V. J. Lewis, R. E. Weaver and D. G. Hollis (Bur. of Dis. Prevent. and Environ. Control, Nat. Comm. Dis. Center, Atlanta, Ga. 30333). *J. Bacteriol.* 96, 1–5 (1968). The total cell fatty acid content of 53 strains (from 9 species) of Neisseria were examined by GLC. Some measure of homogeneity of fatty acid content was observed for *N. sicca, mucosa, flava, flavescens, perflava, subflava* and some serotypes of *meningitidis*. *N. catarrhalis*, shown by other studies to be genetically incompatible with the other *Neisseria*, had a vastly different fatty acid profile justifying reclassification of this organism.

PALM OIL REFINING BY A NEUTRALIZING DISTILLATION PROCESS. A. Gianazza (Gianazza Bros. S.p.A., Legnano, Italy). *Riv. Ital. Sostanze Grasse* 45, 281–3 (1968). A process for refining palm oil is described. The oil is first degummed and filtered, after which it is neutralized, deodorized and bleached in a single step operation. The process takes place under high vacuum at 210–220C, with the neutralization losses being limited to 1.05–1.10 times the acidity of the crude oil.

DEVELOPMENT OF THE POLISH OIL AND FAT INDUSTRY. A. Rutkowski (Univ. of Warsaw, Warsaw, Poland). *Riv. Ital. Sostanze Grasse* 45, 576–83 (1968). Current developments in the Polish fat and oil industry are reviewed with special emphasis on rapeseed oil technology.

RECENT PROGRESS IN THE MANUFACTURE OF MARGARINE. J. Nieuwenhuis (Van den Bergh N.V., Rotterdam, Netherlands). *Riv. Ital. Sostanze Grasse* 45, 584–8 (1968). A brief survey is presented of recent developments in the margarine industry, with regard to hygienic processing, cost reductions, modern views on the health aspects of the use of fats and oils and to consumer demand for improved products, especially in the area of flavor and spreadability.

EVOLUTION IN SEED PREPARATION AND EXTRACTION TECHNIQUES. J. Bulot and J. Desarmeaux (Etabl. A. Olier, Clermond Ferrand, France). *Riv. Ital. Sostanze Grasse* 45, 589–97 (1968). Techniques and equipment used for extracting vegetable oil from seeds are reviewed.

BY-PRODUCTS OF THE OLIVE OIL INDUSTRY AND THEIR UTILIZATION. U. Pallotta and P. Capella (Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 45, 259–65 (1968). Some possible uses of the olive husks and vegetation liquors as well as of the oleins and fatty acids obtained as by-products from the refining of olive oil are reviewed.

DESIGN OF A PLANT FOR THE EXTRACTION OF OIL-BEARING SEEDS FOR ITS REFINING. T. N. Plebani. *Riv. Ital. Sostanze Grasse* 45, 272–80 (1968). Technical and economic criteria useful in the design and construction of edible oil extraction and refining plants are discussed.

SOLVENT WINTERIZATION OF EDIBLE OILS. E. Bernardini (Bernardini S.p.A., Rome, Italy). *Riv. Ital. Sostanze Grasse* 45, 266–71 (1968). A winterizing process using hexane is described. The most desirable oil-solvent concentrations and cooling curves are illustrated and the influence of degree of agitation on crystal size is discussed. The equipment used for solvent winterization is described and the economics of the solvent winterization process are reviewed.

CHEMICAL ASPECTS OF THE ALTERATION OF EDIBLE FATS. M. Naudet (Faculte' des Sciences de Marseille, France). *Riv. Ital. Sostanze Grasse* 45, 252–8 (1968). A survey is made of current knowledge and theories concerning fat autoxidation mechanisms and chemical species involved.

TREATMENT OF EXTRACTION CAKES. S. Semadeni (Buhler Bros., Uzwill, Switzerland). *Riv. Ital. Sostanze Grasse* 45, 573–5 (1968). A review is given of the techniques and operations connected with treating the solid residues obtained after extraction of vegetable oils.

SEPARATION AND IDENTIFICATION OF THE GEOMETRIC ISOMERS OF 9,11-OCTADECADIENOIC ACID. A. Strocchi and G. Losi (Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 45, 598–606 (1968). The high temperature, high vacuum process of ricinoleic or ricinelaidic acid dehydration, in which the dehydration products are distilled as soon as formed, gives rise to geometric isomers of 9,11- and 9,12-octadecadienoic acid, as predicted by theoretical considerations. The double bond produced during dehydration is mostly conjugated to the original double bond and appears to be mainly in the *trans* configuration. The interaction of the double bond with the ions Ag^+ and $[Ag(NH_3)_2]^+$ depends on the geometric configuration of the double bond and on the relative position of the two double bonds, increasing in the following order:

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2 *trans* conjugated; 2 *cis/trans* conjugated; 2 *trans/cis*; 2 *cis*. The methyl esters of the four geometric isomers of 9,11-octadecadienoic acid show on GLC column packed with polar stationary phase (DEGS) and on capillary column packed with non-polar phase (Apiezon L) the following elution order: 1) GLC on DEGS: 9-*cis*,11-*trans* + 9-*trans*,11-*cis*; 9-*cis*,11-*cis*; 9-*trans*,11-*trans*; 2) GLC on Apiezon L: 9-*cis*,11-*trans*; 9-*trans*,11-*cis*; 9-*cis*,11-*cis*; 9-*trans*,11-*trans*. Unlike the geometric isomers of 9,12-octadecadienoic acid, the corresponding isomers of 9,11-octadecadienoic acid show retention volumes higher than those for methyl stearate.

SEPARATION AND IDENTIFICATION OF THE GEOMETRIC ISOMERS OF 10,12-OCTADECADIENOIC ACID. A. Strocchi and M. Piretti. *Ibid.*, 607–16. A comparative study of the products formed by alkali isomerization of 9-*cis*,12-*cis* octadecadienoic acid and its geometric isomers was carried out by TLC, GLC, IR and UV. Using a capillary column coated with a non-polar phase (Apiezon L) the four possible geometric isomers of 10,12-octadecadienoic acid were eluted in the following order: 9-*cis*,11-*trans*; 10-*cis*,12-*trans* + 9-*trans*,11-*cis*; 10-*trans*,12-*cis*; 9-*cis*,11-*cis* + 10-*cis*,12-*cis*; 9-*trans*,11-*trans* + 10-*trans*,12-*trans*. Different rates of isomerization were observed for the different isomers, with full conjugation occurring in 25 min. for the 9-*cis*,12-*cis* isomer, in 2 hrs for the 9-*cis*,12-*trans* and 9-*trans*,12-*cis* isomers and in 4 hrs. for the 9-*trans*,12-*trans* isomer. Double bonds which do not migrate retain their configuration; among migrating bonds, *cis* usually give rise to *trans*, while *trans* can indifferently assume either the *trans* or *cis* configuration. By comparing the retention volumes of the geometric isomers of 10,12-octadecadienoic acid obtained by alkali isomerization with those of similar isomers obtained by Se isomerization, it was shown that Se causes double bond isomerization but not a shift of the double bond along the chain. Specific extinction coefficients of the UV and IR absorption bands which are characteristic of the various isomers have also been determined.

• Biochemistry and Nutrition

EFFECTS OF ESTROGENS ON CHOLESTEROL BIOSYNTHESIS AND TISSUE DISTRIBUTION IN RATS. A. J. Merola, R. R. Dill and A. Arnold (Sterling-Winthrop Res. Inst., Rensselaer, New York). *Arch. Biochem. Biophys.* 123, 378–84 (1968). Studies with tissues from rats medicated orally with estrone or the estrogen, 17-(3-hydroxy-1-propinyl)-3-methoxyestra-1,3,5(10)-17-β-ol-17-α-hydrocinnamate, have shown that cholesterol biosynthesis was inhibited at the decarboxylation of mevalonic acid in liver homogenates. In slices of livers from these rats inhibition also occurred at the cyclization of squalene. In contradistinction to the *in vitro* findings, evidence for the inhibition of cholesterol synthesis could not be elicited *in vivo*. Labeling of sterol pools prior to estrogen administration showed that a redistribution of cholesterol from blood to liver occurred so that the hypercholesteremia seen could best be described as due to a shift in the serum:liver cholesterol ratio.

