Solvent Extraction of Pelleted Oilseeds and Related Materials

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Abstract

A method of seed preparation is described in which the comminuted seed is formed into pellets by a conventional feed pelleting mill. Small scale preparation of pellets from soybeans, expelled palm kernels, sheanuts, and rice bran is described and extraction rates for different sized pellets of soybeans and rice bran with trichloroethylene at 55C are compared. Bulk densities and solvent retention by the marc were also measured and the results showed promise of an increase in plant capacity and a reduction in steam consumption for soybeans and rice bran.

Soybeans were selected for plant scale experiments in which 3.17 mm diam and 4.76 mm diam pellets were processed successfully through a Bibby basket extractor on trichloroethylene backed either by a desolventizer-toaster or a Bibby steamer. An increase in the maximum throughput of 40–50% with a residual oil of 0.8% in the marc for the same steam consumption as on rolled soybeans was achieved with the smaller pellets. The advantages of using the process on a hexane plant are also discussed.

Introduction

CAREFUL SEED PREPARATION is important in processing oilseeds for oil and meal by solvent extraction. The method of preparation affects the process economics as properties of the material such as bulk density, extraction rate, solvent ratio, drainage of solvent through a bed of material, residual oil content, and solvent retention by the extracted meal passing to the desolventizer, can all be influenced to a certain extent. On the other hand some of these properties such as extraction rate (1) are characteristic of the seed in question, soybeans for instance extracting faster than cottonseed and linseed when similarly prepared.

In order to achieve less than 1% residual oil in the meal it is necessary to reduce the material to a fine state of subdivision at some stage in the process usually by gradual reduction through rolls. Related materials such as rice bran and wheat bran, residues from other processes, are already in a finely powdered state when received by the crusher. This particular constraint imposed on the preparation process yields a material through which the solvent will drain only with difficulty, this in turn would reduce the extractor throughput and increase the load on the desolventizer unless further steps were taken.

In some countries (2) it is usual to condition and flake seeds such as soybeans to 0.254 mm thickness or less before direct extraction. This improves certain properties such as extraction and drainage rates but has an adverse effect on bulk density which is reduced to 0.39 g/cc (3) thus imposing a greater load on the solvent recovery system due to the increased air intake, and reducing capacity. The processing of certain high oil content materials such as peanuts, palm kernels, and corn germ is facilitated by pre-expelling to about 20% oil before extraction. This has the beneficial effect of increasing extractor throughput due to a high bulk density and increased extraction rate. Solvent retention of the extracted meal is also lowered and protein coagulation in the pre-expelling cookers assists the final stage desolventizing. Additionally, corn germ and peanuts are more readily comminuted after pre-expelling.

Another preparation procedure has been proposed (4) pertaining, in particular, to finely powdered materials. Granulation of the powder using water or solvent is claimed to improve drainage and related properties. In this paper the laboratory scale preparation and processing of various oilseeds in the form of conventional pellets is described. For soybeans the description includes the behavior of the pellets on a basket or percolation type extractor followed by a desolventizer-toaster (D.T.).

Experimental

(a) *Small scale.* Soybeans, rice bran, sheanuts, and pre-expelled palm kernels were selected for experiment. A small feed pelleting mill was used, preceded by a jacketed cooker fitted with inserts for live steam. Soybeans (18.5% oil, 11.4% H_2O) were passed through single beaker rolls and a set of 5 high rolls before pelleting. U. S. rice bran (13.2% oil, 9.1% H_2O) was used as received. Sheanuts (48.0% oil, 7.0% H_2O) were breaker and anglo-rolled; palm kernels were rolled and pre-expelled to 22% oil, 8.0% H_2O.

All pellets produced were tested for bulk density. Drainage of solvent through a 6″ bed of material was examined; extraction rates with trichloroethylene at 55C were measured in an apparatus previously described (5,6) with slight modifications in procedure. The retention of solvent by the extracted meal was measured by extracting a known weight of material to below 1% oil in a replica extractor bucket section, weighing the drained meal plus solvent and the final air desolventized meal which was also analyzed for oil (7) and moisture. Assuming no loss or gain of moisture during the extraction the retention value was calculated as weight of solvent retained by unit weight of oil free meal plus moisture. Fines were estimated through appropriate screens and a mixture of fines and pellets used for the tests.

Soybeans and rice bran formed excellent pellets of low fines content at all die sizes using a mill feed at 50–60C. On cooling the pellets were sufficiently hard to transport with little increase in fines content. The sheanut pellets were very soft, hardened on cooling but disintegrated on contact with hot trichloroethylene. Expelled palm kernels would not pellet readily at this oil level (22%). All samples of trichloroethylene extracted pellets were readily desolventized on the laboratory hot plate (60–70C) or by exposure to the atmosphere and remained stable in pellet form through the extraction process.

From considerations of bulk density (Table I) it can be seen that there is a potential increase in plant capacity of approximately one third for each size of pellet with soybeans and rice bran. For residual oil results comparable with the control it is obvious from Figures 1 and 2 that the smaller sized pellets must be used and here the reduced extraction rate would reduce the potential capacity increase. The much reduced solvent retention with a consequent saving in steam consumption was of sufficient order

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TABLE I

Effect of Size on Bulk Density, Fines Content, and Solvent Retention of Pelleted Soybeans and Rice Bran

Pellet		Fines	Bulk density	Solvent retained in meal
Diameter	Length			
mm	*mm*	*(%)*	*g/cc*	*g solvent/g oil free meal*
[a] 3.2	3.8	10.3	0.62	0.61
[a] 4.8	3.8	15.0	0.61	0.38
[a] 9.5	14.0	7.70	0.64	0.35
[a] 12.7 (cubes)	19.3	21.0	0.66	0.59
[a] Control meal	.....	.....	0.45	1.02
[b] 3.2	3.8	28.0	0.61	0.85
[b] 4.8	3.8	30.0	0.65	0.86
[b] 9.5	14.0	3.80	0.66	0.26
[b] 12.7	19.3	24.0	0.57	0.53
[b] Control meal	.....	.....	0.43	2.13

[a] Soybeans.
[b] Rice bran.

