7. *Equilibration:* Equilibrate finely ground seed with 30% aqueous alcohol (by weight) for ten minutes; 72% (by weight) aqueous alcohol added (70 ml./30 ml.) according to method of Boatner, Hall, and Rollins, Bot. Gaz. (in press).
8. *Blending:* Blend cottonseed meats 5 minutes in a Waring Blendor with a mixture of 20 ml. of 30 per cent aqueous alcohol (by weight) 55 ml. of 72 per cent aqueous alcohol (by weight) and 15 ml. of diethyl ether, according to the method of Smith, F. H., Ind. Eng. Chem., Anal. Ed., *18,* 43-45 (1946).

Methods for the Estimation of Gossypol in Cottonseed Extracts

Gravimetric:

1. As dianilino-gossypol by addition of aniline to a Skellysolve F solution of an ether extract of cottonseed, according to method of Schwartze and Alsberg, J. Agr. Res., *25,* 289-95 (1923).
2. As dianilino-gossypol by addition of aniline and pyridine to Skellysolve F solution of ether extract of cottonseed according to method of Royce and Kibler, Oil & Soap *11,* 116, 118, 119 (1934).
3. As dianilino-gossypol by addition of aniline and ethylene glycol to Skellysolve F solution of ether extract of cottonseed according to method of Smith, Ind. Eng. Chem., Anal. Ed., *9,* 517-8 (1937).

Spectrophotometric:

4. As dianilino-gossypol in n-butyl alcohol solution of ether extract according to method of Lyman, Holland, and Hale, Ind. Eng. Chem., Anal. Ed., *15,* 489-91 (1943).
5. As dianilino-gossypol in aqueous alcohol-ether solution of aqueous alcohol-ether extract of cottonseed according to method of Smith, Ind. Eng. Chem., Anal. Ed., *18,* 43-45 (1946).
6. As antimony trichloride reaction product of chloroform solution of chloroform or ether extract of cottonseed. N. B. Omit treatment of extract with concentrated hydrochloric acid according to method of Boatner, Caravella, and Kyame, Ind. Eng. Chem., Anal. Ed., *16,* 566-73 (1944).

In addition to the above methods, procedures have been devised which permit application of all of the methods for the determination of gossypol to aliquots of the same extract. Thus, the completeness of both extraction and estimation methods can be determined independently of each other.

J. T. R. Andrews
O. M. Lyman
H. D. Royce
Allen Smith
F. H. Smith
Charlotte H. Boatner,
chairman

Abstracts

Oils and Fats

Edited by
M. M. PISKUR and SARAH HICKS

Fat formation in F. lycoperseci. R. F. Witter and E. Stotz (Cornell Univ., Geneva, N. Y.). *Arch. Biochem. 9,* 331-9 (1946). A micro titrimetric method for the determination of the total fatty acids in the mycelium has been developed. The synthesis of fat from glucose by *F. lycoperseci* in nonnitrogen-containing solutions has been studied in shaken and stationary cultures which were buffered at different pH values. The greatest synthesis of fat from carbohydrate was observed at pH 7-8. Since there was little or no growth of the mycelium (as estimated by the change in the level of Kjeldahl N) with the formation of large amounts of fat in these high-glucose solutions, the processes of growth and of fatty acid formation have been separated.

Observations on solubilities and other properties of several antioxidants in fats. W. O. Lundberg and H. O. Halvorson (Hormel Inst., Austin, Minn.). *Proc. Inst. Food Tech. 1945,* 115-26. Analytical procedures have been devised for the determination of various phenolic antioxidants in fats. The methods may be applied in various types of research involving antioxidants, and in control analyses in connection with the commercial introductions of antioxidants into fats. Detailed descriptions have been given of one of the methods using a modified Emmerie and Engel iron-bipyridine reagent and of its use in a study of the solubilities of hydroquinone, NDGA, propyl gallate, and gallic acid in cottonseed oil and lard. The results indicate that all 4 of these antioxidants, including gallic acid, have solubilities that are greater than the concentration ordinarily required to stabilize fats. It was found that NDGA, under the conditions of the active oxygen test, is more effective than any of the other approved antioxidants in stabilizing lard. It was also found that slight colors developed when lards containing the more effective antioxidants were exposed to air for long periods of time at 98°. Color changes were greatest for NDGA and gallic acid which, however, were also exposed for the longest periods of time. Samples of lard containing .01% NDGA were not appreciably oxidized and developed almost no changes in color when stored at room temperatures for a period of 19 months and either exposed to diffuse daylight or kept in complete darkness.