ASSOCIATION OF LIPASE ACTIVITY WITH THE SPHEROSOMES OF RICINUS COMMUNIS. R. L. Ory, L. Y. Yatsu and H. W. Kircher (Seed Protein Pioneering Res. Lab., New Orleans, Louisiana). *Arch. Biochem. Biophys.* 123, 255–64 (1968). The fatty layer obtained after centrifuging a macerate of ungerminated castor beans, *Ricinus communis*, contains an active lipase. The fatty layer has been examined by a combination of biochemical and electron microscope techniques before and

after periods of active lipolysis with Pb^{++} in the reaction mixture. The results confirm the presence of spherosomes, fat storage organelles of the cells which are concentrated in the fatty layer. Lipase activity is localized in the spherosomes derived from endosperm tissue of ungerminated seeds.

CALCIUM ION ACTIVATION OF LIPOXIDASE. R. B. Koch (Honeywell Corporate Res. Center, Hopkins, Minnesota). *Arch. Biochem. Biophys.* 125, 303–7 (1968). Fresh extracts of ground navy beans had very low activity for peroxidation of linoleic acid at pH 7.5. The addition of calcium ions to the reaction mixture prior to the addition of extract caused a large increase in the rate of production of linoleic acid hydroperoxides and diene conjugation. Calcium ions had no effect on the rate of production of hydroperoxides from linoleic acid at pH 5.5 or from a trilinolein substrate at either pH tested. Sodium deoxycholate and EDTA affected the rate of linoleic acid lipoxidase activity at pH 7.5 when calcium ions were present. Soybean extracts also possessed a calcium ion stimulated lipoxidase.

THE OCCURRENCE OF SQUALENE IN LIPID OF FOWLPOX VIRUS. H. B. White, Jr., Shirley Powell, L. G. Gafford and C. C. Randall (Depts. Biochem. Micro., Univ. Miss., School of Med., Jackson, Miss. 39216). *J. Biol. Chem.* 243, 4517–4525 (1968). The lipids of highly purified fowlpox virus and those of the normal and infected host cell (chick scalp epithelium) were studied. The virus contained 34% lipid with squalene being a major component (16.8%) and the only hydrocarbon present. In contrast, squalene was either absent or present only in trace amounts in normal epithelium. Except for the presence of squalene, the lipid classes of the virus qualitatively resemble those found in the normal cell, but thin-layer chromatography and individual measurements revealed marked differences in quantitative distribution. The amount of cholesteryl ester, in particular, was elevated in the virus. Cholesterol, mono-, di-, and triglycerides, free fatty acid, phospholipid and an unidentified lipid class composed the remainder of the virus lipid. Total fatty acids of the virus and the surrounding matrix and those of the normal and infected epithelium were mainly saturated and monoenoic with less than 10% polyenoic members present. Analysis with a complementary thin-layer and gas-liquid chromatographic procedure revealed that a minimum of 31 fatty acids were present including both even and odd chain members from C_{12}–C_{28} inclusive. Branched chain acids were not found. Two points of dissimilarity between the fatty acid composition of the virus and the normal epithelium were the depression in percentage of odd chain acids and the increased monoene to saturate ratio observed with the virus acids. Fatty acid patterns in the cholesteryl ester, triglyceride, free fatty acid and phospholipid fractions of the virus did not differ greatly.

EFFECT OF FEEDING SAFFLOWER OIL ON THE COMPOSITION OF ABSORBED FATTY ACID IN GRAZING COWS. J. C. Wadsworth (Dairy Res. Found., Univ. of Sydney, Univ. Farms, Camden, New South Wales, Australia). *J. Dairy Sci.* 51, 1382–5 (1968). Two lactating cows were fed a single, large dose of safflower oil. Its effect on the fatty acid composition of triglyceride and phospholipid in lymph from the thoracic duct was examined. The proportion of the fatty acid designated 18:1, 18:2, 18:3, 19:0 and 21:0 increased after oil-feeding and there was a compensating decrease in the proportion of most of the other fatty acids. The hourly output of most of the fatty acids in lymph triglyceride did not change after oil-feeding, whereas, the output of 18:1, 18:2, 18:3, 19:0 and 21:0 increased three- to ten-fold. Evidence is presented that the fatty acids indentified from gas chromatography as 19:0, 18:3 and 21:0 contained significant proportions, respectively, of 18:1 having the double bond near the methyl end of the carbon chain, *cis,trans* conjugated 18:2 and *trans,trans* conjugated 18:2. The effect of oil-feeding on the fatty acid composition of phospholipid in lymph from one of the cows was examined. The proportion of 18:0 and 18:3 decreased and that of 18:2 increased following oil-feeding. These changes were not as marked as those observed for triglyceride.

HETEROGENEITY IN PROTEIN SUBUNITS OF HUMAN SERUM HIGH-DENSITY LIPOPROTEINS. B. Shore and V. Shore (Div. of Biology and Med., Lawrence Radiation Lab., Univ. of Calif., Livermore, Calif. 94550). *Biochemistry* 7, 2773–7 (1968). The protein moieties of high-density lipoproteins of human serum contain comparable quantities of two polypeptide subunits of different amino acid sequence. These peptides in urea solutions were separated by polyacrylamide gel elec-

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trophoresis and by chromatography on DEAE-cellulose. The carboxyl-terminal sequences -Thr-Gln and probably -Lys-Tyr-Lys-Asn-Leu-Thr were elucidated by the actions of carboxypeptidases A and B on the lipid-free protein moieties of two fractions (1.083–1.124 and 1.126–1.195 g/cc) of lipoproteins and on the peptides fractionated on DEAE-cellulose. Glutamic acid λ-hydrazide, indicative of C-terminal glutamine, in addition to threonine, was found among the products of hydrazinolysis of the protein. The protein contains approximately 2 moles of C-terminal glutamine plus threonine per 30,000 g of protein.

EFFECTS OF FOUR COMPONENTS OF THE POLYENE ANTIBIOTIC, FILIPIN, ON PHOSPHOLIPID SPHERULES (LIPOSOMES) AND ERYTHROCYTES. G. Sessa and G. Weissmann (Dept. of Med., New York Univ. School of Med., New York, N.Y. 10016). *J. Biol. Chem.* 243, 4364–71 (1968). Effects of a complex polyene antibiotic, filipin, and its four components were studied upon biological (erythrocyte) and artifical (liposome) membranes in order to test the "sterol receptor" hypothesis of polyene action. The hemolytic activity of filipin complex could be removed more effectively by liposomes in which cholesterol was incorporated (phosphatidyl choline (7 parts), dicetylphosphate (2), cholesterol (1)) than by cholesterol-lacking spherules (phosphatidyl choline(7), dicetylphosphate (2), cholesterol (0)). The order of hemolytic activity of filipin components was: filipin II ≅ filipin III >> filipin I > filipin IV and this order paralleled their biological action. Filipin II, which is the major (53%) component of the complex, preferentially disrupted liposomes prepared with cholesterol (judged by release of $CrO_4^=$); filipin II (25% of the complex) indiscriminately disrupted liposomes whether or not cholesterol was present. Filipin I and filipin IV were far less disruptive to the artificial structures. Other phospholipids (sphingomyelin > cardiolipin > phosphatidyl ethanolamine) were also shown to interact with filipin components. The experiments resolve discrepancies reported with filipin complex, the interaction of which with artificial membranes prepared either with or without cholesterol depends upon the relative enrichment of the complex in one or another of its components and the subsequent polyene-lipid ratio. Consequently, although filipins clearly interact with phospholipids in model systems, no significant objections remain to the general sterol receptor hypothesis of polyene action upon biological membranes.

