

• Fats and Oils

FLAVOR THRESHOLDS FOR FATTY ACIDS IN BUFFERED SOLUTIONS. R.E. Baldwin, M.R. Cloninger and R.C. Lindsay (Dept. of Food Sci. and Nutr., Univ. of Missouri-Columbia, Columbia, Mo. 65201). *J. Food Sci.* 38, 528-30 (1973). Threshold levels were determined for flavor of free fatty acids in water, in oil, in butteroil and in butter. For butanoic and hexanoic acids, the thresholds were lower in oil than in water. The reverse trend was apparent for octanoic and decanoic acids, as a markedly greater concentration was indicated for the threshold in oil than in water. Tuckey and Stadhouders found that rancid flavor was detected at a lower level of fat hydrolysis in an acidified or in a cultured product than in milk at the normal pH. A synthetic butter culture flavor concentrate, developed by Lindsay et al. had an undesirable acetic acid-like flavor when the pH was below 4.5 but not when the pH was in the range of 4.6-4.8. Bills et al. stated that acidification of solutions of sodium salts of fatty acids resulted in an intensified aroma. Ethanoic, butanoic, hexanoic, octanoic and decanoic acids are representative of fatty acids which play a dominant role in the characteristic flavor of dairy products and other foods. This study was designed to determine the concentration at which the flavor of these fatty acids are detectable (recognition threshold) in citrate-phosphate buffer systems at pH levels of 3.2, 4.5 and 6.0.

SORPTION HYSTERESIS AND CHEMICAL REACTIVITY: LIPID OXIDATION. H.E. Chou, K.M. Acott and T.P. Labuza (Dept. of Food Sci. and Nutr., Univ. of Minn., St. Paul, Minn. 55101). *J. Food Sci.* 38, 316-9 (1973). In studying intermediate moisture foods, Labuza et al. found that at the same water activity, reaction rates for deterioration can be very different depending on the direction of reaching the final water activity, either adsorption by going up the isotherm or desorption by going down the isotherm from the natural moisture content. They reported that the lipids in the system on the adsorption branch of the hysteresis loop oxidized about four to five times slower than the desorption systems at the same water activity. It was shown that water was protective for dehydrated foods and as water activity increased the oxidation rate decreased. It was also shown that in the capillary region of the isotherm (intermediate moisture foods range) the oxidation rate increased. The protective effect of water at low water activity and low moisture content was attributed to hydration of metal catalysts decreasing their effectiveness and hydrogen bonding of peroxide thus slowing the chain reaction. The accelerative effect of water at higher water activity and moisture content was postulated to be due to the soluble solids content, viscosity of the liquid phase and swelling of the polyceric matrix. The purpose of this study is first to confirm the results found in actual food systems and second to elucidate the exact mechanisms and kinetics which control the rate of oxidation as affected by sorption hysteresis. The model system approach was used in order to provide conditions more amenable to control.

VITAMIN E CONTENT OF SELECTED BABY FOODS. K.C. Davis (Dept. of Home Econ. Res., Agr. Exp. Station, Univ. of Idaho, Moscow, Idaho 83843). *J. Food Sci.* 38, 442-6 (1973). Now that vitamin E has been added to the list of recommended dietary allowances by the National Research Council, it is important to know how much of this vitamin is supplied by the various baby foods. The RDA for infants to 1 yr of age is 5 IU, with a ratio of 0.6 mg alpha-tocopherol/g polyunsaturated fatty acid (E/PUFA) being desired. At present the information on baby foods is limited to the vitamin E content of milk, milk products, simulated milks for infant nutrition and infant formulas and cereals. These references suggest that the amount of vitamin E present in the products evaluated would not be adequate, either in terms of the total amount of vitamin E present, or the low E/PUFA ratio. No information is currently readily available on the vitamin E content of the strained fruits, meats, vegetables, cereals, breakfasts and mixed dinners obtained in the grocery stores for infant feeding. This study was undertaken to determine the values of vitamin E in baby foods, and to compare these values for baby foods with values for similar fresh, frozen or canned foods for the general population which have been assayed by other investigators. The dry matter

content and total lipid content of these foods were not determined; however, the approximate values as listed in other literature sources are included.

OXIDATIVE RANCIDITY IN DRY-CURED HAMS: EFFECT OF LOW PRO-OXIDANT AND ANTIOXIDANT SALT FORMULATIONS. D.G. Olson and R.E. Rust (Dept. of Animal Sci., Iowa State Univ., Ames, Ia. 50010). *J. Food Sci.* 38, 251-3 (1973). The role of oxidative rancidity in the flavor of dry-cured country hams was reported by Kemp et al. and Turner et al. Their studies showed that hams with greater oxidative rancidity had lower palatability scores. Thus, the reduction of oxidative rancidity would have a desirable effect on the acceptance of these hams. From work reported by Denisov and Emanuel, heavy metal ions (principally iron, copper and chromium) are responsible for catalyzing oxidative rancidity. Iron and copper particularly are usually present in flake salt (NaCl) used in meat curing. Two possible alternatives for retarding oxidative rancidity are: removal of the heavy metal ions from the salt and the addition of antioxidants. Butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), citric acid and propylene glycol were shown to be effective antioxidants in meat products. That heme pigments may also catalyze oxidative rancidity would indicate that the use of salt mixtures containing antioxidants might prove more effective than the removal of the heavy metal ions alone. This research was conducted to determine the effects on oxidative rancidity and flavor using a regular flake salt, an antioxidant salt and a salt with a low concentration of heavy metal ions in the curing mixture when applied to dry-cured hams.

ISOLATION AND IDENTIFICATION OF VOLATILE COMPOUNDS FROM POTATO CHIPS. R.E. Deck, J. Pokorny and S.S. Chang (Dept. of Food Sci., Rutgers, The State Univ., New Brunswick, N.J. 08903). *J. Food Sci.* 38, 345-9 (1973). A number of sulfur compounds have been reported as components of cooked potato flavor. Casey et al. identified hydrogen sulfide, methane thiol, dimethyl sulfide and ethane thiol in cooked potatoes. The same compounds were identified with the use of headspace analysis. Gumbmann and Burr detected four alkyl thiols, three sulfides, three disulfides and hydrogen sulfide in the volatile compounds isolated from freshly cooked potatoes. However, all these conclusions were based on gas chromatographic data only. The volatile flavor compounds isolated from potato chips were found to contain 2.3% of nitrogen. The first nitrogen compound in the volatiles of potato chips was identified. They reported that 2,5-dimethyl pyrazine had an earthy, raw potato flavor, at a concentration of approximately 10 ppm. Recently Buttery et al. identified 18 pyrazine and pyridine compounds in the basic fraction of the steam volatile oil from potato chips. Guadagni et al. determined the minimum detectable amounts of some pyrazine compounds in dehydrated mashed potatoes. Pyrazine compounds were further identified by Sapers et al. in the volatile concentrates prepared from explosion puffed and conventionally dehydrated potatoes. The present study is a systematic characterization of the volatile compounds in potato chips.

FATTY ACID COMPOSITION OF BOVINE INTRAMUSCULAR AND SUBCUTANEOUS FAT AS RELATED TO BREED AND SEX. A.T. Gillis (Dept. of Foods and Nutr., Univ. of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2), N.A.M. Eskin and R.L. Cliplef. *J. Food Sci.* 38, 408-411 (1973). Thirty-six animals representing six crossbreeds and two sexes were used in this study. The breeds represented the F₁ generation produced by crossing Limousin and Simmental bulls with Hereford, Shorthorn and Aberdeen Angus cows. Intramuscular fat from the longissimus and biceps femoris muscles as well as a portion of the corresponding subcutaneous fat were extracted by the chloroform-methanol method of Bligh and Dyer. Methyl esters of the total intramuscular and subcutaneous fat were separated by gas-liquid chromatography. Significant differences were found among the various fatty acids in both the intramuscular and subcutaneous fats when comparing breed effects and also sex differences.

CONTINUOUS DIFFUSION OF CHLOROGENIC ACID FROM SUNFLOWER KERNELS. F.W. Sosulski, M.A. Sabir and S.E. Fleming (Dept. of Crop Sci., Univ. of Saskatchewan, Saskatoon, Canada S7N 0W0). *J. Food Sci.* 38, 468-470 (1973). Continuous diffusion of chlorogenic acid from sunflower kernels was more

rapid than consecutive batch extractions with 0.001N HCl. However, over 4 hours of continuous extraction at 80C was required to produce a light-colored meal when adjusted to pH 10. Diffusion rates were not greatly enhanced by increasing the solvent-to-kernel ratio but the diffusion time was reduced to one-half by pearling the kernels. A split kernel technique for testa removal is recommended for rapid diffusion under high or low temperature conditions. Losses of oil from diffusion extraction and testa removal were negligible but the yields of meal were reduced from 45 to 30 grams per 100 grams of kernels. However, this product contained 70% protein and would qualify as a protein concentrate.

FLUOROMETRIC DETERMINATION OF VITAMIN A IN FOODS. J.W. Erdman Jr., S.H. F. Hou and P.A. Lachance (Dept. of Food Sci., Rutgers Univ., New Brunswick, N.J. 08903). *J. Food Sci.* 38, 447-9 (1973). The official AOAC method for vitamin A analysis is the colorimetric Carr-Price reaction. This method is considered by many investigators to be insensitive and non-specific because a number of non-vitamin A compounds interfere with the colorimetric procedure. This paper describes a modification of the fluorometric determination of vitamin A in human blood and liver for use in food analysis. Food samples are ground, saponified, homogenized and extracted with hexane for direct fluorometric measurement. The method is accurate, sensitive and specific for vitamin A when the appropriate correction formula for phytofluene is utilized. Vitamin A has been satisfactorily assayed in several types of foods, including: cereals, margarines, instant breakfast powders and fortified entrees.

A STATISTICAL APPROACH TO THE SUBJECTIVE AND OBJECTIVE MEASUREMENTS OF ODORS INDUCED BY γ -IRRADIATION OF BEEF FAT. N. Kosaric, T.B. Duong and W.Y. Svreck (Chem. Biochem. Eng., Faculty of Eng. Sci., Univ. of Western Ontario, London, Ontario, Canada). *J. Food Sci.* 38, 369-73 (1973). Beef fat, extracted from commercial beef, was subjected to γ -irradiation and the intensity of the odor induced by irradiation was studied. A statistical approach was developed to evaluate the organoleptic data obtained by taste panel evaluation and to correlate this data with the results obtained by chromatographic analysis of the irradiated samples. For this purpose, a step-wise multiple regression analysis was developed and this technique was analyzed for validity and applicability.

γ -IRRADIATION OF BEEF FAT. EFFECTS ON ODOR INTENSITY AND RANCIDITY. *Ibid.*, 374-6. Odor intensity and rancidity of irradiated beef fat were studied at different experimental conditions. Temperature was found to be an important factor in reducing the odor intensity and in increasing the stability of fat. There exists a correlation between the odor intensity and the peroxide value of fat if antioxidants are not incorporated. The addition of antioxidants protects the fat from induced odor and the rancidity developed during and after irradiation.

SURVIVAL OF SALMONELLAE AND ESCHERICHIA COLI DURING THE SPRAY DRYING OF VARIOUS FOOD PRODUCTS. D.L. Miller, J.M. Goepfert and C.H. Amundson (Food Res. Inst., Depts. of Bacteriology & Food Sci., Univ. of Wis., 2115 Herrick Drive, Madison, WI 53706). *J. Food Sci.* 37, 828-31 (1972). The effect of spray drying on the survival of salmonellae in certain food products was studied. Product temperature during drying and powder particle density were demonstrated to be the key factors influencing the rate of destruction of salmonellae during spray drying. A greater fraction of the contaminant flora remained viable when low dryer temperatures were employed and when more dense powders (that is, thicker crusted particles) were prepared. Interestingly, high fat-containing products did not protect salmonellae from destruction during spray drying and even seemed to enhance the rate of destruction. Possibly, this is due to longer retention of heat in the high fat powders. It is evident that spray drying per se cannot be counted upon to supplant adequate pasteurization and post-drying sanitary procedures.

GAS-LIQUID CHROMATOGRAPHIC DETECTION OF PALM KERNEL AND COCONUT OILS IN COCO BUTTER. J.L. Iverson (Div. of Food Technol., FDA, Washington, D.C. 20204). *J. Assn. Off. Anal. Chem.* 55, 1319-22 (1972). A gas-liquid chromatographic method for the detection of palm kernel and coconut oils is presented. Detection of adulteration is based on the programmed-temperature gas chromatographic analysis of lauric acid. Coco butter naturally contains approximately 0.01% lauric acid, while coconut and palm kernel oils contain approximately 50% lauric acid. The 95% confidence interval indicated that it was possible to reliably detect 0.25% lauric acid, which corresponds to 0.5% adulteration.

STUDIES ON THE ANALYSIS OF LIPID CLASSES BY GRADIENT ELUTION ADSORPTION CHROMATOGRAPHY. A. Stolyhwo and O.S. Privett (Univ. of Minn., The Hormel Inst., 801 16th Ave., N.E., Austin, Minn. 55912). *J. Chromat. Sci.* 11(1), 20-5 (1973). Separation of the spectrum of lipid classes is a relatively fast, single operation by gradient elution chromatography as described. The chromatographic system consisted of a pressurized apparatus and involved the use of a continuous series of gradient changes of pentane, ethyl ether, chloroform and methanol containing 8% ammonium hydroxide with a 1 meter by 2.8 millimeter column packed with Corasil II modified by treatment with ammonium hydroxide. Separations were demonstrated with reference mixtures containing methyl oleate, triolein, cholesterol, 1,3-diolein, 1-monolein, phosphatidyl choline, etc. The technique was also applied to a sample of rat red blood cell lipid in which some 28 components were detected.

ANALYSIS FOR CRUDE FATTY ACIDS (TOTAL FATTY ACIDS AND UNSAPONIFIABLE MATTER) IN FEED GRADE FATS: REPORT OF THE JOINT AOAC-AOCS COMMITTEE ON THE ANALYSIS OF FEED GRADE FATS. F.W. Quackenbush, Chairman (Dept. of Biochem., Purdue Univ., W. Lafayette, Ind. 47907). *J. Assn. Off. Anal. Chem.* 55, 846-50 (1972). A method for analysis of total fatty acids plus unsaponifiable matter that employs a newly designed liquid-liquid extraction apparatus has given satisfactory results in a collaborative test. Seven collaborators analyzed samples of prime tallow, chicken fat, yellow grease, 2 samples of cottonseed fatty acids and 2 samples of acidulated soap stock. The method permits removal of hexane-soluble unsaponifiable matter as a separate fraction. The animal fats yielded results which were close to the theoretical values. The hydrolyzed vegetable fats gave lower values, possibly because of the presence of dark insoluble material. The method seems to be acceptable for analysis of low grade samples and has been adopted as official first action.

ANALYSIS OF AFLATOXINS IN SUNFLOWER SEEDS AND SUNFLOWER MEAL. J. Karmelic (Comite de Investigaciones Tecnologicas, CORFO, Santiago 1, Chile), M. Israel, S. Benado and C. Leon. *J. Assn. Off. Anal. Chem.* 56, 219-22 (1973). Aflatoxins are extracted from sunflower seeds and meal by chloroform, eluted from a silica gel column, and determined by thin-layer chromatography, using chloroform-acetone-water-2-propanol as the developing solvent. In addition, the thin-layer chromatography step also removes interfering material from some sunflower varieties which is not removed by the cleanup column. Various silica gels were tested for cleanup efficiency. Recoveries of added B₁, B₂, G₁ and G₂ were satisfactory.

MODIFIED FERRIC GEL METHOD FOR DETERMINING AFLATOXIN IN COTTONSEED MEALS. J. Velasco (Agr. Res. Service, USDA, Beltsville, MD 20705). *J. Assn. Off. Anal. Chem.* 55, 1354-60 (1972). The ferric gel method for determining aflatoxin in cottonseed has been adapted for cottonseed meals. A change in solvent system and an additional purification step required by some meals have been incorporated into the method. Purification of these meals is accomplished by filtration rather than by chromatographic fractionation on columns of silica gel. The time of analysis as compared to the AOAC method is reduced by more than one half with this new method and total recoveries are comparable to or higher than those obtained with the AOAC method. Consideration should be given to cleanup of seed or plant extracts with ferric gel rather than with lead acetate not only because it removes plant pigments more effectively but also because it avoids the disposal of hazardous lead salts into water effluent systems.

