# ABSTRACTS

R.A. REINERS, Editor. ABSTRACTORS: N.E. Bednarcyk, J.E. Covey, J.C. Harris, Yoshio Hirano, S. Kawamura, D.A. Leo, F.A. Kummerow, E.G. Perkins, and R.W. Walker

## • Fats and Oils

ON METHYLATION OF UNSATURATED ACIDS USING BORON TRIHALIDE-METHANOL REAGENTS. W.E. Klopfenstein (Dept. of Biochem., Kansas State Univ., Manhattan, Ks. 66502). *J. Lipid Res.* 12, 773–76 (1971). Methanolysis of unsaturated fatty acids and triglycerides was carried out with boron trihalide-methanol reagents of various ages. Boron trichloride-methanol produced esters apparently free from contaminants; boron trifluoride caused some loss of highly unsaturated esters after 90 min. at 100 or 120C in Teflon-lined screw-cap vials and at 120C in ampoules. The losses were more marked when the reactions were carried out in vinyl-lined screw-cap vials. Noticeable losses did not occur with any of the vessel types when $BCl_3$-$CH_3OH$ was the methylating agent. Long-term studies at 80C further demonstrated that $BCl_3$-$CH_3OH$ caused less loss of unsaturated acid than did $BF_3$-$CH_3OH$.

NONIDEALITY OF THE COLUMN AND RETENTION TIME IN GAS CHROMATOGRAPHY. S. Wicar, J. Novak and N. Ruseva-Rakshieva (Inst. of Instrumental Analytical Chem., Czechoslovak Acad. of Sciences, Brno, Czech.). *Anal. Chem.* 43, 1945–50 (1971). The shifts of chromatographic peak maxima, brought about by the nonideality of the chromatographic process, were investigated. The shifts always result in a decrease of the retention time, and the relative magnitude of the former, when multiplied by the column length, obeys a relation similar to the van Deemter equation. Within the region controlled by longitudinal diffusion, for which there exists an analytical solution, the relative shift is a function of the Peclet number. In the region of a predominant influence of the interphase mass transfer rate, the relative deviations can be correlated with the dimensionless ratio of the van Deemter equation C-terms and the dead retention time, $(C_g + C_s)/t_M$. This has been verified by a combination of the theory of physical similarity and experiment. In current analytical work, the deviations do not exceed, even with high liquid-loading columns, 1.5% and are, especially in case where relative retention data are employed, inconsequential. However, it is necessary that the above deviations always be allowed for in high precision measurement of absolute retention time.

ROLE OF BACKGROUND DETECTOR RESPONSE IN QUANTITATIVE GAS CHROMATOGRAPHY. J. Novak, J. Gelbicova-Ruzickova, S. Wicar and J. Janak (Inst. Instrumental Anal. Chem., Czechoslovak Acad. of Sci., Brno, Czech.). *Anal. Chem.* 43, 1996–2000 (1971). A theoretical analysis of the effects of the background detector response on the net response to a substance was performed. The effects were investigated experimentally with the use of two stationary phases of different volatilities, employing the flame ionization detector. The change in relative response factors caused by bleeding of the stationary phase and systematic errors incidental to the use of a volatile stationary phase in quantitative PTGG were demonstrated.

THE ELECTRON CAPTURE DETECTOR—A NEW MODE OF OPERATION. R.J. Maggs, P.L. Joynes, A.J. Davies and J.E. Lovelock (Pye Unicam Ltd., Cambridge, U.K., and Thornton Res. Center, Shell Res. Ltd., Chester, U.K.). *Anal. Chem.* 43, 1966–71 (1971). An established electron capture detector has been evaluated under a new mode of operation. By means of a suitable power supply, the detector current is held constant while the frequency of the applied pulses is varied. In this way a change of pulse frequency becomes a measure of the concentration of the electron capturing species in the detector. The response was estimated to be linear over a range of about $5 \times 10^4$ with a detection limit of approximately $4 \times 10^{-14}$ gram/ml of Dieldrin. The effects of temperature, reference current level, carrier gas composition and flowrate on detector performance have been studied.

GAS-PHASE COULOMETRY BY THERMAL ELECTRON ATTACHMENT. J.E. Lovelock, R.J. Maggs and E.R. Adlard (Univ. Reading, Reading, Berkshire, U.K.). *Anal. Chem.* 43, 1962–65 (1971). With intensely electron-absorbing substances, the electron capture detector tends toward destructive detection in which a large proportion of the substance entering the detector is ionized irreversibly. This tendency can be developed to the point where the detector can function as a gas-phase coulometer. The paper is concerned with the physical basis, experimental verification and practical conditions for coulometric analysis with the electron capture detector.

INTERPRETATION OF ASYMMETRIC CURVES IN LINEAR CHROMATOGRAPHY. O. Grubner (Dept. Environmental Health Sciences, Harvard School Public Health, Boston, Mass.). *Anal. Chem.* 43, 1934–37 (1971). Asymmetric elution curves in chromatography may be analyzed using their points of inflection. Once these points are located, the first four statistical moments, related to the mean, standard deviation, skewness and excess of the curve can be readily calculated from simple formulas. Verification of this procedure is presented.

A SYSTEMATIC STUDY OF THE QUANTITATIVE EFFECTS OF INSTRUMENT CONTROL ON ANALYTICAL PRECISION IN FLAME IONIZATION GAS CHROMATOGRAPHY. D.W. Grant and A. Clarke (Coal Tar Res. Assoc., Gomersal, Cleckheaton, Yorks, BD194HH, England). *Anal. Chem.* 43, 1951–57 (1971). Statistical experiments have been performed to investigate the effects of variations in gas flow rates, detector temperature, sample injection conditions, detector polarization voltage and method of peak measurement on analytical precision. The results enable estimates to be made of the precision of instrumental control necessary to achieve set precision levels in analysis. Recommendations are also made for achieving higher than normal precision, particularly in relation to peak measurement, sample introduction and the use of internal standards.

HELIUM PHOTOIONIZATION DETECTOR UTILIZING A MICROWAVE DISCHARGE SOURCE. R.R. Freeman and W.E. Wentworth (Dept. of Chem., Univ. of Houston, Houston, Texas 77004). *Anal. Chem.* 43, 1987–92 (1971). A helium photoionization detector for use in gas chromatography systems has been developed. A microwave discharge in purified helium produces an intense 21 electron volt ionization source whose stability and reliability meet the requirements of analytical instrumentation. Use of the helium resonance line enables "universal" detection which is uniform for most compounds. The detector has a sensitivity of $1.3 \times 10^{-11}$ g/ml (argon) and a linear dynamic range of $10^4$. The design of the detector is such that the background current, noise level, and response are independent of temperature ($T \geqslant 280C$).

ANALYSIS OF BLENDS OF MIXTURES USING MULTIVARIATE STATISTICS. S.C. Elliott, N.A. Hartmann and S.J. Hawkes (Oregon State Univ., Corvallis, Oregon 97331). *Anal. Chem.* 43, 1938–39 (1971). When complex mixtures such as essential oils, petroleum products or other natural extracts are blended together, the original components may be identified and determined by a multivariate analysis of data such as is produced by chromatographic analyses. A mathematical method is described which relies solely on library computer routines for all calculations of any complexity and assumes only that the original mixtures blend linearly. When applied to hypothetical blends of peppermint oils and hop oils computed from published data, it was successful in identifying and determining the origins of the original oils in blends of up to four oils.

IDENTIFICATION OF TWO CONJUGATED PENTAENOIC ACIDS IN THE INSECT FAT, AJE. J. Cason, R. Davis and M.H. Sheehan (Chem. Lab., Univ. California, Berkeley, Cal. 94720). *J. Org. Chem.* 36, 2621–5 (1971). The fatty acids from aje, body fat of the coccid *Llaveia axin*, have been examined. In addition to the normal saturated acids at the $C_{14}$, $C_{18}$, and $C_{20}$ molecular weights, and the unsaturated $C_{18}$ acids, oleic and linoleic, there were present pentaunsaturated acids at the $C_{12}$ and $C_{14}$ levels. The latter components were so unstable that separation in a pure condition was not feasible; however, the ultraviolet spectrum of the mixture of acids was virtually identical with that which has been reported for a pentaenoic fatty acid after

alkali isomerization to a conjugated system. The conjugated system in both the $C_{12}$ and $C_{14}$ acids was shown to be in a terminal position by identification of formaldehyde after ozonolysis. The appropriate fragment from ozonolysis also established the other end of the conjugated system as at carbon-3 in the $C_{12}$ acid and at carbon-5 in the $C_{14}$ acid. Confirmatory evidence was obtained from mass spectrometry of the deuterated esters. Thus, assigned structures for the conjugated pentaenoic acids, believed to be the first found in natural products, are 3,5,7,9,11-dodecapentaenoic acid and 5,7,9,11,13-tetradecapentaenoic acid. The names $C_{12}$-ajenoic acid and $C_{14}$-ajenoic acid are proposed.

QUALITATIVE AND QUANTITATIVE DETERMINATION OF 1,2- AND 1,3-DIGLYCERIDES BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY. R.J. Warren and J.E. Zarembo. *J. Pharm. Sci.* 59(6), 840–2 (1970). To determine 1,2-diglycerides in the presence of the 1,3-isomers, prepare an 8% solution of the sample in 3% $CHCl_3$ solution in $CDCl_3$ and record the integrated NMR spectrum at 60 MHz. Measure the ratio of the integrals of the signals at 3.75 ppm (for 1,2-diglycerides) and 7.27 ppm (for $CHCl_3$). The chemical shifts are relative to tetramethylsilane. The method was applied to distearins. (World Surface Coatings Abs. No. 352)

STORAGE BEHAVIOR OF SAFFLOWER AND TOBACCOSEED OILCAKES. T. Lakshminarayana, G. Siva Rami Reddy, S.D. Thirumala Rao and B.R. Reddy (Oil Tech. Res. Inst., Anantapur, India). *Indian Oil Soap J.* 36, 233–8 (1971). The storage behaviour of decorticated and undecorticated safflower oil cakes and taboccoseed oil cake was studied. The cakes were stored in three different ways in gunny bags at ambient room temperature for one year. The cakes were analyzed periodically for moisture and oil contents. It was observed that decorticated safflower cake could be stored well up to 7 months, while the undecorticated variety, up to 3 months only without diminution in oil content. In the case of tobaccoseed oil cake, there was no decrease in oil content even after 12 months.

FATTY ACID COMPOSITION OF SOME INDIAN SEED OILS BY GAS-LIQUID CHROMATOGRAPHY. PART II. GROUNDNUT, SESAME AND MUSTARD OILS. J. Dutta and A. Ghosh (Dept. Chem., Bose Inst., Calcutta 9, India). *Indian Oil Soap J.* 36, 239–242 (1971). Fatty acid compositions of groundnut (3 varieties), sesame (5 varieties) and mustard (4 varieties) oils have been determined by gas liquid chromatography on Apiezon (non-polar) and polyester (polar) columns. The sesame oils studied showed fairly high consistency in their fatty acid compositions. Among the mustard oils studied, one variety contained markedly low acid compositions. Of the groundnut oils, one variety was poor in oleic acid (35%) and rich in linoleic (27%); the other varieties were regular in their fatty acid distribution. Beside these and other minor quantitative differences, no quantitative difference were found.

PROCESS FOR THE COMPLEX TREATMENT OF COTTONSEEDS. Anon. (Central Soviet Licensing Organization, Moscow). *Rev. Franc. Corps Gras* 18, 617–9 (1971). A special technique for processing cottonseeds so as to eliminate gossypol from the meal and to improve the protein quality of the meal is discussed. Most of the gossypol is removed by extracting the miscella with a special solvent. The extracted meal is enriched with soapstock lipids and has increased value for animal feeding. A licensing agreement for the process is possible.

CHOCOLATE CONTAINING SOY FLOUR. A. Sroczynski *et al. Przemysl Spozywczy* 25(7), 267–8 (1971). A method is described for preparing soybeans so the flour is useful in making chocolate. After enrichment with soybean oil, the flour has the color and flavor of chocolate. Plant scale trials were carried out in order to verify the usefulness of this product in the preparation of chocolate and coatings. (Rev. Franc. Corps Gras)

COMPARISON OF METHODS FOR DETERMINING ASH IN OILSEED PRESSCAKE. A. Wojnarowicz. *Tluscze Jadalne* 15(4), 198–205 (1971). The addition of oxidizing agents had no effect on the ash determination but did accelerate the ashing process. Once above minimum values, neither the time nor the temperature of ashing affected the results. As a minimum time, it was convenient to use 5–5½ hours. (Rev. Franc. Corps Gras)

EFFECT OF FLUIDIZED BED DRYING ON THE LIPIDS OF SUNFLOWER SEEDS. V.K. Kostenko *et al. Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* 1971(5), 75–6. Changes which occur in the lipids during drying are determined by the temperature as well as by the condition and the quality of the seeds themselves. The effects of the drying process on the lipase and lipoxidase in the seeds were studied. It was found necessary to use temperatures in the range of 110–115C. (Rev. Franc. Corps Gras)

USE OF THIN LAYER CHROMATOGRAPHY FOR DETERMINING EPOXIDIZED SOYBEAN OIL. V.D. Feofanov. *Izv. Vysshikh Uchebn. Zavedenii, Pishchevaya Tekhnol.* 1971(5), 168–70. TLC on silica gel was used to separate epoxidized soybean oil into six fractions. The solvent system consisted of hexane/diethyl ether/acetic acid (73/25/2). The epoxidized oil also migrated on films of polyisoprene hydrochloride developed with water and heptane. It did not migrate on a film containing 2% oil and 10% dioctylsebacate using the same solvents. (Rev. Franc. Corps Gras)

INITIAL OXIDATION THROUGH OXYGEN AND OLEFIN INTERACTIONS. N.A. Khan (PCSIR Labs., Dacca, Bangladesh). *Oleagineux* 26, 631–4 (1971). The theoretical chemistry of the interactions between oxygen and olefins is reviewed. Special attention is paid to the oxidation of unsaturated fatty acids. The triplet state of $O_2$ is shown to produce only the conjugated cis-trans hydroperoxide.