LIPID CLASS AND FATTY ACID COMPOSITION OF RAT LIVER PLASMA MEMBRANES ISOLATED BY ZONAL CENTRIFUGATION. R. C. Pfleger, N. G. Anderson, and F. Snyder (Lovelace Found. for Medical Educ. and Res., Albuquerque, N. M. 87108). *Biochemistry 7*, 2826–33 (1968). Plasma membranes of rat liver were isolated by zonal centrifugation for analysis of lipid classes and fatty acid composition. The yield of plasma membranes by this technique was 880 μg of protein and 390 μg of total lipid per g of liver. Neutral lipids represented 27% of the total extractable lipids, and this was mainly cholesterol. Phosphatidylcholine accounted for almost 40% of the phospholipids in the plasma membranes of rat liver. Phosphatidylethanolamine and sphingomyelin amount to approximately 20 and 18%, respectively, of the total phospholipids. Phosphatidylserine and phosphatidylinositol were not resolved from each other; this mixed fraction contained approximately 13% of the total lipid phosphorus. Lysophosphatidylcholine and polyglycerolphosphatides plus phosphatidic acid were present as minor components of the membrane lipids.

CONVERSION OF $\Delta^{5,7}$-CHOLESTADIEN-3β-OL TO 3α,7α,12α-TRIHYDROXY-5β-CHOLANOIC ACID IN THE BILE FISTULA RAT. P. P. Nair, Maureen Gordon, Shirley A. Tepper, and D. Kritchevsky (Biochem. Res. Div., Dept. of Med., Sinai Hosp. of Baltimore, Inc., Baltimore, Md. 21215). *J. Biol. Chem.* 243, 4034–7 (1968). The present study has shown that labeled cholic acid is a major metabolite formed when 7-dehydrocholesterol-4-^{14}C is fed to bile fistula rats. Since biliary and hepatic cholesterol were essentially devoid of radioactivity, it has been postulated that the biogenesis of cholic acid under these conditions may proceed either through a pathway that excludes cholesterol as a metabolic intermediate or through a small pool of cholesterol which is being actively converted to bile acids. In intact rats, however, the efficient conversion of 7-dehydrocholesterol to cholesterol was shown. The results are discussed in the light of recent observations that naturally

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occurring sterols containing 27 carbon atoms could be oxidized to more polar products by microsomal enzymes similar to those which catalyze hydroxylation reactions in the early stages of bile acid biogenesis.

ENZYMATIC DESATURATION OF STEARYL ACYL CARRIER PROTEIN. J. Nagai and K. Bloch (Conant Lab., Harvard Univ., Cambridge, Mass. 02138). *J. Biol. Chem.* 243, 4626–4633 (1968). Stearyl acyl carrier protein, chemically prepared from 1-^{14}C stearic acid and *Escherichia coli* acyl carrier protein, is desaturated to oleic acid by extracts of photoauxotrophic *Euglena gracilis* and of spinach. The soluble stearyl acyl carrier protein desaturase system from *Euglena* has been separated into three components, a reduced triphosphopyridine nucleotide oxidase, the desaturase, and a nonheme iron protein (ferredoxin). The enzyme requires reduced triphosphopyridine nucleotide and molecular oxygen. Desaturation is inhibited by KCN but is not affected by carbon monoxide.

ANTITUMOR EFFECT OF INTRACUTANEOUS INJECTION OF BACTERIAL LIPOPOLYSACCHARIDE. D. Mizuno, O. Yoshioka, M. Akamatu and T. Katooka (Pharmaceutical Sciences, Univ. of Toyko, Hongo, Tokyo, Japan). *Cancer Res.* 28, 1531–6 (1968). Intracutaneous injection of the lipopolysaccharide of *Proteus vulgaris* was found to stimulate the reticuloendothelial system and have a marked antitumor effect in mice bearing solid-type Ehrlich carcinoma and Sarcoma 180. The stimulation of the reticuloendothelial system was tested by measuring the clearing activity of intravenously injected colloidal carbon in mice. Of the various routes of injection tested, the actions of lipopolysaccharide were observed most after intracutaneous injection. Two possible modes of action of lipopolysaccharide were indicated: one is a stimulation of the reticuloendothelial system which can be expected to provoke subsequent antibody formation, and the other action is a direct cytocidal action.

RESPONSES OF CALVES FED DIETS SUPPLEMENTED WITH DIFFERENT SOURCES OF NITROGEN AND WITH VOLATILE FATTY ACIDS. A. E. Miron, D. E. Otterby and V. G. Pursel (Dept. of Animal Science, Univ. of Minnesota, St. Paul). *J. Dairy Sci.* 51, 1392–5 (1968). Responses of young calves to starters containing supplements as follows: (I) soybean meal (44%), (II) soybean meal and branched-chain volatile fatty acids, (III) urea, and (IV) urea and branched-chain volatile fatty acids were studied. Calf starters and high quality alfalfa hay were fed *ad libitum*. Calves fed starters containing supplements of soybean meal (I and II) gained faster ($P < 0.01$) than those consuming starters containing supplements of urea (III and IV). The addition of the volatile fatty acid mixture had no effect on weight gains ($P > 0.05$). Hay consumption and concentrate consumption among groups were not different ($P > 0.05$). Molar proportions of rumen volatile fatty acids were not different even though branched-chain acids were fed to two of the groups.

CATALYSIS OF WATER OXYGEN AND OF ACETATE INCORPORATION INTO FATTY ACIDS BY ESCHERICHIA COLI FATTY ACID SYNTHETASE. A. Kaplan and P. D. Boyer (Mol. Biol. Inst., and Dept. of Chem., Univ. Calif., Los Angeles, Calif. 90024). *J. Biol. Chem.* 243, 4077–82 (1968). During synthesis of long chain fatty acids by an *Escherichia coli* fatty acid synthetase preparation in the presence of acyl carrier protein (ACP), fatty acyl-ACP is cleaved. The cleavage in $H^{18}OH$ resulted in the incorporation of about 1.7 atoms of water oxygen into each molecule of fatty acid synthesized. A portion of these water oxygens entered the fatty acid as a result of an exchange reaction. Addition of acetate and malonate decreased the number of water oxygens incorporated per fatty acid synthesized to 1.2 and inhibited the exchange of oxygen between the fatty acid carboxyl group and water. Free acetate and to a much lesser extent free malonate were incorporated into fatty acid. The synthesis of fatty acid and the incorporation of acetate were differentially inhibited by high levels of ACP fraction. No transfer of oxygen from the carboxyl group of acetate to the carboxyl group of long chain fatty acids was noted. These data support the proposal that fatty acyl-ACP is hydrolytically cleaved by the *E. coli* fatty acid synthetase preparation. The hydrolysis reaction was not rate-limiting as shown by the lack of detectable fatty acyl-ACP levels at any time during the course of the incubation.

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Committees in New York →→

AOCS Committee Activities are always an important part of National Meetings. Here are some of the key people who gathered to shape the Society in the year to come.

1. **National Program & Planning Committee**
2. **Education Committee**
3. **Joint AOCS-ISF Meeting Committee**
4. **Advertising Committee**
5. **Seed & Meal Analysis Committee**
6. **Membership Committee**
7. **Education Committee**
8. **Lipid Advisory Board**
9. **Publications Committee**
10. **Instrumental Techniques Committee**
11. **National Program & Planning Committee**
12. **Commercial Fats & Oil Analysis Committee**
13. **Publications Committee**
14. **Commercial Fats & Oil Analysis Committee**
15. **Society Improvement Committee**
16. **Governing Board**
17. **Protein Nutrition Committee**
18. **Uniform Methods Committee**
19. **Governing Board**
20. **ASTM-12 Subcommittee T-5 TG-5**
21. **Governing Board**

22–24. Society Improvement Committee

Committee Proposal to Cut Feed Grains Would Compound Trouble for Soybeans

A proposal by the Nattional Advisory Committee on Grains for steps to gain a 10% boost in compliance with the government's 1969 feed grains program could mean lower prices for all soybean growers and a back-breaking addition to the mushrooming soybean carryover.