• *Local Section News*

North Central Section

The March 6 Meeting of the AOCS North Central Section, at the Builder's Club in Chicago, was highlighted by the precentation of the 1963 Alton E. Bailey Award to JAOCS Editor A. R. Baldwin. The Award was conferred by Section President Angelo Graci, in recognition of Dr. Baldwin's outstanding efforts during the 15 years he has served as Editor of the *Journal of the American Oil Chemists' Society.*

In keeping with his devotion to the dissemination of technical developments to the profession and related industries, Dr. Baldwin's acceptance address, entitled "Fats and the Needed Catalyst," vividly alerted all those present that an important place to look for expansion and improvement is overseas. Recognizing the fat industry as one which has successfully shown its ability to improve knowledge, techniques, tools and applications, Dr. Baldwin discussed the fact that additional efficiency and improvement is becoming increasingly hard to realize. The needed idea, or catalyst, to spark sudden and substantial growth of the fat industry in addition to the continued refinement of our current situation may lie overseas. Exports, already growing with unpredicted speed, can be substantially improved. The ability to instigate such improvements lies in gaining knowledge of the current needs and wants of overseas people and industries; and gaining knowledge of the use skills developed and perfected by overseas scientists, who realized considerable advantage from the knowledge that has been exported to them along with our products. Equipped with the market data, and new technical developments from overseas, substantial improvement in exports can be affected. Dr. Baldwin went on to suggest methods by which the industry may overcome the difficulties in this area. A complete text of this interesting presentation will appear in a future issue of the Journal.

Mr. Graci announced the North Central Section officers for the 1963-64 term as follows: S. C. Miksta, President; Cecilia Gilmore, Vice President; T. W. Findley, Secretary; and D. P. Arndtsen, Treasurer. J. F. Hanrahan and Eric Jungermann are to be Board Members-at-Large.

The next NC Section Meeting will be "Ladies Night," to be held May 1, 1963. As always, this program promises to be of unusual interest. All Section members and interested parties are encouraged to submit their reservations in advance to Lawton Gentry, Treasurer, NC Section—AOCS, % Wesson Division, Hunt Foods, 4421 W. 31st Street, Chicago 23, Illinois.

Northeast Section

A regular meeting of the Northeast Section was held on December 4, 1962 at Whyte's Restaurant. As usual, the meeting was well attended, with seventy-five members and guests present.

E. I. Marshack, Section President, was indeed pleased to introduce A. E. MacGee, President of the parent Society. Dr. MacGee expressed his good wishes and appreciation for the cooperation received in his effort to stimulate growing interest in the sections and to organize others. It was certainly a pleasure to have him visit us and we look forward to his future visits.

Mr. Marshack announced his resignation from Bunge Corp. to open E. Marshack Associates—International Consulting and Coordination firm. We wish Gene the best of success in his new endeavor.

D. S. Bolley, Program Chairman for the meeting, introduced the speaker, D. B. Lake, Du Pont Co., who spoke on "Recent Developments in Amine Oxide Chemistry." The presentation included a description of the chemical structure, mechanism of oxide formation, historical developments leading up to the current formation, historical developments leading up to the current interest in fatty amine oxides in detergent formulation, preparative of techniques developed in the Du Pont laboratory and a discussion of fatty amine oxides which make them particularly useful in a wide range of surfactant applications, including consumer and industrial detergents.

The February 5 Northeast Section Meeting found H. G. Salomon in the hospital with a slipped disc.

The Section Nominating Committee was presented: Frank White, Chairman; Les Hale and Don Bolley.

All were pleased to hear that D. S. Bolley had been nominated for AOCS Board Member-At-Large. A vigorous campaign has been started to elect Don—a popular, experienced and active member of the National Organization.

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• *New Members*

Active

James R. Baxley, Chemist, Sessions Co., Enterprise, Ala.
Arthur E. Bayce, Metallurgist, Stanford Research Institute, Menlo Park, Calif.
Dmytro Buchnea, Ass't. Professor, Banting and Best Dept. of Medical Research, University of Toronto, Banting Institute, Toronto, Ont., Can.
Katherine M. Buswell, Chemist, Archer-Daniels-Midland Co., Minneapolis, Minn.
Herman W. Campbell, Production Services Manager, Witco Chemical Co., Chicago, Ill.
Hugh C. Campbell, Development Specialist, DuPont Co., Electrochemicals Dept., Wilmington, Del.
David A. Carroll, Research Chemist, Archer-Daniels-Midland, Research Center, Minneapolis, Minn.
Myron Coopersmith, Research Chemist, Enjay Laboratories, Linden, N. J.
Ahmed S. El-Nockrashy, Researcher, National Research Center, Cairo, Egypt.
Gerald L. Feldman, Chief, Biochemistry Section, Division of Ophthalmology, Baylor University College of Medicine, Houston, Texas.
Thomas J. Gabor, Supervisory Trainee, Drew Chemical Co., Boonton, N. J.
Clarence W. Huffman, Supervisor of Organic Chemical Research, International Minerals and Spirits Corp., Skokie, Ill.
Alexander T. Karklis, Plant Chemist, Drew Chemical Ltd., Ajax, Ont., Can.
Walter H. Kiesel, Chemist, Swift and Co., Chicago, Ill.
Daniel B. Menzel, Associate, Dept. of Nutritional Sciences, University of California, Berkeley, Calif.
Richard G. Newell, Analyst, Ralston Purina Co., St. Louis, Mo.
Winston S. Ogilvy, Director, Nutritional Product Development, Mead Johnson and Co., Evansville, Ind.
Ronald E. Peres, Chemist, Wesson Division, Hunt Foods and Industries, Inc., Gretna, La.
Herbert W. Schubert, Ass't. Manager, Technical Service Dept., Armour and Co., Chicago, Ill.
Donald D. Staker, Research Section Leader, Emery Industries, Inc., Cincinnati, Ohio
Richard F. Thanasse, Ass't. Chief Chemist, Humko Products Division, National Dairy Co., Champaign, Ill.
Dale W. Thorpe, Chemist, Best Foods Division, Corn Products Co., Bayonne, N. J.