BLEACHING OF SOYBEAN OIL IN THE MISCELLA. E.I. Zuev *et al. Tr. Vses. Nauchn.-Issled. Inst. Zhirov* 27, 108–16 (1970). Under the conditions chosen for bleaching in the miscella, a sufficiently selective extraction of the pigments without appreciable absorption of phosphatides occurs. A decrease in isomerization of unsaturated fatty acids and of formation of melanophosphatides was observed. Since the process takes place at a lower temperature (20C instead of 90C), loss of neutral oil is reduced about fivefold. (Rev. Franc. Corps Gras)

POSITIONAL ISOMERIZATION OF THE UNSATURATED FATTY ACIDS DURING CONTINUOUS INDUSTRIAL HYDROGENATION OF SUNFLOWER OIL. E.I. Gorskova *et al. Tr. Vses. Nauchn.-Issled. Inst. Zhirov* 27, 192–8 (1970). The kinetics of positional isomer formation in the double bonds of linoleic and oleic acids during continuous selective hydrogenation of sunflower oil using a nickel-copper catalyst under high temperature conditions was studied. At low catalyst concentrations, the rate of positional and geometrical isomer formation was lowered. Under these conditions, an equilibrium ratio between the positional

isomers of the trans monounsaturated acids was observed even in the early stages of the hydrogenation. For the cis monounsaturated acids, it occurred only below 75 I.V. (Rev. Franc. Corps Gras)

THE AMOUNTS OF 3,4-BENZOPYRENE IN SUNFLOWER SEEDS AND PRODUCTS MADE FROM THEM. L.T. Grigorenko *et al. Tr. Vses. Nauchn.-Issled. Inst. Zhirov* 27, 32–41 (1970). The greatest amount of 3,4-benzopyrene was contained in the lipids from the shell. Its presence did not occur as a result of manufacturing practices, but rather it came from the seeds themselves. The amount of this compound was lowered with increases in the degree of refining. (Rev. Franc. Corps Gras)

THE EFFECT OF VEGETABLE OIL ISOMERIZATION PROCESSES ON THE FATTY ACID COMPOSITION OF THE ISOMERIZED OIL. N.A. Smirnova *et al. Tr. Vses. Nauchn.-Issled. Inst. Zhirov* 27, 199–204 (1970). Isomerization of sunflower oil results in the appearance of conjugated dienes and with linseed oil, in conjugated trienes. Isomerized sunflower oil ($n_D^{20}$ = 1.4792) contained 27.5% conjugated acids of which 14% were cis-trans and 13.5% were trans-trans. Isomerized linseed oil ($n_D^{20}$ = 1.4905) contained 32% conjugated dienes in which the double bonds occurred in trans-trans, cis-trans, and trans-cis configurations and 7% conjugated trienes. (Rev. Franc. Corps Gras)

CAUSES AND PREVENTION OF SOAPY OFF-FLAVORS IN CANDY AND CHOCOLATE. N.V. Vengerova *et al. Tr. Vses. Nauchn.-Issled. Inst. Zhirov* 27, 184–91 (1970). A hard fat of improved stability is obtained from successive fractionation of the acetone residue obtained from a unique fractionation of fully hardened palm oil. The authors were successful with a double fractionation procedure. In the first crystallization, the ratio of fat to acetone was 1:4; the temperature 25–28C; and the length of time 4 hours. The filtrate, after adjustment of the fat:acetone ratio to 1:5, was cooled to 6C and held for 4 hours. A fraction melting at 33.6C was obtained. It worked well in candies and chocolates and was stable for 2 months. (Rev. Franc. Corps Gras)

EFFECT OF REFINING ON SOME PHYSICAL PROPERTIES OF SUNFLOWER OIL. C.T. Hadziski *et al. Maslo-Sapunema Prom., Byul.* 7(4), 17–25 (1971). The influence of the individual stages of refining of sunflower oil on density, viscosity and surface tension was studied. Refining caused an increase in surface tension but did not affect density and viscosity at all. Some empirical formulas for calculating the density and the viscosity at different temperatures are given. (Rev. Franc. Corps Gras)

BACTERIOLOGY AND MYCOLOGY OF TALLOWS. P. Liger (I.N.R.A.). *Rev. Franc. Corps Gras* 18, 605–8 (1971). No significant amounts of toxic bacteria were found in any of the samples tested. However, fungal contamination was quite widespread, with the extent of contamination related to the quality of the finished product. The addition of fungistats to tallows (principally propionates and thiabenzol) is discussed. Thiabenzol was effective at a level of 10 μg/g of tallow containing 8% moisture.

OXIDIZED ACIDS PRESENT IN CRUDE FATS. III. THIN LAYER CHROMATOGRAPHY OF METHYL ESTERS OF OXIDIZED ACIDS. J. Graille and M. Naudet (ITERG, Marseille). *Rev. Franc. Corps Gras* 18, 609–15 (1971). In this paper, the authors report on a technique for separating the oxidized acids and estimating the amounts of each band by photodensitometry. The densitometric procedure is accurate and reproducible. The procedure for the thin-layer chromatography is given in detail.

FILTER-MELTER FOR COOKING FAT. R.T. Keating. *U.S. 3,630,361.* The combined filter and melter for use with food fryers has a heated circulating and filtering system adapated to remove used cooking fat from a fryer, filter, decolorize, and deodorize it, and then return it to the fryer.

PROCESS FOR CONVERTING A MIXED TOCOPHEROL CONCENTRATE TO ESSENTIALLY ALL α-TOCOPHEROL. D.R. Nelan (Eastman Kodak). *U.S. 3,631,068.* The mixed tocopherol concentrate is reacted with an aldehyde such as formaldehyde and a hydrogen halide such as HCl in the presence of metallic tin as a reducing agent.

MARGARINE FAT CONTAINING RANDOMIZED COMPONENT. M.P.V. Fondu and M.G.A. Willems (Lever Bros.). *U.S. 3,634,100.* The fat has a high content of polyunsaturated fatty acids and is not hydrogenated. The hard stock is obtained by interesterifying palm and coconut fats with, for example, palm stearine, or by randomizing the glycerides of a corresponding mixture of the fatty acids.

METHOD FOR CONTINUOUS HYDROGENATION OF OILS AND FATS. W. Kehse (Fried. Krupp G.m.b.H.). *U.S. 3,634,471.* The oil is passed along a tortuous path on the upper faces of a series of stacked, horizontal plates and then dropped to the next lower plate. The hydrogen is simultaneously passed upward through the holes in the plates.

PROCESS FOR MANUFACTURE OF SYMMETRICAL GLYCERIDES. J. Harwood (SCM Corp.). *U.S. 3,634,473.* Substantially pure di- and tri-glycerides are prepared by an improvement in the conventional glycerolysis process. The improvement consists in liquifying an anhydrous mixture of glycerol and the fat, adding a low temperature rearrangement catalyst, and then agitating the mixture until a symmetrical diglyceride is formed. Crystallization of the diglyceride is induced, as by cooling, seeding or adding a solvent, cooling, and then evaporating the solvent. The crystals are removed as they are formed. Symmetrical triglycerides are formed by acylating the triglycerides.

METHOD FOR REMOVING METALS FROM VEGETABLE OILS. R.E. Beal and R.A. Eisenhauer (U.S. Sec'y Agr.). *U.S. 3,634,475.* The oil is washed in a multistage countercurrent process with water which has been previously treated by passing through a cation exchange resin in the hydrogen form. The wash water can be recycled through the resin and reused.

## • Fatty Acid Derivatives

CONFIGURATION AND CONFORMATION OF THE LONG-CHAIN CYCLIC ACETALS OF GLYCEROL. W.J. Baumann (Univ. of Minnesota, Hormel Inst., Austin, Minn. 55912). *J. Org. Chem.* 36, 2743–7 (1971). The structural and geometrical isomers of long-chain cyclic acetals of glycerol were prepared by acid-catalyzed condensation of glycerol with *n*-hexadecanal followed by purification of the individual components by adsorption and gas-liquid chromatography. The structures of the four isomers were established by chemical and spectroscopic means. Configurations and conformations were determined by 100-MHz nmr spectroscopy aided by deuterium labeling. The isomers were identified as cis-2-pentadecyl-5-hydroxy-1,3-dioxane, trans-2-pentadecyl-5-hydroxy-1,3-dioxane, cis-2-pentadecyl-4-hydroxymethyl-1,3-dioxolane, and trans-2-pentadecyl-4-hydroxymethyl-1,3-dioxolane. The lower energy structures are those having cis configuration. It was found that the dioxane isomers differ in the orientation of their substituents at C-5, while the long-chain alkyl groups remain locked in equatorial conformation.

DETERMINATION OF THE SPECIFIC RADIOACTIVITY OF FATTY ACIDS SEPARATED AS THEIR METHYL ESTERS BY GAS-LIQUID CHROMATOGRAPHY. C. Bishop, R.F. Glascock, Elizabeth M. Newell and V.A. Welch (Nat. Inst. for Res. in Dairying, Univ. Reading, Shinfield, Reading, Berkshire, England). *J. Lipid Res.* 12, 777–80 (1971). Free or combined $^{3}H$-labeled fatty acids are converted to their methyl-$^{14}C$ esters or, if labeled with $^{14}C$, to their methyl-$^{3}H$ esters. For a given specific radioactivity of the methyl group, the nuclide ratio in the esters separated by GLC is a direct measure of the specific radioactivity of the fatty acids, and quantitative collection is unnecessary. Methods of methylation with minimum quantities of labeled methanol, and of deriving nuclide ratios from channel ratios in a scintillation spectrometer, are given.

A CONVENIENT PROCEDURE FOR THE SYNTHESIS OF CERAMIDES. S. Hammarstrom (Dept. of Med. Chem., Royal Vet. College, Stockholm, Sweden). *J. Lipid Res.* 12, 760–64 (1971). A procedure for the preparation of ceramides by direct coupling of long-chain bases and fatty acids in the presence of a mixed carbodimide is described. This method has been used to prepare ceramides containing sphing-4-enine or sphinganine and various saturated and unsaturated fatty acids as well as saturated 2-hydroxy acids. Ceramides containing 4-hydroxy sphinganine and saturated nonhydroxy acids have also been prepared. The yields were 60–75%. The characterization of these compounds by gas-liquid chromatography-mass spectrometry as trimethylsilyl derivatives has been previously reported. Some of the ceramides are further characterized in this report by infrared spectroscopy and one compound, in addition, by elementary analysis. Use of racemic constituents for 2-hydroxy acid ceramide syntheses leads to the formation of diasteroisomers which separate by the thin-layer chromatography. These were characterized by gas-liquid chromatography-mass spectrometry as the trimethylsilyl derivatives and by infrared spectroscopy. Their configurations were established by syntheses with optically active constituents.

PRODUCING LACTYLIC ACID ESTERS OF FATTY ACIDS. E. Eng (Glyco Chemicals). *U.S. 3,636,017.* The process consists of (a) reacting lactic acid with a partly or completely water soluble alkali metal, alkaline earth metal or ammonium base to form the corresponding lactic acid salt; (b) esterifying the salt with a fatty acid; and (c) treating the product with mineral acid to convert it to the fatty acid ester of lactic acid.

## • Biochemistry and Nutrition

INTERACTIONS BETWEEN ENDOTOXIC LIPOPOLYSACCHARIDES AND THE COMPLEMENT SYSTEM IN THE SERA OF LOWER VERTEBRATES. N.K. Day, R.A. Good, J. Finstad, R. Johannsen, R.J. Pickering and H. Gewurz (Dept. of Pediat. and Surg., Univ. Minn. Hosp., Minneapolis, Minn. 55455). *Proc. Soc. Exp. Biol. Med.* 133, 1397–1401 (1970). Endotoxic lipopolysaccharides (LPS) are ubiquitous biologically active products derived from the outer membrane of most, if not all, gram-negative bacterial species. In recent years it has become increasingly clear that the biological responses induced in the host by LPS are related in part to their potent ability to activate and generate biologically active peptides from the complement (C) system. The underlying mechanism(s) of these interactions is not yet understood. To date, studies of the C-endotoxin interaction have been performed only in the higher vertebrates. Further insights might be gained by investigations in the phylogenetic perspective. In the present work we studied the effect of LPS on C activity of lower animals. We found that LPS is able to consume C activity in very primitive as well as more highly developed vertebrates. These include the lower fishes, amphibians, reptiles and birds.

FAT AND NITROGEN BALANCES IN RATS WITH ALCOHOL-INDUCED FATTY LIVER. C. Rodrigo, C. Antezana and E. Baraona (Sect. of Gastroenterology, Dept. of Med., Hospital J.J. Aguirre, Santiago, Chile). *J. Nutr.* 101, 1307–10 (1971). To test the role of defective intestinal absorption produced by ethanol on the pathogenesis of alcohol-induced fatty liver, fat and nitrogen balances were studied in rats pair-fed nutritionally adequate liquid diets containing ethanol (36% of calories) or isocaloric carbohydrate (controls). Alcohol feeding resulted in three- to fourfold increase in hepatic triglyceride concentration, whereas low protein feeding (4% of calories) only doubled it. Ethanol did not affect either fecal fat or nitrogen excretion or ideal losses of nitrogen, but increased significantly the urinary excretion of nitrogen. This effect of ethanol on nitrogen balance persisted in animals fed low protein diets, incriminating alteration of protein metabolism induced by ethanol rather than increased colonic breakdown of unabsorbed amino acids.