RAPID QUANTITATIVE TLC METHOD FOR DETERMINING AFLATOXINS IN COTTONSEED PRODUCTS. W.A. Pons Jr., A.F. Cucullu and A.O. Franz Jr. (Southern Reg. Res. Lab., Ag Res. Service, USDA, New Orleans, La. 70179). *J. Assn. Off. Anal. Chem.* 55, 768-74 (1972). The official AOAC method for aflatoxins in cottonseed products was modified to provide a rapid quanti-

HAHN LABORATORIES

Consulting and Analytical
Chemists

1111 Flora St. P.O. Box 1177 Columbia, S.C. 29202

tative method whereby an analysis can be completed in as little as 1 hour. The method incorporates a choice of either 5 minutes blender or 30 minutes shaker extraction and either half-plate (20 min) or full-plate (50 min) TLC development to provide a flexible method to meet different analytical requirements. There was some variation between the rapid method, the official AOAC method, and the ferric gel method of Velasco, but the rapid method should be useful in screening a large number of seed or meal samples.

MOLECULAR INTERACTIONS IN MIXED MONOLAYERS AT THE WATER/AIR INTERFACE (INTERACTIONS BETWEEN LONGCHAIN NORMAL FATTY ALCOHOLS). G.V. Patil (Indian Inst. of Technol., Powai, Bombay-76, India), A.B. Biswas and R.N. Shukla. *J. Indian Chem. Soc.* 19, 1349-65 (1972). Pressure-area isotherms at water surface, of mixed monolayers of hexadecanol (C_{16} -OH), as well as octadecanol (C_{18} -OH) with docosanol (C_{22} -OH) were studied as a function of mole fraction and temperature. Both positive and negative deviations from additivity rule, $A_{12} = A_1N_1 + A_2N_2$, were observed for both the mixtures. Positive deviations were observed at lower temperatures and pressures. These deviations were attributed to the changes taking place as a result of packing of the molecules in the monolayer state.

QUANTITATIVE FLUORODENSITOMETRIC MEASUREMENT OF AFLATOXIN B₁ WITH A FLYING-SPOT DENSITOMETER. II. COMPARATIVE STUDY OF B₁ MEASUREMENTS IN SPIKED AND NATURALLY CONTAMINATED PEANUT PRODUCTS. P.R. Beljaars, F.H.M. Fabry, M.M.A. Pickott and M.J. Peeters (Food Inspection Service, Florynruive 111, Maastricht, The Netherlands). *J. Assn. Off. Anal. Chem.* 55, 1310-15 (1972). Peanut butter extracts and samples spiked with 5 to 40 micrograms aflatoxin B₁ per kilogram of sample were analyzed, together with naturally contaminated peanut products, by 3 extraction procedures followed by thin-layer chromatography. After development, the TLC plates were scanned with a reflectance flying-spot densitometer. Average recoveries for spiked peanut butter extracts ranged from 99 to 105%, with variation values of 11-12%. Two of the methods, a methanol extraction and an IUPAC method, yielded extracts suitable for densitometric analysis after TLC. The official Dutch method (KB), contained more interfering fluorescent material.

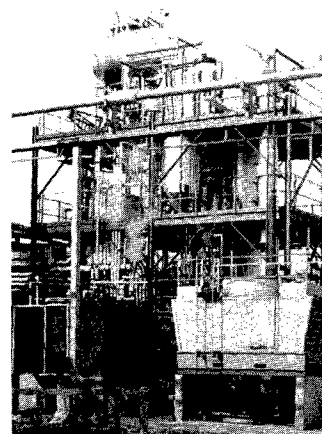
COLLABORATIVE STUDY OF THE DETERMINATION OF AFLATOXIN IN CORN AND SOYBEANS. O.L. Shotwell and R.D. Stubblefield (Northern Reg. Res. Lab., ARS, USDA, Peoria, Ill. 61604). *J. Assn. Off. Anal. Chem.* 55, 781-8 (1972). A study was made to determine whether the procedure commonly designated as the CB method, previously recommended for determining aflatoxin in peanuts and peanut products, could be applied to corn and soybeans. Both naturally contaminated and spiked corn and soybeans were extracted and analyzed by TLC. Of the 15 collaborating laboratories, 9 were equipped to measure aflatoxins on TLC plates densitometrically, as well as visually. Seven collaborators used molar absorptivities to determine the concentration of aflatoxins in solutions to be used for TLC standards. The official CB method has been extended to include corn and soybeans, and the rapid TLC screening technique for aflatoxin in corn has been adopted as official first action.

PER CENT FATTY ACID COMPOSITION AND QUALITY DIFFERENCES OF CHINOOK AND COHO SALMON. J.L. Iverson (Div. of Food Technol., FDA, Washington, D.C. 20204). *J. Assn. Off. Anal. Chem.* 55, 1187-90 (1972). The fatty acid profiles of prime and "spent" (inferior quality) Chinook salmon and coho salmon have been determined. There are indications that the long chain monounsaturated acids are preferentially utilized by the migrating salmon. However, there may be larger generic and specific run variations that preclude the use of a fatty acid compositional approach to differentiate between prime and spent salmon.

THE IDENTIFICATION AND SEMI-QUANTITATIVE ASSAY OF SOME FAT-SOLUBLE VITAMINS AND ANTIOXIDANTS IN PHARMACEUTICAL PRODUCTS AND ANIMAL FEEDS BY THIN-LAYER CHROMATOGRAPHY. G.W. Johnson and C. Vickers (Anal. Res., Quality Control, The Boots Co. Ltd., Pennyfoot St., Nottingham, England). *Analyst* 98, 257-67 (1973). A TLC method for the identification and semi-quantitative assay of vitamin A, its acetate and palmitate, vitamin D, α -tocopherol, α -tocopherol acetate, BHA, BHT, and ethoxyquin in vitamin preparations is described. The sample solutions are applied to thin layers of silica gel and the vitamins and antioxidants are separated by using n-hexane-ethyl methyl ketone-di-n-butyl ether (34 + 7 + 6) as a developing solvent. The compounds are identified

For complete
**FATTY
AMINE
Plants**

designed and
built to your
requirements.



Jowett registered design.

CONSULT:

Peter Jowett & Co. Ltd.
CHEMICAL ENGINEERS

116 Stockport Road, Marple,
Stockport, England.

Phone: 061-427 2457. Telex: 669760.

*ALSO for Hydrogenation and Fatty
Acid Processing Plants.*

by means of their R_f values, their appearance in ultraviolet radiation and their response to spray reagents; they are assayed by visual comparison with standards. The method has been applied to gelatin-protected vitamin beads, animal feed additives, multi-vitamin tablets, oily vitamin concentrates and halibut-liver oil samples. Also described is a simple color test for distinguishing vitamin D₂ from vitamin D₃ after removal of vitamin A and its esters.

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF VITAMIN D IN COD-LIVER OIL. J.G. Bell and A.A. Christie (Dept. of Trade and Industry, Lab. of the Govt. Chemist, Cornwall House, Stamford Street, London, SE1 9NQ, England). *Analyst* 98, 268-73 (1973). A gas-liquid chromatographic method for the determination of vitamin D in cod-liver oil is described. It involves saponification of the oil, extraction of the unsaponifiable matter, removal of interferences such as cholesterol and retinol by precipitation and column chromatography on Sephadex LH-20 and Florisil; the final determination of vitamin D is carried out by gas-liquid chromatography. A determination can be completed in less than 2 days.

OVERCOMING PROBLEMS IN FLAVOR COMPONENT IDENTIFICATION. S.S. Chang (Dept. of Food Sci., Rutgers Univ., New Brunswick, N.J. 08903). *Food Technol.* 27(4), 27-39 (1973). A description of the instruments and methodologies for the isolation, fractionation and identification of volatile flavor compounds in foods, with special emphasis on the importance of the isolation step. The application of these techniques to the study of objectionable flavors and the deterioration of flavors during food processing is also discussed.

FOOD ADDITIVES—SOME ECONOMIC CONSIDERATIONS. J.F. Angeline and G.P. Leonardos (Arthur D. Little, Inc., 15 Acorn Park, Cambridge, Mass. 02140). *Food Technol.* 27(4), 40-50 (1973). Food additives are basically used for sound technical and economic reasons; additives help extend or improve shelf life as well as preserving many difficult-to-preserve foods. The authors discuss the estimated costs of removing additives from margarine and processed cheese as well as from bread and specialty meats. The impact on the consumer would be a nearly two billion dollar rise in net costs a year. And, the convenience factors, such as longer storage life, imparted to

many foods by virtue of additive, would be lost.

LIQUID CHROMATOGRAPHY OF POLYCYCLIC AROMATIC HYDROCARBONS. N.F. Ives and L. Giuffrida (Div. of Chem. and Physics, FDA, Washington, D.C. 20204). *J. Assn. Off. Anal. Chem.* 55, 757-61 (1972). The liquid chromatography of 18 polycyclic aromatic hydrocarbons was investigated by using a continuous monitoring ultraviolet detection system. Two column materials, Durapak OPN and 40% cellulose acetate, were compared for order of elution and resolution. Neither system resolves all the compounds tested but the use of more than one system increases the number which may be resolved. This investigation demonstrates the potential of analytical liquid chromatography for the resolution and analysis of such compounds.

DETECTION OF HEXACHLOROBENZENE RESIDUES IN DAIRY PRODUCTS, MEAT FAT AND EGGS. R.J. Smyth (Customs Lab., Seaton, South Australia 5023). *J. Assn. Off. Anal. Chem.* 55, 806-8 (1972). A rapid, one column chromatographic method using deactivated Florisil for the cleanup of fatty foods is described. Hexachlorobenzene which is only partially recovered by multiple residue methods is recovered in excess of 80%, using the method described. A gas chromatographic column containing a mixture of DC-200 and QF-1 as stationary phase for the separation of hexachlorobenzene from α -benzene hexachloride is also described.

USDA FORECASTS FOOD OUTPUT. Anon. *Food Eng.* 45(4), 86-92 (1973). The 1973 production-price trends for fats and oils plus dairy products, eggs, meat, poultry, vegetables and wheat are reported. Oil yield for both soybeans and cottonseeds is off but overall production is up. USDA spots changing export pattern.

A SIMPLIFIED HALPHEN PROCEDURE FOR CYCLOPROPENE FATTY ACIDS. E.C. Coleman and D. Firestone (Div. of Chem. and Physics, FDA, Washington, D.C. 20204). *J. Assn. Off. Anal. Chem.* 55, 1288-93 (1972). A simplified Halphen procedure was developed for the quantitative determination of cyclopropene fatty acids in fats and oils. Butanol, dimethyl sulfoxide (DMSO) and mixtures of butanol and DMSO were used as reaction media in a closed system. Higher sample absorbances were produced in butanol than in mixtures of butanol and DMSO. Butanol was superior to the other solvent systems for both quantitative and qualitative analyses. The lower limit of sensitivity for the closed tube-butanol system for quantitative and qualitative analyses was 18 and 15 micrograms cyclopropene fatty acids per gram of oil, respectively.

GAS CHROMATOGRAPHIC DETERMINATION OF LOW LEVELS OF DI-(2-ETHYLHEXYL) PHTHALATE IN SOY OIL. D.T. Williams (Food Div., Health Protection Branch, Dept. of National Health & Welfare, Ottawa, Ontario, Canada K1A 0L2). *J. Assn. Off. Anal. Chem.* 56, 181-3 (1973). Di-(2-ethylhexyl) phthalate can be determined by gas chromatography at a level of 0.3 parts per million in soy oil. A cleanup procedure involving epoxidation of soy oil residues with *m*-chloroperbenzoic acid allows confirmation of the phthalate ester by thin-layer chromatography-mass spectrometry or gas chromatography-mass spectrometry.

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF CHLOROANISOLE IN SOY OIL AND OTHER VEGETABLE OILS. *Ibid.*, 200-3. A method for the detection of chloroanisoles in soy oil utilizes partitioning between petroleum ether and acetonitrile followed by column chromatography on activated alumina. The eluate from the column, after treatment with concentrated sulfuric acid, is analyzed by electron capture gas-liquid chromatography. Recoveries from a 2 gram sample of soy oil fortified at 0.01-1.0 parts per million were 85-103% for pentachloroanisole, 82-99% for 2, 3,4,6-tetrachloroanisole and 75-96% for 2,4,6-trichloroanisole. Recoveries from samples fortified at 0.1-1.0 parts per million were 83-99% for 2,4,5-trichloroanisole, 67-85% for 2,6-dichloroanisole and 78-99% for 2,4-dichloroanisole.

POPE TESTING LABORATORIES, INC.

Analytical Chemists

2618 1/2 Main

P.O. Box 903

Dallas, Tex.

AQUEOUS PROCESSING OF FRESH COCONUTS FOR RECOVERY OF OIL AND COCONUT SKIM MILK. R. Hagenmaier, C.M. Cater and K.F. Mattil (Food Protein R&D Ctr., Texas A&M Univ., College Station, TX 77843). *J. Food Sci.* 38, 516-8 (1973). Fresh, husked coconuts were shelled, the meats ground with coconut water and the mixture pressed to separate the solids (residue) from the liquid emulsion. The liquid emulsion was centrifuged to give three phases: a precipitate (insoluble protein), an aqueous phase and a creamy emulsion. The creamy emulsion was diluted with oil and agitated to produce coconut oil and more aqueous phase. The combined aqueous phases (coconut skim milk) were dried to give a product that contains 25% crude protein, 5.1% fat, 45% soluble carbohydrates, 9% ash and 0.0% crude fiber. The cost of production of dry skim milk fraction is estimated to be \$0.16 per pound.

SENSORY EVALUATION USING COMPOSITE COMPLETE-INCOMPLETE BLOCK DESIGNS. J.A. Cornell and F.W. Knapp (Statistics & Food Sci. Depts., Univ. of Florida, Gainesville, FL 32601). *J. Food Sci.* 37, 876-82 (1972). The complete block (CB) and incomplete block (IB) designs presently used for sensory evaluations are inadequate for testing and measuring the panelists \times treatments (P \times T) interaction (the difference in magnitude of variations in judgements). This testing is possible with a composite complete-incomplete (C-I) block design in which each CB is augmented with an IB; such as some of the samples in the former are replicated in the latter. Removal of the P \times T interaction allows the estimation of pure error in the analysis of variance. The use of pure error only, when comparing sample effects, leads to a more efficient test than can be attained with the CB or IB designs.

COMPOSITION OF TALL OIL FATTY ACIDS FROM BULGARIAN MILLS. N. Gerasimova-Pulieva, K. Lekova and K. Filipecheva. *Gidroliz. Lesokhím. Prom.* 25 No 1, 7-8 (1972). Samples of fatty acids obtained from Bulgarian tall oils were analyzed by GLC after conversion into the methyl esters. The components were identified and their contents in the samples evaluated from the chromatographic peaks. Also determined were the physical properties (density, refractive index), the A.V., saponification and iodine values, and the contents of rosin acids and unsaponifiables in the samples. A comparison of the fatty acid composition of the Bulgarian samples with that of Scandinavian and American tall oil fatty acids (taken from the literature) showed that the Bulgarian fatty acids have a higher content of linolenic acid. The Bulgarian samples contained 44.22% oleic acid, 31.80% linoleic acid and 7.8% linolenic acid. (World Surface Coatings Abs. No. 370)

INVESTIGATION OF THE TRIGLYCERIDES OF HEMPSEED OIL. P. Biacs. *Olaj, Szappan, Kosmetika*, 21 No 2, 42-7 (1972). Hydrolysis of the triglycerides of vegetable oils by pancrease lipase was studied. Hempseed oil containing many unsaturated fatty acids served as model substance. The fatty acid composition of hempseed oil and of its hydrolysis products was established by thin-layer chromatography and gas chromatography. According to measurements, the 2-monoglyceride fractions consist of 98% unsaturated fatty acids; thus the saturated fatty acids are bound to the extreme C atoms of glycerol. Using the van der Waals method of calculation, the main features of the structure of triglycerides in hempseed oil were elucidated in comparison with other oils. Similarly to linseed oil, the 1- and 3-positioned unsaturated fatty acids in hempseed oil are oxidized more easily and cyclic compounds are also detectable in the chromatograms. (World Surface Coatings Abs. No. 370)

CHEMICAL EXAMINATION OF THE FIXED OIL DERIVED FROM THE SEEDS OF DOLICHOS BIFLORUS (LINN). P. Dube and R.M. Purohit (Dept. Chem., U. of Saugar, Sagan (M.P.), India). *Indian Oil & Soap J.* 37(11), 284-288 (1972). Fixed oil from the seeds of *Dolichos biflorus* was extracted with petroleum ether and upon removal a yellow colored oil was obtained in 10% yield. The following acids in the saponifiable portion were obtained: Oleic acid 60.3%, linoleic 18.5%, linolenic 5.2%, palmitic 6.98% and stearic acid 9.02%. Lupeol β -sitosterol was found in the unsaponifiable portion.

