

THE EFFECTS OF A HIGH FAT DIET IN A TEMPERATE ENVIRONMENT. F. C. Consolazio and W. H. Forbes (Harvard Univ., Boston, Mass.). *J. Nutr.* 32, 195-211 (1946). A group of 8 men living in a cool environment and doing work consisting mostly of laboratory procedures subsisted for 9 days on a high fat diet (pemmican) providing 71% of the calories from beef fat and 2% from carbohydrate. Four controls subsisted on a diet adequate in all respects and providing 30% of the calories from fat. The utility of pemmican alone as a field ration for ordinary men was very poor because of the inability of all but one subject to eat enough of it. Morale deteriorated on the diet and most of the men resigned themselves to semi-starvation for the duration of the diet, mainly because of the nauseating taste. Nevertheless, scores in a physical fitness test remained practically constant. This work should not be taken to apply to all high fat diets, but at this point the authors do not know why there appears to be a difference between a diet of pemmican and a diet of fresh meat and fat.

BIOLOGICAL INCORPORATION OF A CHOLINE HOMOLOGUE INTO LIVER PHOSPHOLIPIDS. C. S. McArthur (Univ. Toronto). *Science* 104, 222-3 (1946). The "choline fraction" was precipitated from the hydrolysate with K tri-iodide reagent at about 0°. The bases were freed and oxidized with alkaline permanganate at the boiling point. The resulting tertiary amines were separated by fractional distillation on a microscale and identified as chloroaurates. The finding of trimethylamine (from choline) was anticipated, of course. The isolation of a significant percentage of the fraction as triethylamine, which could have been derived only from the triethyl homologue of choline, proved that this foreign quaternary ammonium base with lipotropic properties had been incorporated into the phospholipids of the liver.

THE INFLUENCE OF BIOTIN UPON THE RELATIVE LIPO-TROPIC EFFECTS OF CHOLINE AND INOSITOL. C. H. Best, C. C. Lucas, J. M. Patterson, and J. H. Ridout (Univ. Toronto). *Biochem. J.* 40, 368-73 (1946). No evidence has been obtained to support the claims (a) that biotin produces a selective deposition of cholesteryl esters in liver, (b) that inositol has a specific effect on bound cholesterol, and (c) that the fatty liver observed when biotin is administered is particularly resistant to the action of choline. The accumulation of cholesteryl esters in liver bears a remarkably constant relationship to the deposition of glyceride in this organ. The administration of biotin does not affect this relationship. The synergistic effect of cho-

line and inositol on liver lipids has been confirmed. No evidence of any effect of choline, inositol or biotin upon the absolute amount of phospholipin or of free cholesterol in the liver has been obtained in this series of experiments, nor has any effect upon kidney lipids been observed. The absence of a specific effect of biotin on the deposition of liver fat necessitates a revision of certain theories and deductions, two of which (Beveridge and Lucas, 1945; McHenry *et al.*, 1941-4) have been discussed. It is recommended that the term "biotin fatty liver" be abandoned.

THE LIPO-TROPIC ACTION OF MANGANESE. M. O. Andur, L. C. Norris, and G. F. Heuser (Cornell Univ., Ithaca). *J. Biol. Chem.* 164, 783-4 (1946). At a given level of choline, more fat was observed to be present in the livers of Mn-deficient rats than in the livers of rats receiving adequate Mn. The lipotropic action of Mn was much greater when the choline content of the diet was low, thus indicating an interaction between Mn and choline. An analysis of variance showed that the reduction of liver fat by Mn was highly significant. As expected, choline likewise markedly reduced liver fat. The Mn by choline interaction was found to be highly significant. As further evidence the Mn has a lipotropic action, it was found that the presence of Mn in the diet caused a highly significant reduction in the percentage of fat occurring in the fresh bone. Choline also significantly reduced bone fat.

#### PATENTS

METHOD OF DEODORIZATION. G. W. Phelps and H. C. Black (Industrial Patents Corp.). *U. S.* 2,407,616. The equipment for steam-vacuum deodorization of fats contains means for supplying heat to the vapor zone above the liquid in order to minimize the reflux condensation of the vapors issuing from the liquid.