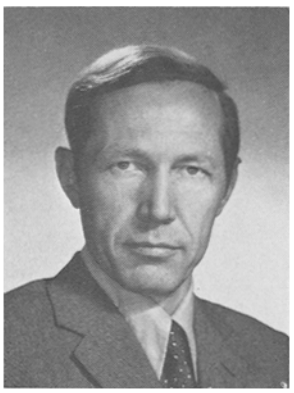
ESTROGEN-INDUCED PROTEIN. TIME COURSE OF SYNTHESIS. A. Barnea and J. Gorski (Dept. Physiol. Biophys., Univ. Ill., Urbana, Ill. 61801). *Biochemistry* 9, 1899–1904 (1970). Single injection of 17$\beta$-estradiol into immature rats or mature ovariectomized rats induces the increased incorporation of labeled amino acids into a specific soluble uterine protein (induced protein), detectable by starch gel electrophoresis. The induced protein was not detected when uterine proteins were labeled with radioactive amino acids prior to estrogen injection. This indicated de novo synthesis of this protein and not changes in conformation or subcellular compartment. The induced protein is detectable after a lag period of 40 min following an injection of 17$\beta$-estradiol, when the synthesis of induced protein is measured under in vivo conditions. Induced protein continues to be synthesized at the high estradiol-induced rate for the period between 45 and 120 min after estradiol injection, whereas by 4 hr it appears to decline.

EFFECTS OF THE METABOLITES OF PROSTAGLANDIN $E_1$ ON THE SYSTEMIC AND PERIPHERAL CIRCULATIONS IN DOGS. J. Nakano (Dept. of Pharm. and of Med., Univ. of Okla., School of Med., Okla. City, Okla. 73104). *Proc. Soc. Exp. Biol. Med.* 136, 1265–68 (1971). The effects of $PGE_1$ and its three metabolites, 15-keto-$PGE_1$, dihydro-$PGE_1$, and 15-keto-dihydro-$PGE_1$, were studied in anesthetized dogs and in isolated dog hind limb preparations. The systemic hemodynamic effects of these metabolites were qualitatively similar to those of $PGE_1$ in dogs, but the magnitude of the effects was smaller with these three metabolites than with $PGE_1$. Among these metabolites, dihydro-$PGE_1$ exerted the most potent hemodynamic and vasodilator actions. The present study suggests that the inactivation of $PGE_1$ in the lungs is caused, not by the saturation of the $\Delta^{13}$ durable bond of $PGE_1$, but by the oxidation of the secondary alcohol group at C-15 and probably by further degradation.

EFFECT OF TOLBUTAMIDE ON PLASMA FREE FATTY ACIDS AND BLOOD SUGAR IN BIRDS. F. Grande (Jay Phillips Res. Lab., Mt. Sinai Hosp., and Lab. of Phys. Hygiene, Univ. of Minn., Minneapolis, Minn. 55404). *Proc. Soc. Exp. Biol. Med.* 137, 548–52 (1971). Intravenous injection of tolbutamide (15.0 mg/kg) caused a significant decrease of plasma FFA and BS concentration in geese and ducks, but not in owls. The decrease of plasma FFA was significant 5 min after the injection whereas the decrease of BS became significant first at 15 min of injection. The decrease of plasma FFA produced by tolbutamide in geese and ducks whose plasma FFA had been elevated by continuous infusion of glucagon (0.2 mg/kg/min) was not greater than that observed in intact birds injected with the same dose of the drug. Glucagon infusion in geese previously injected with tolbutamide caused an elevation of plasma FFA comparable to that observed when glucagon was infused at the same rate in intact birds. These results indicate that tolbutamide does not inhibit the adipokinetic effect of glucagon in vivo.

EFFECT OF DIETARY OLEATES ON LYMPH LIPIDS IN THE YOUNG BOVINE. D.C. Beitz, Welsonia J. Magat, R.S. Allen and A.D. McGilliard (Depts. Animal Sci. & Biochem. & Biophysics, Iowa State Univ., Ames, Iowa 50010). *J. Dairy Sci.* 54, 1681–87 (1971). The effect of feeding mono-, di- and triolein and oleic acid with skimmilk on thoracic duct lymph

## Jarvi Joins Capital City Products as Research Chemist



**Pentii K. Jarvi**

Pentii K. Jarvi has joined Capital City Products Co., Division of Stokely-Van Camp, Inc., as a research chemist.

A native of Finland, Jarvi immigrated to the U.S. in 1966 and served as research chemist with Swift and Co. before joining Capital City Products. He was technical manager of a margarine factory in Helsinki, Finland, before coming to the U.S.

Jarvi earned his Ph.D. from the University of Helsinki and has taken post doctoral courses at Oklahoma A & M. He is a member of the American Chemical Society, the American Oil Chemists' Society and the Finnish Chemists Society.

flow and lipid composition was studied in dairy calves. Administration of either reconstituted skimmilk only (aqueous dispersion containing 20% nonfat milk solids) or reconstituted skimmilk plus any of the lipids increased the flow rate of lymph in the thoracic duct. The concentration of lipid in the lymph and the amount of lipid transported per hour increased significantly by 2 to 5 hours after the lipids were fed; feeding only reconstituted skimmilk did not alter the lipid concentration in the lymph. Feeding of each test lipid also caused about a 2-fold increase of the proportion of oleic acid in the triglycerides of the lymph lipids. This elevation of oleic acid and the concomitant decrease of the other fatty acids occurred less rapidly after the monolein feeding than when other lipids were fed. Free fatty acids and cholesterol esters in the lymph were altered only slightly, suggesting that most of the oleic acid in the dietary lipids was incorporated into triglycerides.

EFFECT OF CHOLESTERYL 14-METHYLHEXADECANOATE ON THE RNA POLYMERASE ACTIVITY OF RAT LIVER NUCLEI IN VIVO AND IN VITRO. E. Komarkova and J. Hradec (Dept. Biochem., Oncological Inst., Prague 8-Bulovka, Czechoslovakia). *FEBS Letters* 18, 109–12 (1971). Cholesteryl 14-methylhexadecanoate (CMH) affects the activity of several enzymes required for protein synthesis. It enhances in vitro the charging of tRNA with amino acids and evidence has been presented that this ester is probably a normal constituent of aminoacyl-tRNA synthetases and essential for their normal function. The same holds true for peptide elongation factors in rat liver. The activity of aminoacyl-tRNA synthetases is also affected by the administration of CMH to living animals. Moreover, administration of this compound to rats is followed by changes in ribosomal peptide synthesis indicating that not only the translation but also the transcription of genetic information may be affected by CMH. The DNA-dependent RNA polymerase (nucleoside triphosphate: RNA nucleotidyl transferase, E.C. 2.7.7.6) is the key enzyme involved in the expression of the genetic information. Mutiple forms of this enzyme apparently exist in nuclei of eukaryotic cells, some of them synthesizing mRNA while the others produce other species of RNA. These different enzymes seem to be bound to different subcellular structures. In the present experiments the effect of CMH was tested on the RNA polymerase activity of solubilized rat liver nuclei and evidence is presented suggesting that the ester affects this enzymatic activity in a similar way to that of enzymes required for translational processes.

DEVELOPMENT OF ABNORMAL LIPID BODIES IN VARIOUS SPHINGOLIPIDOSES. M. Adachi and B.W. Volk (Isaac Albert Res. Inst. of the Kingsbrook Jewish Med. Center, Brooklyn, N.Y. 11203). *Proc. Soc. Exp. Biol. Med.* 138, 195–8 (1971). The sphingolipidoses are hereditary disorders, secondary to enzyme defects, in which lipids accumulate in brain and other organs. The present studies indicate that the abnormal lipid cytosomes are derived from the smooth portion of the endoplasmic reticulum, and that the mitochondria appear to be the organelle that is primarily associated with the enzyme defect. Preliminary studies of mitochondrial fractions from normal and Tay-Sachs disease brains showed that the mitochondrial fraction of normal brains contained 28.6% N-acetyl hexosaminidase A activity, while it was absent in that from Tay-Sachs disease brain.

DDT ADMINISTERED TO NEONATAL RATS INDUCES PERSISTENT ESTRUS SYNDROME. W.L. Heinrichs, R.J. Gellert, J.L. Bakke and N.L. Lawrence (Dept. Obstetrics and Gynecol., Univ. of Wash. School of Med., Seattle, Wash. 98195). *Science* 173, 642–3 (1971). The o,p'-isomer of the insecticide DDT when injected into neonatal female rats significantly advanced puberty, induced persistent vaginal estrus after a period of normal estrous cycles, and caused the ovaries to develop follicular cysts and a reduced number of corpora lutea. The uterotropic response to administered estradiol was reduced, and the female pattern of mating behavior was slightly disturbed. Residues of DDT in ovarian, brain and adipose tissues of the adult animals were the same in both treated and control groups.

D-GALACTOSAMINE HEPATITIS. I. HEPATOCELLULAR INJURY AND FATTY LIVER FOLLOWING A SINGLE DOSE. R.S. Koff, Gloria Gordon and S.M. Sabesin (Med. Serv., Boston Vets. Adm. Hosp. & Boston Univ. Sch. of Med., Boston, Mass., 02130). *Proc. Soc. Exp. Biol. Med.* 137, 696–701 (1971). Administration of 1.5 g/kg of D-galactosamine HCl in a single injection resulted in profound histological and biochemical evidence of hepatocellular injury. Electron microscopy disclosed focal cytoplasmic degeneration 6 hr after injection and this was paralleled by a progressive increase in the serum levels of glutamic oxaloacetic transaminase and glutamic pyruvic transaminase. Progressive cellular injury was accompanied by lipid accumulation, hyperplasia of the smooth endoplasmic reticulum and organelle injury involving almost every cell. Although liver triglyceride levels were normal 6 hr following D-galactosamine administration, at 24 hr significant hepatic triglyceride accumulation was demonstrated. Serum enzyme levels, histologic features of the liver and hepatic triglyceride content remained normal in animals treated with equimolar D-glucosamine HSl and 2-deoxygalactose.

II. MECHANISM OF FATTY LIVER PRODUCTION. R.S. Koff, J.J. Fitts, and S.M. Sabesin. *Ibid.* 138, 89–93. The administration of a single dose of D-galactosamine (1.5 g/kg) results in hepatocellular necrosis and fatty liver in the rat. Hepatic triglyceride accumulation is not altered by administration of adenine, ATP, uridine, uridine nucleotides or uridine diphosphoglucose. Protein synthesis in vivo is impaired as early as 4 hr after administration of D-galactosamine. Subsequently, the expected post-Triton WR 1339 hypertriglyceridemia is reduced and beta-lipoproteins are decreased by electrophoretic analysis. These data suggest that impaired hepatic lipoprotein release, presumably due to inhibition of synthesis of the protein moiety of lipoprotein, is the mechanism of the D-galactosamine-induced fatty liver.

CHOLESTEROL VEHICLE IN EXPERIMENTAL ATHEROSCLEROSIS; PART II, PEANUT OIL. D. Kritchevsky, Shirley Tepper, D. Vesselinovitch and R.W. Wissler (Wistar Inst. Anatomy Biology, Philadelphia, Penn. 19104). *Atherosclerosis* 14, 53–64 (1971). In four consecutive experiments, young adult, male, Dutch belted rabbits were fed diets containing 6% of fats of varying fatty acid composition. These fats included coconut oil (CNO), corn oil (CO), peanut oil (PNO) and a special fat (PGF) simulated to resemble peanut oil minus arachidic and behenic acids. All diets contained 2% cholesterol and were fed to the rabbits for eight weeks. Biochemical and histological findings were then compared. These findings support the concept that arachidic and behenic acids, which are present in peanut oil, but not in the special fat, may be responsible, in part, for the unexpectedly greater atherogenic effect of peanut oil. However, our observations suggest other factors, such as triglyceride structure, may also play an important role in atherogenesis.

CHOLESTEROL PRODUCTION IN OBESITY. T.A. Miettinen (Third Dept. of Medicine, Univ. of Helsinki, Finland). *Circulation* 44, 842–50 (1971). Sterol balance studies were performed in 10 control subjects, 10 normolipidemic obese patients and 10 hypertriglyceridemic (type IV, mainly obese) patients on a low-cholesterol solid food diet. Fecal elimination of cholesterol was markedly elevated in the overweight patients and tended to be high in the hypertriglyceridemic subjects also. A significant correlation was found between body weight and fecal excretion of neutral, acidic and total steroids, indicating that the greater the body weight the higher was the rate of cholesterol synthesis. Sterol balance data in obese subjects showed that excess daily cholesterol production roughly amounted to 20 mg/kg of adipose tissue. The control subjects produced only 12 mg/kg of body weight daily. Thus, obesity is associated with an increased rate of cholesterol synthesis in man. However, the correlation between serum cholesterol concentration and cholesterol production was low, suggesting that the overall rate of cholesterol synthesis was not the only factor determining the serum cholesterol level. That enhanced cholesterol production is not an irreversible phenomenon in obese subjects was indicated by the normalization of sterol balance values in three overweight patients after their weights had been reduced by total fast fallowed by a low-calorie diet.

