TABLE II

Active Oxygen and Storage Stability Values Obtained with Various Antioxidants. [Storage in Glass Vials at 21° C. (70° F.)]

Antioxidants added percent	Stability		Protection factors	
	A. O. M. 98.5° C.	Storage 21° C.	A. O. M. 98.5° C.	Storage 21° C.
	hrs.	*mos.*		
Control (steam-rendered lard—A)	2.5	4.5	1	1
+1.0 crude corn oil	8	13	3.2	2.9
+1.0 refined corn oil	3.5	8	1.2	1.8
+5.0 crude corn oil	18	20	7 2	4.5
+5.0 crude corn oil +.06 d-IP[1]	26	>20*	10.4	>4.5
+5.0 refined corn oil	9	15.5	3.6	3.4
+5.0 refined corn oil +.06 d-IP	15	>20	6.0	>4.5
Control (refined corn oil)	10	7	1	1
+.06 d-IP	30	>20	3	>2.9
Control (steam-rendered lard—B)	1.5	4	1	1
+.05 ethyl phosphoric acid	4	8	2.7	2.0
+.05 butyl tyrosine	2	6	1.3	1.5
+.1 galacturonic acid	4	7	2.7	1.8
+.05 gum guaiac	7	17	4.7	4.3
+.01 hydroquinone	10	>20	6.7	>5
+.05 NDGA[2]	40	>20*	27	>5
+.05 B,B′-thiodipropionic acid	95	>20	63	>5
+.14 lauryl thiodipropionate	52	>20	35	>5

> means greater than; test still under way.

[1] d-Isoascorbyl palmitate.

[2] Nordihydroguaiaretic acid.

* Became discolored to an objectionable extent.

THE difference in the protection factors by the active oxygen method and by the storage test is not so great as in the results given in Table 1. The data indicate that the addition to lard of about 5 percent of a tocopherol-bearing oil, such as corn oil, may provide a practical means of imparting sufficient protection for most storage requirements. There is good reason to think that even greater storage stability would be gained by adding similar amounts of partially-hydrogenated corn oil, soybean oil, or similar tocopherol-bearing oil (7).

The most effective antioxidants of the series given in Table 2, as indicated by the active oxygen method, are still in the storage test. The samples containing NDGA and those containing both crude corn oil and d-isoascorbyl palmitate have developed an off-color to an objectionable extent.

Some "off" odors and flavors in all the samples were detected during the latter part of the storage period before they were classified as rancid. Probably in some instances, these would be called "reverted" odors and flavors; in other instances they seemed to be characteristic of the antioxidant used.

It should be borne in mind that these storage data, obtained on small samples in glass, may not be comparable with results on large samples in commercial packages. But at least, they give a rough indication of the relative significance of rapid stability tests by the active oxygen method in terms of storage and point out the need for further comparisons with other rapid stability tests. Further experiments of this sort, including stability tests on stabilized lard stored in commercial packages, are in progress.

Summary

The stability of lards containing various antioxidants was determined by the active oxygen method and by storage in glass vials at 21° C. In many instances there was general agreement in the results, but no constant relationship was found. The difference between the results of the rapid test and those of the storage tests seemed to be greatest when tocopherol concentrate and lecithin were added to lard. In most instances where antioxidants were used, the protection indicated by the rapid stability test was higher than that found in the storage test.

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Abstracts

Oils and Fats

Edited by
M. M. PISKUR and SARAH HICKS

PROCESSING SOYBEANS. W. H. Goss. *Soybean Digest 5*, No. 1, 6-9 (1944).

DETERMINATION OF CRUDE LIPID IN VEGETABLE MATTER. J. P. Nielsen and G. S. Bohart. *Ind. Eng. Chem., Anal. Ed., 16*, 701-3 (1944). This quick method of detg. fat in moist material is based on extn. with acetone, evapn. and extg. the residue with petr. ether.

NEATSFOOT OIL [FOR LEATHER]. C. C. Kritzinger. *Leather Ind. Research Inst. 2*, Circ. No. 24, 337-41 (1943). Oils rendered from neat's feet and shins and sheep's feet and shins, resp., and clarified by settling for 3 weeks have approx. the same analytical values; they function equally well in fat-liquors for leather or as raw material for sulfated oils for leather. (*Chem. Abs.*)

THE OXIDATION OF THIO-ETHERS BY UNSATURATED FATTY ACIDS. W. v. B. Robertson, J. L. Hartwell and S. Kornberg. *J. Am. Chem. Soc. 66*, 1894-7 (1944). It was observed that β,β-dichloroethyl sulfide was oxidized at room temp. to the sulfoxide by unsatd. oils in the presence of O_2. All the unsatd. acids and their esters which were examd. were found to mediate the oxidation, with the following exceptions: *a*-eleostearic (in which the double bonds are conjugated), Δ^{10}-undecylenic, ricinoleic and the acetylenic acids tariric and stearolic. The agents found to be responsible for the oxidation of the thio-ethers were the peroxides of the unsatd. fatty acids or esters. One mol. of peroxide oxygen was consumed for each mol, of thio-ether oxidized. In addn., carotene and *p*-dimethylaminoazobenzene were decolorized and biotin was found to be inactivated by peroxidized oils.

