was diluted with sufficient water to yield an aqueous alcohol of about 50% concentration by volume. The pigments remained dissolved almost entirely in the hydrocarbon layer which was separated by gravity and steam distilled in a continuous still. The slop which flowed from the still continuously contained about 5% of oil. It was run through a National Acme Centrifuge designed for the separation of liquids using an average feed rate of 210 gallons per hour, a maximum rate of 720 gallons per hour. The oil was recovered in about 95% yield. It contained 6.7% moisture during the period of most rapid flow through the centrifuge.

The xanthophyll oil is a viscous material which if not thoroughly dried may assume a pasty character due to emulsified water. It is almost black in color but gives a yellow solution on dilution with suitable solvents.

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2. Peterson, W. J., Hughes, J. S., and Scott, H. M. "The Role of Xanthophylls in the Ration of the Fowl." Presented before the Division of Biological Chemistry, Boston, Mass., Sept. 1939.

Abstracts

Oils and Fats

Edited by
M. M. PISKUR and SARAH HICKS

APPLICATION OF NONCORROSIVE METALS TO DEODORIZING OF VEGETABLE OILS. Alan Porter Lee. *Proc. Inst. Prod. Tech. 1941*, 219-23 (1941). Several samples of edible cottonseed oil deodorized in stainless-steel equip. have been preserved in partially filled clear glass bottles with exposure to the effects of light and air for periods up to 6 months without developing rancidity to extent determinable by taste or odor. Development of a series of comparative induction-period tests to obtain quant. data for checking these reported results is planned.

TRANSFORMING CARBOHYDRATES INTO FAT WITH THE AID OF MICROORGANISMS. Hugo Fredholm. *Kgl. Lantbrudsakad. Tid. 80*, 341-9 (1941) (English summary). Production of fat by Oospora (1) when cultivated on whey has been studied, with special attention given to the symbiosis with lactic acid bacteria. The optimum temp. was 28°. Generally autolysis began on the 7th to 9th day. The amt. of fat reached its max. on the 5th to 6th day. I utilizes the N compds. of autoclaved whey. Two parts of dry matter contg. 25.5% fat are obtained from 4.25 parts of lactose + lactic acid, when I is grown in pure culture. Better results are obtained when I is grown symbiotically with certain bacteria of the family Lactobacteriaceae, viz., Streptococcus lactis (II), Streptococcus cremoris (III) and Leuconostoc citrovorum (IV). With II, III, and IV, 1.84 parts of dry matter, contg. 40% fat, is obtained from 4.15 parts of lactose + lactic acid. The extd. fat has a yellowish color. At 15° it is semiliquid. *(Chem. Abs.)*

THE EFFECT OF FEEDING SOME FAT SOLUBLE DYES TO MILKING COWS UPON THE COLOR OF MILK FAT. C. F. Huffman and C. W. Duncan (*Mich. Sta. Quart. Bul. 24*, No. 1, 54-55 [1941]). *Expt. Sta. Record, 86*, 82. When trials were conducted with Sudan III, Sudan IV, brilliant green, and perfect purple, each fed at the rate of 15 gm. dissolved in 0.5 lb. of soybean oil, the Sudan III or Sudan IV imparted a pronounced pink color to butterfat, most intense 24 hr. after feeding. Some color persisted up to 144 hr. after feeding, and some color persisted for 132 hr. The perfect purple gave a pronounced green color to the fat, which was most pronounced at 36 hr. and persisted at a diminishing rate for more than 84 hr. Nigrosine black, fed at a 45-gm. level, imparted a pink color to the butterfat. The possibility of using these fat-soluble dyes in studying the relation of food fat to milk is indicated.

INFLUENCE OF SOME DIETARY FACTORS ON THE DEVELOPMENT OF RANCIDITY IN THE FAT OF THE WHITE RAT. Andrea Overman. *J. Biol. Chem. 142*, 441-4 (1942). Rats were fed a synthetic diet; one group received no supplement, a second group received 1 mg. of ascorbic acid daily, and a third group received 1 mg. of hydroquinone daily. The fats from each series were analyzed for rancidity at stated intervals. The results indicate that the difference in resistance to reacidity are due partly to thinness or fatness of the animal, and partly to the diet. Ascorbic acid feeding, together with a low per cent of gain in wt. resulted in a significant increase in resistance of the fat to rancidity.