Individual Associates

Joe N. Garcia, Oil Mill Analyst, Pecos Cotton Oil Co., Pecos, Texas.
Donald J. McIntyre, Manager, Special Accounts, American Mineral Spirits Co., Minneapolis, Minn.
Ralph L. Riggs, Chemist, Sucher Packing Co., Dayton, Ohio

Active Juniors

George K. Chako, Research Ass't., Dept. of Food Technology, Burnsides Research Laboratory, University of Illinois, Urbana, Ill.
Alan Po-Shing Ma, Graduate Ass't., Dept. of Biochemistry, Iowa State University, Ames, Iowa.
Vida Parvaneh (Mrs.), Graduate Student, Food Processing, Iowa State University, Ames, Iowa.

ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, C. C. Litchfield, Louise R. Morrow, E. G. Perkins, and T. H. Smouse

• Fats and Oils

INSECTICIDE RESIDUES IN FAT, A SCREENING METHOD FOR CHLORINATED PESTICIDE RESIDUES IN FAT WITHOUT CLEANUP. L. F. Krzeminski and W. A. Landmann (Div. of Analytical and Physical Chem., American Meat Institute Foundation, Chicago, Ill.). *J. Agr. Food Chem.* 11, 81–83 (1963). A screening method for the estimation of total chlorinated hydrocarbon residues in fat has been developed. The method can be used on fat samples without the isolation of the pesticide residue. Fat samples, from which water-soluble inorganic chloride ion has been removed by heat rendering adipose tissue through filter paper, are treated with sodium in anhydrous liquid ammonia to reduce organically bound chlorine to chloride ion. Reduction is complete in a few minutes and gives better than 90% recovery for a 10-gram fat sample containing 10 ppm DDT. Chloride ion concentration is measured potentiometrically and converted to ppm insecticide by referring to a standard calibration curve.

INSECTICIDE RESIDUES IN MILK AND MEAT, RESIDUES IN BUTTERFAT AND BODY FAT OF DAIRY COWS FED AT TWO LEVELS KELTHANE (1.0 and 2.0 P.P.M.). G. Zweig, E. L. Pye, and S. A. Peoples (Pesticide Residue Res., Lab. and Dept. of Physiological Sciences, Univ. of Calif., Davis, Calif.). *J. Agr. Food Chem.* 11, 72–74 (1963). A microanalytical method for analysis of Kelthane in butterfat or body fat of dairy cows, without the removal of the substrate material, was developed. Five cows were fed daily rations containing 2.0 ppm Kelthane for 71 days and 1.0 ppm for 39 days. Milk and body fat were analyzed for residues of Kelthane. A feeding level of 2.0 ppm Kelthane in the daily feed produced an average of 0.23 to 0.40 ppm Kelthane in the butterfat, while 1.0 ppm Kelthane added to the cows' daily feed produced insignificant residues of Kelthane in the milk. Body fat, analyzed during the latter part of the experiment, contained 1.07 to 2.70 ppm Kelthane.

HERITABILITY OF VARIATION IN OIL CONTENT OF INDIVIDUAL CORN KERNELS. L. F. Bauman (Dept. of Botany and Plant Pathology. Purdue Univ., Lafayette, Indiana). T. F. Conway and S. A. Watson. *Science* 139, 498–499 (1963). Nuclear magnetic resonance spectroscopy was used to determine oil content of individual corn kernels in order to evaluate this technique as an aid in the development of strains having greater oil content. This method is rapid and does not impair viability. Individual kernels from a selfed single-cross ear ranged from 2.7 to 5.4 percent oil and were significantly correlated ($r = +0.75$) with the oil content of their progeny. This indicates that the single-kernel differences in oil content were heritable, and this method may greatly increase selection efficiency in breeding for higher oil content in corn.

FLOUR LIPIDS AND BREADMAKING. R. L. Glass (Inst. of Agric., Univ. of Minn., St. Paul, Minn.). *Baker's Dig.* 36(6), 40–42 (1962). This is a review of flour lipids and their involvement in the baking process taken from literature appearing from 1932–1962.

THE DEVELOPMENT AND USES OF FLUID SHORTENINGS. R. H. Ellinger (Durkee Famous Foods, Chicago, Ill.). *Baker's Dig.* 36(6), 65–69 (1962). Through improved shortening and emulsifier technology, it is now possible to use fluid shortenings for nearly every baking use. Fluid shortenings have been developed which have superior functioning properties to those of plastic shortenings. Many of their advantages over plastic shortenings are presented.

BRANCHED CHAIN FATTY ACIDS. PART II. SYNTHESIS AND STUDY OF PHYSICAL PROPERTIES. R. Haque and A. N. Saha (Dept. of Applied Chem., Univ. Colleges of Sci. and Technol., Calcutta 6, India). *J. Indian Chem. Soc.* 39(7), 485–489 (1962). Five branched chain fatty acids have been synthesized from myristic acid. They are α-ethyl-, α-*n*-butyl-, α-isobutyl-, α-*tert*-butyl-, and α-phenyl-myristic acids. Their conductance, surface tension, and solubilizing power was studied and presented. The melting points were all lower than their corresponding straight chain isomers.

THE ANALYSIS OF MIXTURES OF ANIMAL AND VEGETABLE FATS. III. SEPARATION OF SOME STEROLS AND STEROL ACETATES BY THIN-LAYER CHROMATOGRAPHY. J. W. C. Peereboom and H. W. Beekes (Gov. Dairy Sta., Leiden, The Netherlands). *J. Chromatog.* 9(11), 316–320 (1962). The separation of the following sterols was achieved using kieselgur G as the adsorbent and cyclohexane-ethyl acetate mixture (99.5 : 0.5) as the solvent: ergosterol-cholesterol, cholesterol-lanosterol, and cholesterol-vitamin D_2. In reverse-phase systems (undecane/acid-water), cholesterol acetates could be separated from the acetates of the major phytosterols i.e. β-sitosterol and stigasterol. This permits the analyysis of mixtures of animal and vegetable fats.