CHANGES OF CHOLESTEROL METABOLISM IN THE AGEING RAT. M. Yamamoto and Y. Yamamura (3rd Dept. of Inter. Med.,

School of Med., Osaka Univ., Fukushima-ku, Osaka, Japan). *Atherosclerosis* 13, 365–74 (1971). Changes in the various steps of cholesterol metabolism were examined among rats of different ages using the radioisotope tracer method. No change with ageing was observed in the serum cholesterol level of the rat. By contrast all the following decreased with increase of age from 2 to 18 months: hepatic cholesterogenesis in vitro from acetate-1-$^{14}$C; in vivo incorporation of acetate-1-$^{14}$C into hepatic and serum cholesterol; biliary and fecal excretion of cholesterol-$^{14}$C and its metabolites after cholesterol-4-$^{14}$C injection; and gastrointestinal absorption of cholesterol-4-$^{14}$C.

ATHEROSCLEROSIS INDUCED IN HYPERCHOLESTEROLAEMIC BABOONS BY IMMUNOLOGICAL INJURY; AND THE EFFECTS OF INTRAVENOUS POLYUNSATURATED PHOSPHATIDYL CHOLINE. A.N. Howard, J. Patelski, D.E. Bowyer and G.A. Gresham (Dept. Investigative Med. and Pathol., Univ. Cambridge, Cambridge, Great Britain). *Atherosclerosis* 14, 17–29 (1971). Groups of 5–8 baboons were fed either a control or hypercholesterolaemic diet for 6 months. During the last 90 days, each group was given 5 i.v. injections of bovine serum albumin (BSA) at 16 day intervals or control injections of saline. Only those animals which were both hypercholesterolaemic and injected with BSA developed aortic and coronary atherosclerosis. An intravenous injection of 1 g polyunsaturated soya phosphatidyl choline (Lipostabil) thrice weekly into animals receiving the atherogenic diet and BSA, reduced the incidence and severity of aortic atherosclerosis but had no effect on plasma cholesterol, phospholipids or the fatty acid composition of the cholesterol esters and lecithin. Compared with controls, animals given the hypercholesterolaemic diet had increased aortic lipase and normal cholesterol esterase activity. Those given the same diet and Lipostabil had a normal aortic lipase and over 50% increase in cholesterol esterase activity. It is concluded that immunological injury hastens the onset of atherosclerosis produced by feeding a hypercholesterolaemic diet and that changes in aortic lipolytic enzymes may be the mechanism by which Lipostabil reduces atherosclerosis.

A SPHINGOLIPID HAVING A NOVEL TYPE OF CERAMIDE AND LACTO-*N*-FUCOPENTAOSE III. H. Yang and S. Hakomori (Biochem. Lab., Dept. Pathobiol., School of Public Health & Community Med., Univ. Washington, Seattle, Wash. 98105). *J. Biol. Chem.* 246, 1192–1200 (1971). A new sphingoglycolipid was isolated from human adenocarcinomas. The glycolipid had a novel ceramide which contained predominantly 4-hydroxysphinganine (phytosphingosine) and a high content of $\alpha$-hydroxy fatty acids. The structure of the carbohydrate moiety was identified as O-$\beta$-galactosyl-(1 → 4)-[O-$\alpha$-L-fucosyl-(1 → 3)]-O-$\beta$-(*N*-acetyl)glucosaminosyl-(1 → 3)-O-$\beta$-galactosyl-(1 → 4)-glucose, which was identical with that of lacto-*N*-fucopentaose III. The precipitating antibody against this glycolipid was produced in rabbits; the antiserum reacted specifically with this glycolipid. The precipitin reaction was inhibited by lacto-*N*-fucopentaose III.

6-AMINO DERIVATIVES OF STIGMASTANOL AND CHOLESTANOL. H. Pinhas, A. Loiseau, A. Krikorian-Manoukian, D. Courmarcel, N.P. Buu-Hoi and P. Jacquignon (Lab. Laroche Navarron, Levallois, 92, France). *J. Med. Chem.* 14, 1048–50 (1971). A number of new 6-$\beta$-amino and 6-$\beta$-(N,N-dialkylaminoalkyl) amino derivatives of stigmastanol and cholestanol have been prepared by reductive amination of the corresponding 6-keto sterols or reduction of Schiff bases from the same ketones. Several of these amines produce a decrease in the blood cholesterol level in normal rats.

ON THE FLEXIBILITY OF HYDROCARBON CHAINS IN LIPID BILAYERS. J. Seelig (Physikalisch-Chemisches Inst. Univ. Basel, CH-4056, Basel, Switzerland). *J. Amer. Chem. Soc.* 93, 5017–23 (1971). The spin label technique is used to investigate the flexibility of the hydrocarbon chains of a smectic phase with bilayer structure. The experimental data, especially the temperature dependence of the flexibility, can be explained in terms of a phenomenological theory which is based on the mathematical formalism of the rotational isomeric model. This approach leads to conclusions about the apparent configurational entropy per methylene group which are consistent with calorimetric data.

METHOD AND REAGENT FOR DETERMINING TOTAL CHOLESTEROL IN BLOOD SERUM. A. C. Parekh and D.H. Jung (Research Corp., New York). *U.S. 3,615,232.* The total serum cholesterol is solubilized and interfering chromogens precipitated by adding to the serum a mixture of ferric acetate and uranium acetate. The liquid phase is separated from the precipitate and the cholesterol determined by standard colorimetric techniques.

PROCESS FOR THE EXTRACTION OF TOXIC SUBSTANCES FROM A PRESSCAKE OF BRASSICA NAPUS. F.M. Barros (Univ. of Chile). *U.S. 3,615,648.* One part presscake is macerated in five parts by weight of water at room temperature for 15 hours. The water is drained off and the presscake is again extracted for 3 hours. Then it is dried below 60C and ground. The biological value of the protein is improved by this process.

A METHOD FOR THE DETERMINATION OF LIPOPROTEIN LIPASE IN POSTHEPARIN PLASMA AND BODY TISSUES UTILIZING A TRIOLEIN-COATED CELITE SUBSTRATE. I. Posner and V. Bosch (Hosp. Central de las Fuerzas Amadas, Univ. Central de la Venzuela, Caracas, Venezuela). *J. Lipid Res.* 12, 768–72 (1971). A simple and specific method for assaying lipoprotein lipase activity is described. Postheparin plasma, heart homogenates or extracts of acetone powder of adipose tissue were incubated with a triolein-coated Celite substrate, and enzyme activity was determined from the rate of free fatty acid (FFA) release in the incubation system. FFA release was linear for 30 min. and was proportional to protein concentration in the incubation system. FFA release was decreased by addition of deoxycholate or Triton X-100. Increasing the concentration of heparin in the incubation system caused a gradual decrease in FFA release by postheparin plasma and increased in activity of heart homogenates and adipose tissue lipoprotein lipase. The Celite substrate was found to be satisfactory for assaying pancreatic lipase activity as well.

A NOTE ON THE STABILITY OF CONJUGATED DIENE ABSORPTION OF RAT LIVER MICROSOMAL LIPIDS AFTER CARBON TETRACHLORIDE POISONING. S. Srinivasan and R.O. Recknagel (Dept. of Physiol., School of Med., Case Western Reserve Univ., Cleveland, Ohio 44106). *J. Lipid Res.* 12, 766–67 (1971). Liver microsomal lipid peroxidation has been observed in fatal human $CCl_4$ poisoning, in rats with fatty livers induced by $CCl_4$ or by yellow phosphorus, and in mice poisoned with 1,1,2,2,-tetrachloroethane. These observations suggest the possibility that other instances of toxic liver injury may involve lipid peroxidation. Cases of acute, fatal, toxic liver injury (e.g. from halothane anesthesia) are not likely to occur at or near laboratories equipped to determine whether any lipid peroxidation might have taken place. The data presented indicate that rat livers may be stored frozen for at least 7 days with no demonstrable diminution in $CCl_4$-induced conjugated diene absorption of liver microsomal lipids.

DIFFERENTIAL DISTRIBUTION OF ORTHOPHOSPHATE-$^{32}$P AND GLYCEROL-$^{14}$C AMONG MOLECULAR SPECIES OF PHOSPHATIDYLINOSITOLS OF RAT LIVER IN VIVO. B.J. Holub and A. Kuksis (Dept. of Biochem., Med. Res., Univ. of Toronto, Toronto 101, Canada). *J. Lipid Res.* 12, 699–705 (1971). The incorporation of orthophosphate-$^{32}$P and glycerol-2-$^{14}$C into

# Robert Hussong Earns New Appointment

The appointment of Robert C. Hussong as Vice President, Manufacturing, for Spencer Kellogg Division of Textron Inc. has been announced. Hussong will be responsible for the division's manufacturing and purchasing operations.

Hussong is a graduate of Columbia University where he received a BA degree in chemistry, and he has also pursued additional studies at Polytechnic Institute of Brooklyn. He joined Spencer Kellogg as a plant chemist at the Edgewater plant in 1936. Prior to becoming plant manager, Hussong held the positions of refinery superintendent and assistant plant manager. In July 1971 he was transferred to Buffalo as production superintendent. He has had overseas assignments for Spencer Kellogg in Africa and Brazil.

Hussong is a past president of the Northeast Section of the American Oil Chemists' Society and has been active in the Bergen County Industrial Management Club and the American Field Service. He has also served as chairman of the New Jersey section of Partners of the Alliance for Progress.

various species of rat liver phosphatidylinositols as a function of time was determined in vivo. $^{32}P$ was administered intraperitoneally and glycerol-$^{14}C$ was given intravenously. The phosphatidylinositols were resolved intact according to degree of unsaturation. Within 1–3 hr after injection of the labeled phosphate, the relative specific activity of the linoleoyl dienes exceeded that of the arachidonoyl tetraenes about 17-fold, and that of the trienes and polyenes about 8-fold. The relative specific activities of all the fractions became about equal 2–3 days after administration of $^{32}P$. The labeling patterns obtained with glycerol were comparable to those seen for the phosphate. As early as 5 min. about 65% of the activity was localized in the monoenes plus dienes, while only 17% was found in the tetraenes, although the mass proportions of these fractions were 7.1 and 77.0% of the total phosphatidylinositols, respectively. The recovery of the total radioactivity in the monoenes and dienes decreased continuously with time to about 15% at 9 hr, while that recovered in the tetraenes rose steadily to about 70%. The present data are consistent with an active synthesis of the monoenoic and dienoic phosphatidylinositols by way of the phosphatidate, followed by a deacylation-reacylation cycle involving arachidonic acid, as claimed for other rat liver glycerophosphatides.

CELLULARITY OF ADIPOSE DEPOTS IN THE GENETICALLY OBESE ZUCKER RAT. P.R. Johnson, L.M. Zucker, J.A.F. Cruce and J. Hirsch (Rockefeller Univ., New York, N.Y. 10021). *J. Lipid Res.* 12, 706–14 (1971). Cell size and number of three adipose depots, epididymal, retroperitoneal, and subcutaneous, were determined during growth of the obese Zucker rat ("fatty") and nonobese Zucker control. Cellularity of these depots in the adult "fatty" was compared with that in nonobese controls and in nonobese Zucker rats made obese by ventromedial hypothalamic lesions. Epididymal and retroperitoneal depots in the nonobese rat grew by cell enlargement and increase in cell number until the 14th wk, when number became fixed; further increase in depot size occurred by cell enlargement. The subcutaneous depot added cells until the 26th wk. In the Zucker "fatty," cell number increased until the 26th wk in all depots, accompanied by extreme cell enlargement. The enlarged adipose depots of the adult Zucker "fatty," when compared with the nonobese control, are the result of both hypertrophy and hyperplasia. Depot enlargement in the lesioned animal is the result of hypertrophy. "Fatties" have more cells in adipose depots than do lesioned rats. Genetic obesity in the Zucker rat is clearly different from the obesity produced by hypothalamic lesioning.

LIPOGENESIS FROM GLUCOSE-2-$^{14}C$ AND ACETATE-1-$^{14}C$ IN AORTA. C.F. Howard, Jr. (Dept. of Primate Nutr., Oregon Reg. Primate Res. Center, Beaverton, Oregon 97005). *J. Lipid Res.* 12, 725–30 (1971). Lipogenesis was measured with glucose-3-$^{14}C$ and acetate-1-$^{14}C$ in the everted aortas of normal and atherosclerotic rabbits. More glucose-2-$^{14}C$ than acetate-1-$^{14}C$ was incorporated into lipids in both the normal and the atherosclerotic aorta. Radiocarbon from glucose-2-$^{14}C$ appeared mainly in triglycerides and phospholipids with a small amount in cholesteryl esters. Incorporation increased almost threefold with atherosclerosis, most of the radioactivity being in the glycerol moiety; radioactivity was predominantly in carbon 2 of glycerol. About 70% of the acetate-1-$^{14}C$ incorporated into phospholipids and triglycerides was in the fatty acids, and the remainder was in glyceride-glycerol; 98% of the radioactivity in cholesteryl esters was in the fatty acid moiety. Incorporation into cholesteryl esters was increased most during the development of atherosclerosis.