Factors and processes influencing the keeping quality of bacon. D. A. Greenwood, J. E. Striter, and H. R. Kraybill (Am. Meat Inst., Chicago). *Proc. Inst. Food Tech. 1945,* 58-71. The development of rancidity measured organoleptically or by the peroxide values appeared to be related to the nitrite content of the bacon. This is evident from results obtained at the low storage temperatures —17.8 to —15°, where microbes were present in only relatively small numbers. High free fatty acid values appear to be correlated with high microbial counts, particularly of molds and yeasts. Keeping time and quality of bacon can be improved by the addition of small quantities of moldicides and antioxidants which help to control growth of microbes and retard the oxidation of the bacon by atmospheric O_2. Of the moldicides, a sealed carton containing CO_2 was most effective. Ca propionate prevented a deterioration of the bacon, but only in concentrations which made the product inedible. A number of antioxidants retarded development of peroxides but not of free fatty acids. Further studies on the addition of the moldicides and antioxidants to bacon should be conducted.

The surface tension of slightly soluble fatty acids. D. G. Douglas and C. A. MacKay (Univ. Saskatchewan, Saskatoon). *Can. J. Res. 24A,* 8-14 (1946). Surface tension measurements have been made on normal heptylic, pelargonic, capric, and lauric acids above their melting points, and on aqueous solutions of heptylic, pelargonic, capric, and undecylic acids, at various concentrations. A modified capillary rise method was employed. Evidence is given for the existence of a monolayer of closely packed molecules, with long axes perpendicular to the surface, each molecule occupying an area of approximately 25 A. for heptylic acid.

COMPLEX FORMATION WITH HIGH MOLECULAR WEIGHT AMINES. II. A SPECTROPHOTOMETRIC STUDY OF THE DODECYLAMINE-CUPRIC ACETATE SYSTEM. F. K. Broome, A. W. Ralston (Armour & Co., Chicago), and M. H. Thornton. *J. Am. Chem. Soc. 68,* 849-51 (1946). A spectrophotometric study of bisdodecylamino-cupric acetate has disclosed its dissociation in trichloromethane solution. At room temperature, a 0.04 *M* solution in trichloromethane is approximately 10% dissociated into dodecylamine and cupric acetate. Due to its dissociation, this compound does not obey Beer's law except in a special instance.

THE SOLUBILITIES OF HEXYL- AND DODECYLAMMONIUM CHLORIDE IN VARIOUS DILUTIONS OF AQUEOUS ETHANOL. A. W. Ralston and C. W. Hoerr (Armour & Co., Chicago). *J. Am. Chem. Soc. 68,* 851-4 (1946). The solubilities of hexyl- and dodecylammonium chloride have been determined in various mixtures of water and ethanol. The correlation between solubility and micelle-forming ability is noted.

FURTHER STUDY OF THE USEFULNESS OF DIFFERENT TYPES OF SHORTENING WHEN INCORPORATED IN BISCUITS AT VARIOUS LEVELS AND WITH DIFFERENT BAKING TEMPERATURES. E. W. Crampton and M. F. Mills (McGill U., Que.). *Can. J. Res. 24F,* 157-67 (1946). One hundred ninety-two 30-day-old male white rats were fed diets containing 4 different types of shortening (compound animal-vegetable, blended vegetable, hydrogenated vegetable, and lard) incorporated at 0, 8, 16, and 24% levels by weight and baked at 375° and 425° F. Diets were mixtures of flour, milk powder, shortening, salt, and bone meal with supplementary allowances of vitamins A, D, and B_1. The proportion of ingredients was adjusted to maintain protein at 16% by weight. Gains decreased with increasing fat level, apparently owing to a reduction of the proportion of protein to non-protein calories from the replacement of carbohydrate by fat. Digestibility of the fat component was unaffected by baking temperatures or level of fat in the ration. Lard was slightly more digestible than the other types which included vegetable fats. Rats fed diets baked at 425° F. made slower gains than those on the diets baked at 375° F. This was not traceable primarily to heat damage to the fat but more probably to some effect on the protein fraction.