FATTY ACID COMPOSITION OF ROOT BARK OF CRATAEVA-NURVALA. J.S. Chauhan, V.K. Saxena and V. Lakshmi (Chem. Labs., U. of Allahabad, Allahabad-2, India). *Indian Oil & Soap J.* 37(11), 288 (1972). The mixed fatty acids comprised 25.4% solid acids and 74.6% liquid fatty acids. The fatty acids were mixtures of lauric, stearic, undecylic, oleic and linolenic acids.

THE EFFECT OF DIETARY FAT AND STORAGE TEMPERATURE ON

THE STORAGE STABILITY OF TURKEY MEAT. R.E. Salmon and J.B. O'Neil (Res. Station, Res. Branch, Canada Agr., Swift Current, Saskatchewan S9H 3X2). *Poultry Sci.* 52, 314-7 (1973). The abdominal depot fat of turkeys fed 11.4% dietary rapeseed oil became rancid when stored for eight months at -12°C but not at -22°C . The depot fat of birds fed 11.4% palm oil was stable at both storage temperatures. A similar trend in thigh meat was not significant. Storage temperature did not affect the stability of breast meat. The instability of carcass fat of birds fed rapeseed oil in comparison to palm oil was associated with higher levels of linoleic and linolenic acids in the tissues.

MASS FRAGMENTOGRAPHIC ANALYSIS OF STEROIDS, CATECHOLAMINES AND AMINO ACIDS IN BIOLOGICAL MATERIALS. B.F. Maume, P. Bournot, J.C. Lhuguenot, C. Baron, F. Barbier, G. Maume, M. Prost and P. Padieu (Lab. of General Biochem., Faculty of Sci., 21000 Dijon, France). *Anal. Chem.* 45, 1073-82 (1973). Mass fragmentographic methods are described for quantitative evaluation of some biological metabolites present under physiological conditions in blood or tissue. The use as internal standards of perdeuterated-TMS ethers of studied substances themselves is proposed and discussed for quantitative analysis; a nonbiological isomer of the compound submitted to the analysis is also used. Examples are given for the analysis of rare amino acids in heart cell culture, of endogeneous corticosteroids in rat adrenals and blood, of catecholamines in rat adrenals, of estrogens in nonpregnant woman blood, and of endogenous metabolites of corticosterone in the rat liver. These metabolites are analyzed at the nanogram range. Preliminary works in some of these fields made with a coupled glass-capillary column are also described.

POLYCHLOROBIPHENYLS IN NORTH ATLANTIC OCEAN WATER. G.R. Harvey, W.G. Steinhauer and J.M. Teal (Woods Hole Oceanographic Inst., Woods Hole, Mass. 02543). *Science* 180, 643-4 (1973). Concentrations of polychlorobiphenyls (PCB's) have been measured at the surface and at various depths in the water of the North Atlantic Ocean between 26°N and 63°N . The concentrations average about 20 parts per trillion and amount to an estimated 2×10^4 metric tons of PCB's in the upper 200 meters of water. The average concentrations of PCB's in the surface water of the Sargasso Sea are lower than those in the northern North Atlantic.

CHANGES IN FATTY ACIDS IN RIPENING MANGO PULP (VARIETY ALPHONSO). C. Bandyopadhyay and A.S. Gholap (Biochem. and Food Technol. Div., Bhabha Atomic Res. Centre, Trombay, Bombay 85, India). *J. Agr. Food Chem.* 21, 496-7 (1973). Oil extracts were isolated from five stages of ripening Alphonso mango pulp and the fatty acid compositions of the extracts were determined by gas-liquid chromatography. Ripening of pulp was found to be associated with an increase in glyceride content, followed by changes in fatty acid composition of the pulp. As the fruit ripens, a decrease in linoleic acid content and an increase in linolenic acid content, as well as reciprocal distribution of palmitic acid and palmitoleic acid, were seen. A correlation of organoleptically evaluated aroma and flavor characteristics with the ratio of palmitic acid to palmitoleic acid was observed.

CONTINUOUS PROCESS FOR THE SEPARATION OF MIXTURES OF FATTY ACIDS OF DIFFERENT MELTING POINTS. H. Hartmann and W. Stein (Henkel & Cie). *U.S.* 3,737,444. This invention relates to an improvement of the known continuous process for the detergent fractionation of solid and liquid fatty acids, particularly of commercial oleic and stearic acids. The improvement consists in withdrawing part of the recycling wetting agent solution from the cycle and replacing it with fresh wetting agent solution.

ANTIOXIDANT COMPOSITION TO STABILIZE ORGANIC MATERIALS. I. Yamane, M. Nagayama and M. Takai (Lion Fat & Oil Co., Ltd.). *U.S.* 3,741,909. A stable organic material is prepared by mixing a compound of the formula $(\text{R-S-X-COO})_n\text{M}$, (wherein R represents a hydrocarbon radical having 6-22 carbon atoms, X represents a lower alkylene radical having 1-5 carbon atoms, M represents non-alkali metal, and n is an integer from 1 to 5) along with a phenol-type antioxidant or amine-type antioxidant, with synthetic resins, rubberlike substances or various oils.

RENDERING PROCESS. E. Levin (Viobin Corp.). *U.S.* 3,742,001. The process reduces the water content of a biological tissue, in particulate form and retaining a certain amount of fat, by coagulating the particles and thereafter contacting the particles with a gas at an elevated temperature. Water vapor



passes from the tissue into the gas. Subsequently the partially dehydrated particles are extracted. In one embodiment, the extraction is accomplished by warm polar-type fat solvent, and in another, the partially dehydrated particles are introduced into a water immiscible fat solvent. By azeotropic distillation, the water content is further reduced, and by extraction, the fat content is reduced. The dehydrated, defatted product is treated for solvent removal. The process is preferably carried out in a continuous manner using a specific apparatus.

• Biochemistry and Nutrition

EFFECT OF DRY-CHILLING ON THE FLAVOR OF FRIED CHICKEN. K.K. Hale, Jr., W.J. Stadelman and V.D. Bramblett (Depts. of Animal Sci. and Home Econ., Agr. Exp. Station, Purdue Univ., Lafayette, Ind. 47907). *Poultry Sci.* 52, 253-62 (1973). Experiments were conducted to determine the effect of wet- and dry-chilling on fried chicken flavor as measured by a flavor panel and gas chromatographic analysis of the flavor volatiles. Dry chilling was shown to help produce a fried chicken product with a subtle but detectable flavor advantage over conventionally wet chilled poultry. Stepwise discriminant analysis of the gas chromatogram of the volatiles from wet and dry chilled fried chicken indicated that certain ratios from peak areas of the chromatogram quite readily allowed discrimination between the two groups.

MEASUREMENT OF FAST LATERAL DIFFUSION OF LIPIDS IN VESICLES AND IN BIOLOGICAL MEMBRANES BY ¹H NUCLEAR MAGNETIC RESONANCE. A.G. Lee, N.J.M. Birdsall and J.C. Metcalfe (Natl. Inst. for Med. Res., Mill Hill, London NW7, 1AA). *Biochemistry* 12, 1650-8 (1973). The proton spin-lattice relaxation times (T_1) for lecithin in deuteriomethanol are dominated by intramolecular motion. In contrast, the proton T_1 values of lecithin diluted in vesicles of the same lipid with perdeuterated chains show that intermolecular relaxation is important in the fully protonated bilayer. There are a number of possible molecular motions which could dominate this intermolecular relaxation. We have considered the relative rotational motion of close neighbors, oscillatory motions perpendicular to the surface of the vesicle, and lateral diffusion of the lipid molecules in the plane of the membrane. We conclude that lateral diffusion is the most plausible candidate for the intermolecular motion dominating the transverse relaxation (T_2), and on this assumption we calculate a self-diffusion coefficient for egg lecithin at 20°C of ca. 0.9×10^{-8} cm²/sec.

EFFECT OF DIETARY CARBOHYDRATE ON FATTY ACIDS IN THE R3230AC MAMMARY ADENOCARCINOMA. D. Zalenski and R. Hilf (Biochem. Dept., Univ. of Rochester Schl. of Med. and Dentistry, Rochester, N.Y. 14642). *Proc. Soc. Exp. Biol. Med.* 142, 1137-40 (1973). The R3230AC mammary carcinoma demonstrated an increase in free fatty acids and triglyceride levels in animals consuming a diet high in carbohydrate content. Examination of the fatty acid composition of the lipid fractions in the tumor revealed that the dietary response was due primarily to an increase in the levels of the shorter chain fatty acids, C₁₀ and C₁₂; fatty acids that are characteristic of mammary tissue.

PLASMA PROTEIN ESCAPE FROM THE INTESTINAL CIRCULATION TO THE LYMPHATICS DURING FAT ABSORPTION. A. Wollin and L.B. Jaques (Hemostasis-Thrombosis Res. Unit, Dept. of Physiol., College of Med., Univ. of Saskatchewan Saskatoon, Saskatchewan, Canada). *Proc. Soc. Exp. Biol. Med.* 142, 1114-7 (1973). An escape of plasma proteins labeled with Evans blue was observed in the small intestines of rats. Lymph was collected from an intestinal fistula and the rate of protein escape measured by the appearance of Evans blue. During feeding of olive oil the amount of Evans blue collected was much higher than when rats received glucose solution.

ANTICOAGULANT-RESISTANT RATS: POSSIBLE CONTROL BY THE USE OF THE CHLORO ANALOG OF VITAMIN K₁. J.W. Suttie (Dept. of Biochem., College of Agr. and Life Sci., Univ. of Wis., Madison, Wis. 53706). *Science* 180, 743-5 (1973). X-ray diffraction shows that chondroitin 6-sulfate and some further sulfated derivatives, can occur in two ordered structures in stretched films. Both structures contain single helices with similar projected disaccharide lengths (9.6 and 9.8 angstroms) but with very different turn angles between successive disaccharides (120 and 45 degrees). In contrast, coaxial double helices of hyaluronates and l-carrageenates have shorter projected disaccharide lengths (8.5 and 8.9 angstroms).

VITAMIN E-SELENIUM DEFICIENCY AND ITS INFLUENCE ON AVIAN MALARIAL INFECTION IN THE DUCK. J.T. Yarrington, C.K. Whitehair and R.M. Corwin (Depts. of Pathol. and Microbiol. and Public Health, Michigan State Univ., East Lansing, Mich. 48823). *J. Nutr.* 103, 231-41 (1973). The effect of feeding to ducklings a Torula yeast, cod-liver oil basal diet, deficient or supplemented with vitamin E and selenium, and its influence during acute avian malarial infection were determined in three experiments. Ducklings fed the basal, deficient diet developed clinical signs of deficiency in 9 days. Prominent clinical signs included poor growth and skeletal muscular weakness in ducklings fed the deficient diet and an anemia in malarious ducks, irrespective of their diet. The main lesions associated with the vitamin E-selenium-deficient diet were skeletal and smooth (gizzard and duodenum) muscle necrosis and myocarditis. Severe muscle lesions undergoing mineralization and extensive reparative processes were more apparent in muscles of malarious, deficient ducklings than of noninfected, deficient ones. A prominent lesion associated with malarial infection was necrotizing pancreatitis. For the duration of each experiment despite marked influences on other parameters, dietary vitamin E-selenium did not affect the death rate of acutely infected ducks.

GLYCERIDE LIPASES IN NERVE ENDINGS OF GUINEA-PIG BRAIN AND THEIR STIMULATION BY NORADRENALINE, 5-HYDROXYTRYPTAMINE AND ADRENALINE. O.S. Vyvoda and C.E. Rowe (Dept. of Biochem., Univ. of Birmingham, P.O. Box 363, Birmingham B15 2TT, U.K.). *Biochem. J.* 132, 233-48 (1973). Combined guinea-pig cortex and cerebellum was shown to contain triglyceride lipase, diglyceride lipase and monoglyceride lipase, which were assayed by the release of [¹⁴C] palmitate from [1-¹⁴C]palmitoylglycerol esters. Triglyceride lipase and diglyceride lipase were found in all particulate fractions. With osmotically ruptured synaptosomes the rates of release of palmitate from glyceryl tripalmitate and glyceryl dipalmitate were 7-25 μmol/h per g of protein and 0.18-0.69 mmol/h per g of protein respectively. The logarithm of the rate of hydrolysis of glyceryl monopalmitate increased linearly with the logarithm of protein concentration. The pH optima of triglyceride lipase and diglyceride lipase were between 7 and 8. The pH optimum for monoglyceride lipase was approximately 8.3. Triglyceride lipase and diglyceride lipase of osmotically ruptured synaptosomes were stimulated by noradrenaline, 5-hydroxytryptamine and adrenaline. Triglyceride lipase of isolated synaptic membranes was stimulated by 0.01-1 mM-noradrenaline. Aging of membranes at 0°C decreased activity, which could still be stimulated by noradrenaline. Diglyceride lipase of isolated membranes was stimulated by 1 μM-1 mM-noradrenaline. The activity of triglyceride lipase in isolated synaptic vesicles was diminished by 1 mM-5-hydroxytryptamine.

THE EFFECT OF THE LEVEL AND SOURCE AND OF A CHANGE OF SOURCE OF DIETARY FAT ON THE FATTY ACID COMPOSITION OF THE DEPOT FAT AND THE THIGH AND BREAST MEAT OF TURKEYS AS RELATED TO AGE. R.E. Salmon and J.B. O'Neil (Res. Station, Res. Branch, Canada Agr., Swift Current, Saskatchewan S9H 3X2, Canada). *Poultry Sci.* 52, 302-14 (1973). The fatty acids of abdominal depot fat and thigh and breast meat of turkeys fed 0, 2 and 11.4% palm oil or rapeseed oil from day-old to 24 weeks of age were strongly influenced by the level and source of dietary fat. Birds fed no added dietary fat deposited palmitic, palmitoleic, stearic and oleic acids in greater proportions than were provided in the diet. Increasing the level of fat in the diet resulted in the decomposition of fat that resembled the dietary fat in composition, the greatest similarity occurring at the higher level of added fat. Increasing levels of palmitoleic, stearic and oleic acids with age indicated an increasing rate of fatty acid biosynthesis as the birds approached maturity. Thigh meat contained a higher level of stearic acid than depot fat, and breast meat contained higher levels

SOUTHWESTERN

LABORATORIES

Fort Worth, Tex.

Analytical Chemists
Inspection & Testing
Engineers

Agricultural Products
Feeds—Seeds—Oils
& Related Products

817-332-5181, P.O. Box-1379, 2900 Cullen St., 76101

of stearic and arachidonic acids and fatty aldehydes than thigh meat. These differences reflected the greater proportions of phospholipids in thigh and breast meat, which were reflected also in decreased sensitivity of the meat lipids to changes in fatty acid composition in response to dietary fat. The average rate of change of fatty acid levels following a change of dietary fat at 16 weeks was such that half the total change in level took place in 2.4 weeks. The previously reported effects of dietary fat on carcass composition and quality are substantiated by the fatty acid data presented here.