In a letter to Secretary of Agriculture Orville Freeman the American Soybean Association points out that the Committee's recommendations may reduce the feed grain surplus, but only "compound the trouble ahead for soybeans; in one short year the Advisory Committee could be back facing the same dilemma on soybeans."

The ASA, an organization of U.S. soybean producers, notes that a 10% increase in compliance would still leave farmers producing 25% of the feed grains—predominantly corn—outside the program.

If these non-complying growers are denied price support loans on soybeans, as mentioned by the Advisory Committee, it could mean 10% of the soybeans produced would be forced to sell at a lower free market price. This, in turn, would drive down the price—by several cents per bushel—of all soybeans sold.

A cutback in feed grains acreage to comply with the program could also mean upwards of one million additional acres planted to soybeans and further worsening of the already ominous buildup in soybean carryover.

ASA took issue with the fact that the Committee considered only the supply side of a supply-demand situation. The association's letter called for further discussion and consideration of ways to stimulate demand and increase sales worldwide.

The association agreed with the committee's recommendation to maintain the $2.50 per bushel price support for soybeans. But it said that the loan "should be for all growers on an equal basis—not just those complying with the supply control program on another crop."

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THE SELECTIVE INCORPORATION OF GLYCEROL INTO DIFFERENT SPECIES OF PHOSPHATIDIC ACID, PHOSPHATIDYLETHANOLAMINE AND PHOSPHOTIDYLCHOLINE. E. E. Hill, D. R. Husbands and W. E. M. Lands (Dept. Biol. Chem., Univ. Mich., Ann Arbor, Mich. 48104). *J. Biol. Chem.* 243, 4440–51 (1968). A solubilized preparation from pigeon liver microsomes produced four species of phosphatidate when incubated with a mixture of linoleoyl- and stearoyl-CoA and *sn*-glycero-3-phosphate. The appearance of distearoyl (15%) and dilinoleoyl (42%) species indicates that either acid may acylate both positions 1 and 2. L-Stearoyl-2-linoleoyl-glycero-3-phosphate (21%) was no more abundant than 1-linoleoyl-2-stearoylglycero-3-phosphate (22%) indicating that the cell free system was not selective in esterifying these two acids. Slices of rat liver provided results in marked contrast to those above in that small amounts (1%) of disaturated phosphatidates were produced and essentially none (3%) of the acids at position 2 were saturated. The major species produced by the slices were predominantly (75%) monoene and diene types formed by the esterification of oleate and linoleate, respectively, at position 2 with saturated acids at position 1. Choline and ethanolamine phosphoglycerides also contained disproportionately greater amounts of newly synthesized, radioactive diene species than would be expected from the endogenous abundance of these types. Endogenous species of diacylglycerophosphorylethanolamine include monoene (2%), diene (19%), tetraene (48%), and hexaene (19%), whereas the isotopic content of the newly synthesized species was approximately 14, 28, 19 and 20%, respectively.

STUDIES ON THE ACTION OF INSULIN IN ISOLATED ADIPOSE TISSUE CELLS. I. STIMULATION OF INCORPORATION OF ^{32}P-LABELED INORGANIC PHOSPHATE INTO MONONUCLEOTIDES IN THE ABSENCE OF GLUCOSE. D. Hepp, D. R. Challoner and R. H. Williams (Div. of Endocrinology, Dept. of Med., Univ. of Washington, Seattle, Washington 98105). *J. Biol. Chem.* 243, 4020–6 (1968). Insulin stimulated the incorporation of ^{32}P-labeled inorganic phosphate into acid-soluble mononucleotides in isolated fat cells incubated in the absence of glucose in the medium. The specific radioactivity of the ATP increased by approximately 60%. This increase was accompanied by a small but significant increment in steady state concentration of ATP over control. Experiments with previously labeled cells, incubated in the absence of phosphate in the incubation medium, suggest that this stimulation by insulin of mononucleotide labeling was not a result of an effect of insulin on active transport across the plasma membrane. Lipolytic agents, which are known to increase the concentration of cyclic AMP in adipose cells, diminished the incorporation of $^{32}P_i$ into mononucleotides. They also decreased ATP concentration, suggesting that fatty acids, their derivatives, or an unknown factor connected with lipolysis imparied oxidative phosphorylation. Insulin diminished the inhibitory action of lipolytic agents and restored ATP concentration.

DIOSGENIN AND β-SITOSTEROL: ISOLATION FROM SOLANUM XANTHOCARPUM TISSUE CULTURES. M. R. Heble, S. Narayanaswami and M. S. Chadha (Biology Div., Bhabha Atomic Res. Centre, Bombay-74, India). *Science* 161, 1145 (1968). Diosgenin and β-sitosterol were isolated from *Solanum xanthocarpum* callus, crystallized and chemically characterized. These metabolites, particularly diosgenin, form in significant amounts in tissue cultures.

THE ASSOCIATION OF A METABOLITE OF VITAMIN D_3 WITH INTESTINAL MUCOSA CHROMATIN IN VIVO. M. R. Haussler, J. F. Myrtle and A. W. Norman (Dept. Biochem., Univ. Calif., Riverside, Calif. 92502). *J. Biol. Chem.* 243, 4055–4064 (1968). Administration of a physiological dose of radioactive vitamin D_3 to vitamin D-deficient chicks results in a localization of the radioactivity isolated from intestinal mucosa within the nuclear chromatin fraction. Extraction and chromatography of this chromatin-bound radioactivity in several systems indicates that 87% of it exists as a polar metabolite of vitamin D_3. This polar metabolite has biological activity equivalent to the parent vitamin. The association of this metabolite with the chromatin fraction occurs only in the target intestinal mucosa and is specifically inhibited by pretreatment of the rachitic chick with nonradioactive vitamin D_3 or vitamin D_3 analogues such as vitamin D_2 and dihydrotachysterol$_3$. The time course of appearance of the polar metabolite in the entire intestine parallels the location of

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The Lighter Side of Fall Meeting Activities → → →

Moments of relaxation are indeed well deserved at AOCS Meetings, where hard work is the watchword. The AOCS photographer has captured the mood of registrants during social periods.

1. **Some of the 800 registrants attending the Annual Fall Banquet.**
2. **Serving line at the Annual DPI-ECPI Reception, where hundreds gathered and relaxed.**
3,4. **Those attending the DPI-ECPI Reception found some serious business conversations (3) and some purely social contacts as well (4).**
5. **Dr. & Mrs. J. D. von Mikusch-Buchberg of Hamburg, Germany enjoy the international selections of wines at the Wine Tasting Mixer Sunday evening.**
6. **Dr. & Mrs. T. H. Applewhite pose for the AOCS photographer at the Annual DPI-ECPI Reception.**
7. **G. Weber is seen talking with Mr. & Mrs. R. E. Anderson before the Annual Fall Banquet.**
8. **AOCS Treasurer N. T. Joyner and General Chairman F. B. White escort their wives to one of the many receptions preceding the Annual Fall Banquet.**
9. **G. H. Bonnington is served a fine cut of roast beef by the chef at the traditional DPI-ECPI Reception for AOCS Fall Meeting Registrants.**
10. **Mr. & Mrs. E. I. Marshack relax before the Annual Banquet with Mr. Marshack's secretary (left). Mr. Marshack served as Chairman of the Entertainment Committee.**
11. **AOCS President & Mrs. J. C. Cowan meet Past President R. C. Stillman (left) at a reception preceding the AOCS Banquet.**
12. **J. Clement helps Misses J. C. Blum and R. E. Johnson rate wines at the Wine Tasting Mixer.**
13. **E. R. Hahn, Chairman of the AOCS Examination Board enjoys moments of conversation with Mrs. G. C. Cavanagh, wife of the Society's President-elect.**
14. **Registrants enjoy a superb meal at the 42nd Fall Meeting Banquet. The head table is to be seen in the background.**
15. **Mr. and Mrs. B. N. Stuckey (right) host AOCS President & Mrs. J. C. Cowan at the DPI-ECPI Reception.**
16. **F. A. Norris (left) and D. R. Erickson find a moment for serious conversation at the Wine Tasting Mixer.**
17. **Dr. & Mrs. D. H. Wheeler enjoy one of the many receptions which preceded the Fall Banquet.**
18. **I. Y. Murase, M. Hiquchi, Shu-Chi Lee, R. K. Viswanadhan, M. M. Paulose and A. Kato enjoy good wine and good conversation at the Wine-Tasting Mixer.**
19. **J. V. Luck and Stanley Dominik stop to test the wine at one of 10 testing stations at the Mixer.**
20. **Judith M. Schultz congratulates Daniel Swern on his capture of the 1968 Award in Lipid Chemistry.**
21. **Mr. & Mrs. L. A. Wishner evaluate one of the many fine wines to be judged at the Wine Tasting Mixer.**

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radioactivity in the chromatin fraction and is consistent with the lag in the physiological response to vitamin D.