THE TOLERANCE OF MAN TO COLD AS AFFECTED BY DIETARY MODIFICATION: CARBOHYDRATE VERSUS FAT AND THE EFFECT OF THE FREQUENCY OF MEALS. H. H. Mitchell, N. Glickman, E. H. Lambert, R. W. Keeton, and M. K. Fahnestock (Univ. Ill., Urbana). *Am. J. Physiol. 146,* 84-96 (1946). For the maintenance of body weight the 5 subjects on the high-carbohydrate diet required an average of 188% of food calories expressed in per cent of their basal expenditures. Those on the high-fat diet required 200%. The two diet groups were not statistically different in this respect. However, all 4 of the men on the high-fat diet required more food energy than they needed while consuming a high-carbohydrate diet. The cooling of the internal tissues of the body on exposure to intense cold is greater on a high-carbohydrate diet than on a high-fat diet, but only when the interval between meals is reduced to 2 hours. With regard to the cooling of the skin, no superiority of a high-fat meal over a high-carbohydrate meal was demonstrated in a subsequent 4-hour exposure to cold. It is highly probable that a high-fat diet is superior to a high-carbohydrate diet in maintaining general psychomotor performance and visual efficiency as measured by fusion frequency of flicker. With reference to the speed of tapping, the superiority of fat over carbohydrate food seems clear-cut. High-carbohydrate, and particularly high-fat, foods are to be preferred to high-protein foods. Small meals spaced at short intervals of time (2 hrs.) are more favorable in this respect than large meals spaced at the usual 4- to 6-hour intervals.

THE POSITION OF THE HIGHER FATTY ALDEHYDES IN FATTY ACID METABOLISM OF RAT MUSCLE. G. Ehrlich and H. Waelsch (Columbia Univ., N. Y.). *J. Biol. Chem. 163,* 195-202 (1946). A modification of the previously reported procedure for isolation of the higher fatty aldehydes as *p*-carboxyphenylhydrazones is described. The deuterium concentration of the higher fatty aldehydes, fatty acids of different lipid fractions, and unsaponifiable material of muscle of rats was determined after periods of 18 hours and 6 days respectively, during which the body fluids were enriched with deuterium through the administration of heavy water. In a second set of experiments the deuterium concentration was determined in the same components of the muscle lipids 8 and 16 hours after the administration of a single dose of fat labeled with deuterium. In both types of experiments the higher fatty aldehydes contained appreciable amounts of deuterium, but invariably less than was present in the fatty acid fractions. This result indicates that the higher fatty aldehydes are not involved in the over-all synthesis or transport of fatty acids but are concerned with some special aspect of fatty acid metabolism. In both sets of experiments the rate of turnover of the muscle fatty acids corresponded roughly to that previously found for the fatty acids of the decapitated and eviscerated carcass. The unsaponifiable lipids isolated from muscle of rats, the body water of which was enriched with heavy water, contained much less deuterium than those isolated from carcass previously under the same experimental conditions. The high metabolic activity of the unsaponifiable material of carcass appears to be restricted to the skin, since it cannot be accounted for by muscle. The fatty acid fraction of the phosphatides of muscle and of liver showed a higher deuterium concentration than the fatty acid of neutral fat of the same organ.

PATENTS

STABILIZATION OF OILS AND FATS. M. R. Coe, Jr. and M. R. Coe (Sec. Agr.). *U. S. 2,397,920.* The process for retarding development of rancidity in vegetable and animal fats comprises adding to and mixing with them tocopherol plus an enzyme, selected from the class consisting of trypsin, pepsin, and clarase.

FOOD ANTIOXIDANTS. M. F. Gribbins, F. W. Miller, and D. K. O'Leary (E. I. du Pont de Nemours & Co.). *U. S. 2,397,960.* Three-hydrocarbon substituted β-mercaptopropionic acid is used as an antioxidant for edible fats and oils.

Process for refining fats. G. B. Bradshaw and W. C. Meuly (E. I. du Pont de Nemours & Co.). *U. S. 2,398,492.* A process for refining a low-grade fat comprises esterifying the free acid components with a dialkyl sulfate not higher than diethyl sulfate, in the presence of an acid absorbing agent in quantity sufficient to neutralize the mineral acid liberated by the esterification process.

Emulsions. A. K. Epstein and M. Katzman (The Emulsol Corp.). *U. S. 2,398,295-6.* The non-alkaline emulsion contains oleaginous material, aqueous material, and small proportions of (1) a cation-active substance in the form of a salt of a higher molecular weight alkyl non-tertiary amine, and (2) a higher molecular weight fatty acid mono-ester of an aliphatic polyhydroxy substance.

Ointments, creams, salves, and the like. N. K. Rosenthal (Ninol Development Co.). *U. S. 2,398,254.* The product consists essentially of petrolatum and a minor percentage of a condensation product of diethanolamine and oleic acid, the molal ratio of the diethanolamine to the oleic acid being about 1-2.

Production of lubricants. H. M. Fraser (International Lubricant Corp.). *U. S. 2,397,956.* The lubricating grease contains a grease-forming lubricant base and a Li soap of 12-hydroxy stearic acid in a quantity which increases the ability of the grease to maintain its consistency when mechanically worked.