FORMATION OF ISOMERIC HYDROXY ACIDS BY SULFATION OF OLEIC ACID. B. B. Schaeffer, E. T. Roe, J. A. Dixon and W. C. Ault. *J. Am. Chem. Soc. 66*, 1924-5 (1944). Hydroxy acids resulting from the sulfation and subsequent hydrolysis of oleic acid were oxidized with nitric acid. Esters of dibasic acids having more than 10 C atoms were found by fractionation of the Me esters of the steam-non-volatile, water-insol. portion. The dimethyl ester of 1,14-tetradecanedicarboxylic acid was isolated and identified. Esters of monobasic acids longer than decanoic appeared to be present. The sulfation of oleic acid leads not only to 9- and 10-hydroxystearic acids but also to other isomeric hydroxy acids.

THE PREPARATION OF SOME FATTY ACID CHLORIDES BY MEANS OF PHOSGENE. J. Prat and A. Etienne. *Bull. soc. chim. 11,* 30-4 (1944). Gaseous phosgene (I) is introduced in the molten acids through a fritted gas distributor. With lauric acid (II), the rate of chlorination increases with temp. up to 150°, and then decreases, the most favorable temp. range being 140-150°, under which conditions a yield of 85-90% is obtained. The rate of introduction of I is also important. If it is slow, the reaction is very slow, specially toward the end. The best rate was found to be 60 g. per hr. with 120 g. acid. Under similar conditions, palmitic and stearic acids yield 70-75% of the corresponding chlorides. The reaction with oleic acid is also dependent upon the temp., the rate increasing with the temp. up to 160°, but the yields are lower than with II. (*Chem. Abs.*)

FAT CHEMICAL WORK AND ITS ECONOMICAL ORGANIZATION. V. THE CONVERSION OF UNSATURATED FATTY COMPOUNDS INTO SATURATED ONES. K. Lindner. *Fette u. Seifen 50,* 82-7 (1943). The importance of hardened fats in the production of margarine, stearin and ointment bases is discussed. The use of the reaction of Varrentrapp, which consists in heating fat acids with caustic potash soln. until no more H_2 is evolved, is described. With its use white to light yellow, strongly alk. soaps similar to coconut-oil soap can be produced from fish oils. A similar decompn. of unsatd. acids can be obtained with the "persapol" process of Stiepel in which the hydrated liquid train-oil soaps are treated with a current of steam in an autoclave at 200°. This yields fat acids having I nos. corresponding to those of the oleic acid series. Unsatd. acids can also be converted into ether fat acids at 250-300°. The advantage of the Varrentrapp reaction is the possibility of decompg. high-mol. and highly unsatd. C_{20} to C_{22} chains into simple unsatd. C_{14} to C_{18} chains or to satd. C_{10} to C_{14} chains and the use of fish-oil products in place of palm-kernel and coconut oils. The H_2 produced during these reactions can be subsequently used for hydrogenation. The hardening process makes it possible to produce fats of greater or less hardness without changing the length of the C chain (*Chem. Abs.*)

DESATURATION VALUE (IODINE NUMBER) OF BLOOD-FAT AS A POSSIBLE AID IN THE STUDY OF OBESITY AND LEANNESS. Clara S. Shapiro. *Med. Woman's J. 51,* No. 7, 17-21, 24 (1944). A review of the literature leads to conclusion that the normal human body has the ability selectively to regulate the ratio of desatd. to satd. fat in the blood, plasma and adipose tissue so as to maintain a const. and characteristic I no. in each one of these tissues. The I no. of adipose fat is the same in health and disease. The I no. of blood and plasma fat is affected by fatty food intake. As to pathol. conditions, measurements are available in hyperthyroidism and anemia only, where a rise of I no. is reported. On recovery return to normal is prompt. On the basis of the above evidence S. believes that: (1) the extent and direction of alimentary shift in the I no. of blood and plasma fat varies with the I no. of the ingested fat. (2) In pernicious anemia, hyperthyroidism and impaired fat metabolism the mechanism controlling the fat-desatn. process becomes impaired to a degree proportional to the severity of the disease, which could be utilized for diagnostic purposes. She suggests that the measurement of the I no. of blood-fat might be of diagnostic value in different types of obesity and leanness. (*Chem. Abs.*)