THE PLASMA TRANSPORT AND METABOLISM OF RETINOIC ACID IN THE RAT. J.E. Smith, P.O. Milch, Yasutoshi Muto and D.S. Goodman (Dept. of Med., Columbia Univ. College of Physicians and Surgeons, New York, N.Y. 10032). *Biochem. J.* 132, 821-7 (1973). The transport of retinoic acid in plasma was examined in vitamin A-deficient rats maintained on small doses of radioactively labelled retinoic acid. After ultracentrifugation of serum adjusted to density 1.21, most of the radioactivity (83%) was associated with the proteins of density greater than 1.21, and not with the serum lipoproteins. Gel filtration of the labelled serum on Sephadex G-200 showed that the radioactive label was associated with protein in the molecular-weight range of serum albumin. These findings indicate that retinoic acid is transported in rat serum bound to serum albumin, and not by retinol-binding protein (the specific transport protein for plasma retinol). Most of the radioactive material was found in the carcass, rather than in the specific tissues analyzed. Two-thirds of the radioactivity in the carcass appeared to represent unchanged retinoic acid. Of the tissues examined, the liver, kidneys and intestine had relatively high concentrations of radioactive compounds, whereas the testes and fat-pads had the lowest concentrations.

CHANGES IN RAT LIVER PLASMA MEMBRANE PHOSPHOLIPIDS DURING AGING. M.S. Rubin, N.I. Swislocki and M. Sonenberg (Sloan-Kettering Inst. for Cancer Res., New York, N.Y. 10021). *Proc. Soc. Exp. Biol. Med.* 142, 1008-10 (1973). Phospholipid distribution in livers and liver plasma membrane preparations were determined on rats of various weights. Phosphatidyl ethanolamine levels decreased from 18% of liver membrane phospholipids in rats of 62 g to 12% of membrane phospholipid in rats of 500 g. No differences were apparent in other phospholipid classes.

ENERGY METABOLISM IN ATHEROSCLEROSIS-RESISTANT AND SUSCEPTIBLE PIGEONS. C.R. Olson and F. Young (Dept. of Food and Nutr. Sciences, Univ. Hawaii, Honolulu, Ha. 96822). *J. Nutr.* 103, 189-95 (1973). Energy metabolism in atherosclerosis-susceptible White Carneau (WC) and resistant Show Racer (SR) pigeons was investigated to ascertain if this could be the basis for the difference in susceptibility to aortic atherosclerosis. Two groups of 6-week-old pigeons from each breed were used, one as a baseline group (SRB, WCB) and the other as an experimental group (SRE, WCE). All groups were fed a basal diet. Two weeks after the basal diet had been fed, resting oxygen consumption of the two base-line groups (SRB, WCB) was measured, followed by a 1-week feeding of a low iodine diet. Though not significantly, WC also showed higher uptake of ^{131}I , greater food intake per 100g body weight, and lower energy expenditure for physical activity. The difference in susceptibility to the disease in these two breeds cannot be explained by the differences in thyroid activity. Food intake and physical activity levels may be closely related to the susceptibility to the disease.

THE INFLUENCE OF FEEDING ASCORBIC ACID AND SULFATE ON EGG PRODUCTION AND ON CHOLESTEROL CONTENT OF CERTAIN TISSUES OF THE HEN. C.F. Nockels (Dept. of Animal Sci., Colorado State Univ., Fort Collins, Colorado 80521). *Poultry Sci.* 52, 373-8 (1973). Continuously feeding 1333 ppm ascorbic acid to SCWL chicks resulted in delayed onset of egg production compared to controls. Ascorbate fed hens had increased ($P < 0.05$) percent liver lipids and decreased ($P < 0.05$) percent thigh muscle (semitendinosus) lipids compared to controls. Supplementing ascorbate fed hens with 1.0% sulfate decreased ($P < 0.05$) percent liver lipids relative to hens fed ascorbate. Sulfate ingestion by either ascorbate hens or controls reduced thigh cholesterol concentrations. While liver cholesterol levels were highest in ascorbate fed birds, their adipose tissue contained the least concentration. Control hens fed sulfate had the lowest liver cholesterol content and the highest adipose concentration of the different treatments. There is possibly a problem in liver lipid mobilization or tissue lipid uptake when ascorbic acid is ingested. Sulfate

feeding to control and ascorbate hens resulted in reduced muscle cholesterol compared to controls. Eggs were collected from individual ascorbate fed hens before and after 1.0% sulfate was included in their diet. Sulfate ingestion increased the total egg cholesterol significantly ($P < 0.05$). Ascorbic acid may have sulfated the cholesterol, which enhanced its mobilization from tissues such as muscle and promoted its excretion into the egg. Plasma cholesterol levels were not influenced by treatments.

BIOSYNTHESIS OF PHOSPHATIDYL ETHANOLAMINE AND PHOSPHATIDYL CHOLINE IN SPINACH LEAVES. M.O. Marshall and M. Kates (Dept. of Biochem., Univ. of Ottawa, Ottawa, Canada K1N 6N5). *FEBS Letters* 31, 199-202 (1973). Knowledge of the biosynthesis of nitrogenous phosphatides in plants is incomplete. On the basis of in vivo results with tomato root, Willemot and Boli suggested the biosynthesis of PE to occur by decarboxylation of PS, and PC by the pathway involving methylation of PE. The latter pathway has also been demonstrated in photosynthetic bacteria. Recently, Morré et al. have established the presence of the complete nucleotide pathway for PC biosynthesis in onion stem, while the work of Devor and Mudd together with that of Tanaka et al. strongly indicate the presence of this pathway in spinach leaves. Recent preliminary findings have suggested the occurrence of an analogous nucleotide pathway for PE biosynthesis in spinach leaves. In addition, biosynthesis of PE by exchange reactions is known to occur. We report here the results of studies on the existence of the above-mentioned pathways for the biosynthesis of PE and PC in spinach leaves.

TRIGLYCERIDE CLEARANCE DURING DIETS RICH IN CARBOHYDRATE OR FATS. P.J. Nestel and P.J. Barter (Dept. of Clin. Sci., The John Curtin Schl. of Med. Res., The Australian Natl. Univ., Canberra, ACT, Australia). *Amer. J. Clin. Nutr.* 26, 241-5 (1973). The effect of different diets on the removal of exogenous triglyceride was studied in eight subjects. Clearance rates of the fat emulsion, Intralipid, were measured from new steady-state triglyceride increments during constant infusions of the fat emulsion. Infusions were carried out after the subjects consumed diets rich in polyunsaturated fat, saturated fat or carbohydrate. Clearance rates were always faster with polyunsaturated than with saturated fat and could not be attributed merely to smaller triglyceride pools. With the carbohydrate studies, infusions were performed during glucose consumption and postabsorptively: the plasma triglyceride concentration was always higher in the postabsorptive phase, whereas the clearance of Intralipid was reduced. During glucose absorption, clearance of Intralipid increased. These studies show that dietary changes influence the removal of large fat particles and may help to explain differences in endogenous triglyceride concentrations with different diets.

THE EFFECT OF ALTERATIONS IN FATTY ACID COMPOSITION AND CHOLESTEROL CONTENT ON THE NONELECTROLYTE PERMEABILITY OF ACHOLEPLASMA LAIDLAWII B CELLS AND DERIVED LIPOSOMES. R.N. Meelhaney, J. De Gier and E.C.M. Van Der Neut-kok (Dept. of Biochem., Univ. of Alberta, Edmonton, Alberta, T6G 2E1, Canada). *Biochim. Biophys. Acta* 298, 500-12 (1973). The fatty acid composition and cholesterol content of the membrane lipids of *Acholeplasma laidlawii* B were systematically altered and the rates at which glycerol and erythritol passively diffuse into intact cells and into liposomes prepared from the total membrane lipid were measured at a variety of temperatures. The mean activation energy values calculated for the permeation of glycerol and erythritol into intact cells are 18.2 and 21.3 kcal/mole, respectively. In contrast to permeation rates, which are dependent on both permeant structure and membrane lipid composition, activation energy values for the overall permeation process are dependent only on permeant structure and are not significantly affected by variations in fatty acid composition or cholesterol content. The permeability of intact cells and derived lipo-

IR, UV, AA SPECTROSCOPY, GAS CHROMATOGRAPHY
SPECIALIZING IN ANALYSES OF FATS AND OILS



JERSEY ANALYTICAL SERVICE, INC.

3 MAPLE AVENUE
ANDOVER, N.J. 07821

TEL: (201) 786-6191

comes is a function of the fluidity of the membrane lipids as measured by their reversible, thermotropic gel to liquid-crystalline phase transition temperatures. Cells or liposomes placed in isotonic permeant solutions undergo spontaneous lysis when the temperature is reduced to the point where most of the membrane lipids exist in the gel state.

REGULATION BY CYTIDINE NUCLEOTIDES OF THE ACYLATION OF *sn*-[¹⁴C]GLYCEROL 3-PHOSPHATE. REGIONAL AND SUBCELLULAR DISTRIBUTION OF THE ENZYMES RESPONSIBLE FOR PHOSPHATIDIC ACID SYNTHESIS DE NOVO IN THE CENTRAL NERVOUS SYSTEM OF THE RAT. F. Passmayer, B. Meiners, and J.B. Mudd (Dept. of Biochem. and Air Pollution Res. Center, Univ. of Cal., Riverside, Cal. 92502). *Biochem. J.* 132, 381-94 (1973). The regional and subcellular distribution of the incorporation of *sn*-[¹⁴C]glycerol 3-phosphate into rat brain lipids in vitro was investigated and compared with the relative specific activity of various chemical and enzyme markers. The similarity between the subcellular distribution of this incorporation and of NADPH-cytochrome *c* reductase activity indicated that the synthesis of phosphatidic acid via this route correlated with the presence of endoplasmic reticulum. Experiments in which various amounts of the microsomal fraction were added to fixed amounts of nuclear, myelin, nerve-ending and mitochondrial preparations clearly demonstrated that the endoplasmic-reticulum contamination of these fractions was entirely responsible for the incorporation of *sn*-[¹⁴C]glycerol 3-phosphate. These results indicate that the various organelles of the central nervous system are more dependent on endoplasmic reticulum for the production of glycerolipids de novo than has previously been appreciated.

INTERACTION OF AN APOLIPOPROTEIN (ApoLP-ALANINE) WITH PHOSPHATIDYLCHOLINE. J.D. Morrisett, J.S.K. David, H.J. Pownall and A.M. Gotto, Jr. (Depts. of Med. and Biochem., The Methodist Hospital, Baylor College of Med., Houston, Tex. 77025). *Biochemistry* 12, 1290-9 (1973). The apolipoprotein containing C-terminal alanine (apoLP-Ala) from very low density lipoprotein and phosphatidylcholine were used as a prototype to study lipid-protein interactions in human plasma lipoproteins. ApoLP-Ala strongly inhibited the reactivation of delipidated mitochondrial β -hydroxybutyrate dehydrogenase, an enzyme which requires phosphatidylcholine for biological activity. These studies indicate that apoLP-Ala can bind up to a saturating level of 50-80 phosphatidylcholine molecules. The binding of phosphatidylcholine induces a shift from a disordered to a helical secondary structure and shifts one or more of the three tryptophan residues from a more polar to a more hydrophobic environment. These results show that highly lipidated species of apoLP-Ala may be formed which can be partially dissociated at high salt concentrations and suggest that ionic associations of lipid and apolipoproteins may play at least a minor role in the formation of plasma lipoprotein complexes. Our experiments are discussed in terms of their relationship to possible lipid-protein interactions in membranes.

THE RELATIONSHIP BETWEEN PALMITOYL-COENZYME A SYNTHETASE ACTIVITY AND ESTERIFICATION OF *sn*-GLYCEROL 3-PHOSPHATE IN RAT LIVER MITOCHONDRIA. M. Sánchez, D.G. Nicholls and D.N. Brindley (Dept. of Biochem., Univ. of Nottingham Med. Schl., Nottingham NG7 2RD, U.K.). *Biochem. J.* 132, 697-706 (1973). The specific activities for palmitoyl-CoA synthetase and for *sn*-glycerol 3-phosphate esterification, with palmitoyl-CoA generated either by the endogenous synthetase or from palmitoyl(-)-carnitine, CoA and excess of carnitine palmitoyltransferase, were measured with rat liver mitochondria. The mean specific activity of palmitoyl-CoA synthetase was approximately five- and seven-fold the rates of *sn*-glycerol 3-phosphate esterification from palmitate and palmitoyl(-)-carnitine respectively. No significant correlation was found in different rats between the activities of palmitoyl-CoA synthetase and *sn*-glycerol 3-phosphate esterification from either acyl precursor. However, there was a significant correlation ($r = 0.83$, $P < 0.001$) between the rates of glycerolipid synthesis from palmitate and palmitoyl(-)-carnitine. It is concluded that in the presence of optimum substrate concentrations the activity of *sn*-glycerol 3-phosphate acyltransferase and not of palmitoyl-CoA synthetase is rate-limiting in the synthesis of phosphatidate and lysophosphatidate in isolated rat liver mitochondria.

INDUCTION BY DIMETHYLHYDRAZINE OF INTESTINAL CARCINOMA IN NORMAL RATS AND RATS FED HIGH OR LOW LEVELS OF VITAMIN A. A.E. Rogers, B.J. Herndon and P.M. Newberne (Dept.

of Nutr. and Food Sci., Mass. Inst. of Tech., Cambridge, Mass. 02139). *Cancer Res.* 33, 1003-9 (1973). Induction of intestinal tumors by intragastric administration of 1,2-dimethylhydrazine (DMH) was studied in rats fed a semi-synthetic diet containing either high, adequate or low levels of vitamin A. Sixty to 100% of the treated rats had intestinal carcinoma 6 months after administration of the first dose of DMH. Total doses in amounts ranging from 195 to 420 mg/kg did not affect tumor incidence; however, rats given the largest total dose in the largest individual doses (30 mg/kg) developed more tumors in the colon than in other sites. Tumors were polypoid or intramural adenocarcinomas, of which a variable number produced mucus. In many cases they caused passage of bloody stools, intestinal obstruction and/or intussusception. Tumor incidence and morphology were in all ways comparable to those reported in studies in which DMH was administered s.c. A high level of vitamin A in the diet (sufficient to raise the vitamin content in the serum and liver and reduce growth) did not change the incidence of colon tumors but decreased the number of tumors per rat at the highest DMH dose. Chronic dietary deficiency of vitamin A increased the incidence of tumors slightly and may have reduced induction time.

CHARACTERIZATION OF AN OBESE SYNDROME IN THE PIG. R.J. Martin, J.L. Gobble, T.H. Hartsock, H.B. Graves and J.H. Ziegler (Dept. of Animal Sci. and Dept. of Poultry Sci., Penn. State Univ., University Park, Pa. 16802). *Proc. Soc. Exp. Biol. Med.* 143, 198-203 (1973). Metabolic abnormalities associated with obesity were studied with two strains of pigs possessing varying propensities for lipid and protein deposition. The lean strain has a subcutaneous fat thickness of 2.8 cm and the obese strain, 8.0 cm. Adipose tissue enzymes associated with lipogenesis were elevated severalfold in the obese pig. The same enzymes in the liver were not altered. Gluconeogenic enzymes were elevated in the obese pig indicating a shift in the metabolism of amino acids. Enzymatic response to fasting and refeeding appears to be more dynamic in the lean type pig.

THE USE OF NEUTRALIZED SOYBEAN OIL SOAPSTOCK FOR BROILERS. H. Menge and R.E. Beal (Nutr. Inst., ARS, U.S. Dept. of Agr., Beltsville, Md. 20705). *Poultry Sci.* 52, 219-22 (1973). Comparative broiler feeding experiments were conducted with a neutralized, dried soybean soapstock (NDSS) and an animal and vegetable commercial feed fat (CFF) fed at 4% of diet. In the first experiment, four replicates of 20 chicks each were fed the CFF and four replicates of 20 chicks each were given the same type of diet in which NDSS was substituted for the CFF. This format was repeated in the second experiment. The results of both experiments showed no significant differences in body weights or feed conversion between the groups fed either the NDSS or the CFF. No differences in rate of mortality were observed with either treatment. NDSS produced a shank pigmentation score significantly greater than that obtained with feeding CFF. These results demonstrate that NDSS can be used successfully in broiler feeds as a source of energy and a pigmenter. The production of NDSS does not present a problem of waste disposal.

THE ROLE OF MEMBRANE PHOSPHOLIPIDS IN THE INTERACTION OF RIBOSOMES WITH ENDOPLASMIC RETICULUM MEMBRANE. S. Jothy, S. Tay and H. Simpkins (Lady Davis Inst. for Med. Res. of the Jewish General Hosp., Montreal 249, Quebec, Canada). *Biochem. J.* 132, 637-40 (1973). It is shown that the ionic head groups of the membrane phospholipids cannot be solely responsible for the attachment of the ribosome and that other membrane components must also be involved in the binding process.