NORDIHYDROGUAIARETIC ACID CONCENTRATE. O. Gisvold (Univ. Minn.). *U. S.* 2,382,475. The process comprises extracting plant material of the species *Larrea divaricata* with an aqueous solution of alkali hydroxide containing a reducing agent, acidulating the aqueous extraction solution until a flocculent precipitate occurs, and separating the flocculent nordihydroguaiaretic acid containing precipitate. The preparation is an antioxidant.

TERNARY SYNERGISTIC ANTIOXIDANT COMPOSITION. R. W. Riemenschneider and J. Turer (Sec. Agr.). *U. S.* 2,383,815. The antioxidant composition comprises an ascorbyl monoester of a saturated aliphatic monocarboxylic acid containing 12-18 C atoms per molecule,  $\alpha$ -tocopherol, and soybean phospholipids.

## Abstracts

### Drying Oils

Edited by  
HOWARD M. TREETER

KINETIC STUDIES IN THE CHEMISTRY OF RUBBER AND RELATED MATERIALS. II. THE KINETICS OF OXIDATION OF UNCONJUGATED OLEFINS. J. L. Bolland and G. Gee (Brit. Rubber Producers' Research Assoc., Welwyn Garden City, Herts, Eng.). *Trans. Faraday Soc.* 42, 236-43 (1946). The kinetics of the autoxidation of Et linoleate, Et linolenate, Me oleate and squalene were studied, and in several instances autoxidations catalyzed by benzoyl peroxide were included. The process is believed to proceed by means of a chain reaction:

The first step is formation of a hydrocarbon radical which unites with O<sub>2</sub> and then reacts with another olefin molecule to produce a hydroperoxide and a new free radical. The chain may be initiated either by direct action of O<sub>2</sub> on the olefin or by decomposition of the hydroperoxide or of the added peroxidic catalyst. Termination occurs by combination of 2 free radicals. III. THERMOCHEMISTRY AND MECHANISMS OF OLEFIN OXIDATION. *Ibid.* 244-52. Bond strengths and resonance energies were employed to estimate the

heats of a number of alternative oxidation reactions of olefins. The mechanism described above is found to be thermodynamically satisfactory, but no decision can be made as to the mechanism of initial attack by  $O_2$ . The reactions leading to polymeric peroxides indicated that the probability of the formation of these polymers is highest for conjugated olefins and least for 1,4-dienes. This result is in good agreement with the observation that conjugated olefins actually yield considerable polymeric peroxides while Et linoleate and Me oleate yield quantitatively hydroperoxides. The reactions leading to polymeric peroxides and to hydroperoxides are kinetically indistinguishable. At any stage of the formation of the polymeric peroxide, growth of the polymer may be stopped by a transfer reaction which results in the formation of a hydroperoxidic radical. This is in agreement with the observation that peroxidic polymers actually isolated have relatively low molecular weights. In connection with this work the heats of oxidation for Et linoleate, Et linoleate plus 0.4% benzoyl peroxide, and Et linolenate were measured. The results were, respectively, 53.3, 52.5, and 52.0 kcal. per mol. The O-O bond strengths in the hydroperoxide groups formed were calculated and found to be, respectively, 66, 65, and 68 kcal. per mol.