THE PREPARATION OF FRACTIONS FROM PANCREAS THAT PREVENT FATTY LIVERS IN DEPANCREATIZED DOGS MAINTAINED WITH INSULIN. C. Entenman, I. L. Chaikoff and M. L. Montgomery. *J. Biol. Chem. 155,* 573-8 (1944). The prepn. of pancreatic fractions that prevent fatty livers in completely depancreatized dogs maintained with insulin is described. Active fractions were obtained from dil. acid exts. of pancreas by pptn. with $(NH_4)_2SO_4$ between concns. of 0.25 and 0.5 satn. The daily feeding of as small an amt. as 60 mg. of a fraction maintained a normal fat content in the livers of completely depancreatized dogs for as long as 6 months.

BIOCHEMICAL STUDY OF OLIVE-YOLK EGGS FROM HENS FED COTTONSEED MEAL. E. A. Fieger, C. W. Upp and A. D. Swenson. *Proc. Louisiana Acad. Sci. 7,* 85-92 (1942). Gossypol was shown to be the factor in cottonseed meal responsible for the formation, in storage, of the olive-colored yolks in eggs from hens fed cottonseed meal. The characteristic olive color is due to an Fe-gossypol complex formed with ferric Fe released from yolk proteins during storage. Fresh-egg yolk has insufficient ferric Fe to give a test with the usual reagents. Ammonia accelerates the release of Fe from yolk proteins. The chocolate-colored compd. formed by Fe and gossypol in the presence of NH_3 is believed to be the NH_4 salt of the green compd. in olive yolks. Addn. of sol. ferric salts to the ration contg. cottonseed meal prevents the absorption of the gossypol by the hen and thus the formation of olive yolks in stored eggs. This inhibition is probably due to the decreased soly. of the Fe-gossypol complex in the intestines. (*Chem. Abs.*)

THE RELATIONSHIP OF METHIONINE TO FATTY LIVER PRODUCTION AND GROWTH. C. R. Treadwell, H. C. Tidwell and J. H. Gast. *J. Biol. Chem. 156,* 237-46 (1944). The amt. of dietary methionine available for lipotropic action appeared to be limited by the amt. used in growth. The rats receiving the diet which contained 20 g. of arachin and 0.5 g. of methionine per 100 g. of diet grew normally and developed fatty livers. The rats receiving the diet which contained 20 g. of arachin and 1 g. of methionine per 100 g. of diet grew normally and the level of the liver lipids was only slightly above normal. The addn. of methionine to a methionine-deficient diet promoted the storage of protein and fat in the tissues.

THE SOURCE OF THE EXTRA LIVER FAT IN VARIOUS TYPES OF FATTY LIVER. D. Stetten, Jr. and J. Salcedo. *J. Biol. Chem. 156,* 27-32 (1944). The fatty liver of choline deficiency has been shown to result from impaired transportation of fatty acids from liver to depots. The fatty liver following the feeding of cystine, like that incident to thiamine administration, is the result of increased rate of fatty acid synthesis. The fatty liver that follows the injection of anterior pituitary substance into fasting mice is the result of excessive mobilization of depot fat and migration to the liver. This latter process is most nearly like that which appears to cause the human fatty livers seen in routine autopsy material.

Effect of thyroxine on the neutral fat and cholesterol content of the body and liver of rats. J. C. Forbes. Endocrinology *35,* 126-9 (1944). Young rats on a high-carbohydrate, low-protein, fat-free moderate-choline diet had livers of lower cholesterol and neutral fat content and skins and carcasses of lower fat plus cholesterol concn. when given 1 mg. thyroxine per 100 g. diet than did untreated controls. When choline was omitted, liver fat was high; hence its presence is essential for this lipotropic action of thyroxine. (*Chem. Abs.*)

Decrease in the quantity of proteins fed to swine and its effect on the deposition of fat. H. Bünger, E. Fissmer, H. Schmidt and A. Naegelsbach. *Z. Tierernähr. Futtermittelk 6,* 222-51 (1943). The expts. indicate that protein-poor feed resulted not only in a smaller increase in the quantity of meat, but also of fat. Decreasing the quantity of proteins in the feed retarded the growth and resulted in an insufficient assimilation of the feed and nutritive substances. The smaller increase in the quantity of fat was caused chiefly by the smaller assimilation of carbohydrate feeds. Decreasing protein feeding did not affect the increase in fat if the normal consumption of the feed was not disturbed thereby. (*Chem. Abs.*)