INFLUENCE OF ELECTRON TRANSPORT ON THE INTERACTION BETWEEN MEMBRANE LIPIDS AND TRITON X-100 IN HALOBACTERIUM CUTIRUBRUM. J.K. Lanyi (Biol. Adaptation Branch, NASA, Ames Res. Center, Moffett Field, Calif. 94035). *Biochemistry* 12, 1433-8 (1973). Earlier results showed that respiring *H. cutirubrum* cells were resistant to Triton X-100 treatment but respiration-inhibited cells could be lysed readily. In this study, the kinetics of turbidity decrease, the appearance of menadione reductase activity, an enzyme that marks the interior surface of the cell membrane, the release of various intracellular constituents, and the shift in the bacterioruberin absorption spectrum, which indicates the association of this pigment and presumably other membrane lipids with Triton X-100, were followed after adding the detergent to potassium cyanide inhibited and respiring cells.

The results indicate that respiring cells lose the integrity of their cell envelope, but, unlike the inhibited cells, resist the penetration of Triton into the membrane lipid phase. The maintenance of respiring cell envelopes in the presence of the detergent is apparently a consequence of this resistance to perturbation.

STRUCTURE OF THE LIPID PHASE IN CELL ENVELOPE VESICLES FROM HALOBACTERIUM CUTIRUBRUM. A.F. Esser and J.K. Lanyi (Biol. Adaptation Branch, Ames Res. Center, Natl. Aeronautics and Space Admin., Moffett Field, Cal. 94035). *Biochemistry* 12, 1933-9 (1973). The flexibility of the lipids in *H. cutirubrum* cell envelope vesicles and extracted lipid dispersions was investigated with the spin-label method using fatty acid derivatives of the general formula $\text{CH}_3(\text{CH}_2)_m\text{-CR}(\text{CH}_2)_n\text{COOH}$ ($\text{R} = \text{N-oxy-1',4',4'-dimethylloxazolidine}$) as probes. These observations suggest that in *H. cutirubrum* cell envelopes the membrane proteins cause all but a narrow center portion of the lipid bilayer to become more ordered. Since the estimated lipid content of these membranes (lipid: protein ratio < 0.2) is relatively low, it is possible that such immobilization is due to the existence of a protein matrix in the membrane.

THE METABOLIZABLE ENERGY CONTENT OF RAPESEED OILS AND RAPESEED OIL FOOTS AND THE EFFECT OF BLENDING WITH OTHER FATS. S.P. Lall and S.J. Slinger (Dept. of Nutr., Univ. of Guelph, Guelph, Ontario, Canada). *Poultry Sci.* 52, 143-51 (1973). Experiments were carried out with chicks and turkey poults to determine the metabolizable energy content of rapeseed oils and rapeseed oil foots and the effect on energy utilization of blending these oils with tallow and mixtures of saturated fatty acids. Chicks fed mixtures made up chiefly of palmitic and stearic acids, along with rapeseed oil or rapeseed foots, demonstrated similar synergism in fat utilization to those fed tallow with rapeseed oil. These results confirm and extend previous findings indicating that rapeseed oil is imbalanced in fatty acid make-up for maximum absorption, being too low in the long chain saturated fatty acids, palmitic and stearic. While synergism in energy utilization was also demonstrated when low erucic acid oil was mixed with tallow, the effect was less than with regular *Brassica campestris* oil. This is probably explained by the fact that the low erucic acid oil is better utilized when fed alone than the regular rapeseed oil.

HYPERTRIGLYCERIDEMIA IN CHRONIC NONNEPHROTIC RENAL FAILURE. R.A. Gutman, A. Uy, R.J. Shalhoub, A.D. Wade, J.M.B. O'Connell and L. Recant (Vet. Admin. Hosp., Washington, D.C.). *Amer. J. Clin. Nutr.* 26, 165-72 (1973). Elevated plasma triglyceride (TG) levels were present in 11 out of 14 undialyzed (U) patients and 17 out of 25 hemodialyzed (H) uremic patients with chronic nonnephrotic renal failure (CRF). Plasma postheparin lipolytic activity (PHLA) was strikingly reduced in 21 out of 22 patients examined in the CRF groups under study. After hemodialysis, TG fell to normal simultaneously with a significant increase in PHLA. TG and PHLA returned to predialysis values 12 to 36 hr after hemodialysis. The role of heparin was investigated. Our data indicate that in CRF, a quantitatively subnormal PHLA response to heparin exists and that abnormal TG clearance mechanisms may play a major role in CRF hypertriglyceridemia. In addition, sufficient caloric intake and a good nutritional status resulting in adequate TG synthesis seem to be necessary for the hypertriglyceridemia to be evident.

ADIPOSE-TISSUE LIPOPROTEIN LIPASE ACTIVITY AND CELLULARITY IN THE GENETICALLY OBESE ZUCKER RAT (FA/FA). P. de Gasquet and E. Peignot, D. Lemonnier and A. Alexiu (Unite d'Etudes de Recherches Dietetiques, Inst. Natl. de la Sante et de la Nutrition, Hosp. Bichat, 170 Boulevard Ney, 75018 Paris, France). *Biochem. J.* 132, 633-5 (1973). The lipoprotein lipase activity per adipocyte was increased in the genetically obese rat (fa/fa). However, there was no difference between obese and lean animals when the enzyme activities were related to adipocyte surface area. The possible implications of the findings are discussed.

INSULIN AND THE REGULATION OF ADIPOSE TISSUE ACETYL-COENZYME A CARBOXYLASE. A.P. Halestrap and R.M. Denton (Dept. of Biochem., Univ. of Bristol, Bristol BS8 1TD, U.K.). *Biochem. J.* 132, 509-17 (1973). Rat epididymal fat-pads were incubated for 30 min with glucose (2 mg/ml) in the presence or absence of insulin. A twofold or greater increase in acetyl-CoA carboxylase activity was observed in extracts from insulin-treated tissue provided that assays were performed

rapidly after extraction. This effect of insulin was evident whether or not extracts were prepared with albumin, and was not noticeably diminished by the presence of citrate or albumin or both in the assay. Incubation of extracts before assay led to activation of acetyl-CoA carboxylase and a marked diminution in the insulin effect. The enzyme in extracts was very sensitive to reversible inhibition by palmitoyl-CoA even in the presence of albumin (10 mg/ml); inhibition persisted on dilution of enzyme and inhibitor. It is suggested that the observed activation of acetyl-CoA carboxylase by insulin may reflect changes in enzyme activity in the fat cell resulting from the reduction of long-chain fatty-acyl-CoA that occurs in the presence of insulin. Activation of the enzyme with loss of the insulin effect on incubation of the extracts may be due to the slow dissociation of long-chain fatty acyl-CoA from the enzyme.

DIFFUSION STUDIES ON PHOSPHATIDYLCHOLINE VESICLES. C. Huang and L. Lee (Dept. of Biochem., Univ. of Virginia Schl. of Med., Charlottesville, Va. 22901). *J. Amer. Chem. Soc.* 95, 234-9 (1973). Diffusion measurements of homogeneous phosphatidylcholine vesicles in 0.1 M KCl-0.01 M Tris-11.5% D₂O, pH 8.0, have been carried out at 20C in the ultracentrifuge. Since the apparent specific volume of phosphatidylcholine vesicles is nearly equal to the reciprocal of the density of this medium, no appreciable sedimentation occurs during the high speed experiment. Consequently the measurement of diffusion coefficients of the lipid system in the ultracentrifuge at high speed is virtually identical with that of the free diffusion experiments performed in the stationary diffusion apparatus. Procedures are described in detail for calculating the diffusion coefficient from Rayleigh interference data. The averaged diffusion coefficient is $2.03 \pm 0.04 \times 10^{-7} \text{ cm}^2\text{sec}^{-1}$.

FACTORS INFLUENCING THE LIVER FAT CONTENT OF LAYING HENS. C.A. Ivy and M.C. Nesheim (Dept. of Poultry Sci., Cornell Univ., Ithaca, N.Y. 14850). *Poultry Sci.* 52, 281-91 (1973). An incidence of mortality from hemorrhage in fatty livers of Cornell experimental flocks is described. Hens fed diets varying in energy or protein content showed a wide range in liver fat content when sampled at various times during the laying year. The ability of individual hens to adjust to changes in energy concentration of the diet was not correlated with liver fat content. In hens fed specific diets, liver fat was not correlated with energy intake or rate of egg production. Feeding a low energy diet for 21 days caused a reduction in liver fat, compared to that in hens fed a control diet. However, when the hens were returned to the control diet, liver fat quickly returned to the level found in hens fed the control diet continuously. When hens were force fed 10% more feed than ad libitum controls consumed, marked increases in liver size and fat content occurred, but no mortality was observed from liver hemorrhages. Fatty livers had a higher content of neutral lipid, mainly triglyceride, than livers lower in fat. The content of oleic acid increased and linoleic acid decreased as liver fat increased. This suggests that fatty acid biosynthesis is the major source of the lipid in fatty livers. These studies showed that liver fat content of hens is variable and that high levels of liver fat are not necessarily detrimental to laying performance. Hemorrhages from fatty livers may be related to other factors than liver fat content.

THE INFLUENCE OF HIGH-FAT DIETS ON ESTROUS CYCLES, SPERM PRODUCTION AND FERTILITY OF RATS. S. Innami, M.G. Yang, O. Mickelsen and H.D. Hafs (Food Sci. and Human Nutr. Dept., Mich. State Univ., East Lansing, Mich. 48823). *Proc. Soc. Exp. Biol. Med.* 143, 63-68 (1973). The estrous cycle lengths of rats fed high-fat diets (ad libitum or restricted), a grain diet or a low-fat diet were determined in two long-term studies. In the first experiment, with a 40% fat diet, the rats had prolonged estrous cycles beginning at 37-40 weeks of age caused primarily by a prolongation of diestrus. During the early stages of feeding the high-fat diet did not prolong the estrous cycles. In the second experiment, the diet contained 60% fat and the prolongation of diestrus occurred at 23-27 weeks of age. In male rats, however, high fat diets from weanling to 11 weeks of age did not affect fertility or sperm production.

A COMPLEX OF CYTOCHROME C AND MIXED MITOCHONDRIAL PHOSPHOLIPIDS. K.M. Ivanetich, J.J. Henderson and L.S. Kaminsky (Dept. of Phys. and Med. Biochem., Univ. of Cape Town Med. Schl., Cape Town, South Africa). *Biochemistry* 12, 1822-8 (1973). The interaction of cytochrome c with

mixed heart mitochondrial phospholipids has been studied as a model for cytochrome *c* in vivo. Under the conditions of our experiments, cytochrome *c* forms a complex with mixed phospholipids which is insoluble in water but can be solubilized with sodium deoxycholate. There is no preferential binding of any component of the phospholipid mixture by cytochrome *c*. The complex has an uncorrected sedimentation coefficient of 0.1 S in deoxycholate and is essentially homogeneous on ultracentrifugation and electrophoresis. Phosphorus analysis of the complex indicates that there are approximately 42 molecules of phospholipid per molecule of cytochrome *c*. The 695-nm absorbance band of ferricytochrome *c* is retained in the complex indicating the integrity of the methionine-80-heme iron bond. Compared to cytochrome *c* the complex is stabilized against thermal denaturation in deoxycholate solution, monitored by the 695-nm absorbance band. The complex and cytochrome *c* display similar susceptibility to denaturation under conditions of high pH. There is a close correlation between solvents which extract cytochrome *c* from mitochondria and those which solubilize the complex. These results indicate the applicability of the cytochrome *c*-phospholipid complex as a model for cytochrome *c* in the mitochondrion.

1 α -HYDROXY DERIVATIVE OF VITAMIN D₃: A HIGHLY POTENT ANALOG OF 1 α ,25-DIHYDROXY-VITAMIN D₃. M.F. Holick, E.J. Semmler, H.K. Schnoes and H.F. DeLuca (Dept. of Biochem., College of Agr. and Life Sciences, Univ. of Wisconsin, Madison, Wis. 53706). *Science* 180, 190-1 (1973). The 1 α -hydroxy derivative of vitamin D₃ has been chemically synthesized and tested for its biological activity. This analog has comparable biological activity on a weight basis to 1,25-dihydroxy-vitamin D₃ in the stimulation of intestinal calcium transport and bone calcium mobilization in normal and anephric rats. Because the 1 α -hydroxy derivative is synthesized from cholesterol, it is easier and less expensive to prepare than 1 α ,25-dihydroxy derivative, making it attractive as a drug in the treatment of renal osteodystrophy and hypoparathyroidism.

HYDROLYSIS OF CERAMIDE TRIHEXOSIDE BY A SPECIFIC α -GALACTOSIDASE FROM HUMAN LIVER. M.W. Ho (Dept. of Biochem., Queen Elizabeth College, Univ. of London, Campden Hill, London W8 7AH, U.K.). *Biochem. J.* 133, 1-10 (1973). Partially purified ceramide trihexoside α -galactosidase from human liver was studied by using ceramide trihexoside specifically tritiated in the terminal galactose. The hydrolysis of ceramide trihexoside was absolutely dependent on a mixture of sodium taurocholate and Triton X-100 and was markedly inhibited by human serum albumin and by NaCl. The Lineweaver-Burk plot for ceramide trihexoside hydrolysis was upward curving. Ceramide lactoside inhibited hydrolysis of all concentrations of ceramide trihexoside. Ceramide digalactoside stimulated hydrolysis of low concentrations of ceramide trihexoside, but inhibited hydrolysis of high concentrations of the lipid. α -Galactosidase activity assayed with the synthetic substrate 4-methylumbelliferyl α -D-galactopyranoside fractionated together with activity assayed with the natural substrate ceramide trihexoside. Both activities had identical heat-inactivation kinetics. Characteristics of the hydrolysis of the synthetic substrate differed considerably from those of the natural substrate, including pH optimum, shape of the Lineweaver-Burk plot, and differential effects of inhibitors and activators. Mutual inhibition of hydrolysis between the synthetic and natural substrates was predominantly non-competitive. These results are discussed in the light of special problems involved in the hydrolysis of lipids in an aqueous milieu.

MODEL STUDIES ON THE EFFECTS OF NEUTRAL SALTS ON THE CONFORMATIONAL STABILITY OF BIOLOGICAL MACROMOLECULES. III. SOLUBILITY OF FATTY ACID AMIDES IN IONIC SOLUTIONS. A. Hamabata, S. Chang and P.H. Von Hippel (Inst. of Molec. Biol. and the Dept. of Chem., Univ. of Oregon, Eugene, Ore. 97403). *Biochemistry* 12, 1271-8 (1973). The solubilities of *n*-hexanamide, *n*-pentanamide and *n*-butyramide in aqueous salt solutions are measured at several temperatures as a function of NaClO₄ and NaCl concentrations (these salts representing, respectively, a strongly destabilizing and an essentially "inert" perturbant of macromolecular stability). NaCl is found to be a more effective salting-out agent than NaClO₄ for all these amides, and thermodynamic parameters are derived for the transfer of each of these amides (at infinite dilution) from water to 1 M NaClO₄ or NaCl solutions. The free energy of transfer of a methylene group not directly adjacent to the amide dipole is shown to be a constant for each of these salt systems, corresponding to a free energy

of transfer from water to 1 M NaClO₄ of $\sim +60$ cal/mol of CH₂, and a free energy of transfer from water to 1 M NaCl of $\sim +100$ cal/mol of CH₂. These values are approximately independent of temperature. Estimates are made for the (negative) free energy of transfer of an amide group from water to 1 M salt, and used to demonstrate that the average residue transferred from the interior of an average protein in a macromolecular unfolding process may be represented by a peptide group and ~ 2 methylene units. It is also shown that *n*-hexanamide and perhaps *n*-pentanamide can be induced to form micelles at elevated temperatures and NaClO₄ concentrations.