TREATING CASTOR OIL FOR THE PURPOSE OF OBTAINING A TUNG OIL TYPE PRODUCT. A. A. Ivanova and A. I. Bepalko. *Khimicheskaya Prom.* 1945, No. 12, 11-14. Dehydration of castor oil in the presence of several catalysts was studied. The purpose was to produce a drying oil of the tung oil type. Treating castor oil for 4 hours at 275-80° to an acetyl number of 73.3 in the presence of 1% litharge yielded a product containing 1.5% of the 9,11-isomer of linoleic acid. By heating in the presence of 3% metallic Zn and 1.5%  $Al_2O_3$  for 5.5 hours at the same temperature to an acetyl number of 34 a product was formed which contained 26.5% of the isomer. Further experiments were carried out with 5% oxalic acid and maleic and phthalic anhydride as catalysts. The temperature was 275-80°, as only within this range did the reaction proceed satisfactorily. Best results were obtained with maleic anhydride. The time required was 4.5 hours; further heating caused gelatinization. The optimum quantity of maleic anhydride was 5-7.5%. The product obtained from castor oil under these conditions was tested in varnishes, lacquers, and enamels. The product was of a quality between tung and linseed oil. The hardness and water resistance of films made with maleic anhydride modified castor oil resembled closely those properties in films made with tung oil. However there was evidence of syneresis as in linseed oil films. The other catalysts were  $\beta$ -naphthalene sulfonic acid,  $Na_2SO_4$  and  $NaHSO_4$ . Of all the catalysts tried  $NaHSO_4$  was most effective. The optimum quantity is 2%, time 12 hours and temperature 245-50°. Films of  $NaHSO_4$  modified castor oil resemble tung oil films; no syneresis was observed (*Chem. Abs.* 40, 5264.)

THE BLOWING OF SEVERAL (FISH) LIVER OILS. M. Carriere and J. Arnoux (Univ. Aix-Marseille). *Compt. rend. faculte sci. Marseille* 1, 124-6 (1943). Fish liver oils of *Carcharodon carcharias* (I), *Squalus acanthias* (II), and *Centrophorus granulosus* (III) were agitated with a current of dry air while being heated. Analyses made at 0, 3, 10, and 17 hours are tabulated for I. Chemical changes (decreases in I and polybro-

mid indexes and increases in saponification number, acetylation index and oxidized acids) were greater when I was heated to 125° than when it was heated to 80°. Analyses are tabulated for II and III after 0, 3, 10, 17, and 24 hours heating at 125°. III had a high concentration (90% initially) of unsaponifiable material. After 24 hours heating oxidized acids in II increased from 0.4% to 26.2%; in III they increased only to 7.8%. The acetylation index of both II and III increased markedly after 24 hours heating. Values for  $n_D^{20}$ ,  $d_4^{20}$  and viscosity of I, II, and III at different intervals of heating also are tabulated. (*Chem. Abs.* 40, 5583.)

THE LIVER OIL OF CARCHARADON CARCHARIAS. L. L. Margaillan and G. Vaugoyeau (Univ. Aix-Marseille). *Compt. rend. faculte sci. Marseille* 1, 8-10 (1941). The chemical and physical constants of this shark liver oil are given. Methanolysis and fractionation of the saponifiable portion of the oil indicated the following composition in fatty acids: Palmitic 12, hexadecenoic (palmitoleic) 27, oleic 35, linoleic 10,  $C_{20}$  acids with 4 double bonds 3, a  $C_{20}$  acid with 5 double bonds 3, and a  $C_{22}$  acid with 4 double bonds 6%. (*Chem. Abs.* 40, 5583.)

COMPOSITION OF THE INSOLUBLE FAT ACIDS FROM THE OIL OF THE LIVER OF CARCHARADON CARCHARIAS. P. Baudart (Univ. Aix-Marseille). *Compt. Rend. faculte sci. Marseille* 1, 79-80 (1941). The fat acids were separated by fractional distillation of the Me esters and precipitation of the Na salt from acetone. The percent composition in fat acids was: myristic 1.65, palmitic 14.65, hexadecenoic (palmitoleic) 14.70, stearic 6.03, oleic 30.74, linoleic 4.23, eicosenoic (gadoleic) 1.92, eicosadienoic 2.99, eicosatetrenoic (arachidonic) 1.44, dodosenoic 0.99, docosadienoic 1.29, docosapentenoic (clupanodonic) 2.21, tetracosadienoic 1.14 and tetracosahexenoic 1.82. Some other acids (not named) were noticed in amounts less than 1%. Among them were  $C_{26}$  acids with 5 and 6 double bonds. (*Chem. Abs.* 40, 5584.)