THE RESPONSE OF LIPID METABOLISM TO ALTERATIONS IN NUTRITIONAL STATE. II. THE EFFECTS OF OVERNUTRITION ON THE POSTABSORPTIVE LEVELS OF THE BLOOD LIPIDS OF THE DOG. C. Entenman and I. L. Chaikoff. *J. Biol. Chem. 142*, 129-37 (1942). The expl. production of obesity (in which dogs were made to increase their wts. by as much as 80%) led to little or no rise in the total cholesterol content of the blood. There was a tendency for total fatty acids and phospholipids to rise in the obese dog, but this response was not uniform in the animals studied. Raw pancreas (which readily influences the blood lipids of the completely depancreatized dog maintained with insulin) failed to produce significant changes in the blood lipid constituents in the *normal* dog. Fasting appears to produce a more pronounced fall in the blood lipids in the obese dog than in the dog of normal nutritional state.

A NOTE ON THE EPIDERMIS OF THE RAT ON A FAT-FREE DIET. R. Williamson. *Biochem. J. 35*, 1002-5 (1941). The epidermis of rats on fat-free diets becomes thicker, and more differentiated than that of normal rats, the stratum granulosum becoming especially distinct and the horny layer thick. When rats were fed on fat-free diets with supplements of unsaturated acids the epidermis was found to be nearly normal.

FAT-DEFICIENCY DISEASE OF RATS. THE STORAGE OF FAT IN THE FAT-STARVED RAT. I. S. MacLean and E. M. Hume. *Biochem. J. 35*, 990-5 (1941). Rats were kept on a fat-free diet for periods varying from 172

to 330 days and the proportions of (a) total lipoid and (b) arachidonic acid to fat-free weight determined in skin, liver and carcass. In the subcutaneous tissue the proportion of total lipoid increased with the duration of fat-starvation. The proportion of lipoid to fat-free dry weight showed no diminution when compared with the corresponding values in a rat which had received linseed oil in addition to the fat-free diet throughout the whole period. There was, therefore, no evidence of any diminished fat-storage in the fat-starved rat. From the 6th to 11th months of fat-starvation, there was very little change in the ratio of arachidonic acid to fat-free dry weight in skin, liver and carcass. The proportion of arachidonic acid to fat-free dry weight was very low in the subcutaneous tissue of the fat-starved rat. The amount of this acid in the subcutaneous tissue was not increased significantly when minimal doses of '¼ drop' methyl arachidonate were given to rats for 5 weeks after 179 days of content was detected. The change was less apparent in the carcass. The level of arachidonic acid in the liver rose immediately and markedly on giving minimal doses of the curative acid even for a short period. One rat received a daily dose of 7050 mg. methyl arachidonate or of 0.1 g. linseed oil with the fat-free diet for a period of 330 days from weaning. Here the percentage of highly unsaturated acid in the skin was especially high. The conclusion was drawn that a plentiful supply of highly unsaturated acid was necessary for the formation of new tissue but not for the maintenance of the normal metabolism of the cell. The addition of choline to the diet produced no significant effect.

FAT-DEFICIENCY DISEASE OF RATS. THE INFLUENCE OF TUMOR GROWTH ON THE STORAGE OF FAT AND OF POLYUNSATURATED ACIDS IN THE FAT-STARVED RAT. I. S. MacLean and E. M. Hume. *Biochem. J. 35,* 996-1002 (1941). Walker tumors were implanted in (a) seven rats which had been maintained for 97 days on a fat-free diet, and in (b) seven rats which had received for the same period daily doses of linseed oil in addition to the fat-free diet. Large tumors developed in all the fat-starved rats and in five of those which had received the linseed oil. In two rats receiving linseed oil, small nodules formed but failed to develop further. The five 'linseed oil rats' which had developed tumors showed a large diminution in the proportion of total lipoid material (chiefly fatty acids) in both skin and carcass when compared with the two rats in which the tumors had remained as small nodules. The proportion of lipoid material was also much lower in the tumor-bearing fat-starved rats than in fat-starved rats in which no tumors had been implanted. A marked lowering of highly unsaturated acids in the subcutaneous tissue but not in the carcass fat accompanied the development of the tumors. There was no significant change in the proportion of this acid in the liver. The fat-starved rats had not reached the stage of complete cessation of growth, so that any highly unsaturated acid available for normal growth would have been available for utilization in tumor development. The ether insoluble bromides from the fatty acids of the livers of the rats which had received linseed oil contained 70% Br., corresponding with the decabromide of clupanodonic acid $C_{22}H_{34}O_2$ Br. The corresponding bromides from the livers of the fat-starved rats contained only 65% Br. which would be in agreement with a mixture of arachidonic octabromide and dihydroarachidonic hexabromide. This suggests the synthesis by the rat of clupanodonic from linoleic or linolenic acid.