SEPARATION OF OXYGENATED FATTY COMPOUNDS BY THIN-LAYER CHROMATOGRAPHY. R. Subbarao, M. W. Roomi, M. R. Subbaram, and K. T. Achaya (Regional Res. Lab., Hyderabad, India). *J. Chromatog.* 9(11), 295–299 (1962). Thin-layer chromatography was applied to the separation of various types of fatty compounds using mixtures of ether and petroleum ether as the solvent systems. It was found that the following could be separated: (1) Compounds of same chain length but different hydroxyl numbers, (2) Compounds differing in chain length by four carbon atoms, (3) Compounds with an epoxy group from those containing hydroxy group, and (4) *cis* and *trans* isomers. Compounds which could not be separated are given.

THE RELATIONSHIP BETWEEN SOLID SUPPORT, COLUMN EFFICIENCY, AND STEROL QUANTITATION BY GAS CHROMATOGRAPHY. D. K. Bloomfield (Western Reserve Univ., Cleveland, Ohio). *J. Chromatog.* 9(12), 411–418 (1962). This paper shows that the argon ionization detector is not a truly linear instrument for the quantitative analysis of sterols. Various effects which change the molar response are described and a method is given for the quantitation of complex sterol mixtures. Standardization of detector response is necessary.

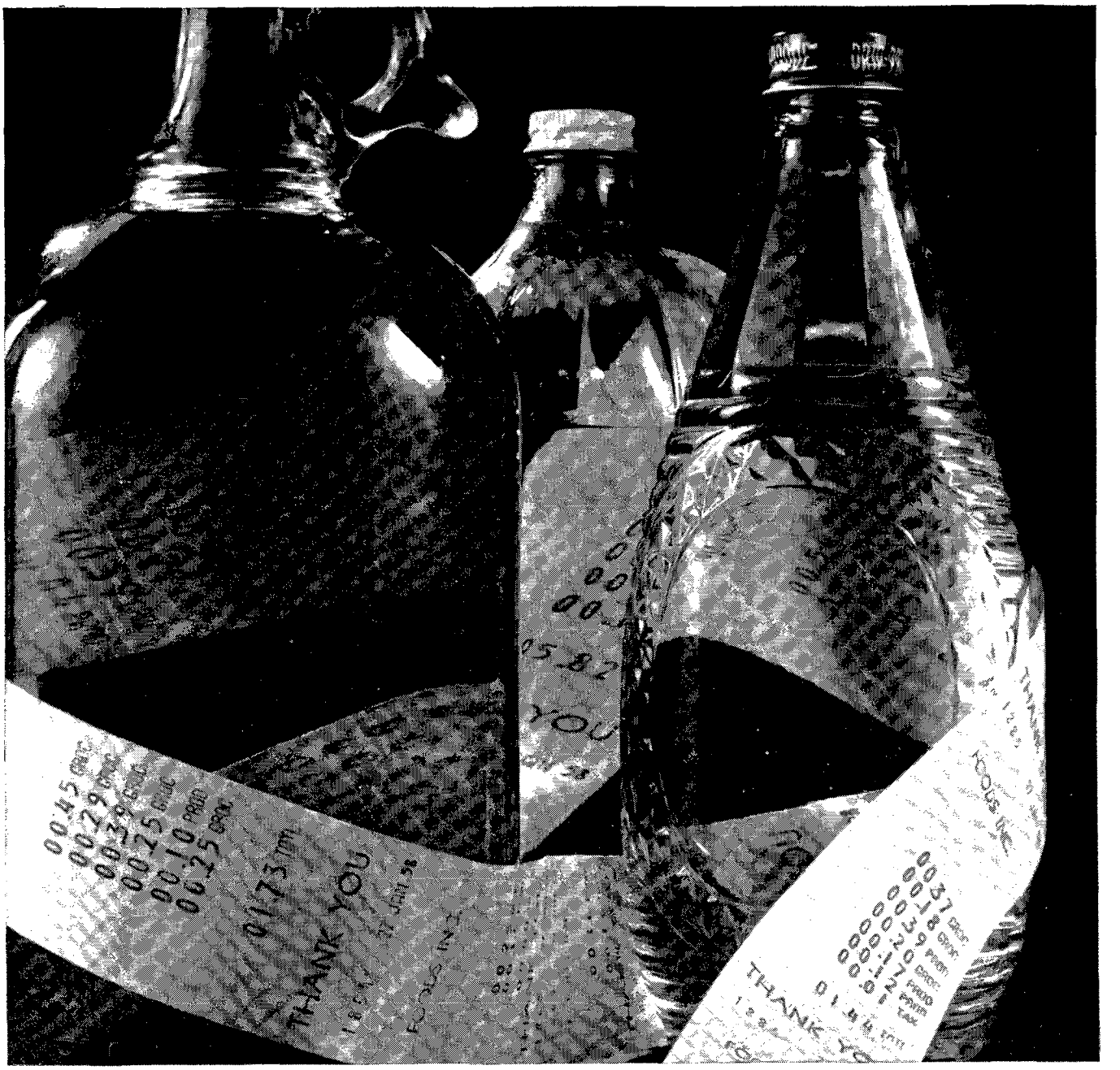
SUGAR CANE PHOSPHOLIPIDS, THE ISOLATION, SEPARATION, AND IDENTIFICATION OF PRINCIPAL PHOSPHOLIPIDS OF SUGAR CANE JUICE. J. J. Friloux and N. A. Cashen (Sugarcane Prod. Lab., Houma, La.). *J. Agr. Food Chem.* 10(6), 509–12 (1962). By utilizing a combination of solvent fractionation and silicic acid column chromatography, the principal phospholipides were isolated from lyophilized fresh sugar cane juice. They corresponded chromatographically to phosphatidyl ethanolamine and lecithin on silicated glass paper.

PEROXIDE VALUE-FLAVOR SCORE RELATIONSHIPS IN STORED FOAM-DRIED WHOLE MILK. Phyllis G. Kilman, A. Tamsma, and M. L. Pallansch (Dairy Prod. Lab., U.S.D.A., Wash., D.C.). *J. Agr. Food Chem.* 10(6), 496-99 (1962). The possibility of relating peroxide value with the flavor score of stored, vacuum-foam dried, whole milk powders was studied. No useful correlation was found between P. V. and flavor score.