THE POLYETHELYNIC FAT ACIDS FROM THE OIL OF THE LIVER OF CARCHARADON CARCHARIAS. I. SEPARATION OF CLUPANODONIC ACID,  $C_{22}H_{34}O_2$ . P. Baudart (Univ. Aix-Marseille). *Compt. rend. faculte sci. Marseille* 1, 86-8 (1942). The acid was isolated by fractionation of the mixed Me esters (b.p. 195-212° at 0.4-0.6 mm.) and by fractional precipitation of the Na salt from acetone. Properties of the various fractions are tabulated. The fraction considered to be pure Me clupanodonic acid had saponification number 162.6, I number 370 (Wijs), 354 (Rosenmund-Kuhn),  $d_4^{15}$  0.923,  $n_D^{15}$  1.4960,  $M_D$  109.0 (theo. 107.7). The yield of bromides insoluble in ether was 157% with a Br content of 69.2% (theo. 70.88%). II. CONSTITUTION OF CLUPANODONIC ACID,  $C_{22}H_{34}O_2$ . *Ibid.* 127-9 (1943). Oxidation of Me clupanodonic (I) in acetone with  $KMnO_4$  yielded Me succinate and acetic, propionic, and succinic acids. When I was 2/5 hydrogenated and then oxidized, succinic, enanthic, and capric (and possibly a trace of caproic acid) were obtained. When I was 4/5 hydrogenated and then oxidized, a small amount of behenic acid and a larger amount of myristic acid were obtained. Conclusion: clupanodonic acid has the formula:  $C_2H_5CH=CH(CH_2)_2CH=CHCH_2CH=$   
 $CH(CH_2)_2CH=CH(CH_2)_2CH=$   
 $CH(CH_2)_2COOH,$

assigned by Toyama and Tsuchya. Small amounts of

the isomer with the formula assigned by Tokano may also be present. (*Chem. Abs.* 40, 5584.)

DRYING OILS AND DRYING. A. Nauroy. *Peintures pigments vernis*, 17, 635-9 (1942). A discussion of the structure of drying oils, autoxidation, drying action, and polymerization. 15 references. (*Chem. Abs.* 40, 5577.)

#### PATENTS

CONJUGATED FATTY POLYENE COMPOUNDS. A. Turk and P. D. Boone. *U. S.* 2,405,380. In the process of producing conjugation is the step of heating a liquid containing a non-conjugated polyene compound which has an acyl nucleus of at least 12 C atoms, with a solid Mg silicate at a temperature not below 200° until the resulting liquid has a conjugation of 15% above the initial liquid, calculated on the basis of the increase of refractive index.

MODIFICATION OF FATTY OILS. L. Auer. *U. S.* 2,406,337. A process for treating fatty oils having drying properties, to improve their film-forming characteristics when used as components of surface coating materials comprises incorporating in the oil up to 30% of a polyhydroxy benzene as the sole active treating agent, and heating the mixture at 75-350°, but not above the boiling or decomposition point of the oil, whichever is lower, for at least 30 minutes.

COATING COMPOSITIONS. L. M. Kebrich and E. P. Peterson (Natl. Lead Co.). *U. S.* 2,406,609. This improved vegetable drying oil coating composition contains a lead salt of a hydroxy aromatic acid.

MODIFIED DRYING OILS AND LIKE UNSATURATED ESTERS. E. I. du Pont de Nemours and Co. (Imperial Chemicals, Ltd.). *Brit.* 565,777. A glycerol ester of an unsaturated aliphatic monocarboxylic acid preferably of long chain having at least 12 C atoms and several double bonds is treated with an organic compound containing several isocyanate or isothiocyanate groups. The ester may be a natural, at least partially unsaturated oil containing a free hydroxyl group as in castor oil. Improved plasticizers, coating, and drying oil compositions are obtained from linseed oil and decamethylene diisothiocyanate or ethylene diisocyanate. (*Chem. Abs.* 40, 5267.)