DRYING OILS AND RESINS. Alkali-induced isomerization of drying oils and fatty acids. T. F. Bradley and D. Richardson. *Ind. Eng. Chem. 34,* 237-42 (1942). The isomerizing action of alkali metal hydroxides on unconjugated fatty acids and oils is reviewed, and data are presented which show that the isomerization proceeds in water as well as in alcohols, provided the temperatures are sufficiently high. A commercially feasible process is described which has enabled the formation of from 30 to 50 per cent of conjugated acids from soybean and linseed oils. Such acids have been found to be useful for the production of improved drying oils and resins.

PATENTS

TREATMENT OF OLEAGINOUS MATERIAL. Raymond T. Anderson (V. D. Anderson Co.). *U. S. 2,269,898.* Mechanical features of a combined cooker and expeller are described.

REFINING OF OILS, FATS AND WAXES. Hugo J. Kauffmann (Buffalo Electro-Chemical Co.). *U. S. 2,269,667.* The method of refining oils, fats and waxes comprises generating chlorine dioxide and an inert gas in the presence of but in a zone in contact with and below the oil, fat or wax to be bleached whereby the mixed gases diffuse into the material to be bleached.

REFINING OF ANIMAL AND VEGETABLE OILS. Benj. Clayton (Refining, Inc.). *U.S. Re. 21,992.* The process of refining animal and vegetable oils which comprises: mixing a refining reagent with said oils to precipitate the foots therein, pumping a stream of a substantially uniform mixture of said oil and foots into a vapor separating zone, heating said stream during said pumping to a temperature sufficient to separate gaseous and vaporizable materials from said mixture in said zone in order to produce a substantially dehydrated mixture of oil and foots and thereafter separating the dehydrated foots from said oil is described.

PROCESS OF REFINING OILS CONTAINING FREE FATTY ACIDS. B. Clayton and W. B. Kerrick, and H. M. Stadt (Refining, Inc.). *U. S. 2,268,567.* A process of refining oils contg. free fatty acids; that is, animal, vegetable and fish oils, comprises: mixing the oil with a reagent capable of saponifying said acids; injecting compressed air into said mixture; forcing the mixture to flow at a high velocity in a thin stream through a reaction chamber in which the fatty acids are intimately contacted with the reagent due to the turbulence of said stream; and thereafter separating said air and the reaction products produced by the action of said reagent on said acids from the oil, the reaction chamber being so constructed that no tight emulsion is formed therein but high fluid friction losses occur therein.

PROCESS FOR REFINING FATTY COMPOUNDS. W. J. D. van Dijck. *U. S. 2,268,786.* In a process of refining an ester type oil contg. free fatty acid by neutralization of said acid with ammonia and multistage countercurrent ext. with aqueous isopropyl alc., the improvement comprises introducing into the first ext. stage in which the oil is first contacted with said alc. an amt. of ammonia approximately equivalent stoichiometrically to the free acid content of said oil and

into the last ext. stage from which refined oil is recovered an addl. amt. of ammonia between about 10% and 40% of the amt. added in the first stage.

PROCESS FOR PREPARATION OF VITAMIN E CONCENTRATE AND ANTIOXIDANT. John S. Andrews (General Mills, Inc.). *U. S. 2,263,550.*

PREPARATION OF OILS CONTAINING ANTIOXIDANTS. James G. Baxter and Jakob L. Jakobsen (Distillation Products, Inc.). *U. S. 2,269,243.* The process of refining an animal or vegetable oil which contains a natural antioxidant comprises treating the oil with an organic dibasic acid whereby the impurities are coagulated, separating the oil from these impurities, subjecting the oil to high vacuum unobstructed path distillation and separating a fraction of the oil which contains at least a part of the necessary antioxidant. Examples of suitable org. acids are oxalic, tartaric, citric and maleic.

PHOSPHATIDE PRODUCT, AND PROCESS OF OBTAINING IT. Norman F. Kruse (Central Soya Co., Inc.). *U. S. 2,269,772.* A crude phosphatide fraction is sepd. directly as a waxy material from vacuum-stripped solvent-extracted vegetable oils contg. it by addg. to such a vegetable oil both a small amt. of moisture and a crude oil which is high in phosphatide content, which fraction is substantially free from volatile materials that cause disagreeable odors and taste, and has a high content of acetone-insoluble material, a low oil content, and a moisture content of between 3% and 10%.