Process for producing a tall oil of low viscosity and free from crystallization. W. H. Jennings (Camp Manufacturing Co.). *U. S. 2,398,312.* The tall oil is dried to less than 0.1% moisture and then polymerized in the presence of H_2SO_4 in such a manner as to polymerize certain resin acids; the residue and acid is then separated by washing.

Stabilization of fats and oils. D. K. O'Leary (E. I. du Pont de Nemours & Co.). *U. S. 2,397,976.* Thio di-fatty acids and their esters are used as antioxidants.

Waterproofing textiles. D. Aelony (Monsanto Chemical Co.). *U. S. 2,398,272.* The textile products are coated with fat acid carbamyl or fat acid sulfamyl substitution products of benzoic acid.

Abstracts

Drying Oils

Edited by
HOWARD M. TEETER

Film formation-film properties-film deterioration. J. S. Long. *Official Digest Fed. Paint Varnish Prod. Clubs 255,* 150-169 (1946). An address outlining a proposed research program for the Federation.

Oil modification of alkyd resins for protective coatings. C. G. Moore (The Glidden Co.). *Natl. Paint Bull. 10,* No. 3, 7, 11 (1946). A discussion of the chemistry and technology of oil modified alkyd resins.

Changes in wood oil and tung oil on prolonged storage. G. Eisenschiml (Scientific Oil Compounding Co., Chicago). *Official Digest Fed. Paint Varnish Prod. Clubs 255,* 170-172 (1946). See *Oil and Soap 23,* 176 (1946).

The chemists' contribution to the field of drying oils during the war. E. H. Valance (Spencer Kellogg and Sons, Inc.). *Official Digest Fed. Paint Varnish Prod. Clubs 255,* 183-5 (1946). A review of developments in chinawood oil replacements and linseed oil replacements. No references.

The tung oil industry. Growth and prospects. E. L. Ranker. *Natl. Paint Bull. 10,* No. 3, 5, 6, 8, 9, 12, 18 (1946).

Drying oil and oleoresinous varnish films. V. J. Frilette (Ridbo Laboratories, Paterson, N. J.). *Ind. Eng. Chem. 38,* 493-6 (1946). A large increase in the acidity of air-dried varnish and oil films with aging was shown using a semimicro titration method developed by the author. Increase in acidity of air-dried films is found to correspond to decreased alkali resistance. Evidence is presented to indicate that oxidation at points of unsaturation in the glyceride molecule is responsible for the increase in acidity, and it is postulated that antioxidant activity of phenolic resins may account for the better alkali resistance of phenolic varnishes. Varnishes dried by baking do not develop acidity with aging.

Effect of dehydration conditions of castor oil on the quality and quantity of the product. I. T. Osnos and I. I. Galovistikov. *Khimicheskaya Prom. 1945,* No. 2, 19-20. Experimental dehydration of castor oil was carried out with 200 g. and 2 kg. samples at 280°, 290°, and 300° and pressures of 750, 700, 600, 200, and 100 mm. of Hg. The dehydration was carried out in the presence of catalyst "a" and catalyst "b" (not defined) and without any catalyst. Depending on the quantity of active catalyst present the rate of dehydration was faster, its degree greater (more water removed), the pyrogenic decomposition lessened, and the yield of dehydrated oil increased. Raising the temperature from 280-290° and 300° and diminishing the pressure to 100 mm. hastens dehydration, increases pyrogenic decomposition and hydrolysis of the oil, and decreases the yield. The effects of raised temperature and diminished pressure are more pronounced with catalyst "b" than with "a." (*Chem. Abs. 40,* 2652.)

Linseed oil fat acids. R. Rosenbusch. *Paint Tech. 10,* 281-7 (1945). The various methods of preparation are considered. Vacuum distillation, both the batch and continuous processes, is discussed. Methods of preparing pure fat acids are reviewed. (*Chem. Abs. 40,* 2655).

Does linseed oil contain conjugated double bonds? L. L. Nesbitt and E. P. Painter (State College Station, Fargo, N. Dakota). *N. Dakota Agr. Exp. Sta. Bimonthly Bull. 6,* No. 6, 31-5 (1944). *Exp. Sta. Record 92,* 3 (1945). Several linseed oils were examined for the differences between Wijs and Woburn I numbers, and by means of an ultraviolet spectroscope glycerol esters of fat acids containing conjugated double bonds were studied to find out their effect on the properties of drying oils. Linseed oils show slight absorption near that for triene conjugation. The absorption is so small, however, that if