ANTIOXIDANT MEASUREMENT, DETERMINATION OF 2,6-DI-*tert*-BUTYL-4-HYDROXYTOLUENE (BHT) : APPLICATION TO EDIBLE FATS AND OILS. C. R. Szalkowski and J. B. Garber (Merck Chem. Div., Merck and Co. Inc., Rahway, N. J.). *J. Agr. Food Chem.* 10(6), 490–95 (1962). The method presented is based upon the steam distillation of BHT from the fat and oil and colorimetric determination with a dianisidine-nitrous acid reagent. The method is capable of determining 10 to 200 ppm BHT in the presence of other allowable antioxidants.

TOTAL ORGANIC CHLORIDE CONTENT IN BUTTERFAT BY A RAPID METHOD OF NEUTRON ACTIVATION ANALYSIS. R. A. Schmitt, G. Zweig (General Atomic Div. of General Dynamics, San Diego, Calif.). *J. Agr. Food Chem.* 10(6), 481–84 (1962). A rapid neutron activation method is given for the determination of total organic chloride content in milk products. It consists of irradiating butterfat and a chlorine reference standard in a nuclear reactor for a short time and then measuring and comparing the induced Cl^{38} radioactivity.

MEASURING THE OIL-BINDING CHARACTERISTICS OF FLOUR. W. C. Shuey, O. S. Rask and P. E. Ramstad (U.S.D.A. Hard Red Spring and Durum Wheat Qual. Lab., Crops Res. Div., Cereal Technol. Dept., North Dakota State Univ., Fargo, N. D.). *Cereal Chem.* 40(1), 71–78 (1963). Two methods for measuring oil-binding characteristics of flour are described. With increased protein content, the oil-binding capacity increases. However, it is shown that this is not entirely explained by an interaction between protein and oil in that the oil-binding capacity of wheat starch increases by a chlorine bleaching treatment. It is also shown that the oil-binding characteristics are physical rather than chemical by comparing oil-binding measurements when a comparatively unsaturated triglyceride, a saturated triglyceride, and a hydrocarbon (mineral) oil are incorporated with the wheat flour.



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JOHNS-MANVILLE

THE CHROMATOGRAPHY OF LIPIDS IN TEST TUBES COATED WITH A THIN LAYER OF SILICIC ACID. K. B. Lie and J. F. Nyc (Dept. of Physiol. Chem., Sch. of Medicine, Univ. of Calif. Med. Ctr., Los Angeles, Calif.). *J. Chromatog.* **8**, 75–81 (1962). Test tubes, coated on the inner surface with a thin film of silicic acid, were used as the stationary phase for the ascending chromatography of various lipids. The behavior of several purified lipids was determined with the mobile phase being mixtures of chloroform with methyl alcohol and *n*-hexane with ethyl ether.

APPLICATION OF REVERSED PHASE CIRCULAR PAPER CHROMATOGRAPHY TO THE ANALYSIS OF HIGHER FATTY ACIDS. C. V. Viswanathan and B. M. Bai (Dept. Biochem., Indian Inst. of Sci., Bangalore, India). *J. Chromatog.* **7**, 507–15 (1962). A detailed study of various reversed phase systems for the qualitative analysis of fatty acids was performed. It was found that a liquid paraffin-aqueous methanol system is the most convenient one. Details of a simple and rapid method for the quantitative estimation of oleic, linoleic, linolenic, lauric, myristic, palmitic, and stearic acids are discussed.

METHOD FOR THE REGENERATION OF BLEACHING EARTHS. C. Thomopoulas and C. Liapis (Lab. Nut. Chem. and Tech. of The Nat. Tech. Univ., Athens, Greece). *Rev. Franc. Corps Gras* **9**, 611–615 (1962). A unique method for the regeneration of bleaching earths is described. The cake is washed with detergent to remove adsorbed oil, and then washed with water. Fifty grams of washed earth is suspended in 200 milliliters of water containing 10 milliliters of sulfuric acid. The suspension is boiled and five grams of potassium permanganate added, just enough to give a stable red color. The earth is then filtered and dried at 70C. Potassium dichromate is equally effective. Ninety eight percent efficiency is obtained.

OBTAINING LIGHT-COLORED OIL AND SOAPSTOCK IN REFINING COTTONSEED OIL. I. EXPERIMENTAL DATA ON OIL REFINING AND ACID OIL DISTILLATION. P. L. Narayana Rao and K. T. Achaya (Reg. Res. Lab., Hyderabad, India). *Indian Oilseeds J.*, **6**, 43–52 (1961). Monoethanolamine (2%), as an additive, can replace the excess alkali used during refining of crude cottonseed oil. Used in conjunction with excess alkali, monoethanolamine yields a bleached oil of considerably reduced color, but has no effect on soapstock color. Use of 2% of 30% hydrogen peroxide as a refining additive decreases bleach color by a factor of 1.7, decreases soapstock color by a factor of 2 to 4 and increases oil yield by about 1.5%. In certain instances, use of 2% of hydrogen peroxide as an additive can dispense with the need for re-refining. Conducting both refining and re-refining using hydrogen peroxide is advantageous for highly color-fixed oils. Oils derived by hydrogen peroxide refining and straight refining have the same storage quality. Fatty acids distilled from hydrogen peroxide derived soapstocks are 1.5 to 2.0 times as light as acids distilled from normal soapstocks. The cost of 2% of the additive is nullified when an extra 3% yield of oil is obtained.

THE FATTY ACID COMPOSITION OF HYDROGENATED RAPESEED OIL. A. Jakubowski, I. Sobierajska and K. Modzelewska (Inst. for Ind. Fatty Acids, Warsaw, Poland). *Rev. Franc. Corps Gras* **9**, 678–680 (1962). Fourteen samples of hydrogenated rapeseed oil suitable for use in margarine were studied. The iodine value of the members of the group ranged from 82.1 to 64.3. The fatty acid composition was studied by gas liquid chromatography. It was observed that the type of hydrogenation used (not stated) was highly selective for linolenic and linoleic. Little erucic or eicosenoic acid was hydrogenated

TALLOW AND ITS MARKETS. M. Moulin (Dir. of Society S.I.P.O.R.). *Rev. Franc. Corps Gras* **9**, 601–610 (1962). The source, use, production and distribution of tallow throughout the world is reviewed.