IV. PROPERTIES OF FATTY ACID AMIDE MICELLES. *Ibid.*, 1278-82. The anomalous alterations in the rate of change of the solubility of *n*-hexanamide with temperature in water and aqueous salt solutions, which were observed previously, are shown to be due to the onset of micelle formation in this system. The fact that micellar aggregates of fairly discrete size are being established at the cmc is confirmed by preliminary sedimentation velocity experiments. It is shown that $k_{s,cmc}$ is equivalent to the salting-out coefficients (K_s) obtained from solubility data in preceding articles, and free energies of transfer from water to 1 M salt solutions are calculated from the $k_{s,cmc}$ data. These values correspond to the net effect of the transfer of that portion of the hexanamide monomer which changes microenvironments in going from the free monomer to the micellar state, and the data obtained are compared with free energies of transfer measured on the same groups in macroscopic systems. The results are used to interpret micelle structure and to illustrate some of the ambiguities which accompany the notions of "interior," "exterior" and "surface" on the macromolecular size scale.

COFACTOR ACTIVITY OF PROTEIN COMPONENTS OF HUMAN VERY LOW DENSITY LIPOPROTEINS IN THE HYDROLYSIS OF TRIGLYCERIDES BY LIPOPROTEIN LIPASE FROM DIFFERENT SOURCES. R.J. Havel, C.J. Fielding, T. Olivecrona, V.G. Shore, P.E. Fielding and T. Egelrud (Cardiovascular Res. Inst. and Dept. of Med., Univ. of Cal., San Francisco, Cal.). *Biochemistry* 12, 1828-33 (1973). The protein component of very low density lipoproteins of human plasma with carboxyl-terminal glutamic acid was a potent activator of the hydrolysis of triglycerides in a lecithin-stabilized emulsion by highly purified lipoprotein lipase from human and rat post-heparin plasma and cows' milk, and by crude preparations of the enzyme from cows' milk and rat adipose tissue. The protein components with carboxyl-terminal serine and alanine also had slight but detectable activity with enzyme preparations from all sources, except that purified from milk. Of three subfractions of the component with carboxyl-terminal alanine, one caused greater stimulation of lipoprotein lipase than the others. This difference could not be attributed to contamination of the former with the component with carboxyl-terminal glutamic acid.

EFFECT OF CHOLESTYRAMINE ON FECAL BILE SALT EXCRETION IN RATS FED DIETS CONTAINING MEDIUM-CHAIN TRIGLYCERIDES OR CORN OIL. L.M. Hagerman and D.L. Schneider (Dept. of Nutritional Res., Mead Johnson Res. Center, Evansville, Ind. 47721). *Proc. Soc. Exp. Biol. Med.* 143, 93-6 (1973). Rats were fed diets containing medium-chain triglycerides or corn oil and graded levels of cholestyramine to determine if fatty acid competition influences resin bile salt binding ability. When low levels of the resin were fed, MCT promoted a higher rate of bile salt excretion than did corn oil. With higher levels of resin, bile salt excretion apparently was limited by hepatic capacity for bile salt synthesis; animals fed corn oil had higher rates of bile salt excretion than those fed MCT. Rats fed dietary MCT had relatively greater amounts of taurine-conjugated bile salts in the duodenal bile than did rats fed dietary corn oil. Cholestyramine affected the bile salt composition of bile by increasing the relative amounts of glycine-trihydroxy bile salt, and decreasing the relative amounts of taurine-dihydroxy bile salt in the bile.

NATURAL ABUNDANCE CARBON-13 NUCLEAR MAGNETIC RESONANCE SPECTRA OF HUMAN SERUM LIPOPROTEINS. J.A. Hamilton, C. Talkowski, E. Williams, E.M. Avila, A. Allerhand, E.H. Cordes and G. Camejo (Dept. of Chem., Indiana Univ., Bloomington, Ind. 47401). *Science* 180, 193-5 (1973). Human serum lipoproteins have been studied by Fourier transform nuclear magnetic resonance of carbon-13 in natural abundance. Spectra of high-density, low-density and very-low-density lipoproteins were recorded and partly assigned. The prominent features of these spectra reflect the qualitative and quantitative com-

position of the lipid moiety of these complexes. The results suggest that carbon-13 nuclear magnetic resonance will be a useful technique for studies of the structural and dynamic parameters of lipoproteins.

IN VITRO BINDING OF MIXED MICELLAR SOLUTIONS OF FATTY ACIDS AND BILE SALTS BY CHOLESTYRAMINE. L.M. Hagerman, D.A. Julow and D.L. Schneider (Dept. of Nutritional Res., Mead Johnson Res. Center, Evansville, Ind. 47721). *Proc. Soc. Exp. Biol. Med.* 143, 89-92 (1973). When cholestyramine was incubated with pure bile salts in isotonic saline, it preferentially bound taurine-conjugated bile salts and dihydroxy bile salts as compared with the respective glycine conjugates and trihydroxy bile salts. Addition of fatty acids to the incubation mixtures resulted in decreased binding of each bile salt, an effect directly related to concentration of fatty acid. Medium-chain fatty acids had relatively little effect on binding, whereas the longer chain fatty acids markedly depressed binding of each of four pure conjugated bile salts in isotonic saline and of naturally occurring mixed bile salts in swine bile.

CHARGE HETEROGENEITY OF HUMAN LOW DENSITY LIPOPROTEIN (LDL). S. Ghosh, M.K. Basu and J.S. Schweppe (Dept. of Biochem., Northwestern Univ. Med. Schl. and Dept. of Med., Northwestern Memorial Hosp., Wesley Pavilion, Chicago, Ill. 60611). *Proc. Soc. Exp. Biol. Med.* 142, 1322-5 (1973). Plasma samples were obtained from patients with known history of atherosclerosis as well as from a group of Bantus of South Africa and a group of medical students without any history of atherosclerotic vascular disease. The isoelectric point (IEP) of LDL of the different persons was determined by electrophoresis in agarose gel at different pH values. The IEP of the LDL of the students or of the Bantus, were fairly constant at pH 5.28; for the patients the IEP varied widely. The IEP of LDL from hypercholesteremic persons (Fredrickson type II) showed consistently a significantly higher IEP than for the controls. Electrophoretic mobility of the different samples of LDL was determined at pH 6.8 at different ionic strengths using NaCl or CaCl₂. The effect of ionic strength (using NaCl) on the mobility was different for LDL isolated from different persons. Low concentrations of CaCl₂ reverse the charge of lipoprotein from a negative to a positive one at pH 6.8. The drastic effect of Ca²⁺ on the net charge of LDL at pH 6.8, possibly due to the exposed phospholipid groups of LDL, shows that this ion may be important in the interaction between the lipoprotein and the mucopolysaccharides; such an interaction has been suggested by other workers as occurring in the arterial wall.

THE EFFECT OF CARBON MONOXIDE ON THE NATURE OF THE ACCUMULATED 4,4-DIMETHYL STEROL PRECURSORS OF CHOLESTEROL DURING ITS BIOSYNTHESIS FROM [2-¹⁴C]MEVALONIC ACID IN VITRO. G.F. Gibbons and K.A. Mitropoulos (Med. Res. Council Lipid Metabolism Unit, Hammersmith Hosp., London W12 0HS, U.K.). *Biochem. J.* 132, 439-48 (1973). Cholesterol biosynthesis was studied in rat liver subcellular fractions incubated with DL-[2-¹⁴C]mevalonic acid under gas phases consisting of either N₂ + O₂ (90:10) or CO + O₂ (90:10). CO inhibits cholesterol biosynthesis from [2-¹⁴C]mevalonic acid and results in a large accumulation of radioactive 4,4-dimethyl sterols. Separation of the components of the 4,4-dimethyl sterol fraction showed that lanosterol and dihydrolanosterol are the major components that accumulate during cholesterol biosynthesis in an atmosphere containing CO, whereas 14-dimethyl-lanosterol and 14-demethyl-dihydrolanosterol are the major components of the much less intensely radioactive 4,4-dimethyl sterol fraction isolated from incubations with N₂ + O₂ as the gas phase. The relative amounts of 4,4-dimethyl- Δ^3 -sterols and 4,4-dimethyl-24,25-dihydrosterols present in each type of incubation suggest that enzymic reduction of the sterol side chain occurs predominantly at a stage after that of lanosterol.

CONTROL OF OVARIAN CHOLESTEROL ESTER BIOSYNTHESIS. A.P.F. Flint, D.L. Grinwich and D.T. Armstrong (Depts. of Physiol. and of Obstetrics and Gynaecology, Health Sci. Centre, Univ. of Western Ontario, London, Ont., Canada). *Biochem. J.* 132, 313-21 (1973). Experimental evidence is presented for a role of progesterone and 20 α -hydroxypregn-4-en-3-one as inhibitors of cholesterol ester synthetase in the acute depletion of ovarian cholesterol ester after trophic stimulation. The results are discussed with reference to the acute control of cholesterol ester concentrations in the ovary and adrenal cortex.

DEVELOPMENT OF RENAL GLUCONEOGENESIS IN CHICKS FED HIGH FAT AND HIGH PROTEIN "CARBOHYDRATE-FREE" DIETS. R.M. Evans and R.W. Scholz (Dept. of Vet. Sci., The Penn. State Univ., University Park, Penn. 16802). *J. Nutr.* 103, 242-50 (1973). The activities of selected liver and kidney enzymes associated with gluconeogenesis and the capacity of kidney slices to form glucose from glycerol and pyruvate were studied in developing chick embryos and in hatched chicks during adaptation to high fat (HF) and high protein (HP) "carbohydrate-free" diets. Although the specific pattern of development for each enzyme differed, the activities of phosphoenolpyruvate carboxykinase (PEPCK), glycerol kinase (GK) and L-glycerol-3-phosphate dehydrogenase (GPDH) were higher in embryonic liver than kidney from 13 days of incubation to hatching. Xanthine dehydrogenase (XDH) activity was higher in embryonic kidney than liver. The data suggest that renal gluconeogenesis from pyruvate, and hence from gluconeogenic amino acids, may be of greater relative significance than glucose formation from glycerol.

SILICA UROLITHIASIS IN DOGS FED AN ATHEROGENIC DIET. L.A. Ehrhart and K.G. McCullagh (Res. Div., Cleveland Clinic Found., Cleveland, Ohio 44106). *Proc. Soc. Exp. Biol. Med.* 143, 131-2 (1973). Obstructive calculi, shown by emission spectroscopy to contain silicon as a major component, were observed in the kidneys, bladders and urethras of dogs fed a semisynthetic atherogenic diet. Deposition of these stones was due in part to the presence of large amounts of silicates in the diet as nonnutritive bulk constituents. The occurrence of silica urolithiasis, previously unreported in dogs, suggests that silicon containing compounds should not be included in formulated diets fed to dogs for prolonged periods.

INTERACTION OF WHEAT GERM AGGLUTININ AND CONCAVALIN A WITH ISOLATED FAT CELLS. P. Cuatrecasas (Dept. of Pharmacol. and Experimental Therapeutics and the Dept. of Med., Johns Hopkins Univ. Schl. of Med., Baltimore, Md. 21205). *Biochemistry* 12, 1312-23 (1973). The binding to isolated fat cells of high specific activity (2-4 μ Ci/ μ g) ¹²⁵I derivatives of wheat germ agglutinin and concanavalin A has been studied in detail. The binding of wheat germ agglutinin to fat cells is quite complex and suggests the existence of multiple and interacting classes of binding sites. Intracellular membrane structures also possess specific lectin-binding sites; the binding sites for wheat germ agglutinin are susceptible to neuraminidase digestion. Under the conditions used here intracellular translocation of the plant lectins appears to be negligible. The ability of simple sugars to rapidly dissociate the highly stable cell-lectin complexes suggests that lectin molecules bound to cells possess unoccupied saccharide-binding sites. Binding of sugars to these sites results in changes in the lectin molecule which drastically alter the existing cell-lectin interaction. The maximal number of binding sites in a given cell for wheat germ agglutinin, concanavalin A or insulin appears to be relatively independent of cell size since the number is nearly constant in cell populations whose average surface area varies more than sevenfold. Rapid reduction of fat cell size by starvation does not appreciably change the total number of binding sites per cell of these surface receptors.

ACETOACETATE AND BRAIN LIPOGENESIS: DEVELOPMENTAL PATTERN OF ACETOACETYL-COENZYME A SYNTHETASE IN THE SOLUBLE FRACTION OF RAT BRAIN. B.M. Buckley and D.H. Williamson (Metabolic Res. Lab., Nuffield Dept. of Clin. Med., Radcliffe Infirmary, Oxford OX2 6HE, U.K.). *Biochem. J.* 132, 653-6 (1973). The existence of acetoacetyl-CoA synthetase in rat brain cytosol is reported. The coupling of this enzyme with cytosolic acetoacetyl-CoA thiolase can provide acetyl-CoA for lipogenesis and cholesterol synthesis without the need for mitochondrial participation. This new route for acetoacetate utilization may be important in developing brain.

THE RELATIONSHIP BETWEEN PALMITOYL-COENZYME A SYNTHETASE ACTIVITY AND ESTERIFICATION OF SN-GLYCEROL 3-PHOSPHATE BY THE MICROSOMAL FRACTION OF GUINEA-PIG INTESTINAL MUCOSA. D.N. Brindley (Dept. of Biochem., Univ. of Nottingham Med. Schl., Nottingham NG7 2RD, U.K.). *Biochem. J.* 132, 707-15 (1973). With microsomal fractions of guinea pig intestinal mucosa the mean specific activity of palmitoyl-CoA synthetase was approximately 1.3-fold the esterification of sn-glycerol 3-phosphate with palmitoyl-CoA generated by the endogenous synthetase. The latter activity was approx. 2.5- and 5-fold that when palmitoyl-CoA was generated from palmitoylcarnitine or when it was added directly to the assay system. There were significant correlations ($P < 0.001$) between the specific activities of palmitoyl-

CoA synthetase and glycerolipid synthesis from either palmitate or palmitoylearnitine. The mean molar composition of glycerolipid synthesized from palmitate or palmitoylearnitine was approx. 18% lysophosphatidate, 75% phosphatidate and 7% neutral lipid. Low concentrations of palmitate and ATP produced greater decreases in synthetase activity than in glycerolipid synthesis. There appears to be a fine balance between the activities of palmitoyl-CoA synthetase and glycerol phosphate acyltransferase, with neither activity being in excess with respect to phosphatidate synthesis.

CHICK AORTA PYROPHOSPHATASE. M. Chen, J. McCarry, M.M. Chan, R.S. Riggins and R.B. Rucker (Dept. of Nutr. and Orthopaedic Surgery, Univ. of Cal., Davis, Cal. 95616). *Proc. Soc. Exp. Biol. Med.* 143, 44-9 (1973). Chick aorta inorganic pyrophosphatase is inhibited by collagen and micromolar amounts of calcium. These effects may be important in the regulation of aorta calcification by controlling the degree to which PP_i in aorta tissue is hydrolyzed. The pH optima for the enzyme is near pH 8.0. The apparent binding constant for the substrate is $7 \times 10^{-4}M$, once it is associated with magnesium ($Mg_2P_2O_7^{2-}$). Magnesium was the only cation that markedly stimulated activity. At pH 8.0, inorganic pyrophosphate appears to be the primary substrate for the enzyme. The effect of magnesium-deficiency on pyrophosphate levels appeared most related to the elevation of calcium in tissue extracts which concomitantly resulted in partial inhibition of the extracted enzyme activity.

ISOLATION AND PROPERTIES OF A LOW MOLECULAR WEIGHT PROTEIN (APOVITELLENIN I) FROM THE HIGH-LIPID LIPOPROTEIN OF EMU EGG YOLK. R.W. Burley (Commonwealth Scientific and Ind. Res. Org., Div. of Food Res., North Ryde, N.S.W., 2113, Australia). *Biochemistry* 12, 1464-70 (1973). As part of a study of protein-lipid interactions in avian egg yolk, the high-lipid lipoprotein (density 0.96 g/ml) of the egg yolk of the emu (*Dromaeus novaehollandiae*) has been examined. The major fraction of this lipoprotein has a particle weight of 3×10^6 with 13% of apoprotein. This apoprotein is more soluble than the corresponding apoprotein from the egg yolk of the hen (*Gallus domesticus*). Purified apovitellenin I contains no histidine, cystine, sulfhydryl groups or phosphate. It contains a small amount of amino sugar. Lysine is the N-terminal residue. In disaggregating solvents (6 M guanidine hydrochloride and 6 M urea) apovitellenin I is present as a randomly coiled monomer at low concentrations. In water, in methanol and in aqueous methanol, the protein has a high viscosity and a large proportion of α -helical structure according to optical rotatory dispersion, the maximum (nearly 80% helix) being in 50% aqueous methanol. In aqueous solutions above about pH 4 large aggregates were present and the protein was precipitated by low concentrations of salt. From its physical properties it is suggested that apovitellenin I has a structural role in the lipoprotein.