LIVER ACETYL COENZYME A CARBOXYLASE. II. FURTHER MOLECULAR CHARACTERIZATION. C. Gregolin, E. Ryder, R. C. Warner, A. K. Kleinschmidt, Huei-Che Chang and M. D. Lane (Dept. of Biochem., New York Univ., School of Med., New York, N. Y., 10016). *J. Biol. Chem.* 243, 4236–45 (1968). The factors effecting the reversible interconversion between the protomeric and polymeric forms of liver acetyl coenzyme A carboxylase were investigated by sucrose density gradient centrifugation and electron microscopy. Certain anions (citrate, isocitrate, malonate, tricarballylate, sulfate, and P_i), acetyl-CoA, high protein concentration, and pH 6 to 7 promote aggregation to the protomer. Other factors, such as carboxylation of the enzyme to produce enzyme-CO_2^-, Cl^-, and pH values greater than 7.5, cause dissociation of the polymeric form.

BIOSYNTHESIS OF 9α,15-DIHYDROXY-11-KETOPROST-13-ENOIC ACID. E. Granstrom, W. E. M. Lands and B. Samuelsson (Dept. of Chem., Karolinska Inst., and the Dept. of Med. Chem. Royal Vet. College, Stockholm, Sweden). *J. Biol. Chem.* 243, 4104–8 (1968). Incubation of 8,11,14-eicosatrienoic acid with homogenates of sheep vesicular gland yielded a new product, which has been identified as 9α,15-dihydroxy-11-ketoprost-13-enoic acid. The identification was based on mass spectrometry of the methyl ester and the methoxime derivative, and on infrared spectroscopy and ultraviolet spectroscopy, before and after treatment with alkali. Reduction of the isolated compound with borodeuteride yielded prostaglandin $F_{1\alpha}$ containing deuterium in the ring, as established by mass spectrometry of a derivative. Further proof for the location of the keto group in the isomer was obtained through biosynthesis from (9-^{3}H, 3-^{14}C)- and (11-^{3}H, 2-^{14}C)8,11,14-eicosatrienoic acids. Incubation with (13D-^{3}H, 3-^{14}C)8,11,14-eicosatrienoic acid revealed that the 13D-hydrogen atom is retained during the formation of the isomer, which is also the case with prostaglandin E_1. The mechanism of the conversion of 8,11,14-eicosatrienoic acid into prostaglandins is discussed. The identification of 9α,15-dihydroxy-11-ketoprost-13-enoic acid and the finding that ^{3}H at C-9 is retained during its formation further support the involvement of an endoperoxide in the biosynthesis of prostaglandins.

THE ENZYMATIC REDUCTION OF RETINAL TO RETINOL IN RAT INTESTINE. N. H. Fidge and D. S. Goodman (Dept. of Med., Columbia Univ. College of Physicians and Surgeons, New York, N. Y. 10032). *J. Biol. Chem.* 243, 4372–9 (1968). The reduction of retinal to retinol was examined with enzyme preparations from homogenates of rat intestinal mucosa. The enzyme appears to be a relatively nonspecific aldehyde reductase. Short and medium chain aliphatic aldehydes of length C–2 to C–14 were actively reduced, with greatest activity being seen with aldehydes of length C–4 to C–8. Unsaturated C–18 fatty aldehydes were reduced at a lesser rate, but saturated aldehydes of length C–16 or greater were not reduced. The enzyme was stereospecific for 4R–NADH-4-$^3H_1$ and did not incorporate tritium from 4S-NADH-4-$^3H_1$ into the product retinol.

BIOSYNTHESIS OF PLANT STEROLS. VII. THE POSSIBLE OPERATION OF SEVERAL ROUTES IN THE BIOSYNTHESIS OF CARDENOLIDES FROM CHOLESTEROL. J. A. F. Wickramasinghe, P. C. Hirsch, S. M. Munavalli and E. Caspi (Worcester Found. for Exptl. Biology, Shrewsbury, Mass. 01545). *Biochemistry* 7, 3248–53 (1968). The significance of the biosynthetic pathway, cholesterol → 20 α-hydroxy cholesterol → pregnenolone → progesterone → cardenolides, in plants has been examined by the simultaneous administration of a mixture of (7-^{3}H) 20 α-hydroxycholesterol and (4-^{14}C)cholesterol (^{3}H/^{14}C ratio 8.68) to a *Digitalis lanata* plant. The *in vivo* transformation of the administered steroids to cardenolides was observed. In addition, (7-^{3}H)progesterone totally devoid of ^{14}C was isolated. The variations in the ^{3}H/^{14}C ratios of the cardenolides, digitoxigenin (6.74), eigoxigenin (1.72), and gitoxigenin (2.58), may be viewed as being indicative of the operation of several biosynthetic routes. Apparently, the route involving progesterone is not the most significant pathway. These deductions are based on the assumption that the pool sizes and the relative rates of penetration to the active sites of the two administered precursors are comparable.

CAROTENOIDS OF CENTENNIAL VARIETY SWEET POTATO, IPOMEA BATATAS L. A. E. Purcell and W. M. Walter, Jr. (Dept. of

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Talking Shop at 42nd Fall Meeting ➔ ➔

It is often said that as much information is traded outside AOCS Technical Sessions as inside them. The Society's photographer has certainly proved this theory. Here are some of the many registrants studying and talking shop at the 42nd Fall Meeting. (Groups are identified left to right)

1. **Mr. & Mrs. J. Monick, G. H. Bonnington and J. Murphy.**
2. **A. J. Schlaeger, H. J. Lipman and L. R. Dugan.**
3. **A. L. Kapecki, R. Reiser, J. Clement, E. W. Benson.**
4. **Z. Zehnder, N. T. Joyner, and J. M. Bodman.**
5. **A. Waltking, N. E. Bednarcyk, V. F. Scorese and Helen Zmachinski.**
6. **Mr. & Mrs. J. Monich, G. H. Bonnington and J. Murphy.**
7. **J. R. Harrison, Mrs. S. P. Taylor and R. A. Hagberg.**
8. **P. A. Williams and R. T. O'Connor. Background: Mini Exhibit Hostess Jeanine Barreres and Chairman L. A. Salomon.**
9. **Mrs. H. Malteni, P. Kalustian and E. T. Payne.**
10. **Mr. and Mrs. R. Doris.**
11. **T. T. Ashta and W. J. McPherson.**
12. **J. C. Cowan, AOCS President; A. F. Kapecki and H. G. Salomon.**
13. **T. T. Ashta, R. E. Henson, S. G. Sourelis and J. De Blanco.**
14. **A. A. Rodeghier, J. Stanley and S. A. Hernandez.**
15. **Miss C. Tratnyek and H. E. Gallo-Torres.**
16. **P. P. Nair and George Rouser.**
17. **W. R. Supina.**
18. **W. E. M. Lands and Sister P. M. Slakey.**
19. **W. E. M. Lands and F. D. Gunstone.**
20. **K. E. Holt, W. T. Coleman and T. J. Potts.**
21. **S. J. Rini, J. N. Bodman and F. Eber.**
22. **B. C. Black and E. W. Benson.**
23. **R. T. McIntyre, G. Zinzalian and F. B. Flint.**
24. **F. Gauagier, D. G. Manly, R. J. Long and S. Eng.**
25. **N. A. Green and Mr. & Mrs. M. L. Valletta.**

Testing Laboratory for Sale

The sale of all tangible and intangible assets of the Van Trump Testing Laboratory, Inc., Chicago, is announced as a result of the death of its principal owner and sole operator, Roderick Van Trump. The Van Trump family desires to liquidate the assets or sell the corporation. Included is all equipment required for asphalt, concrete, cement and building material testing, in addition to equipment for many other miscellaneous tests.