THE CHEMISTRY OF FATTY ACIDS. G. Cusinberche (Dir. of Ets Cusinberche, Clichy (Seine), Fr.). *Rev. Franc. Corps Gras* **9**, 671–677 (1962). A review.

PREPARATION AND PROPERTIES OF SYNTHETIC FATTY ACIDS OBTAINED BY THE OXIDATION OF PARAFFINS. B. Solomon (ITERG). *Rev. Franc. Corps Gras* **9**, 626–635 (1962). A review of the Russian methods for preparing fatty acids from paraffins. There are 60 references.

A LABORATORY DEODORIZER. J. Heide-Jensen (Aarkus Oliefabrik A/S, Denmark). *Oleagineux* **17**, 879–82 (1962). A compact, portable laboratory deodorizer is described. Capacity is 5 liters. A schematic diagram is supplied.

PROTON MAGNETIC RESONANCE AND THE POLYMORPHISM OF TRIGLYCERIDES. N. Nakajima. *J. Phys. Soc. Japan* **16**, 1778 (1961). The nuclear magnetic resonance spectra of the α- and β-forms of tristearin and tripalmitin are obtained as a function of temperature from −125C to +50C. The data support the hexagonal structure for the α-form as suggested by X-ray and infrared studies. (Rev. Current Lit. Paint Allied Ind.)

FIXATION OF NITROGEN BY VEGETABLE OILS. S. A. Saletore and V. N. Gavai. *J. Sci. Ind. Res.* **21D**(3), 86–8 (1962). Raw, refined and bleached samples of ground nut oil, when exposed to the air for long periods under laboratory conditions, have been found to show an increase in their N content. Accelerated tests carried out by bubbling air at 95C through groundnut oil and its fatty acid esters, coconut oil and linseed oil also result in an increase, though more rapid, in N content. It is suggested that this increase in N contents is due to fixation of atmospheric N_2 by the oils; this phenomenon does not appear to have been reported before. In aerated oils the development of organoleptic rancidity appears to be more closely related to the N contents of the oils than to their peroxide values. (Rev. Current Lit. Paint Allied Ind.)

FUNDAMENTAL STUDIES ON AUTOXIDATION. Hyderabad Regional Res. Lab. *Annual Report*, **1960–61**, 10–12. During studies on autoxidation, it was noted that an increase in N content also occurred. A standard Kjeldahl digestive technique was adopted for determining N in samples of methyl palmitate, oleate and linoleate on ageing at 63C. The N content of methyl palmitate increased in 41 days from 27 to 49 mg. per 100 g. ester, from 31 to 83 for the oleate and from 36 to 84 for the linoleate. N content of oleic acid rose from 51 mg. to 144 mg. per 100 g. on ageing for 48 days at 63C. (Rev. Current Lit. Paint Allied Ind.)

BLEACHING EARTHS. Hyderabad Regional Res. Lab. *Annual Report*, **1960–61**, 57–9, 71. Korvi and Mudh earths were activated with HCl and H_2SO_4 prior to testing. Mudh earth was comparable to Tonsil Optimum in bleaching efficiency, oil retention and bulk density. Preliminary experiments with a fluidization technique for activating earths are briefly described. Work on a standard earth for evaluation of bleaching earths is also described and various heats of wetting are reported. Work on the quality of water suitable for washing acid-activated bleaching earths included a study of the effect of cations present in the water on the activity of the earths. The decolorizing capacity of some of the acid-activated earths was almost 20% more when distilled water was used for washing instead of well water. The results indicate that different earths adsorbed ions in different proportions and that the adsorbed ions reduced the bleaching capacity of these earths to a considerable extent. (Rev. Current Lit. Paint Allied Ind.)

TALL OIL FATTY ACIDS. Anon. *Paint Tech.* **26**(5), 26–7 (1962). A brief history of tall oil fatty acid production is given. Because of the decrease of 30% in the price of tall oil fatty acids during the last 3 years, there is now a high demand for them. (Rev. Current Lit. Paint Allied Ind.)

NON-GLYCERIDE CONSTITUENTS OF OILS AND FATS. I–III. *British Oil & Cake Mills Tech. Notes* **1962**, Nos. 42–4, 3 pp. The occurrence of minor non-glyceride constituents, such as free fatty acids, coloring matter, phosphatides and waxes, in glyceride oils is briefly reviewed. (Rev. Current Lit. Paint Allied Ind.)

• Fatty Acid Derivatives

PREPARATION OF MONOGLYCERIDES FROM CASTOR OIL. III. EFFECT OF GLYCEROL AND WATER. S. K. Dey, P. K. Kochhar and P. K. Bhatnagar (Shir Ram Inst. for Ind. Res., Delhi, India). *Indian Oilseeds J.* **6**, 215–225 (1962). During glycerolysis of oils the ratio of glycerol to oil present at any time in the reaction mixture determines the composition of the final product to a great extent. The higher this ratio is, the greater will be the percentage of monoglycerides in the final product. Small amounts of water (4–5% on weight of anhydrous glycerol) is optimum for high mono preparation. Without water, the reaction rate is extremely slow, but large amounts leads to excessive generation of fatty acids.

ASSOCIATION OF α-MONOGLYCERIDES IN NON-AQUEOUS SOLVENTS P. Debye and H. Coll. *J. Coll. Sci.* **17**, 220–30 (1962). Number average mol. wts. of monocaprin are determined as a function of its concentration in C_6H_{12}, CCl_4, C_6H_6 and $CHCl_3$ by measurement of vapor pressure lowering (thermoelectric method). Variations of dipole moment with concn. are measured using a heterodyne beat frequency apparatus. Change in the proportion of free to H-bonded −OH with concn. is deduced from infrared spectra. Some unsatisfactory light-scattering results are reported. It is concluded that some association of α-monoglycerides takes place in non-aqueous

solvents; clustering increases with decreasing cohesive energy density of the solvents. (Rev. Current Lit. Paint Allied Ind.)

ELECTRON-DIFFRACTION STUDIES OF FATTY-ACID MONOLAYERS. B. R. Banerjee, B. Ostrofsky, and H. E. Ries, Jr. *Nature* **193**, 873–4 (1962). (Rev. Current Lit. Paint Allied Ind.)