NUTRITION, METABOLISM AND BLOOD LIPIDS IN HUMANS WITH TYPE II_A HYPERLIPOPROTEINEMIA. E.R. Briones, P.J. Palumbo, B.A. Kottke, R.D. Ellefson and R.A. Nelson (Mayo Clinic and Mayo Found., Rochester, Minn. 55901). *Amer. J. Clin. Nutr.* 26, 259-63 (1973). Increasing the polyunsaturated fat and decreasing the saturated fat in the diet did not affect plasma cholesterol levels in 18 patients with type II_A hyperlipoproteinemia. Increasing dietary cholesterol increased plasma cholesterol levels. Increasing dietary carbohydrate increased plasma triglyceride levels but not beyond the normal range. Quantities of carbohydrate, protein and fat used for basal and exercise metabolism were not changed despite considerable changes in fat and carbohydrate contents of diets. Under conditions of carbohydrate stress, lipoprotein profiles characteristic of type III or type IV hyperlipoproteinemia were not observed. Traces or small amounts of pre- β HDL were present in all but 2 of the 18 patients and traces of pre- β VLDL were present in 14 patients.

MECHANISM OF WARFARIN RESISTANCE. WARFARIN AND THE METABOLISM OF VITAMIN K₁. R.G. Bell and P.T. Caldwell (Dept. of Biochem., Univ. of R.I., Kingston, R.I. 02881). *Biochemistry* 12, 1759-62 (1973). If warfarin exerts its anticoagulant effect by causing an accumulation of phylloquinone oxide, an inhibitor of vitamin K, resistance to warfarin could be due to a mutation which renders the conversion of the oxide to vitamin K less sensitive to warfarin. Metabolic studies with ³H-labeled vitamin K₁ and [³H]phylloquinone oxide have provided evidence that resistance is due to the inability of the anticoagulant to inhibit the oxide-K₁ conversion. The results are consistent with the idea that

resistance is due to a mutation which alters the enzyme system which converts oxide to K₁ so that it is no longer inhibited by warfarin. The metabolic studies also suggest that the altered enzyme was less effective in catalyzing the oxide-K₁ conversion which could account for the high vitamin K requirements. However, the oxide was as effective as K₁ in stimulating prothrombin synthesis in hypoprothrombinemic resistant rats.

EFFECT OF DIETARY MONOSODIUM GLUTAMATE AND CHOLESTEROL ON GROWTH AND LIPID METABOLISM IN THE RAT. T.A. Anderson and J. Redlin (Dept. of Pediatrics, Univ. of Iowa, Iowa City, Iowa 52242). *Proc. Soc. Exp. Biol. Med.* 143, 270-4 (1973). Male weanling rats were divided into 4 isonitrogenous dietary treatment groups, all of the dietary N and glutamic acid in groups A and B being derived from casein whereas 20% of the N and 65% of the glutamic acid in diets C and D were derived from MSG. Diets B and D contained 1% cholesterol. At the end of a 28-day feeding period, the rats receiving MSG (groups C and D) exhibited the following statistically significant differences from the rats receiving N only from casein (groups A and B): depressed weight gain, heavier kidneys, higher levels of serum albumin, lower levels of serum globulin, and a greater percent incorporation of an ip injection of ¹⁴C acetate into hepatic TNS lipid. Rats fed the diets containing 1% cholesterol (groups B and D) exhibited the following statistically significant differences from those fed the cholesterol-free diets (groups A and C): heavier livers, higher levels of serum albumin, globulin and total protein, greater concentration of hepatic cholesterol, and lower percent incorporation of an ip injection of ¹⁴C acetate into hepatic cholesterol.

VITAMIN E AND CORONARY HEART DISEASE. R.E. Hodges (Univ. of California School of Med., Davis, Cal.) *J. Am. Dietetic Assoc.* 62, 638-42 (1973). While vitamin E is considered an essential nutrient and a recommended allowance has been established, human requirements have not been determined. It is felt, nevertheless, that the American diet contains sufficient vitamin E to meet needs, even with relatively high intakes of polyunsaturated fatty acids. Claims by the Drs. Shute for the efficacy of vitamin E in treating heart diseases are based largely on their clinical observations. In controlled studies, it has not been possible to confirm these claims.

MINERALS IN CARDIOVASCULAR DISEASE. H.M. Perry, Jr. (Washington Univ. School of Med., St. Louis, Mo.). *J. Am. Dietetic Assoc.* 62, 631-7 (1973). The inverse relationship between water hardness and cardiovascular disease is discussed. Cadmium appears to be related to essential hypertension, although the sources from which it is concentrated in the kidneys are not definitively known. Sodium intake, too, plays a positive role in the etiology of hypertension. There are indications that chromium may contribute to diabetes and thus indirectly to the development of arteriosclerosis.

TRIGLYCERIDEMIA. M.J. Albrink (West Virginia Univ. School of Medicine, Morgantown, W.V.). *J. Am. Dietetic Assoc.* 62, 626-30 (1973). Hypertriglyceridemia is a risk factor in arteriosclerotic heart disease. The normal occurrence of plasma triglycerides is described together with changes in levels occurring with age and with other symptoms of heart disease. Relationships between carbohydrate and hypertriglyceridemia and between obesity and hypertriglyceridemia are detailed. Weight reduction is the most effective form of diet therapy. Reciprocal changes between triglycerides and cholesterol on low fat diets must be kept in mind.

DIETARY ASPECTS OF HYPERLIPOIDEMIA. A.M. Gotto, Jr. and L. Scott (Baylor College of Med., Methodist Hosp., Houston, Tx.). *J. Am. Dietetic Assoc.* 62, 617-25 (1973). The lipid hypothesis of arteriosclerosis, i.e., elevation of plasma cholesterol and/or elevated plasma triglycerides with normal cholesterol leading to the development of arteriosclerosis, is discussed together with dietary implications. The different types of plasma lipoproteins are described together with procedures for diagnosing hyperlipoproteinemia. The five phenotypes of hyperlipoproteinemias are defined and their hereditary aspects described. Indications for dietary intervention are detailed, and dietary treatment by phenotype is summarized.

A DIETARY APPROACH TO CORONARY ARTERY DISEASE. J.F. Mueller (Brooklyn-Cumberland Medical Center, Brooklyn, N.Y.). *J. Am. Dietetic Assoc.* 62, 613-6 (1973). The

rationale on which the American Heart Association diets are derived is discussed. These recommendations call for: (a) reduction in total fat intake to no more than 35% of calories; (b) restriction of saturated fat intake to 10% of total calories; (c) restriction of dietary cholesterol to less than 300 mg per day; and (d) adjustment of caloric intake to achieve and/or maintain optimal weight. Also discussed are ways of modifying the above recommendations for use in treating hyperlipoproteinemias.

N-SUBSTITUTED AMIDES OF NATURAL FATTY ACIDS. T. Seki, K. Toki, H. Nakatami, Y. Suzuki, H. Fukushima and Y. Nawashiro (Sumitomo Chemical Co. Ltd.). *U.S.* 3,741,999. Novel N- α -(C₂-C₄)alkylbenzyl natural fatty acid amides have excellent blood cholesterol-lowering effects.

• Edible Proteins

RECYCLING OF EFFLUENT FROM MEMBRANE PROCESSING OF COTTONSEED WHEYS. J.T. Lawhon, S.H.C. Lin, C.M. Cater and K.F. Mattil (Food Protein Res. & Dev. Ctr., Texas A&M, College Station, Tx. 77843). *Food Technol.* 27(2), 26-34 (1973). Whey disposal, a potential problem of food processors isolating protein from cottonseed and other oilseeds, was investigated. Results indicate that recycling of reverse osmosis permeate from cottonseed whey is feasible and that this process innovation could be used to prevent water pollution and reduce process water requirements.

ISOLATED PROTEIN FROM LINSEED MEAL. I. NUTRITIVE VALUE AND TOXICOLOGICAL TESTS. M.E. Sambucetti, G. Gallegos and J.C. Sanahuja (Dept. de Bromatologia y Nutricion Experimental. Facultad de Farmacia y Bioquimica. Univ. de Buenos Aires). *Arch. Latinoamer. Nutr.* 23, 79-94 (1973). Isolated linseed protein (*Linum usitatissimum* L.) was analyzed as a new source of edible protein. Tests for nutritive value included: essential amino acid composition, net protein utilization, protein efficiency ratio and chemical score. Results indicate that lysine, threonine and leucine were present in suboptimal quantities. Toxicological studies were performed with rats of both sexes during 28 days. They showed no signs of pathological damage, except a light fat liver infiltration.

PROTEIN VALUE OF BY-PRODUCTS OF THE WHEAT INDUSTRY. II. COMPLEMENTATION AND SUPPLEMENTATION OF WHEAT-SHORTS WITH PROTEIN CONCENTRATES. L.G. Elias and R. Bressani (Inst. de Nutricion de Centro America y Panama, Guatemala, C.A.). *Arch. Latinoamer. Nutr.* 23, 95-111 (1973). Wheat-shorts supplemented with increasing levels of fish protein concentrate, soybean flour, cottonseed flour and Torula yeast resulted in an improvement in utilizable protein probably due to an increase in total dietary protein. Wheat-shorts complemented with soybean flour resulted in an increase in nutritive value not found with cottonseed flour. Wheat-shorts could be good supplements for cereal grains when mixed with proteins having an adequate amount of lysine.

WET CONCENTRATION PROCESS FOR EXTRACTION AND PRECIPITATION OF PROTEIN FROM COTTONSEED. H. Mayorga, E. Quintanilla, J. Gonzalez, A. Arzu, J.F. Menchu and C. Rolz. (Inst. Centroamericano de Investigacion y Technol. Ind., Guatemala, C.A.). *Arch. Latinoamer. Nutr.* 23, 55-77 (1973). Laboratory experiments were carried out to determine conditions which permit extraction and precipitation of the greatest quantity of proteins from cottonseed by means of a wet concentration process. Tests were performed to establish the distribution of gossypol and of proteins of different molecular weight as a function of the precipitation pH. It was determined that the distribution of gossypol is a function of pH with the maximum precipitation of total gossypol and minimum precipitates formed at different pH levels contained principally proteins of a molecular weight greater than 20,000.

WATER SOLUBLE PROTEIN MATERIALS. A. Pour-El and T.C. Swenson (Archer Daniels Midland). *U.S.* 3,741,771. Dispersed plant proteins are digested with an acid active enzyme at a pH below 4.6. Quiescent conditions are maintained in the reaction medium and digestion proceeds until the insoluble colloidal protein is completely dissolved. The pH is raised to 4.6 and the medium allowed to stand, causing additional insoluble protein to precipitate. The insoluble residue is removed and the soluble protein dried. A clear liquid, which can be carbonated, is formed containing the soluble protein material at a pH corresponding to the isoelectric point of the protein.

• Drying Oils and Paints

POLYMERISATION IN THE LINOLEIC SERIES. J. Petit. *Double Liaison* 19 No 208, 567-75 (1972). Thermal polymerisation of drying oils is a well known reaction. Nevertheless, the structure of the macromolecules so obtained is not defined precisely. In this study, from structural and steric factors of linoleic acid, the author shows that this acid gives at most a trimer according to the accepted mechanisms. An experimental study on the glycerides made from safflower oil shows a part composed of the linking of 8 glyceride units with formation of macrocyclic structures. (World Surface Coatings Abs. No. 370)

SYNTHESIS AND OXYETHYLATION OF ESTERS OF PENTAERYTHRITOL AND FATTY ACIDS. J. Perka and S. Ropuszynski. *Przem. Chem.* 51 No. 12, 796-800 (1972). Studies were carried out concerning the direct esterification of pentaerythritol by means of lauric, stearic and oleic acids at temps. of 170-175°C., 200-210°C and 240-250°C in the presence of ZnO as catalyst, without solvent, as well as in boiling toluene in the presence of p-toluenesulphonic acid as catalyst. The resulting esters of pentaerythritol were oxyethylated with liquid ethylene oxide in the presence of NaOH as catalyst. The resulting products were characterized and thin-layer chromatography was performed on the esters. (World Surface Coatings Abs. No. 370)

EFFECTS OF CYCLOALIPHATIC AND ALKYLARYLIC GLYCOLS ON THE RELATIONS BETWEEN THE CHEMICAL STRUCTURE AND THE PROPERTIES OF FATTY ACID MODIFIED ISOPHTHALIC ALKYD RESINS. A. Blaga (Bucharest, Rumania). *Farbe u. Lack* 79(5), 413-9 (1973). Some isophthalic alkyd resins modified with tall oil fatty acid and copolymerized with cycloaliphatic or aromatic glycols were prepared. The investigations have shown that the relationship between the structure and the properties of these products are similarly to those of the simple linear polyesters.

CYCLOPENTADIENE/FATTY ACID SYSTEM USED AS SYNTHETIC DRYING OIL. Jap. 25,841/72 (Hitachi Chem. Ind. Co.). A cyclopentadiene/fatty acid system synthetic drying oil composition comprises adding Chinese tung oil of 10-70 wt. % (based on total wt.) to a synthetic oil obtained by treating higher fatty acid, cyclopentadiene and/or one or more of its derivatives, and if necessary adding fillers. Higher fatty acids used are lauric, palmitic, stearic, oleic acids, etc. Cyclopentadiene derivatives are di- and tri-cyclopentadiene, optionally substituted by CH₃, C₂H₅ or halogen. The treatment of fatty acid, cyclopentadiene or its derivatives is preferably at 200-250°C. The amount of Chinese tung oil is preferably 30-60 wt. %. (World Surface Coatings Abs. No. 369)

STUDY OF COUPLED OXIDATION OF UNSATURATED ALIPHATIC ESTERS AND UNSATURATED ARYLALIPHATIC DIALDEHYDES. I-III. H. LeBlanc. *Double Liaison* 19 No. 205, 417-22 (1972). A bibliography of earlier work on autoxypolymerization precedes an account of an investigation showing the possibility of reaction between an unsaturated dialdehyde, e.g. benzene-1,4-di(propen-2-yl), and an unsaturated triglyceride when these are together submitted to oxidation. An oil with poor drying power, such as almond oil, was found to form a three-dimensional macromolecular network in such reactions. Experimental work to limit side reactions was established and further work was then carried out using methyl oleate and methyl linoleate. After fractionation of the condensation products with the dialdehyde noted above, evidence was obtained for the conversion of the unsaturated aliphatic chains to dihydroxy derivatives and of the dialdehyde groups to diacids, followed by polycondensation to form an oligomer of polyester type. These results are discussed in terms of the mechanism of film formation from drying oils. (World Surface Coatings Abs. No. 370)

• Detergents

THE SAFETY OF HEXACHLOROPHENE. B.P. Vaterlaus and J.J. Hostynek (Givaudan-Esrolko AG, Forschungsgesellschaft, Dübendorf-Zürich). *J. Soc. Cosmet. Chem.* 24, 291-305 (1973). An extensive review with 26 references.

RAPID LIQUID CHROMATOGRAPHY OF BACTERIOSTATS. T. Wolf and D. Semionow (R&D Center, Colgate-Palmolive Co., Piscataway, N.J. 08854). *J. Soc. Cosmet. Chem.* 24, 363-70 (1973). High-pressure liquid chromatography provides a fast,

convenient method for separating and identifying bacteriostats in cosmetic preparations, such as toilet soaps. Four of the commonly used bacteriostats may be separated in one analysis, either by gradient or step elution technics. Chromatography requires 15 minutes and the limit of detection is 0.1 µg or better.

THE FUNCTION OF COSMETIC COMPONENTS. J.F.L. Chester (Croda Chemicals, Ltd., Snaith, Goole, Yorkshire). *Soap, Perfumery Cosmet.* 46(4), 205-9 (1973). The specific functions of components of cosmetic formulations are reviewed. Cited are specific functions of anti-gelling agents and viscosity control agents, anti-irritants, dispersing and wetting agents, emulsifying waxes, emollients/moisturizers, emulsifiers O/W, emulsifiers W/O, emulsifiers for electrolytes, foaming agents, foam stabilizers, gelling agents, pearling agents, plasticizers, sequestrants, solubilizers, superfatting agents, stabilizers and natural products.