The source of business of the Van Trump Testing Laboratory was from the Chicago area, the state of Illinois and bordering states. All contracts were fulfilled before R. Van Trump died, so no outstanding obligations exist.

If you have an interest in the corporation, the name, business contacts, equipment, or any combination of them, please call or write Richard Van Trump, 3600 Winifred Dr., Ft. Worth, Texas 76133; phone (817) AX2-2541. Temporary phone in Chicago, FL4-4816.

OLD JAOCS

Have you finished reading the January and March 1968 issues of JAOCS and have no more need for them? AOCS will buy these issues from you at $1.50 each. Send copies to American Oil Chemists' Society, 35 East Wacker Drive, Chicago, Ill. 60601.

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Food Science, North Carolina State Univ., Raleigh, N.C. 27607). *J. Agr. Food Chem.* **16**, 769–70 (1968). The carotenoids of Centennial variety sweet potato, *Ipomea batatas L.*, were analyzed. The major carotenes found were, in per cent, β-carotene 86.35, phytoene 2.55, phytofluene 1.95, and ζ-carotene 1.77 α- and γ-Carotenes and derivatives of α-carotene were also present.

STEROLS: ISOLATION FROM A BLUE-GREEN ALGA. N. J. De Souza and W. R. Nes (Dept. of Biological Science Drexel Inst. Technol., Philadelphia, Pa. 19104). *Science* **162**, 363 (1968). A crystalline mixture of sterols was isolated from the filamentous blue-green alga *Phormidium luridum*. The mixture consisted of unsaturated 24-ethylcholesterols possessing Δ^7-, $\Delta^{5,7}$- and Δ^5-bonds together with their Δ^{22}-derivates and a small amount of cholesterol. The major component was 24-ethyl-Δ^7-cholestenol. Squalene and phytol were also evident.

PRODUCTION OF β-LIPOPROTEIN BY INTESTINE IN THE RAT. H. G. Windmueller (Lab. Nutr. and Endocrinol., Nat. Inst. of Arthritis and Metabolic Diseases, Nat. Inst. of Health, Bethesda, Md.). *J. Biol. Chem.* **243**, 4878–84 (1968). Evidence for the production of circulating β-lipoprotein and endogenous triglycerides by the intestine was obtained from an examination of intestinal lymph in control rats and in rats fed orotic acid as 2% of the diet. The lipoproteins in lymph were characterized by immunochemical methods, electrophoresis, preparative ultracentrifugation and lipid analysis. In control rats on a fat-free diet, intestinal lymph contained higher concentrations of β-lipoprotein and triglycerides than did plasma, whereas the lymph concentration of α-lipoprotein was lower than in plasma. In rats fed orotic acid the intestinal lymph content of β-lipoprotein and triglycerides was as high as in the controls, although the plasma concentrations of both β-lipoprotein and triglycerides were less than 5% of normal. In control as well as in orotic acid-fed rats, all intestinal lymph β-lipoprotein and 95% of lymph total fatty acids were recovered in a very low density lipoprotein fraction (density less than 1.006 g per ml) with pre-β electrophoretic mobility. α-Lipoprotein was found in the fraction of density greater than 1.006 g per ml and in the very low density lipoprotein after partial delipidation. Data from the present experiments and earlier experiments with Triton WR-1339 indicate that on a fat-free diet approximately 10% of the plasma triglyceride is derived from the intestine and reaches the blood via lymph in association with very low density lipoprotein. Chylomicrons appeared in the lymph of orotic acid-fed as well as control rats following a fat meal. Previous work has shown that the livers of orotic acid-fed rats are unable to produce β-lipoprotein or to release triglycerides into the circulation.

METABOLISM OF CHOLEST-5-ENE-3 β,26-DIOL IN THE RAT AND HAMSTER. Nili Wachtel, S. Emerman, and N. B. Javitt (Dept. of Med., New York Univ. School of Med., N.Y., N.Y. 10016). *J. Biol. Chem.* **243**, 5207–12 (1968). The Clemmensen reduction procedure has been adapted for the tritiation of krptogenin to obtain cholest-5-ene-3 β,26-diol-^{3}H. Intravenous administration of this diol to the bile fistula rat and hamster was followed by rapid excretion of bile acid metabolites in bile. Cholic acid was identified as a metabolite of cholest-5-ene-3 β,26-diol by reverse isotope dilution in five hamsters and three rats. In addition, a monohydroxy bile acid, 3 β-hydroxy-5-cholenoic acid, was identified as a metabolite of cholest-5-ene-3 β,26-diol. It seems possible, therefore, that a pathway from cholesterol to primary bile acid can exist which begins with the oxidation of the side chain to a C-24 carboxylic acid and is followed by alterations of the steroid ring.

STRUCTURAL INVESTIGATION OF THE LOW-DENSITY LIPOPROTEIN OF HEN'S EGG YOLK USING PROTEOLYSIS. D. C. Steer, W. G. Martin and W. H. Cook (Div. of Biosciences, National Research Council, Ottawa, Canada). *Biochemistry* **7**, 3309–15 (1968). To obtain information on the location of the protein moiety in low density lipoproteins, comparative proteolysis studies using trypsin and Pronase were carried out on the low density lipoprotein of hen's egg yolk and on its partially and completely delipidated forms. The results demonstrated that 20% of the protein in the native lipoprotein was not accessible to Pronase, although the resistant portion consisted of peptides of considerable size. In contrast, the protein of the partially and completely delipidated forms was completely digested by Pronase. The most likely explanation was considered to be that the resistant peptide is not at the surface in native lipoprotein particles. Three possible models were

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PLAN NOW!--60th Annual Meeting

MSU Scientists Launch Microwave Research in Food Processing

Michigan State University food scientists will direct microwaves at food to add a new dimension to their food processing research.

Microwaves, a form of energy similar to light or radio waves, allow rapid heating of products, explains Prof. Walter Urbain. This research is made possible by the gift of a continuous microwave heating unit from Armour and Company.

Professor Urbain explains that with microwave energy, heat is generated from inside the product. Food molecules have positive and negative ends. If placed in an electromagnetic field such as a microwave, they line up—negative end toward positive pole and positive end toward negative pole. If the polarity of the electromagnetic field is alternated, Urbain continues, food molecules will have to stay lined up. The movement causes friction and heat, so the faster the polarity is alternated, the more heat is generated.

Dr. Urbain gives the example of the potato chip industry's use of microwave heating's special features.

In deep-fat frying, moisture in the potato prevents the chips from burning. Problem is that the chips continue to heat after all water is driven off, and scorching results. These burned chips must be discarded, causing loss for manufacturers and, to some extent, higher prices to consumers.

Since water in food absorbs microwaves, as soon as the last of the water in the chip is driven off, heating automatically stops and burning is impossible.

Some foods are poor absorbers of microwave energy, however, and do not respond well to this kind of treatment. Michigan State's scientists will work with MSU electrical engineers to conduct basic research on what and how properties influence a substance's response to microwaves.

Expansion of Jacobs Engineering Co.

Jacobs Engineering Co. has acquired the 47-year-old firm of Wurster & Sanger, Inc., Chicago-based engineering specialists in the development, design and manufacture of complete process plants for glyceride fats and oils, fatty acids, glycerine, and by-products. Announcement was made by J. J. Jacobs, President of Jacobs Engineering.