SEPARATION OF THE METHYL ESTERS OF FATTY ACIDS BY THIN LAYER CHROMATOGRAPHY. S. Ruggieri. *Nature* **193**, 1282–3 (1962). (Rev. Current Lit. Paint Allied Ind.)

• Biology and Nutrition

CONVERSION OF LECITHIN TO LYSOLECITHIN AS A SOURCE OF FATTY ACIDS IN INCUBATED PLASMA OR SERUM. W. C. Vogel and L. Zieve (*Radioisotope Service and Dept. of Med., Minneapolis Veterans Hospital, Univ. of Minnesota*). *Proc. Soc. Exp. Biol. Med.* **111**, 538–540 (1962). Incubation of human serum or plasma at 38C for 4 hours results in conversion of approximately 10% of the lecithin to lysolecithin. Serum from patients with acute pancreatitis and postheparin plasma was no different than normal serum or plasma in this respect.

GAMMA IRRADIATION AND INTERRELATION OF DIETARY VITAMIN A AND COPPER AND THEIR DEPOSITION IN THE LIVER OF SWINE. R. L. Shirley, T. N. Meacham, A. C. Warnick, H. D. Wallace, J. F. Easley, G. K. Davis, and T. J. Cunha (Animal Science Dept., Agr. Expt. Sta., Univ. of Florida, Gainesville). *J. Nutrition* **78**, 454–460 (1962). A study was made to determine (1) whether dietary vitamin A had an effect on the level of copper deposition in the liver; (2) whether dietary copper had an effect on the deposition of vitamin A in the liver; and (3) whether whole body gamma irradiation had an effect on the deposition of vitamin A and copper in the liver of swine. Vitamin A supplementation decreased the deposition of copper in the liver. Copper supplementation increased the level of vitamin A in the liver. Gamma irradiation increased the deposition of copper in the liver.

EFFECTS OF ETHIONINE AND METHIONINE ON SERUM LIPIDS AND LIPOPROTEINS. J. C. Seidel and A. E. Harper (Dept. of Biochem., Univ. of Wisconsin, Madison). *Proc. Soc. Exp. Biol. Med.* **111**, 579–582 (1962). Prolonged feeding of ethionine to rats receiving a diet containing cholesterol, cholic acid and hydrogenated coconut oil leads to about a 10-fold rise in serum triglyceride concentration which is primarily confined to triglycerides bound to low-density lipoproteins. This increase is prevented if an equal amount of methionine is included in the diet. Serum cholesterol concentrations of rats fed ethionine are lower than those of unsupplemented rats. Addition of methionine with ethionine further lowers the cholesterol concentration. Methionine lowers the concentrations of serum triglycerides and phospholipids only slightly but substantially lowers serum cholesterol concentration.

EFFECT OF UNEQUAL MILKING INTERVALS ON LACTATION MILK, MILK FAT, AND TOTAL SOLIDS PRODUCTION OF COWS. G. H. Schmidt and G. W. Trimberger (Dept. of Animal Husbandry, Cornell Univ., Ithaca, N. Y.). *J. Dairy Science* **46**, 19–21 (1963). Cows of three breeds were milked at 12- and 12-hr, 14- and 10-hr, and 16- and 8-hr daily intervals for complete locations, to determine the effect of milking intervals on the milk, milk fat, and total solids production. Thirty-five trios were used over a 2-yr period in the experiment. The mature equivalent milk records of cows milked at 14- and 10-hr intervals were 0.3% lower, and those of cows milked at 16- and 8-hr intervals were 1.3% lower, than the records of cows milked at equal intervals. The mature equivalent milk production records of all cows averaged over 13,500 lb milk. No significant differences occurred between any two groups in the milk fat and total solids percentages or yields. There was some indication that the 16- and 8-hr intervals had a greater adverse effect on higher-producing cows in comparison to lower-producing cows, and on first-calf heifers in comparison to older cows; however, the evidence was not conclusive. Unequal intervals had no effect on udder health or the incidence of ketosis.

GLYCEROL INTAKE, BLOOD CHOLESTEROL LEVEL AND ANEMIA IN THE GUINEA PIG AND RABBIT. R. Ostwald (Dept. of Nutritional Sciences, Univ. of California, Berkeley). *Proc. Soc. Exp. Biol. Med.* **111**, 632–634 (1962). A solution of either glycerol in saline or saline alone was administered by stomach tube to groups of guinea pigs and rabbits. Their plasma and cell cholesterol levels and their red blood cell count were compared over periods of 30 to 50 days. Guinea pigs given more than 5 ml of a 50% glycerol solution daily died with acutely toxic symptoms. Rabbits tolerated at least 10 ml daily. In neither species of animals did the level of the plasma or cell cholesterol show consistent changes attributable to the intake of glycerol. It appears probable that in the guinea pig the intake of glycerol is accompanied by an anemia.

IMPAIRED PIGMENTATION IN CHINOOK SALMON FED DIETS DEFICIENT IN ESSENTIAL FATTY ACIDS. N. Nicolaides and A. N. Woodall (Dept. of Biochem. and Div. of Dermatology, Univ. of Oregon Med. School, Portland). *J. Nutrition* **78**, 431–437 (1962). A marked depigmentation was observed in the skin of Chinook salmon fry-fed a fat-free diet since hatching. A similar depigmentation was observed when triolein or linolenic acid was included in the diet, but depigmentation was largely prevented by the inclusion of trilinolein. Depigmentation became apparent after 16 weeks of feeding and reached a maximum in about 24 weeks. General repigmentation occurred during a recovery experiment and appeared to be more pronounced and more rapid in subgroups fed a diet containing 3% of trilinolein than in the subgroups continued with their original diet. Histochemical tests suggest that the depigmentation process involves melanin. Trilinolein or linolenic acid, or both, elicited a positive growth response in Chinook salmon fry when substituted isocalorically for sucrose in a fat-free ration, but triolein did not.