LUBRICATING COMPOSITION. Bert H. Lincoln and Gordon D. Byrkit (Lubri-Zol Development Corp.). *U. S. 2,264,319.* A lubricating compn. comprises a major propn. of oil of lubricating viscosity and a minor propn. of halogenated foots oil.

LUBRICANT. Eugene Lieber (Standard Oil Development Co.). *U. S. 2,262,809.* An improved lubricant comprises a waxy lubricating oil and a condensation product of halogenated "tall oil" and a cyclic compd.

Abstracts

Soaps

Edited by
M. L. SHEELY

INDUSTRIAL RESEARCH IN THE UNITED STATES DURING 1941. William Hamor. *News Ed. A.C.S. 20,* 1 (1942). Cottonseed oil industrial soap is getting trial in place of olive oil base products. From the investigation of the sapon. of fats at high temperatures in the presence of kerosene several operating difficulties in the process have been overcome. As little as 3 to 5% bentonite improves the properties of soap, but this quantity does not effect much of a saving in fat-acid content. Soaps from pyroabietic acid are more germicidal than soaps made from gum rosins, as are also soaps of tetrahydro-dihydro-, and freshly prepared abietic acids.

SYNTHETIC GLYCERINE—Dichloro-tert-butyl alcohol, the principal product from the chlorohydrination of methallyl chloride, has been employed for the synthesis of β-methylepichlororohydrin, β-methylglycerol monochlorhydrin, β-methylglycidol, and β-methylglycerol. A similar but more complex series of compounds has been prepared from trichloro-tert-butyl alcohol. Synthetic glycerol, produced by hydrogenolytic processes, is impure and the isolation of C. P. grade has proved difficult. A new approach to the problem—namely crystallization in the presence of suitable solvents—yields glycerol of purity. It is now possible by treatment with hydrogen to produce glycerol from such abundant carbohydrate materials as starch and dextrose. Shell's synthetic glycerol process has brought a number of intermediates and derivatives formerly obtainable in quantity only from glycerol itself. In the catalytic process of Battelle Memorial Institute glycerol is produced from petroleum refinery gases without high-temperature chlorination. Glycerol formal is being used as a solvent for zein as well as cellulose esters.

THE ETHANOLAMINES. Chester B. Kremer. *J. Chem. Ed. 19,* 80-1 (1942).

INFLUENCE OF SOAPS ON BACTERIAL TOXINS AS ELICITED BY SHWARTZMAN RESPONSE. Herman C. Mason. *J. Bact. 43, Proc. 43,* 54 (1942).

FATTY AND FAT-FREE WASHING AND CLEANING MATERIAL IN VIEW OF THE ORDER OF JAN. 27, 1940. Kurt Lindner. *Seifensieder-Ztg. 67,* 171-2 (1940). Substitutions are discussed. *(Chem. Abs.)*

SIMPLIFICATIONS IN THE DETERMINATION OF FAT ACIDS IN COMMERCIAL SOAPS. J. Grossfeld. *Chem.-Ztg. 65,* 153-4 (1941). G. found that the loss of fat acids from butterfat and coconut fat during analysis is not caused by the volatility of the acids but by their soly. in water, especially in the presence of alc. The following method avoids this loss. Add 5 cc. of HCl (25%) to 5 g. of soap, keep at 100°, until the fat acids have sepd. out., add 50 cc. of naphtha (b. 60-70°), dissolve the acids by shaking, let stand until the soln. is clear, pipet out 25 cc. of soln., evap. the solvent and dry. Soaps filled with clay are extd. for 3 hrs. with 96% alc. and the residue after evapn. of the alc. is treated as before. A fast, less accurate method is given: ext. 2 g. of soap with 20 cc. of 96% alc. for 10 min., add 50 cc. of naphtha, 10 cc. of HCl (25%) and 30 cc. of H_2O, mix and evap. 25 cc. of the clear soln. *(Chem. Abs.)*

DEEP-DRAWING LUBRICANTS. E. E. Halls. *Automobile Engr. 31,* 192-4 (1941). Various compns. that may be used as lubricants for deep-drawing operations are described, and their relative merits discussed. The presence of fixed fatty oils is required because of their unrivaled properties of wetting, adhesion and film strength. Mineral-filled soap-base compds. are recommended. *(Chem. Abs.)*

AN IMPROVED MOISTURE DETERMINATION APPARATUS. John J. Young. *Soap 18,* No. 1, 59 (1942). The standard distillation method for determination of moisture calls for refluxing at least two hours. Thus