METABOLISM OF DEOXYCHOLIC ACID IN BILE FISTULA PATIENTS. R.F. Hanson and G. Williams (Dept. of Internal Med., Univ. of Minn. Med. School, Minneapolis, Minn. 55455). *J. Lipid Res.* 12, 688–91 (1971). Although it has been assumed that the secondary bile acid, deoxycholic acid, is not rehydroxylated by the human liver, little direct evidence is available to support this assumption. To investigate the metabolism of deoxycholic acid in man, deoxycholic acid-$^{14}C$ was given intravenously to two patients with complete external bile fistulas. After hydrolysis of the bile salts and chromatographic separation of bile acids, more than 94% of the radioactivity was found in deoxycholic acid and the remainder was scattered in several small unidentified peaks, none of which was cholic acid. Approximately 85% of deoxycholate was excreted as glycine conjugates and 13% as taurine conjugates in this experiment. No detectable sulfates esters were found. These results indicate that the metabolism of deoxycholic acid in man involves only the reconjugation with glycine and taurine without rehydroxylation to cholic acid or sulfation.

RELATION OF LIPID PEROXIDATION TO LOSS OF CATIONS TRAPPED IN LIPOSOMES. M.E. Leibowitz and M.C. Johnson (Walter Reed Army Inst. of Res., Walter Reed Army Med. Center, Washington, D.C. 20012). *J. Lipid Res.* 12, 662–70 (1971). Lipid peroxidation and alterations in cation loss have been induced in liposomes by ferrous ion, ascorbic acid, reduced and oxidized glutathione and gamma radiation. Modifications of these effects by tocopherol and 2,6-di-tert-butyl-4-methylphenol (BHT) were studied when these antioxidants were either incorporated in the membrane or were added to already formed liposomes prior to the addition of the chemical agent or to irradiation. Lipid peroxidation, as indicated by the thiobarbituric acid test for malonic dialdehyde, did not correlate with alterations in cation loss. The largest amounts of lipid peroxidation induced by ascorbic acid and glutathione were associated with decreased cation loss. Inhibition of $Fe^{2+}$- and radiation-induced lipid peroxidation by antioxidants did not inhibit the associated increase in cation loss. Tocopherol was a more effective antioxidant than BHT when it was incorporated in the membrane, whereas BHT was more effective when it was added to the liposomes after formation.

EFFECT OF EXOGENOUS STEROIDS ON STEROL SYNTHESIS IN L-CELL MOUSE FIBROBLASTS. G.R. Rothblat and M.K. Buchko (Wistar Inst. of Anatomy and Biol., Philadelphia, Pa. 19104). *J. Lipid Res.* 12, 647–52 (1971). A number of steroids have been tested in an L-cell tissue culture system to determine their effects on cellular sterol biosynthesis and cellular growth. Cholesterol, desmosterol, lathosterol, 7-dehydrocholesterol and cholestanone reduce de novo synthesis and produce only limited toxicity at high concentrations of exogenous sterol. Considerable cellular toxicity is observed when cells are grown in the presence of coprostanol and $\Delta^4$-cholestenone. No marked effect on either cell growth or sterol biosynthesis is produced by cholestanol, $\beta$-sitosterol, stigmasterol, campesterol, ergosterol, cholesteryl oleate or cholestane.

COMPARISON OF THE METABOLISM OF CHOLESTEROL, CHOLESTANOL AND $\beta$-SITOSTEROL IN L-CELL MOUSE FIBROBLASTS. G.R. Rothblat and Christina H. Burns. *Ibid.*, 653–61. The following data have been obtained from comparative studies on the metabolism of cholesterol, cholestanol and $\beta$-sitosterol by L-cell mouse fibroblasts. When the sterols are added to the growth medium under similar conditions, cellular incorporation of cholesterol > cholestanol > $\beta$-sitosterol. Only limited cellular esterification of these compounds occurs. No metabolic products arising from the sterols could be detected. Influx of all sterols is dependent upon the concentration, and exogenous cholesterol reduces mevalonate incorporation into cellular sterol to a lesser extent than acetate or glucose. The metabolism of these sterols is discussed in relation to their ability to influence de novo sterol biosynthesis.

BILE ACID SULFATES. I. SYNTHESIS OF LITHOCHOLIC ACID SULFATES AND THEIR IDENTIFICATION IN HUMAN BILE. R.H. Palmer and Merry G. Bolt (Dept. of Med., Univ. of Chicago, Pritzker School of Med., and Argonne Cancer Res. Hosp., Chicago, Ill. 60637). *J. Lipid Res.* 12, 671–79 (1971). Sulfate esters of lithocholic, glycolithocholic and taurolithocholic acids were synthesized using sulfur trioxide in pyridine; they were purified by crystallization from methanol or ethanol as the diammonium salts, and their chemical compositions, infrared spectra and chromatographic behavior were determined. Strong alkaline hydrolysis of these sulfates, as commonly performed during quantitative and qualitative analyses of conjugated bile salts, was found to result in a number of degradation products, presumably through disruption of the C–O bond of the hydroxyl group and conversion of the original steroid to isolithocholate and other (possibly olefinic) compounds. After oral administration of lithocholate-$^{14}C$ to three patients with cholelithiasis, radioactive metabolites having the chromatographic properties of sulfated lithocholates were isolated from bile and were identified as sulfated glycolithocholate and taurolithocholate by their characteristic chromatographic mobilities during a series of specific hydrolytic procedures and by crystallizing them to constant specific activities with the synthetic sulfates. The fraction of endogenous lithocholate present in bile as the sulfate was calculated for two patients by isotope dilution and was shown to be 41% and 75% of the total. Sulfation can be expected to affect the physiological and pharmacological properties of lithocholates and may, therefore, influence the toxic properties of these compounds.

II. FORMATION, METABOLISM, AND EXCRETION OF LITHOCHOLIC ACID SULFATES IN THE RAT. R.H. Palmer. *Ibid.*, 680–7. Sul-

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fate esterification has been shown previously to be a prominent feature of lithocholate metabolism in man. These studies were undertaken to ascertain whether this metabolic pathway is also present in rats, and to investigate the physiological significance of bile acid sulfate formation. Lithocholic acid-24-$^{14}$C was administered to bile fistula rats, and sulfated metabolites were identified in bile by chromatographic and appropriate degradative procedures. They constituted only a small fraction (2–9%) of the total metabolites but a more significant fraction (about 20%) of the secreted monohydroxy bile acids, most of the lithocholate having been hydroxylated by the rat liver. When sulfated glycolithocholate was administered orally, it was absorbed from the intestine without loss of the sulfate, presumably by active transport, and secreted intact into the bile. In comparison with nonsulfated lithocholate, an unusually large fraction (24%) of the sulfated bile acid was excreted in the urine, and fecal excretion took place more rapidly. Both the amino acid and sulfate moieties were extensively removed prior to excretion in the feces. Hydroxylation of bile acid sulfates or sulfation of polyhydroxylated bile acids did not occur to any great extent, if at all.

INHIBITION OF LIPID SYNTHESIS IN ISOLATED RAT HEPATOCYTES BY SERUM LIPOPROTEINS. B. Cooper and S. Margolis (Clayton Lab., Dept. of Med., and Dept. of Physiolog. Chem., Johns Hopkins Univ., Baltimore, Md. 21205). *J. Lipid Res.* 12, 731–9 (1971). The incorporation of labeled acetate into lipids was studied in rat hepatocytes isolated after treatment of liver with collagenase and hyaluronidase. About 60% of the lipid radioactivity was in free cholesterol and 13% was in triglycerides. Acetate incorporation was markedly inhibited when human serum lipoproteins were present in the incubation medium. Very low, high, and low density lipoproteins, at concentrations of 1.0 mg/ml, inhibited acetate incorporation by 70, 55 and 35%, respectively. Chylomicrons, at similar concentrations, did not inhibit acetate incorporation. The distribution of radioactivity into lipid classes was unchanged by the addition of lipoproteins. Lipoproteins did not produce a nonspecific toxic effect on hepatocytes, since their addition did not alter the rate of leucine incorporation into protein. The addition of the delipidated protein from low density lipoprotein or of lecithin in amounts comparable to those present in inhibitory concentrations of lipoproteins failed to diminish acetate incorporation. Artificial cholesterol-lecithin emulsions containing small amounts of free cholesterol did not inhibit lipid synthesis. Although the mechanism for the inhibition of acetate incorporation by lipoproteins is unclear, such effects may play some physiological role in the control of lipid biosynthesis in the liver.

FORMATION OF 1-O-2′-HYDROXYALKYL GLYCEROPHOSPHATIDES FROM 1,2-HEPTADECANEDIOL IN MYELINATING BRAIN. T. Muramatsu and H.H.O. Schmid (Univ. of Minnesota, Hormel Inst., Austin, Minn. 55912). *J. Lipid Res.* 12, 740–6 (1971). 1,2-Heptadecanediol-2-$^{14}$C was administered intracerebrally to 18-day-old rats, and its incorporation, after 8 hr, into the individual aliphatic moieties of the ethanolamine glycerophosphatides was determined. Much of the radioactivity was found in a lipid fraction identified as 1-O-2′-hydroxyheptadecyl glycerol. Evidence is presented that a major portion of the precursor was incorporated into 1-O-2′-hydroxyheptadecyl-2-acyl ethanolamine phosphatides. Some of the diol administered was degraded to palmitic acid. The palmitic acid-1-$^{14}$C derived from 1,2-heptadecanediol-2-$^{14}$C apparently served as precursor for stearic and oleic acids, which were found as acyl groups, and for the biosynthesis of the corresponding O-alkyl and O-alk-1-enyl glycerols. The data presented prove that biological dehydration of 1-O-2′-hydroxyalkyl glycerophosphatides to the corresponding plasmalogens does not occur in myelinating brain.

GLUCOSE: A POSSIBLE INTERMEDIATE IN THE OXIDATION OF THE SIDE CHAIN OF CHOLESTEROL IN RESTING AND STIMULATED RATS. M.R. Malinow, N. Baker, Phyllis McLaughlin and Anne Perley (Oregon Reg. Primate Res. Center, Beaverton, Oregon 97005). *J. Lipid Res.* 12, 747–59 (1971). The effect of repeated muscular contraction on the rate of oxidation of the side chain of cholesterol was studied in anesthetized rats. The animals received an intravenous pulse-label injection of either cholesterol-26-$^{14}$C, incorporated into rat plasma lipoproteins, or bicarbonate-$^{14}$C. In half the animals of each group, the hind legs were repeatedly stimulated by electrical impulses. A multicompartmental analysis was attempted, based on the disappearance curve of plasma free cholesterol-$^{14}$C and on the excretion rate of expired $^{14}CO_2$, as well as on previously reported rates of bile acid and adrenal steroid secretion. The rate of expired $^{14}CO_2$ originating from cholesterol-26-$^{14}$C was much less than that predicted by the digital computer analysis; cholesterol degradation could not be evaluated since the data were incompatible with a model that assumes direct oxidation of the side chain to $CO_2$. A revised model was postulated in which an important fraction of the side chain of cholesterol would be converted to $CO_2$ only after previous conversion to glucose. Direct measurement of plasma glucose-$^{14}$C after the injection of cholesterol-26-$^{14}$C supported this hypothesis.

CHOLINE METABOLISM AND MEMBRANE FORMATION IN RAT HEPATOMA CELLS GROWN IN SUSPENSION CULTURE. III. CHOLINE TRANSPORT AND UPTAKE BY SIMPLE DIFFUSION AND LACK OF DIRECT EXCHANGE WITH PHOSPHATIDYLCHOLINE. P.G.W. Plagemann (Dept. Microbiol., Univ. Minnesota Med. School, Minneapolis, Minn. 55455). *J. Lipid Res.* 12, 715–24 (1971). The initial rate of incorporation of methyl-labeled choline into the acid-soluble pool (phosphorylcholine) of Novikoff hepatoma cells growing in suspension culture was investigated as a function of the choline concentration in the medium. Below, but not above, 20 $\mu$M, choline incorporation followed simple Michaelis-Menten kinetics at 24, 33 or 37C with an apparent $K_m$ of 4–7 $\mu$M. The $V_{max}$ values decreased with a $Q_{10}$ of about 2.3 with a decrease in temperature. Between 20 and 500 $\mu$M, on the other hand, the rate of incorporation increased linearly with an increase in choline concentration in the medium, and the increase in incorporation rate with increase in choline concentration was about the same at all temperatures tested. The data suggest that at low concentrations choline is taken up mainly by a transport reaction, whereas at concentrations above 20 $\mu$M, simple diffusion becomes the principal mode of uptake. The energy of activation for choline transport was estimated from an Arrhenius plot of the $V_{max}$ values as 67,000 J (16 kcal)/mole.

UNSTIRRED WATER LAYERS IN INTESTINE: RATE DETERMINANT OF FATTY ACID ABSORPTION FROM MICELLAR SOLUTIONS. F.A. Wilson, V.L. Sallee and J.M. Dietschy (Dept. Internal Med., Univ. Texas Southwestern Med. School at Dallas, 5323 Harry Hines Boulevard, Dallas, Tx. 75235). *Science* 174, 1031–33 (1971). Bile acid and fatty acid uptake from micellar solutions by intestinal cells fails to reflect the incremental free energy changes expected for permeation that is rate limited by cell membranes. However, altering the size of the diffusing particle or the thickness of the unstirred water layer does change uptake. These observations show that the unstirred water layer is rate limiting for intestinal absorption of lipids from micellar solutions.

RATES OF NET ABSORPTION OF FAT WHEN FED ALONE OR WITH ESSENTIAL NUTRIENTS. D.L. Trout and Emily S. Conway (Human Nutr. Res. Div., Agr. Res. Service, U.S. Dept. Agr., Beltsville, Md. 20705). *Proc. Soc. Exp. Biol. Med.* 138, 556–62 (1971). The net rate of fat absorption, following a test meal of olive oil, was found to be 3.9 g/24 hr/250 g rat. When WR-1339 (800 mg/kg) was injected iv into rats similarly fed olive oil, fatty acids were found to accumulate in the blood plasma at a similar rate. These rates, however, were 30% lower than that observed during prolonged ad libitum consumption of a high-fat diet and were almost 50% lower than that found among fasted rats when fed the same high-fat diet.