The acquisition will now enable Jacobs Engineering to provide full range capabilities through turnkey construction of vegetable oil recovery and refining plants utilizing the Wurster & Sanger process developments. Major current projects are in the United States, South America and Burma; included in the acquisition is the Brazilian company, Wurster & Sanger Internacional do Brasil Ltda. in Sao Paulo, Brazil.

Since its establishment in 1921, Wurster & Sanger has specialized in the field of consulting, developing, designing and manufacturing of complete process plants for extraction of glyceride fats and oils from oil seeds such as cottonseed, soybean, peanut, safflower and others. Advanced process know how in caustic refining, deodorizing, decolorizing, fat splitting and fatty acid and glycerine recovery has resulted from almost 50 years of active technical participation in the production of oils and fats.

"Jacobs Engineering has participated in the design and construction of a number of vegetable oil plants but the depth of Wurster & Sanger know-how will allow the offering of a wide range of services from feasibility analysis of new projects through turnkey engineering and construction."

Now in its 21st year, Jacobs Engineering Co. ranks among the top 50 engineering and construction firms in the United States. During the past 10 years alone, the company has provided engineering, design, procurement, construction and start-up services for $300 million of plant facilities for the production of chemicals, petroleum and petro-chemical products, minerals, food, pharmaceuticals and cosmetics, and the recovery and treatment of water and waste materials.

Jacobs Engineering Co. is headquartered at 837 South Fair Oaks Ave., Pasadena, California. The main offices of Wurster & Sanger, Inc. are at 164 West 144th Street, Chicago (Riverdale), Illinois.

Organic Acid Process for Storing Moist Grain

Considerable interest has been created among farmers in Britain by the appearance of a revolutionary process which inhibits microbiological decay in grain used for animal feeding.

The Propcorn process, which has been developed by BP Chemicals (U.K.), involves the coating of moist grain with a liquid preservative based upon propionic acid, thus enabling it to be stored in good condition for at least 12 months without drying or the use of sealed containers or refrigeration.

Mould spores and bacteria are present on grain at harvest and in a suitable environment will develop rapidly. Two important, interdependent factors are the moisture content and temperature of the grain. Also, mould and many bacteria require oxygen for growth. Existing storage methods attempt to control microbial growth by restricting one or more of these essential requirements. Suppression of moulds and bacteria in moist grain by spraying it with Propcorn, say the manufacturers, will give it a storage life of at least a year. The process prevents dry matter loss, preserves the full value of the grain, and ensures that the grain remains free-flowing and is easily removed from store. Provided only that the grain is protected from rain there is no restriction on the type of storage container used. Storage on the floor is the ideal method since it needs the least capital investment and gives the most flexible use of buildings.

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proposed. An increase in particle size was observed to follow proteolysis of the lipoprotein, and the resulting product was stable and freely water soluble. It was proposed that the increase in size changed the surface-to-volume ratio to a level at which phospholipid and possibly residual protein could give the degree of surface coverage existing in the native lipoprotein. Values were calculated for the surface area available per phospholipid molecule, assuming that the surface of the Pronase-treated particle is covered either by phospholipid alone or by phospholipid plus cholesterol. The results were 70 and 56 A^2, respectively, and as the second value is in better agreement with X-ray data, it was concluded that material other than phospholipid is probably also present at the surface of Pronase-treated low-density lipoprotein fraction.

ENZYMATIC CONVERSION OF SQUALENE TO CHOLESTEROL BY AN ACETONE POWDER OF RAT LIVER MICROSOMES. T. J. Scallen, W. J. Dean and M. W. Schuster (Dept. of Biochem., School of Med., Univ. of New Mexico, Albuquerque, N.M. 87106). *J. Biol. Chem.* 243, 5202–06 (1968). The successful preparation of an acetone powder, prepared from rat liver microsomes and supplemented with the 105,00 × *g* supernatant of rat liver, capable of converting squalene to cholesterol has been demonstrated. This preparation requires the addition of pyridine nucleotides (NAD and NADPH). Under maximal conditions, cholesterol accounted for 62% of the recovered radioactivity, and the distribution of products was nearly identical with that observed for a 20,000 × *g* supernatant of rat liver. The data support the conclusion that in terms of the over-all percentage conversion of squalene to cholesterol, the lipid removed by acetone and ether extraction is not required for enzymatic activity in these reactions.

OBSERVATIONS ON THE PROTEIN COMPONENTS OF HUMAN PLASMA HIGH- AND LOW-DENSITY LIPOPROTEINS. D. Rudman, L. A. Garcia, Liese Abell and S. Akgun (Columbia Univ. Res. Service, New York City, N.Y.). *Biochemistry* 7, 3136–48 (1968). Human plasma high-density (α-) lipoprotein and low-density (β-) lipoprotein were prepared by ultracentrifugation and the purity of the preparations was demonstrated by electrophoresis on cellulose acetate membranes and by immunodiffusion. Both lipoproteins were delipidated by lyophilization followed by extraction of lipid with ethanol-acetone (1:1). Over 99% of cholesterol and phospholipids was removed. The delipidated protein moiety of α-lipoprotein moved as a single band on cellulose acetate electrophoresis and precipitated as a single line on immunodiffusion against rabbit antiserum to human α-lipoprotein, but was resolved into three fractions by gel filtration on Sephadex G-200. The distribution coefficients on G-200 were 0.12 for fraction 1, 0.49 for fraction 2, and 0.64 for fraction 3. Quantitative amino acid analyses showed major differences between the three fractions in the content of arginine, half-cystine, histidine, isoleucine, leucine, lysine, phenylalanine and serine; this observation established that more than one protein species is present in α-lipoprotein.

THE INHIBITION OF MEVALONIC KINASE BY GERANYL AND FARNESYL PYROPHOSPHATES. J. K. Dorsey and J. W. Porter (Dept. of Physiol. Chem., Univ. of Wisconsin, Madison, Wis. 53706). *J. Biol. Chem.* 243, 4667–70 (1968). The inhibition *in vitro* of a highly purified preparation of mevalonate kinase by terpenyl pyrophosphates has been studied. Geranyl-PP and farnesyl-PP are potent inhibitors, while isopentenyl-PP, dimethylallyl-PP, and inorganic pyrophosphate do not inhibit significantly. The kinetics of geranyl-PP inhibition were investigated further and found to be uncompetitive with respect to mevalonic acid and competitive with respect to $MgATP^{2-}$. Computer analysis of the data gave values of 2.65 ± 0.14 μ M for K_{ii} and 1.19 ± 0.12 μ M for K_{is}. These results are consistent with the suggestion that geranyl-PP and farnesyl-PP act as physiological controls over farnesyl-PP biosynthesis and ATP utilization.

BINDING OF LIPID TO PROTEIN IN LIPOVITELLIN FROM THE HEN'S EGG. R. J. Evans, Selma Bandemer, Karen Heinlein and J. A. Davidson (Dept. of Biochem., Michigan State Univ., East Lansing, Mich. 48823) *Biochemistry* 7, 3095–102 (1968). Lipovitellin, isolated from fresh hen's eggs, was used to study the binding of lipid to protein in a high-density lipoprotein. The influence of various treatments and of enzymatic digestion of the lipovitellin on the amount of lipid extracted by ether was determined. Treatment of lipovitellin with urea, guanidine hydrochloride, sodium thioglycolate, or nonionic detergents did not increase the amount of lipid extracted with

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ether, but treatment with sodium deoxycholate or sodium dodecyl sulfate increased it from 17 to 30–45%. Digestion with phospholipase C or D did not increase the lipid extracted. Lipovitellin was digested sequentially with trypsin, papain and Pronase. After each digestion, the lipids were extracted from the digest by ether, and soluble peptides were separated from the insoluble residue by centrifugation. Peptides were analyzed for amino acid content, and lipids were fractionated by chromatography through silicic acid. The compositions of the peptides and lipids released by trypsin from lipovitellin were different from those released by papain or Pronase from the residues.