STUDIES ON IRRITANCY AND STAINING POTENTIAL. K. Laden (Gillette Res. Inst., 1413 Research Blvd., Rockville, Md. 20850). *J. Soc. Cosmet. Chem.* 24, 385-93 (1973). Animal and human methods for evaluating the stinging potential of materials placed on the skin have been devised. Various materials were evaluated for stinging potential, including surfactants. Additionally, the primary irritancy of some of these compositions has been evaluated. Results indicate that stinging potential and primary irritancy are unrelated. No general conclusions could be drawn to predict stinging potential of solutions of acidic materials by considering solely the hydrogen ion concentration, toxicity or the nature of the anion.

SOME ASPECTS OF THE USE OF PRESERVATIVES IN COMBINATION. M.S. Parker (Dept. Pharm. Technol., U. of Strathclyde, Glasgow, Scotland). *Soap, Perfumery Cosmet.* 46(4), 223-4 (1973). Multicomponent preservative systems are suggested as one way to protect the increasingly complex formulations now used in cosmetics and pharmaceuticals. Mixtures and methods for screening them are discussed.

DICARBOXYLIC ACID SOAPS. B.F. Ward (Westvaco Corp.). *U.S.* 3,734,359. Dicarboxylic acid soap compositions are disclosed.

These soaps may be blended with 5-90% of coconut fatty acids, tallow fatty acids, tall oil fatty acids and fatty acids from a variety of other sources and still retain the advantageous properties of using C₂₂ dicarboxylic acid soaps alone. The soaps and soap blends are water soluble at both low and high solids concentration, e.g., above 40% solids and in some cases above 90% solids. They find utility in liquid hand soaps, cleaning aids, and shampoos.

CLEANING COMPOSITIONS AND METHOD. C.E. Buck and V.E. Sheaffer (Colgate-Palmolive Co.). *U.S.* 3,736,259. The composition for shampooing carpets contains water, a detergent, an aliphatic C₁₄-C₂₀ fatty alcohol, finely divided silica, and a water soluble alkali metal phosphate or borax for retarding the formation of sediment.

PROCESS FOR THE PRODUCTION OF MELLITIC ACID. E.P. Gosselink and J.H. Henderson (Procter & Gamble). *U.S.* 3,736,353. An improved process for synthesizing mellitic acid by two-stage nitric acid oxidation of hexakis (methoxymethyl)benzene is disclosed. Specification of particular reaction procedures maximizes product yield and minimizes the need for expensive high pressure reaction equipment.

WASHING, BLEACHING, AND CLEANSING AGENTS. A. Werdehausen (Henkel & Cie). *U.S.* 3,737,385. The agents contain 50-99.9% of the usual components of such compositions and 0.1-50% of salts of poly-(N-alkyldicarboxylic acid)-alkyleneimines having an average molecular weight of 500-500,000. Certain proportions of the recurring substituted alkyleneimine groups should have certain definite substituents.

SOLVENT BASED DETERGENT. R. Geiss and R. Quarch. *U.S.* 3,737,386. The invention relates to a detergent used particularly in industry on the base of a combination of different organic solvents in admixture with cleaning intensifiers.

DETERGENT COMPOSITION. W.L. Marple (Whirlpool Corp.). *U.S.* 3,737,387. The composition may be in the form of a liquid, powder or semi-solid. When added to water, it forms a washing solution which can be used for the efficient removal of complex fats from natural or synthetic fabrics. The composition consists of an emulsifier which is either a polyoxyethylene alkylphenol, a polyoxyethylene alkyl alcohol, a polyoxyethylene ester of a fatty acid, or a polyalkylene oxide block copolymer containing both ethylene oxide and propylene oxide chains, and an organic solvent for the fats. The resulting washing solution made by adding the washing composition to water is a three phase system having an aqueous phase, a dissolved emulsifier phase and a dispersed non-aqueous solvent phase.

BIODEGRADABLE SURFACTANTS FROM STARCH-DERIVED GLYCOSIDES. P.E. Throckmorton, D. Aelony, R.R. Egan and F. Otey (U.S. Sec'y Agr.). *U.S.* 3,737,426. Highly biodegradable surface active products for cleaning and emulsifying agents and the like are obtained by the chemical reaction of a starch derived ethylene and propylene polyol glycosides, such as glycol and glycerol glycosides, with ethylene and propylene oxides, long chain epoxyalkanes and chlorosulfonic acid.

PRODUCTION OF NONIONIC DETERGENTS. J.A. Cahill, J.A. Meyers III and R.W. Sauer (Atlantic Richfield Co.). *U.S.* 3,738,034. Nonionic detergents are prepared by the liquid phase air oxidation of normal paraffins, reduction of the oxidate, fractionation of the reduced oxidate to remove the lighter compounds and reacting the bottoms fraction with ethylene oxide to produce the desired detergents. This process offers a convenient method for the production of detergents from paraffins.

TOILET BARS CONTAINING ALKANOLAMINES. G.L. Woo (Chevron Res. Co.). *U.S.* 3,738,935. The inclusion of a minor portion of trialkanolamines in combination with sodium hydrogenated olefin sulfonate detergent in soap bars which contain more than 5% of inorganic salt prevents blotching of the bar surfaces.

BIODEGRADABLE DETERGENT FOR AUTOMATIC CAR WASH SYSTEMS. T.M. Kanego (BASF Wyandotte Corp.). *U.S.* 3,738,943. The detergent consists of (a) 5-12 parts of a nonionic surfactant, (b) 2-7 parts of an anionic surfactant which is the phosphate ester of the nonionic (a), (c) 2-10 parts of linear alkylbenzene sulfonate anionic surfactant, (d) 0-10 parts of detergent builder, (e) 0-2 parts of alkali, and (f) 91-59 parts of water, based on 100 parts of detergent. This detergent is most usefully employed in concentrations of up to 1 part detergent per 400 parts of water.

(Continued on page 422A)

This Issue's Index to Advertisers

Richard M. Armstrong	404A
Applied Science Labs	405A
Artisan Industries	411A
Ballestra	Cover 2
Chemetron Corp.—Catalysts Div	375A
Chemetron Corp.—Votator Div	396,397A
Crown Iron Works	367A
DeLaval Separator	369A
EMI Corp	387A
Ferrell-Ross	Cover 3
French Oil Mill Machy	363A
Hahn Laboratories	408A
Harshaw Chemical Co	373A
Hoffmann-La Roche	381A
Jersey Analytical Labs	413A
Peter Jowett & Co. Ltd	409A
Lurgi	383A
Arthur G. McKee	Cover 4
North American Equipment	382A
Oxford Laboratories	403A
Parr Instrument Co	401A
Pfaudler Co	364,365A
Pope Kjeldahl Mixtures	380A
Pope Testing Labs	410A
Southern Clay Products	385A
Southwestern Laboratories	412A
Speichem	395A
Sud Chemie	391A
Frank E. Sullivan	393A
Vapor Corp	386A
Wurster and Sanger	384A

Classified Advertising

POSITION WANTED

Lipid chemist, aged 30, Ph.D. (1968), with four years post-doctoral experience and 8 publications seeks a position in academic institution or industry in USA.

Contact:

Box 135
American Oil Chemists' Society
508 S. Sixth St.
Champaign, Illinois 61820

POSITION WANTED

Surfactant and detergents specialist seeks challenging position to manage research, development and applications. Profitable accomplishments in Surface Active field. Specialized in Imidazolines, Amphoteric and biologically active compounds. Publications and patents.

Contact:

Box 137
American Oil Chemists' Society
508 S. Sixth St.
Champaign, Illinois 61820

Position Wanted

B.S. in Chemistry, MBA with 13 years of management experience in processing of fats & oil; and manufacturing of shortening, soap and toothpaste. Handled up to \$12 million annual budget. Experience includes manufacturing, Quality Control, Industrial Engineering, Packaging, Warehouse & Distribution, and starting-up a new plant, all with outstanding results. Average promotion—one every two years.

Interested only in a challenging senior management position with good potential for advancement based on results.

Contact:

Box 146
American Oil Chemists' Society
508 S. Sixth St.
Champaign, Illinois 61820

SITUATION WANTED

Ph.D. in Agricultural Biochemistry, 1972. Research in isolation and characterization of plant lipids; subcellular fractionation; enzyme assays; tracer techniques; herbicide metabolism in animal systems; and evaluation of feed for protein quality. Two years of teaching and two years of research experience. Age: 30. Desires position preferably in Canada.

Contact:

Box 139
American Oil Chemists' Society
508 S. Sixth Street
Champaign, Illinois 61820

SITUATION WANTED

B.Sc. in Chemistry, MBA—manager of quality control and liaison for marketing, sales, technical and production. Background in inedible fats and fatty acids. Seeks responsible management position, USA or abroad.

Contact:

Box 142
American Oil Chemists' Society
508 S. Sixth St.
Champaign, Ill. 61820

RETIRED DIRECTOR OF RESEARCH

Organic chemist. Extensive experience in oils, fats and waxes. Synthesis of surface active chemicals. Derivatives of fatty acids and alcohols. Publications and patents. Seeks consulting work in U.S. and Canada.

Contact:

Box 148
American Oil Chemists' Society
508 S. Sixth St.
Champaign, Ill. 61820

EMPLOYMENT WANTED

Ph.D. Food Science seeks industry position in flavor and fats and oil research, basic and applied. Good experience in the above mentioned fields. Publications and Student Award by AOCS.

Reply to

Box 144
American Oil Chemists' Society
508 South Sixth St.
Champaign, Illinois 61820

FOOD SCIENTIST

PRODUCT DEVELOPMENT

Challenging opportunities for experienced food technologists and food scientists are available at our corporate research laboratories located in the suburban area of metropolitan New York. These positions require a Masters degree and/or several years experience in food science and product/process development. The work will involve product development beginning at the concept stage and following through to final product/process optimization.

Salary is commensurate with education and experience. Please send your resume including salary history and requirements to:

Box 159
American Oil Chemists' Society
508 South Sixth Street
Champaign, IL 61820

POSITION WANTED

BS Chemistry, MBA Marketing. Looking for position in sales management or technical service; detergents, specialties, cosmetics. Over 10 years diversified industrial experience. Prefer N.Y. Metro or West Coast location. Present salary over \$18,000.

Reply to:

Box 151
American Oil Chemists' Society
508 South Sixth Street
Champaign, IL 61820

WORLDWIDE HYDROGEN & NITROGEN PLANT SERVICES

Complete package plants, Technical assistance, Instrumentation services, Construction assistance and plant start-up.

Richard G. Daniel
Measure-Trol Company, Inc.
175 West Wieuca Road, N.E.
Atlanta, Georgia 30342
404-255-7249

POSITION WANTED

Lipid Chemist, Ph.D., 15 years experience in divergent fields, including five years of post-doctoral experience in a pilot plant. Coordination with laboratory, instrumental analysis (UV, IR, GC, MS), tracer techniques and metabolic studies. Publications and good references. Desires position in Quality Control or R/D; no geographical preferences.

Contact:

Box 152
American Oil Chemists' Society
508 S. Sixth Street
Champaign, IL 61820

OPPORTUNITY—CHALLENGE

Leading manufacturer of solvent extraction equipment and turn-key installations requires chemical engineer or B.Sc.—chemistry. Position includes operation of small lab, R & D and on-site, field installation liaison. Mechanical design and/or applications background advantageous, but not required. Salary negotiable. Attractive benefit package. Submit resume in confidence to:

Box 157
American Oil Chemists' Society
508 South Sixth Street
Champaign, IL 61820

POSITION WANTED

Statistician with engineering BS, MS specializing in fluid dynamics, 5 years experience in lab, research in sediment transport, 7 years experience in statistical computer programming and data processing, 1 year experience as research statistical consultant seeks position as statistician with engineering applications.

Contact: Box 155

American Oil Chemists' Society
508 South Sixth Street
Champaign, IL 61820

RESEARCH AND DEVELOPMENT SCIENTIST

Imaginative and productive Ph.D. with twenty years of white and blue collar industrial experience desires position in edible fat and oil or proteinaceous food R&D. Willing to relocate—eastern, southern or midwestern U.S.A. Please, no agencies.

Contact:

Box 156
American Oil Chemists' Society
508 S. Sixth Street
Champaign, IL 61820

• Abstracts . . .

(Continued from page 420A)

DODECYL 2-HYDROXYETHYL SULFOXIDE. H.M. Priestley and J.H. Wilson (Lever Bros.). *U.S. 3,739,031*. This compound has utility in detergent compositions as a foam stabilizing additive.

DETERGENT FORMULATION CONTAINING CURED 6-CARBOXY CELLULOSE AS A SEQUESTANT. D.M. MacDonald (International Paper Co.). *U.S. 3,740,339*. The elimination of phosphorus-containing compounds from detergent formulations and their replacement with nonphosphorus-containing compounds of equal efficacy is achieved by use of the cured product of the reaction between 6-carboxy cellulose and an aqueous solution of a Lewis acid catalyst.

MANUFACTURE OF BIS(ALKOXYAMINOTRIAZINYLAMINO)-STILBENE-2,2'-DISULFONIC ACIDS. P.J. Brocklehurst, E. Hemingway and M.J. Wright (Imperial Chem. Ind. Ltd.). *U.S. 3,740,341*. These optical brighteners are three component mixtures obtained by the reaction of bis(3-chloro-5-alkoxytriazinylamino) stilbene-disulfonic acids with mixtures of optionally substituted mono- or dialkylamines and optionally substituted N-alkylarylamines. The agents separate from the hot reaction mixtures in the form of mobile liquids.

SOYA AMINOPROPYLDIMETHYLAMINE OXIDE. S. Kaplan, K.W. Prodo and E.G. Shay (Millmaster Onyx Corp.). *U.S. 3,740,351*. Claimed is a composition and method for stabilizing the foam of anionic surface active agents by admixing the anionic surface active agent with an amido-amine oxide having the general formula: $RCONHCH_2CH_2CH_2NO(CH_2)_2 RCO$ is derived from the fatty acids in soybean oil.

APPARATUS FOR PRESSURE ROLLING SOAPS AND SIMILAR PRODUCTS. C. Mazzoni. *U.S. 3,741,702*. In the apparatus, the paste is extruded into a pressure chamber from which it is discharged between two rolls moving at different rotational speeds. As a result, the paste is mixed and pulped, assuring a high degree of refining by a single pass.

CHLORINE STABLE COMPOSITION FOR CLEANING AND SANITIZING. H.E. Crotty, C.R. Coffey and T.C. Tesdahl (Chemed Corp.). *U.S. 3,741,805*. An aqueous gelling composition for cleaning and sanitizing comprises (a) a xanthan gum, (b) a diluent selected from the group consisting of Na_2SO_4 and NaCl, (c) a linear alkyl benzene sulfonate, (d) propylene glycol dispersing agent (e) fluorescein dye and (f) a chlorine release agent such as chlorinated trisodium phosphate, chlorinated isocyanurates or sodium hypochlorite. ■

ENGINEERS

MANAGERS

**Blaw Knox Chemical
Plants Division**

NEEDS

Chemical Engineers with 5 years experience in solvent extraction, sugar, vegetable oil and protein processes, to direct proposal preparation, supply guidance to engineering department during project execution and evaluate new processes. Salary commensurate with qualifications, excellent fringe benefits, outstanding growth potential.

Submit Resume and Salary Requirements to:

W. J. WIRANT

Employment Department

Dravo Corporation

One Oliver Plaza

Pittsburgh, Pa. 15222

An Equal Opportunity Employer M/F

Dravo

ANALYTICAL CHEMIST WANTED

A B.S. or an M.S. level analytical chemist with experience in chromatography, primarily Gas-Liquid, X-Ray diffraction, fats systems, thermal analysis, DSC, DTA. Experience in fat and protein chemistry or spectroscopy. 1-3 years minimum experience preferred. An equal opportunity employer.

Contact:

Box 158
Champaign, IL 61820
American Oil Chemists' Society
508 South Sixth Street