METABOLIC FATE OF 1,3-BUTANEDIOL IN THE RAT: LIVER TISSUE SLICES METABOLISM. M.A. Mehlman, R.B. Tobin, H.K.J. Hahn, L. Kleager and R.L. Tate (Dept. Biochem., Univ. Nebraska Med. Center, Omaha, Neb. 68105). *J. Nutr.* 101, 1711–18 (1971). The blood acetoacetate, $\beta$-hydroxybutyrate, lactate and pyruvate of rats fed 1,3-butanediol (BD) for 3 and 7 weeks were examined. A highly significant increase in blood acetoacetate and $\beta$-hydroxybutyrate levels was observed in rats when BD was added to the diet. There was a significant decrease in blood pyruvate levels in animals fed BD for 7 weeks. Addition of BD to liver tissue slices metabolizing

glucose to lactate and pyruvate greatly decreased pyruvate levels and increased significantly lactate/pyruvate ratios. With BD and glucose as substrates, there was a large increase in total ketone (acetoacetate and β-hydroxybutyrate) formation when compared to glucose. With BD alone as substrate, ketone bodies were also formed. It is concluded that 1,3-butanediol is metabolized in cytosol similar to alcohol (ethanol) and is converted in the intact rat and tissue slices to ketone bodies prior to its oxidation in tricarboxylic acid cycle.

METABOLIC FATE OF 1,3-BUTANEDIOL IN THE RAT: CONVERSION TO β-HYDROXYBUTYRATE. R.L. Tate, M.A. Mehlman and R.B. Tobin. *Ibid.*, 1718–26. High speed supernatants of extracts of rat liver exhibited an $NAD^+$ dependent oxidation of both 1,3-butanediol (BD) and ethanol at pH 10 similar to that shown by crystalline horse liver alcohol dehydrogenase. Inhibition of rat liver alcohol dehydrogenase in vivo by intraperitoneal injection of pyrazole or n-butyraldoxime prior to sacrifice for liver slice experiments brought about inhibition of ketone body production from BD. Ethanol and BD oxidation by rat liver extracts in vitro was also strongly inhibited by pyrazole. The ethanol and BD dehydrogenase activities of rat liver extracts were coincident as judged by cellulose polyacetate strip electrophoresis. The products of the BD oxidation catalyzed by either rat liver extracts or crystalline horse liver alcohol dehydrogenase yielded azine derivatives with N-methyl benzothiazolone hydrazone hydrochloride which were identical to the corresponding derivative of 3-hydroxybutenal (aldol). The formation of D-β-hydroxybutyrate from BD by rat liver extracts was strongly dependent on $NAD^+$ and was nearly completely inhibited by pyrazole. It is therefore concluded BD is catabolized to β-hydroxybutyrate in the liver; liver alcohol dehydrogenase catalyzes the initial oxidative step in the cytosol, yielding aldol as an intermediate. Aldol is then further oxidized to β-hydroxybutyrate where it enters known metabolic sequences.

COMBINED EFFECTS OF DIETARY LIPIDS AND ENVIRONMENTAL TEMPERATURE ON GROWTH, METABOLISM AND BODY COMPOSITION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS). R.R. Stickney and J.W. Andrews (Skidaway Inst. of Oceanography, 55 West Bluff Road, Savannah, Ga. 31406). *J. Nutr.* 101, 1703–10 (1971). A study of the interaction of five environmental temperatures (20, 24, 26, 30 and 33C), and three types of dietary lipids (beef tallow, safflower oil and menhaden oil) on the growth and body composition of channel catfish, *Ictalurus punctatus,* indicated that maximum growth was obtained at 30C for fish fed each lipid supplement for a 70-day experimental period. At all temperatures, higher gains were obtained from beef tallow and menhaden oil than safflower oil supplements; likewise, lower food conversion rates were obtained from beef tallow and menhaden oil. The lipid level in fish carcasses increased with increasing temperatures up to 30C for all dietary supplements. At the optimum temperature for growth (30C), fish fed beef tallow contained less lipid than those fed the other supplements. The fatty acid composition of the diets was reflected in both liver and carcass lipids.

FATTY ACID SYNTHETASE FROM LACTATING RAT MAMMARY GLAND. III. DISSOCIATION AND REASSOCIATION. S. Smith and S. Abraham (Bruce Lyon Memorial Res. Lab., Children's Hosp. Med. Center of N. California, Oakland, Cal. 94609). *J. Biol. Chem.* 246, 6428–35 (1971). Fatty acid synthetase from lactating rat mammary gland is shown to be a cold-labile multienzyme complex. The native (13 S) form slowly dissociates into half-molecular weight (9 S) subunits on aging in the cold. Fatty acid synthetase activity observed on addition of the 9 S subunits to the assay system between 20 and 30C, is shown to result from rapid reassociation of the subunits to the 13 S form. Dissociation of the enzyme into subunits is accompanied by a change in the number of protein sulfhydryl groups accessible to 5,5′-dithiobis(2-nitrobenzoate), but reassociation to the parent form is not dependent on the presence of a reduced thiol. The dissociation does not involve oxidation of protein sulfhydryl groups, as the total number of sulfhydryl groups titratable with 5,5′-dithiobis(2-nitrobenzoate) in the presence of 6M urea was the same in the native enzyme and its subunits. Blocking more than two of the 28 subunit sulfhydryl groups with p-chloromercuribenzoate restricted the ability of the subunits to undergo heat-induced reassociation. Evidence is presented which suggests that although protein sulfhydryl groups may be involved in the dissociation-reassociation phenomenon, hydrophobic bonding is probably a more critical factor. Similar studies carried out with the fatty acid synthetase purified from rat liver indicate that this enzyme too exhibits cold lability.



EVIDENCE FOR DIRECT EFFECTS OF ESSENTIAL FATTY ACIDS AT THE HYPOTHALAMUS-PITUITARY LEVEL IN DOMESTIC FOWL. D.A. Roland, Sr. and H.M. Edwards, Jr. (Poultry Sci. Dept., Univ. Georgia, Athens, Ga. 30601). *J. Nutr.* 101, 1683–94 (1971). Essential fatty acid-deficient cockerels had reduced semen quantity, sperm concentration, sperm motility, sperm fertilizing ability and testes size. Histological study of the testes of essential fatty acid-deficient cockerels shows loss of germinal epithelium and degenerative changes occurring in the seminiferous tubules. Injection of luteinizing hormone (NIH-ovine, $S_{12}$, 0.2 μg/kg/day) increased the concentration of sperm, increased the packed cell volume of sperm and caused testes to appear almost normal upon microscopic examination. Follicle-stimulating hormone (NIH-ovine, $S_4$, 0.2 mg/kg/day) and testosterone propionate (2.0 mg/kg/day) enhanced degenerative changes in the seminiferous tubules and did not improve semen quality by any criterion. The classical increase in trienoic and decrease in dienoic and tetranoic fatty acids of testes lipids remained unchanged in deficient cockerels that showed increased semen quality and an improved microscopic picture as a result of receiving luteinizing hormone (LH). Pituitaries from essential fatty acid-deficient cockerels had increased amounts of Periodic Acid Schiff-positive material (secretory in nature) indicating that hormones were produced but not released. Results indicate that one of the basic modes of actions of essential fatty acids may be at the brain or hypothalamic level involved with the production or release of LH-releasing factors from the hypothalamus.

STUDIES ON TWO PHYSIOLOGICAL FORMS OF THE HUMAN RETINOL-BINDING PROTEIN DIFFERING IN VITAMIN A AND ARGININE CONTENT. L. Rask, A. Vahlquist and P.A. Peterson (Dept. Nutr., Inst. Med. Chem., Univ. Uppsala, Uppsala, Sweden). *J. Biol. Chem.* 246, 6638–46 (1971). The human retinol-binding protein (RBP) is shown to exist in two main physiological forms each of which displays electrophoretic heterogeneity. Only one of the two RBP components contains vitamin A. The retinol-containing RBP species is under physiological conditions firmly bound to thyroxine-binding prealbumin. The protein complex thereby formed is the actual vitamin A carrier normally encountered in plasma. Vitamin A per se is not a prerequisite for the binding of RBP to prealbumin since it was shown that RBP from which the vitamin had been extracted retained its affinity for prealbumin. The data obtained in this study strongly suggest that the species devoid of both vitamin A and the COOH-terminal arginine is a catabolite of RBP.

FORMATION OF METHYL STEROLS IN BRAIN CHOLESTEROL BIOSYNTHESIS. R.B. Ramsey, R.T. Aexel and H.J. Nicholas (Inst. of Med. Education & Res., and Dept. Biochemistry., St. Louis Univ. Med. School, St. Louis, Mo. 63104). *J. Biol. Chem.* 246, 6393–6400 (1971). A detailed study was made of methyl sterols involved in cholesterol biosynthesis in adult brain following intracerebral injection of (2-$^{14}$C)mevalonic acid and incubation of this cholesterol precursor with adult brain cell-free preparations. High specific activity lanosterol, 4,4-dimethyl-5α-cholesta-8(9)-24-dien-3β-ol, 4α-methyl-5α-cholesta-7,24-dien-3β-ol and 5α-cholesta-7,24-dien-3β-ol were formed 1 hour after intracerebral injection of the $^{14}$C-labeled precursor. Labeled to a lesser extent were 4,4-14α-trimethyl-5α-cholest-7-en-3β-ol, 4α-methyl-5α-cholest-7-en-3β-ol, desmosterol and cholesterol. Detected by mass only was 4α,14α-dimethyl-5α-cholest-7-en-3β-ol. Incubation of adult rat brain cell-free preparations with (2-$^{14}$C)mevalonic acid yielded two highly labeled methyl sterols. Based on gas chromatographic retention data and gas chromatography-mass spectrometry, these methyl sterols have tentatively been identified as 4,4-dimethyl-5α-cholesta-14(15),24-dien-3β-ol and 4α-methyl-5α-cholesta-14(15),24-dien-3β-ol. The results indicate that the primary pathway of sterol biosynthesis in adult brain is through diunsaturated sterols. The sterols formed in vitro suggest a partial disruption or alteration of the biosynthetic pathway as a result of maceration of the tissue.

REDUCED TRIPHOSPHOPYRIDINE NUCLEOTIDE OXIDASE-CATALYZED ALTERATIONS OF MEMBRANE PHOSPHOLIPIDS. P.M. Pfeifer and P.B. McCay (Dept. Biochem. & Molecular Biol., Univ. Oklahoma School of Med., Oklahoma City, Ok. 73104). *J. Biol. Chem.* 246, 6401–8 (1971). Evidence is given for the generation of a component having the properties of a free radical during the oxidation of TPNH by liver microsomes. The component is apparently responsible for the peroxidative chain scission of polyunsaturated fatty acids in the microsomal membrane which occurs during TPNH-dependent electron transport. The component is also capable of causing rapid lysis of erythrocytes when the latter are added to the reaction system. The hemolysis is prevented (a) by inhibitors of TPNH oxidation, (b) by prior heat denaturation of the microsomes, (c) by including free radical trapping agents in the incubation system, and (d) by elevating the level of α-tocopherol intake of the erythrocyte donors for several days. Hemolysis, when in progress, stops abruptly whenever the enzyme activity ceases, demonstrating that the component has a very short half-life. The hemolysis was shown not to be caused by the microsomal phospholipids which had undergone peroxidative cleavage. The hemolysis occurred even under conditions in which there was no alteration of microsomal phospholipids at all. The results indicate that the mechanism of electron transport from TPNH by microsomes involves free radical intermediates. The course of production of the radical-like component can be followed by observing its lytic action on erythrocytes.

THE INTERACTION OF INSULIN WITH PHOSPHOLIPIDS. M.C. Perry, W. Tampion and J.A. Lucy (Dept. Biochem., Royal Free Hosp. School of Med., Univ. of London, 8 Hunter Street, London WC1N 1BP, U.K.). *Biochem. J.* 125, 179–87 (1971). A simple two-phase chloroform-aqueous buffer system was used to investigate the interaction of insulin with phospholipids and other amphipathic substances. The distribution of $^{125}$I-labelled insulin in this system was determined after incubation at 37C. Phosphatidic acid, dicetylphosphoric acid and, to a lesser extent, phosphatidylcholine and cetyltrimethylammonium bromide solubilized $^{125}$I-labelled insulin in the chloroform phase, indicating the formation of chloroform-soluble insulin-phospholipid or insulin-amphipath complexes. Phosphatidylethanolamine, sphingomyelin, cholesterol, stearylamine and Triton-X-100 were without effect. Formation of insulin-phospholipid complex was confirmed by paper chromatography. The two-phase system was adapted to act as a simple functional system with which to investigate possible effects of insulin on the structural and functional properties of phospholipid micelles in chloroform, by using the distribution of ($^{14}$C)glucose between the two phases as a monitor of phospholipid-insulin interactions. The ability of phospholipids to solubilize ($^{14}$C)glucose in chloroform increased in the order phosphatidylcholine < sphingomyelin < phosphatidylethanolamine < phosphatidic acid. Insulin decreased the ($^{14}$C)glucose solubilized by phosphatidylcholine, phosphatidylethanolamine and phosphatidic acid, but not by sphingomyelin. The significance of these results and the molecular requirements for the formation of insulin-phospholipid complexes in chloroform are discussed.