Influence of diet on the production of tumors on the liver by butter yellow. E. L. Opie. *J. Exptl. Med. 80,* 219-31 (1944). The presence of fat in the diet accelerates the production of hepatic tumor by *p*-dimethylaminoazobenzene (Butter Yellow) (I) and when its quantity is very small, few are produced. (*Chem. Abs.*)

PATENTS

Phosphoric acid esters of glycerol ethers and their manufacture. A. Grün (J. R. Geigy, A.-G.). *U. S. 2,361,286.*

Amino derivative of organic acids for rubber compounding surface activation, etc. E. A. Van Valkenburgh (Amino Products Corp.). *U. S. 2,360,913.* The new products are homogeneous mixts. resulting from the neutralization of at least 1 fat acid with NH_3 and an aromatic amine, said mixt. contg. an appreciable amt. of free fat acid, free amine and a fat acid-amino neutralization product.

Artificial drying oil. H. L. Gerhart (Pittsburgh Plate Glass Co.). *U. S. 2,361,018.* A liquid coating compn. having the air drying characteristics of a drying oil consists essentially of the product obtained by cooking a drying oil sol. resin and a liquid conjoint polymerization product of a heated mixt. consisting essentially of cyclopentadiene and an unsatd. glyceride oil.

Production of blown fatty materials. R. E. Porter and J. Wolfson (National Oil Products Co.). *U. S. 2,361,793.* A process for the production of a highly hydroxylated blown oil comprises blowing a mixt. of a semi-drying oil and water with an O_2-contg. gas at a temp. between about 30° and about 50°, and in the presence of an oil-sol. emulsifying agent. The product is used for fat-liquoring leather.

Treatment of textile fiber with water repellency agents. L. Collins *et al.* (duPont). *U. S. 2,361,270.* In the process of surface treatment of cellulosic fabric with stearamido-Me-pyridinium chloride whereby to impart thereto a water-repellent fin-

Abstracts

Soaps

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Rapid method for the determination of water and fat acids in soap. Aldo Picozzi. *Ann. chim. Applicata 32,* 51-3 (1943). Foaming during the detn. of water in the Marcusson app. is avoided by adding neutral $Pb(OAc)_2$ before distg. Water of crystn. is subtracted from the value found. Detn. of water: 10 g. powder or flake soap, 4 g. quartz sand, 10 g. neutral $Pb(OAc)_2$ and 150 cc. xylene are placed in a 500-cc. flask and well mixed in the cold. The condenser of the Marcusson app. is attached and the mixt. is heated to 170-80° in a paraffin bath, with occasional shaking; 1.4 cc. is subtracted from the water vol. in the buret. The remainder multiplied by 10 is the percentage of water in the soap. Time required: about 45 min.. Detn. of fat acids: Xylene is removed from the residue by heating in the paraffin bath at reduced pressure. The residue is then heated and shaken at reflux temp. with 100 cc. of 20% HCl for about 30 min. The fat acids formed are filtered off on moistened filter paper in a Buchner funnel, washed, dried by suction, and dissolved in Et_2O. The Et_2O soln. is washed 3 times with 10 cc. of water in a separatory funnel, transferred to a weighed flask, the Et_2O removed, and the residue dried at 100-105° and weighed; the wt. $\times\ 10 = \%$ fat acids. (*Chem. Abs.*)

Determination of the total fat acids in filled soaps. Stefan Schutzer. *Seifensieder-Ztg. 70,* 88 (1943). The finely cut soap is extd. with alc. in a Soxhlet app. In this manner only the soap is dissolved. After evapn. of alc. the residue is decompd. with HCl and extd. with petroleum ether. (*Chem. Abs.*)

Suitable supplements to soaps. Sidaly. *Seifensieder-Ztg. 70,* 102-4. The following substances can be used as supplements in the manuf. of soap: water glass, Silirone, pyrophosphate, Na_2HPO_4 Calgon, melts of K and metaphosphate, Na cholate $NaHCO_3$, clay, kaolin, $BaSO_4$, Prosulfan, bentonite, Tixoton, starch, urea, thioruea, Zewa powder and Dekol powder, Colloresin, Tylose, Relatin, Fondin, Zellfondin, Quellfondin SP, Tergina and water-sol. salts of polyacrylic acid. (*Chem. Abs.*)

Determination of detergency. Marc Ringeissen. *Teintex 8,* 31-7 (1943). Detergency can be measured only by washing tests; such properties as surface tension or emulsifying capacity of the cleaning agent are not an accurate measure of detergency, because this depends not only on the cleaning agent, but also
ish, the improvement consists of incorporating in the aq. impregnating bath from 0.1 to 0.5 part by wt. of