WRINKLE COATING COMPOSITIONS. E. L. Luaces. *Brit.* 566,000. The compositions are prepared by treating an oil having several double bonds in non-conjugated positions at 400° F. with an alcoholic solution of an alkali metal hydroxide in excess of the stoichiometric quantity required to transform all the acids into soap. The fatty acids are separated and heated with a polyhydric alcohol and a polycarboxylic acid. (*Chem. Abs.* 40, 5580.)

MODIFIED LINSEED OIL WRINKLE FINISH. W. A. Waldie (New Wrinkle, Inc.). *U. S.* 2,407,623. The method of making wrinkle varnish base consists in heating glycerol with a dehydrating agent from the group consisting of NaAc and NaOH to approximately 500° F. for about 30 minutes, adding non-conjugated double-bonded drying oil and heating to approximately 500-520° F.; adding natural resin and heating to approximately 540° F., and blowing the reaction mixture with air at about 400-420° F.

WRINKLE FINISHES. W. A. Waldie. *Brit.* 566,057 and 566,066. A wrinkle varnish base is prepared by heating a drying oil such as a dehydrated castor oil, an oil-soluble resin such as a rosin modified maleic acid glycerol resin or a phenol-aldehyde resin, and air for approximately 1 hour at 375-400°. A wrinkle coating composition is obtained by adding a metallic drier and solvent to the varnish bases. In 566,066, a polyglycerol modified drying oil is substituted for the drying oil. The cooking time of the varnish is thereby reduced. (*Chem. Abs.* 40, 5580.)

VULCANIZED OR SULFURIZED OIL COMPOSITIONS. J. A. Stokes and E. Bader. *Brit.* 570,262. A coating composition is produced by treating a fatty oil, and particularly one containing a hydroxyl group in the fatty acid radical, with a proportion of SCl<sub>2</sub> in association with a volatile organic solvent functioning as a diluent in a proportion and in conditions by which a highly viscous liquid is produced, which is still however soluble in cyclic hydrocarbons, and then converting the liquid to a final product insoluble in cyclic hydrocarbons with the aid of a curing agent or by the action of heat with or without the use of a curing agent. (*Chem. Abs.* 40, 5267.)

## Abstracts

### Soaps

Edited by  
LENORE PETCHAFT

SOAP GELS IN NONAQUEOUS MEDIA. G. S. Hattiangdi (Roy. Inst. Sci. Bombay). *J. Sci. & Ind. Research (India)* 4, 489-92 (1946). The time of gel setting was used to determine the effect of variations in soap concentration, temperature, and solvent in binary systems constituted from Na oleate or Na stearate in toluene, xylene, pinene, or Nujol. The time of setting of gels of either soap in any of the media used decreased as the soap concentration increased and temperature decreased. Time-concentration curves at 50° of Na oleate indicated the setting effect of the solvents to decrease in the order toluene, Nujol, xylene, pinene. Heats of activation for the setting processes were calculated by the method of Hurd *et al.* (cf. *C. A.* 38, 22545) for Na oleate and Na stearate, respectively, in 4 solvents: toluene —6776, —; xylene, —6713, —7775; pinene, —3202, —2820; Nujol, —5741, —4324. The gelation mechanism was considered as

being that of a true solution obtained by preparation at the b. p., forming a colloidal solution on cooling, consisting of a suspension of micelles in a soap solution, and finally passing to the true gel state. The retarding effect of various substances on the syneresis of the Na oleate-pinene gel was found to be in the order Na palmitate >K stearate >Na stearate for added soaps and Nujol >benzene >toluene for added solvents. (*Chem. Abs.* 40, 4937.)

PERMUTOID TRANSFORMATION OF FATTY ACID CRYSTALS INTO METALLIC SOAP CRYSTALS AND THE TEMPERATURE DEPENDENCE OF THE TWO-DIMENSIONAL PRESSURE OF MONOLAYERS. A. A. Trapeznikov (Colloid-Elektrochem. Inst. Acad. Sci., U.S.S.R.) *Compt. rend. acad. sci. U.R.S.S.* 47, 344-7; *Doklady Akad. Nauk S.S.S.R.* 47, 349-53 (1945). The penetration of crystals by electrolytes and the different stages of the interaction of multivalent cations with fatty acid molecules