ALPHA- AND GAMMA-TOCOPHEROL IN THE RAT: IN VITRO AND IN VIVO TISSUE UPTAKE AND METABOLISM. I.R. Peake and J.G. Bieri (Lab. Nutr. and Endocrinol., Nat. Inst. of Arthritis and Metabolic Diseases, Nat. Inst. of Health, Bethesda, Md. 20014). *J. Nutr.* 101, 1615–22 (1971). In order to compare tissue uptake and metabolism of α- and γ-tocopherol in the rat, vitamin E-deficient male rats were injected intraperitoneally with a 1:1 mixture of dl-($^{3}$H)-α-tocopherol and dl-($^{14}$C)-γ-tocopherol. Blood and tissues were removed from the rats at 10, 19 and 27 hours after injection. In vitro incubations of plasma from these rats with red cells from deficient rats were performed, and α- and γ-tocopherol exchange led to an equilibrium after 6 hours. At equilibrium the red cells showed a slightly greater affinity for γ-tocopherol than α-tocopherol. Similar results were obtained when deficient red cells were incubated with an aqueous dispersion of α- and γ-tocopherol. Tissues from the injected rats were analyzed for both total radioactivity and for tocopherols, and showed approximately equal uptake of the two tocopherols at 10 hours, but a more rapid loss of γ-tocopherol than α-tocopherol after this time. Plasma and red cells analyses confirmed the in vitro incubation results with γ-tocopherol being taken up to a greater extent than α-tocopherol. It was concluded that rat tissues take up α- and γ-tocopherol to approximately the same extent, and in red cells a slight preference for γ-tocopherol exists. Tissues, however, showed a more rapid disappearance of γ-tocopherol.

PLASMA LIPID LEVELS DURING PREGNANCY IN THE RHESUS MONKEY. D.E. Martin, R.C. Wolf and R.K. Meyer (Dept. Phys. and Wisconsin Reg. Primate Res. Center, Univ. of Wis., Madison, Wis. 53706). *Proc. Soc. Exp. Biol. Med.* 138, 638–42 (1971). A significant decrease in plasma phospholipids, total cholesterol and total lipids occurs during pregnancy in the Rhesus monkey. These alterations are initially observed after week 5 of gestation, reach a maximum by week 11, and are maintained at this level essentially throughout pregnancy, with a small upward trend noted during the terminal few weeks. Nonesterified fatty acid and triglyceride levels fluctuate randomly during most of pregnancy but are elevated during the last month of gestation and at parturition. All lipid moieties return to nonpregnant levels by the second postpartum week.

A RECONSTITUTED CELL-FREE SYSTEM FOR THE SPECIFIC TRANSFER OF STEROID-RECEPTOR COMPLEXES INTO NUCLEAR CHROMATIN ISOLATED FROM RAT VENTRAL PROSTATE GLAND. W.I.P. Mainwaring and Brenda M. Peterken (Endocrinology Group, Imperial Cancer Res. Fund, Lincoln's Inn Fields, London WC2A3PX, U.K.). *Biochem J.* 125, 285–95 (1971). A system has been developed for the specific transfer of ($^{3}$H)dihydrotestosterone-receptor complexes into prostatic chromatin in vitro. Under optimum conditions the overall transfer of ($^{3}$H) dihydrotesterone into purified chromatin in this reconstituted system is entirely consistent with the results obtained in whole tissue both in vivo and in vitro. The transfer of ($^{3}$H)dihydrotestosterone into chromatin is tissue-specific and maximal into chromatin isolated from androgen-dependent tissues. The tissue specificity is maintained at two levels: first, in the presence of specific cytoplasmic androgen-receptor proteins; secondly, by the nature and composition of the chromatin itself. Evidence is presented that androgenic steroids in vivo may maintain the tissue-specific nature of chromatin in androgen-dependent tissues by the selective induction of nuclear protein synthesis. The relevance of these findings to the mechanism of action of androgenic steroids is discussed.

STUDIES ON THE LIPID COMPOSITION OF THE FRAGMENTED SARCOPLASMIC RETICULUM OF NORMAL AND DYSTROPHIC CHICKENS. Q. Hsu and G. Kaldor (Dept. of Phys. and Biophysics, Med. College of Pennsylvania, Philadelphia, Pa. 19129). *Proc. Soc. Exp. Biol. Med.* 138, 733–38 (1971). The increased cholesterol content and altered phospholipid composition of the dystrophic FSR seems to support the proposition that membrane alterations may be instrumental in the development of muscular dystrophy.

## • Drying Oils and Paints

COPOLYMERS OF DICYCLOPENTADIENE AND VEGETABLE OILS. G.L. Yukhnovskii *et al. Lakokras. Mat.* 1971(2), 6–10. Fifteen different copolymers were obtained by copolymerising varying amounts of linseed oil and sunflower oil with dicyclopentadiene at 220–280C and atmospheric pressure for 10.5–28 hr. The possible reaction mechanism, optimum process conditions and characteristics of the copolymer films are indicated. These copolymers may be used as film-forming materials or as intermediates in the synthesis of alkyd resins. (World Surface Coatings Abs. No. 352)

## AOCS Northern California Section Elects 1972 Officers

Members of the AOCS Northern California Section have elected Steering Committee officers for 1972. They are as follows: Chairman, Ed Kirschner, Pacific Vegetable Oil; Vice-chairman Dave McClung, CPC International; Treasurer, Frank McKenna, CPC International; Secretary, Bill Wood, Safeway Stores; and Ex-chairman, Glenn Fuller, USDA Western Regional Labs. The Section's first meeting under the leadership of the new officers is scheduled for May 19 at H's Lordship Restaurant in Berkeley, Calif.

A forum on "Quality Control" is planned, with three local specialists in that field leading the meeting, followed by group participation.

OIL-BASED URETHANE COATINGS. I—URETHANES BASED ON SARDINE OIL. J.P. Misra, P.H. Gedam and M.A. Sivasamban. *Paint Manuf.* 41(6), 59–61 (1971). Urethanes have been prepared from raw, refined and upgraded sardine oils by alcoholysing them with various polyols and reacting the products with toluene diisocyanate. Sardine oil-modified alkyd resins have also been modified with toluene diisocyanate. The urethanes obtained have good film characteristics and are free from the defects associated with coatings based on fish oils. (World Surface Coatings Abs. No. 352)

A COMPARATIVE STUDY OF REPLACEMENT POSSIBILITIES OF LINSEED OIL BY DEHYDRATED CASTOR OIL IN OIL PAINTS. M.A. Sivasamban (Regional Res. Lab., Hyderabad-9, India). *Paintindia* 21(9), 23–26 (1971). A combination of dehydrated castor oil (DCO) with linseed oil in equal proportions leads to considerable improvement in the film properties of paints based on the stand oils as media. The drying time, alkali resistance, mechanical properties and resistance to water vapor of the paint films is much improved by the use of DCO.

STORAGE OF TUNG FRUIT AT AMBIENT ROOM AND LOW TEMPERATURES. R. Yousuf Ali Kahn, T. Lakshminarayana, S.D. Thirumala Rao and B.R. Reddy (Oil Technol. Res. Inst., Anantapur, India). *Paintindia* 21(5), 19–21 (1971). Tung (*Aleurites fordii*) fruit was stored for about 240 days after harvesting both at ambient room and low temperatures. It was observed that the oil content of the tung kernel stored at ambient room temperature had gone down from 62 to 51% after 240 days, whereas that of the kernel stored at low temperature remained more or less constant throughout.

ANALYSIS OF PAINT BINDERS BY PYROLYSIS GAS CHROMATOGRAPHY. K. Heinonen and I. Komsi (State Inst. Tech. Res., Helsinki, Finland). *Paintindia* 21(6), 13–16 (1971). A method has been developed by which the paint binders of the same type can be recognized. The binders investigated have been oils, oil paints, alkyd paints, water emulsion paints, lacquers and some other coatings. The paints were pyrolyzed at 500C, which was found to be best. The products of the thermal decomposition were flushed into the gas chromatograph. The pyrograms illustrate a number of characteristic peaks by which the paints can be identified.

ANOTHER LOOK AT OITICICA OIL. A.E. Rheineck and P.R. Sampath (N. Dakota State Univ.). *J. Paint Technol.* 43(560), 89–97 (1971). An investigation of the fatty acid composition of oiticica oil and the incorporation of acrylic copolymers into the licanic acid moiety through reactions involving the keto group are described. Work is described which revealed a lower concentration of licanic acid than that reported earlier, and the presence of appreciable amounts of linoleic and eleostearic acids. By the reduction of the keto group in the licanic acid, the corresponding hydroxy acid was obtained. The yields were more than 90% based on the keto acid. Products were prepared by reacting the hydroxyl group in the reduced product with copolymers of glycidyl methacrylate, butyl methacrylate, and/or methyl methacrylate in the presence of a suitable catalyst. Oiticica-acrylate copolymers which contained 25–55 wt % of oiticica oil were prepared and evaluated with respect to film hardness, flexibility, and chemical resistance. Definite improvements in film properties were noticed with products containing 40–50% oil. Attempts aimed at the conversion of the keto group to the diethyl ketal by reaction with orthoformic ester in presence of an acid catalyst resulted only in a partial conversion.

DETOXIFICATION OF TUNG MEAL. C.L. Huang (Univ. of Mississippi). *U.S. 3,634,093.* Commercial tung meal is detoxified to prepare an animal feed or fertilizer rich in protein and carbohydrate by macerating the meal in water followed by extraction of toxic substances with an alcohol.

NITROCELLULOSE COATINGS IMPROVED BY CERTAIN OXIME ADDUCTS OF POLYMERIC FATTY ACID-BASED ISOCYANATES. R.B. Stokes (General Mills. *U.S. 3,634,113.*

IMPROVEMENTS RELATING TO ALKYD RESINS. B. Passalenti and U. Nistri (Soc. Ital. Resine). *U.S. 3,635,859.* Alkyd resins are prepared by having an organic phosphite present in the monomer condensation stage and treating the condensation product with a metal salt and a peroxide.

## • Detergents

PHYSICOCHEMICAL PROPERTIES OF SODIUM N-ALKYLOYL SARCOSINATES. K. Ohki and F. Tokiwa (Ind. Res. Lab., Kao Soap Co., Minato-Yakushubata, Wakayama-shi, Japan). *Yukagaku* 19, 897–901 (1970). Physicochemical properties of sodium alkyloyl sarcosinates were studied with regard to their alkyloyl chain length. Their foaming powers at 25C increased with increasing chain length up to C-15 and decreased as solubility in water decreased. The solubilizing power toward pigment (Yellow OB) increased with increasing of chain length. The surface tension above the critical micelle concentration was approximately 35 dyne/cm, irrespective of chain length. Solubility was reduced with increasing chain length.

STUDY OF DETERGENCY. XIV. ON THE SEASONAL CHANGES OF NATURAL SOIL COMPONENTS; THEIR INFLUENCE ON DETERGENCY AND FOAMING. I. Kashiwa, H. Kuwamura, Y. Kawasaki, M. Inamori, H. Nishizawa and M. Tsunoda (Res. Lab., Lion Oil Co., 3-2397 Hirai, Edogawa-ku, Tokyo; Hitachi Central Res. Lab., 1-280 Higashi Koigakubo, Kokubunji, Tokyo). *Yukagaku* 19, 1095–1101 (1970). Natural soil components that adhered to collars and undershirts were analyzed by gel filtration, column and gas chromatography and IR. The amount of soil on worn undershirts in summer was half of that in winter. The summer soil contained less triglyceride, more nitrogen and NaCl than the winter soil. No difference was found between spring and autumn. Summer soil was easier to remove with detergent than winter soil. There was no difference in foaming properties among the soils in 4 seasons, probably because no difference was observed in the amount of fatty acids and squalene.

SYNTHESES AND PROPERTIES OF SURFACTANTS CONTAINING ORGANOMETALS. VII. CATIONIC SURFACTANTS CONTAINING DIMETHYLPOLYSILOXANE. H. Maki, Y. Horiguchi, T. Suga and S. Komori (Dept. Chem. Tech., Osaka Univ., Suita, Japan). *Yukagaku* 19, 1029–33 (1970). Cationic surfactants of dimethylpolysiloxane with linear, doubly branched or triply branched hydrophobic groups were synthesized. Regardless of hydrophobic structures, they were very surface active and had foaming ability. Their lowest surface tension was 22 to 23 dynes/cm. in aqueous solution, but their activity was not good in acidic (pH $<$ 4.5) or basic (pH $>$ 9.5) solution. Their bacteriostatic action was also examined.

SURFACE ACTIVITIES OF QUATERNARY AMMONIUM SALTS DERIVED FROM ALKYL BENZYL CHLORIDE. C. Kimura, T. Nabeshima and K. Kashiwaya (Dept. Fuel Chem., Akita Univ., Akita, Japan). *Yukagaku* 19, 1048–50 (1970). Quaternary ammonium salts with various alkyl carbon chains were synthesized from alkylbenzyl chloride and pyridine or triethylamine. Pyridinium salts were better than triethylammonium ones in surface and interfacial tension depression. The order of surface tension depression due to the effect of alkyl groups on both compounds follows: $C_8H_{17} < C_{10}H_{21} < C_{12}H_{25} < C_{16}H_{33} < C_{14}H_{29}$. The $C_{14}$ alkyl group was best as judged by solubilization power and critical micelle concentration.