SYNTHESIS OF TRIACETIC ACID LACTONE BY THE PIGEON LIVER FATTY ACID SYNTHETASE COMPLEX. J. E. Nixon, G. R. Putz and J. W. Porter (Dept. of Physiolog. Chem., Univ. of Wis., Madison, Wis. 53706). *J. Biol. Chem.* 243, 5471–78 (1968). The synthesis of triacetic acid lactone (TAL) is effected by purified soluble pigeon liver fatty acid synthetase. This enzyme system synthesizes TAL from acetyl coenzyme A and malonyl coenzyme A in the absence of TPNG, and synthesizes palmitic acid in the presence of TPNH. The major product of the reaction in the absence of TPNH is TAL, and not free triacetic acid. Presumably triacetic acid, bound as a thioester to the 4′-phosphopantetheine prosthetic group of the fatty acid synthetase, is an intermediate in the formation of TAL. The latter compound is formed from 1 mole of acetyl-CoA and 2 moles of malonyl-CoA in the sequence, acetate-malonate-malonate (proceeding left to right from the methyl end of the molecule). The synthesis of TAL is inhibited by either TPN^+ or TPNH. The very strong inhibition by both forms of the nucleotide implies that TAL is not synthesized *in vivo* by the avian soluble fatty acid synthetase.

ALLOCHENODEOXYCHOLIC, A METABOLITE OF 5α-CHOLESTAN-3β-OL IN THE HYPERTHYROID RAT. S. A. Ziller, Jr., E. A. Doisy, Jr. and W. H. Elliott (Dept. of Biochem., St. Louis Univ. School of Medicine, St. Louis, Mo. 63104). *J. Biol. Chem.* 243, 5280–88 (1968). 5α-Cholestan-3β-ol-4-^{14}C (0.2 to 0.4 mg, 10^7 dpm) was administered intraperitoneally to rats made hyperthyoid by daily subcutaneous injections of L-thyroxine (250 μg per kg per day) for a period of 4 weeks prior to cannulation of the bile ducts. The bile secreted over 17 postoperative days contained 72% of the administered ^{14}C. Bile from the first 2 days was hydrolyzed, and the free bile acids were separated by acetic acid partition chromatography. Of the chromatographed ^{14}C, 38% was associated with dihydroxy acids, 48% with cholic acid, and 9% with more polar fractions. The metabolite in the first zone was separated from known acids by repeated chromatography of the methyl esters and identified by dilution with synthetic allochenodeoxycholic acid. The synthetic material was prepared from methyl chenodeoxycholate by conversion to methyl 3-keto-7α-hydroxy-5α-cholanoate with Raney nickel, followed by catalytic reduction, and its structure was supported by mass spectral studies of the acid and its derivatives.

DIET AND SERUM CHOLESTEROL LEVELS. COMPARISON BETWEEN VEGETARIANS AND NONVEGETARIANS IN A SEVENTH-DAY ADVENTIST GROUP. R. O. West and Olive B. Hayes. *Am. J. Clin. Nutr.* 12, 853–62 (1968). The serum cholesterol levels and the dietary habits of a voluntary study group of 466 Seventh-day Adventists in a Washington, D. C. suburban area were compared to determine the influence of diet on serum cholesterol levels in an adult population whose only environmental differences related to dietary practices—adherence to vegetarianism. This study matched vegetarians with nonvegetarians from the same base population according to several physical and demographic variables—place of residence, age, sex, marital status, height, weight, and occupation—and examined the effects of various levels of meat, fish and fowl consumption (degrees of nonvegetarianism) on serum cholesterol levels. With the exception of those under 25 years of age, the results showed that the nonvegetarians had higher serum cholesterol levels than the vegetarians.

SOME PHYSICAL AND CHEMICAL STUDIES ON TWO POLYPEPTIDE COMPONENTS OF HIGH-DENSITY LIPOPROTEINS OF HUMAN SERUM. V. Shore and B. Shore (Div. of Biol. and Med., Lawrence Radiation Lab., Univ. of Calif., Livermore, Calif. 94550). *Biochemistry* 7, 3396–403 (1968). Two different polypeptides separated from the protein moiety of high-density lipoproteins of human serum were found to be similar in molecular weight but very different in amino acid composition. One of the peptides, characterized by carboxyl-terminal glutamine, contains no histidine, arginine, tryptophane, or cysteine. Its amino acid composition is: Lys_{15}, Cys_2, Asp_5, Thr_{11}, Ser_{11}, Glu_{26}, Pro_7, Gly_6, Ala_9, Val_{10}, Met_2, Ile_2, Leu_{14}, Tyr_6, Phe_7,; the total number of residues is 133 and the molecular weight from amino acid composition is 14,900. Sedimentation equilibrium experiments yield molecular weight values of 14,300 and 14,900 for the polypeptide R-Gln in urea solutions and in guanidine hydrochloride solutions, respectively. The other polypeptide, characterized by carboxyl-terminal threonine, contains no isoleucine, cystine or cysteine. Its amino acid composition is: Lys_{10}, His_3, Arg_9, Asp_{13}, Thr_5, Ser_8, Glu_{24}, Pro_5, Gly_6, Ala_{10}, Val_7, Met_2, Leu_{20}, Tyr_4, Phe_3, Trp_4; the total number of residues is 133 and the molecular weight from amino acid composition is 15,500. Sedimentation equilibrium experiments on the polypeptide R-Thr in guanidine hydrochloride solutions indicated homogeneity with respect to molecular weight. However, the molecular weight value 31,400 indicates that the polypeptide R-Thr exists as a dimer in guanidine hydrochloride solutions. Sedimentation equilibrium experiments on the polypeptide R-Thr in urea solutions and in dilute salt solutions containing sodium dodecyl sulfate indicated heterogeneity with respect to molecular weight and weight-average molecular weights of approximately 20,000.

THE ROLE OF FRUCTOSE 1,6-DIPHOSPHATE IN THE STIMULATION OF THE FATTY ACID SYNTHETASE FROM PIGEON LIVER. C. A. Plate, V. C. Joshi, B. Sedgwick and S. J. Wakil (Dept. of Biochem., Duke Univ. Medical Center, Durham, N.C. 27706). *J. Biol. Chem.* 243, 5439–45 (1968). Kinetic studies of the pigeon liver fatty acid synthetase have revealed that the enzyme is sensitive to inhibition by malonyl coenzyme A, one of the substrates of fatty acid synthesis. The inhibition is of the mixed type with respect to acetyl-CoA, and is competitive with respect to TPNG. Malonyl-CoA most markedly affects the K_m for TPNH, increasing it 19-fold over a malonyl-CoA concentration range of 10 to 37.5 μM. The inhibition by malonyl-CoA can be reversed by fructose 1,6-diphosphate, and this reversal is reflected in a progressive decrease in the K_m for TPNH with increasing fructose 1,6-diphosphate concentrations. Fructose 1,6-diphosphate does not markedly affect the K_m values for either acetyl-CoA or malonyl-CoA. Some of the kinetic patterns obtained, such as nonlinear reciprocal coordinate plots for the rate of fatty acid synthesis against malonyl-CoA inhibition, suggest that the substrate inhibition seen in this study may be due to substrate binding at a regulatory site rather than to the classically invoked interaction of substrate molecules at an active site.

• Detergents

INTERFACE PROPERTIES OF DETERGENT FILMS. L. Shedlovsky (Consulting Chemist, N.Y.C.). *Ind. Eng. Chem.* 16, 47–52 (1968). Interfacial phenomena depend primarily on adsorption and on the composition and properties of the adsorbed films. Interfacial properties are more easily measured on liquid-gas and liquid-liquid interfaces which usually have more homogeneous surface structures than solid surfaces. This discussion deals first with some aspects of the influence of molecular structure and composition of aqueous solutions of sodium alcohol sulfates and sulfonates on the surface and interfacial tension and on minima in the concentration curves. Some examples are cited of selective adsorption at the liquid-air interface. Then, several studies are discussed on the influence of molecular structure, composition and temperature of aqueous solutions of surface active agents, as well as the role of both bulk and surface viscosity on the flow properties of films at the liquid-air interface. This paper reviews and interprets the principal aspects of these studies from the original work of the author and his associates as well as from more recent developments.