ALKYLBENZENE SULFONATE IN THE WATER OF THE TAMA RIVER. V. FROM FEBRUARY, 1968 TO MAY, 1970. I. Ihara *et al.* (13 workers) (Dept. Ind. Chem., Chuo Univ., Kasuga, Bunkyo-ku, Tokyo). *Yukagaku* 19, 1043–48 (1970). Methylene blue active substance, COD, $NH_3$-N, Cl and alkylbenzene sulfonate in the Tama River water were quantitatively analyzed. The Tama River has been continuously polluted with domestic and industrial sewage. IR spectroscopy showed that the linear alkylbenzene sulfonate concentration had been increasing more than the branched alkylbenzene sulfonate.

EFFECT OF DETERGENTS ON HUMAN SERUM AND HEN'S EGG WHITE. K. Aoki and S. Kaneshina (School of Eng., Gifu Univ., Kagamihara, Gifu, Japan; School of Eng. Tokushima Univ., Tokushima, Japan). *Yukagaku* 19, 972–8 (1970). The effect of sodium dodecyl sulfate (SDS) and dodecyl trimethyl ammonium bromide (DTAB) on egg white and human serum was investigated by acrylamide gel electrophoresis. The complex $AD_{2n}(n = 38)$ zone of serum albumin with SDS was not found at pH 9.2. Serum prealbumin with SDS or DTAB gave several zones. Ovalbumin with SDS showed $AD_n$ ($n \geqq 40$). DTAB precipitated ovalbumin. Egg white prealbumin was not affected by SDS or DTAB.

STUDIES ON THE UTILIZATION OF METAL CHELATES. IV. C-ALKYL EDTA CHELATES: PREPARATION AND EVALUATION OF SURFACE AND INTERFACIAL TENSIONS AND DISPERSANT PROPERTIES. T. Takeshita and S. Maeda (Dept. Applied Chem., Kagoshima Univ., Kagoshima, Japan). *Yukagaku* 19, 984–93

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## • *Abstracts . . .*

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(1970). N-(1-carboxypentadecyl)EDTA (I) and N,N'-bis(1-carboxyundecyl) ethylene EDTA (II) were synthesized and treated with various transition metal salts. The investigation by IR spectroscopy, color change and pH effect suggested that C-alkyl EDTA-$Fe_2(SO_4)_2$ had octahedral chelating structure. The chelate surfactants had good surface activity. Especially (II)-$Fe_2(SO_4)_2$ was excellent in dispersing pigments in coatings.

HOUSEHOLD DETERGENT ANALYSIS. A.E. O'Donnell (Shell Development Co., Emeryville, Calif.). *Soap, Cosmetics, Chemical Specialties* 47(8), 26–8, 51 (1971). A procedure based on use of ion exchange columns has been found to be more complete than the usual solvent partitioning procedures for the analysis of light and heavy duty household detergents. The methods for these two types of detergent differ slightly, but in essence they involve use of a cation exchange resin to separate the organic acids and the nonionics from cations such as amine oxides and urea. The effluent from the first column is passed through an anion exchange column to separate the acids from the nonionics. Components from these various fractions can then be analyzed separately.

THE EFFECT OF ABS-TYPE SYNTHETIC DETERGENTS ON SKIN. M. Iimori (Res. Dept., Lion Fat & Oil Co., Hirai, Edogawa-ku, Tokyo). *Yukagaku* 20, 91–94 (1971). The adsorption of linear alkylbenzene sulfonate (LAS) and branched alkylbenzene sulfonate (ABS) on skin, nail and hide powder was determined at various pH values. The dermatological effect of LAS on human skin by immersion and patch test were also investigated. Higher detergent adsorption was found on human skin when treated at acidic pH. Clinical test showed no dermatological side effect on human skin due to detergent adsorption.

SEROLOGICAL STUDIES ON ALPHA-OLEFIN SULFONATE-PROTEIN COMPLEXES. M. Iimori and S. Ushiyama (Res. Dept., Lion Fat & Oil Co., Hirai, Edogawa-ku, Tokyo). *Yukagaku* 20, 88–91 (1971). Sodium α-olefin sulfonate (AOS)-human serum albumin (HSA) complex (HA) was prepared by mixing each component in water, followed by dialysis and precipitation. HA containing 30 mg of total protein was subcutaneously or intravenously injected in rabit. Only 0 or 2′ positive reactions in HA-antiHA system against 3 or 3′ positive reactions in HSA-antiHSA system occurred. No reactions were found in AOS-antiAOS system.

STUDIES OF DISPERSE DYE SUSPENSIONS DISPERSED WITH VARIOUS TYPES OF SURFACTANTS AT HIGH TEMPERATURE. N. Moriyama and F. Tokiwa (Ind. Res. Lab., Kao Soap Co., Wakayama, Japan). *Yukagaku* 20, 41–45 (1971). The effect of surfactants on the stability of aqueous suspension of azo or anthraquinone dye was studied at high temperature. The stability was highly dependent on the ionic nature and chemical structure of surfactants. With ionic surfactants, the suspension was stable when a surfactant carried polynuclear aromatic ring. With nonionics, a surfactant carrying more than two benzene rings and having a cloud point of 20–40C formed stable suspensions. The results are discussed in terms of surfactant's affinity to dyes and the difference between the effect of increasing temperature on ionic and nonionic surfactants.

STUDIES OF THE DERIVATIVES OF EPICHLOROHYDRIN. IV. NONIONIC SURFACTANTS DERIVED FROM EPICHLOROHYDRIN AND ALKANTHIOLS. T. Kuwayama, E. Kamayama and Y. Onoguchi (Dept. Applied Chem., Gunma Univ., Kiryu, Japan). *Yukagaku* 20, 35–40 (1971). Higher homologues of 1,3-bisalkylthio-2-propanol (I) and 1-alkoxy-3-alkylthio-2-propanol (II) were synthesized from epichlorohydrin, 1-alkanthiols and 1-alkanols, and converted by polyaddition of ethylene oxide (EO), and their surface activity was compared with that of EO condensates of glyceryl-α,α′-dialkylethers (III). The order of cloud point depression was III $<$ II $<$ I when they carried the same alkyl chain and EO number. The order of lowering surface tension was III $>$ II $>$ I, wetting III $>$ II $>$ I, foaming III $\leqslant$ II $=$ I, emulsifying III $\sim$ I and suspending III $\leqslant$ I, when the alkyl groups were from $C_6$ to $C_8$. I was the most effective surfactant when their alkyl chain was propyl. These results are discussed in terms of the greater hydrophobic contribution of S atom and differences in adsorption pattern of nonionics between III and I.

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## • *Four Corners . . .*

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papers on the fatty acid composition of oils and fats of marine and animal as well as of human origin. In recent years his interests have been especially directed towards the importance of the polyunsaturated acids in foods and in human blood and depot fats.

Notevarp has been very active in the industrial exploitation of marine oils, and for the last 10 years has directed an industrial research plant.

Although he has held his emeritus title for 2 years, Professor Notevarp has in no way retired. In addition to several of his former activities he is engaged in various research projects sponsored by the industry and the Royal Norwegian Council for Scientific and Industrial Research. Also he is the Norwegian coeditor of *Acta Chemica Scandinavica.*

Since 1952 Notevarp has played a very active part in the Scandinavian Symposia on Fat Rancidity, later in the Scandinavian Symposia on Lipids and in the creation of the Scandinavian Forum for Lipid Research and Technology with secretariat in Göteborg. At the imminent ISF World Congress in Göteborg he will act as cochairman of the Symposium on Marine Oils.

### Meeting on Quality of Fish Protein Held in Bergen

*The following note was received from Mr. H. Russwurm, Jr.*

The unofficial annual meeting of Norwegian fish research workers was held in Bergen on November 18, and was arranged by the Norwegian Fisheries Research Institute. The subject of the meeting was presented in three lectures: The Drying Process of Fish Meal; Quality Criteria of Fish Protein; The Nutritive Value of Fish Protein. The lectures were followed by several hours of discussion.

Next year's meeting will be held in Stavanger, and will be arranged by The Research Laboratory of the Norwegian Canning Industry.

### Sweden

### Larsson Directs New Lab for Lipid Chemistry

A laboratory for lipid chemistry at the University of Göteborg has recently been taken into use by Kåre Larsson, Associate Professor. The research concerns the molecular arrangement in lipids in different states of order based upon results from Raman spectroscopy, X-ray low angle diffraction and surface film technique. One project concerns utilization of hydrophilic lipid crystals in a new type of ointment base and clinical tests have been very promising. Larsson is secretary general of the imminent ISF Congress on Lipids in Göteborg.

### Plans Progress for ISF World Congress on Lipids

Preparations for the XI. ISF World Congress on Lipids, June 18–22, 1972, in Göteborg, Sweden, are progressing satisfactorily. The Congress has created worldwide interest, as participants from 35 countries have sent preliminary applications. Short courses and technical visits announced in the technical program (see December JAOCS, p. 497A) have received much attention. A very promising social program has been arranged with a cocktail reception by the City of Göteborg in the famous Art Museum, a banquet with entertainment at the well known Liseberg Park, and a boat trip in the archipelago to the medieval fortress island of Marstrand. A special ladies program is also planned. A second circular with the program of the Congress was distributed in December.

Deadline for acceptance of abstracts has been extended to March 15. Registration forms should be completed and returned as soon as possible to avoid difficulty in obtaining room reservations. For information write the Congress office at ISF 1972 Congress, Fack, S-400 32 Göteborg 31, Sweden.

### Exhibition to Accompany ISF Congress

As at the earlier ISF Congresses an exhibition of instruments, machines, material, literature, etc., of interest for research and production, will be arranged during the ISF World Congress on Lipids, taking place on June 18 to 22 in Göteborg/Sweden. Suitable localities close to the lecture halls are available for this purpose. Responsible for the local arrangements of the exhibition will be the company PILREKLAM (J.E. Kuhn), 72 Gullrisgatan, S-417 20 Göteborg, Sweden. Tel. 031/23 01 25, 23 90 58. Reservations should be made as soon as possible. Information can also be obtained through the Congress office at ISF 1972 Congress, Fack, S-400 32 Göteborg 31, Sweden.

## • *Abstracts . . .*

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STUDIES OF THIIRANE DERIVATIVES. III. SYNTHESIS OF 1,3-BISALKOXYPROPANE-2-SULFONATES AND THEIR SURFACE ACTIVE PROPERTIES. E. Kameyama, M. Nakajima, A. Ozaki and T. Kuwamura (Dept. Applied Chem., Gunma Univ., Kiryu, Japan). *Yukagaku* 20, 32–35 (1971). 1,3-Bisalkoxypropane-2-sulfonates (number of alkoxyl group from 4 to 8) were synthesized from 1-alkoxy-3-chlorpropane-2-sulfochloride and sodium alcolate. Above cmc, the surface tension of aqueous solution of the n-octyl homologue of the sulfonate was 24.9 dyne/cm at 40C and lower than that of Na-diocylsufosuccinate. The cmc value of the octyl sulfonate was also lower than that of the succinate. The wettability and foam-stability of the octyl homologue were excellent.

EFFECTS OF SURFACTANT AND BUILDERS ON THE INTERFACIAL TENSION AT OILY SOIL/WATER INTERFACE. Y. Minegishi, T. Takeuchi and H. Arai (Household Goods Res. Lab., Kao Soap Co., 2-1-3 Bunka, Sumida, Tokyo). *Yukagaku* 20, 160–4 (1971). The interfacial tension of oily soil and water containing sodium dodecylsulfate (SDS) or builders was measured in a Saite's apparatus. With increasing of SDS concentration, the interfacial tension at polar oily soil (oleic acid, triolein, mixed oil and natural soil)-water interface was remarkably lowered as compared with that at nonpolar oily soil (Nujol)-Water. $Na_2SO_4$ reinforced the interfacial tension lowering. The interfacial tension of oily soils containing free fatty acid-water interface was not affected by $Na_2SO_4$, but was lowered with increasing amounts of alkaline builders. Alkaline builders also exhibited the same effect, when applied to the system of triolein-water. The effect of detergent builders on the interfacial tension of polar oily soil-water interface was great. A mechanism of oily soil removal from fabrics was proposed and discussed.

THE ADSORPTION OF SURFACE ACTIVE AGENTS AT OIL-WATER INTERFACES CONSIDERED FROM ELECTROCAPILLARITY. A. Watanabe and H. Tamai (Faculty of Textile Sci., Kyoto Univ. of Ind. Arts and Textile Fibers Sakyo-ku, Kyoto). *Yukagaku* 20, 101–6 (1971). The adsorbability of surface active agents at oil-water interfaces and the inorganic electrolyte effect on it were studied by electrocapillary curves. The oil phase was the methylisobutylketone solution of tetrabutylammonium chloride and the aqueous phase contained anionic, cationic or nonionic surface active agents in addition to inorganic electrolyte. The kind and concentration of electrolyte strongly affected the interfacial tension. Linear relations were found between the interfacial excess of surface active agent and the cubic root of surface active agent concentration, and between the former and the cubic root of ionic strength. These conformed to the Davies' equation. The free energy of desorption was calculated as 750 cal $mol^{-1}$ for each –CH– in regard to alkylsulphate ions of various chain lengths.

ANALYSIS OF ALKYL COMPOSITION OF ALKYL-POLYGLYCOLETHER-SULFATE (AP) IN LIQUID SHAMPOOS. Y. Iwamoto, S. Kobayashi, N. Toyota and K. Iwase (Mitsuwa Central Lab., Mitsuwa Soap Co., Yahiro, Sumida-ku, Tokyo). *Yukagaku* 20, 510–12 (1971). AP sample in 10% HCl was refluxed for 2 hr and extracted with petroleum ether. After evaporation of solvent, 5 ml of HI (55–58%) was added to 2 g of the extract and refluxed for 90 min. Alkyliodide in the solution was extracted with petroleum ether and analyzed by GLC.