DISTRIBUTION OF ALPHA GLYCERYL ETHERS IN ANIMAL TISSUES. S. Nakagawa and J. M. McKibbin (Dept. of Biochem., State Univ. of New York, College of Med., Syracuse, N. Y.). *Proc. Soc. Exp. Biol. Med.* **111**, 634–636 (1962). A method is described for determination of lipid alpha glyceryl ethers in animal tissues. Purified tissue lipid extracts are hydrolyzed and the lipid soluble fraction of the hydrolysate is fractionated on a silicic acid column. The glyceryl ether fraction is oxidized with periodic acid and the formaldehyde formed is determined colorimetrically. The alpha glyceryl ethers are a minor component of all of the tissues examined except bone marrow. The tissues other than bone marrow range in content from 0.20 to 1.35 micromoles per gram of dry lipid-free tissue and from 0.002 to 0.010 molar ratio to lipid phosphorus.

EFFECT OF AGE ON THE RESPONSE OF CHICKENS TO DIETARY PROTEIN AND FAT. J. E. Marion and H. M. Edwards, Jr. (Poultry Dept., Univ. of Georgia, Athens). *J. Nutrition* **79**, 53–61 (1963). A high level of protein and the presence of corn oil in the diet of growing female chickens each increased body weights, decreased the size and lipid content of the liver, and decreased the incorporation of sodium acetate-1-C^{14} into liver lipids. The changes in liver lipid content were largely a reflection of changes in the level of glycerides and cholesterol esters in this organ. Generally, these measures were not significantly affected by diet after the birds reached sexual maturity. The analysis of eggs, plasma, heart, liver, and depot fat from mature birds showed that the fatty acid content of these sites was altered little by protein level. Adding corn oil to the diet increased the level of linoleic acid in these sites and decreased the palmitoleic and oleic acid content. Egg weights and egg production were not significantly influenced by dietary protein level. However, higher values for these measurements were noted when corn oil was added to the diet.

PHENETHYLBIGUANIDE AND TRIGLYCERIDE SYNTHESIS. C. Longcope and R. H. Williams (Dept. of Med., Univ. of Washington School of Med., Seattle). *Proc. Soc. Exp. Biol. Med.* **111**, 775–777 (1962). The effect of PEBG on triglyceride synthesis has been studied *in vitro*. In intact tissue PEBG interferes with the conversion of diglyceride to triglyceride. In homogenates, PEBG increases the incorporation of labeled fatty acids into triglyceride. It thus differs from insulin in its effect on triglyceride synthesis. An explanation for this is presented.

THE ACTION OF CARBON TETRACHLORIDE ON THE TRANSPORT AND METABOLISM OF TRIGLYCERIDES AND FATTY ACIDS BY THE ISOLATED PERFUSED RAT LIVER AND ITS RELATIONSHIP TO THE ETIOLOGY OF FATTY LIVER. M. Heimberg, I. Weinstein, G. Dishmon, and A. Dunkerley (Dept. of Pharmacology, School of Med., Vanderbilt Univ., Nashville 5, Tenn.). *J. Biol. Chem.* **237**, 3623–3627 (1962). A major metabolic defect induced by CCl_4 administration to the rat appears to be inhibition of the outward transport of hepatic triglycerides. This inhibition of outward triglyceride transport may be the etiology of the fatty liver associated with CCl_4 poisoning.

EFFECTS OF VITAMIN K-ACTIVE COMPOUNDS AND INTESTINAL MICROORGANISMS IN VITAMIN K-DEFICIENT GERM-FREE RATS. B. E. Gustafsson, F. S. Daft, E. G. McDaniel, J. C. Smith, and R. J. Fitzgerald (Nat'l Inst. of Arthritis and Metabolic Diseases, Nat'l Inst. of Dental Research, Nat'l Insts. of Health, Bethesda, Md.). *J. Nutrition* **78**, 461–468 (1962). Vitamin K deficiency was readily induced in two different strains of germ-free rats raised with a vitamin K-deficient

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• *Names in the News*

G. Y. Brokaw

T. H. McGuine

O. W. Johnson

Daniel Swern (1942) was recently named "Federal Civil Servant of the Year" at a luncheon meeting of the Federal Business Association. Dr. Swern was honored for his outstanding contributions to the fundamental chemistry of fats, and for products and processes widely used throughout the plastics industry which have stemmed from his research. Other awards Dr. Swern has received include the John Scott Award of the City of Philadelphia (1956), the Arthur S. Flemming Award (1955), and the Distinguished Service Award (1955).

G. Y. Brokaw (1948) has been named to head the new Development Laboratories recently formed at Distillation Products Industries, Division of Eastman Kodak Company. Dr. Brokaw joined the organic research group at DPI in 1947.

R. W. Lehman (1950) will work with Dr. Brokaw in the new laboratories at Distillation Products Industries as head of a new Technical Service Department. Mr. Lehman joined DPI in the organic research department in 1940.

Ingenuin Hechenbleikner (1952) has been appointed Vice President of Carlisle Chemical Works, Inc., Reading, Ohio. Dr. Hechenbleikner's duties include all technical activities of both the Carlisle Division and the Advance Division in New Brunswick, N. J.

T. H. McGuine (1954) has been transferred to the Industrial Chemicals Department of Archer-Daniels-Midland Co. as a product supervisor. Mr. McGuine joined ADM in January of 1962.

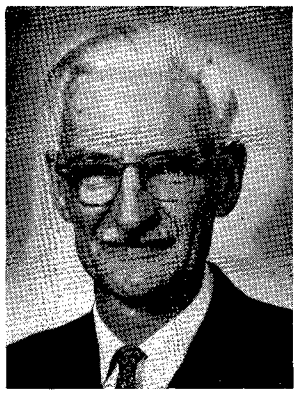
W. N. B. Armstrong (1957) was recently appointed Director of Materials Chemical Research of Ontario Research Foundation. Mr. Armstrong has been with ORF since 1946.

O. W. Johnson (1948) has been named Manager of the recently expanded Distribution Sales Division of Dorr-Oliver, Inc., Stamford, Conn. Mr. Johnson joined Dorr-Oliver as Staff Assistant to the General Sales Manager.

M. J. Hein (1958) was recently appointed Sales Manager of the Sterotex and Stearate Department of The Capital City Products Co. This appointment is an addition to Mr. Hein's present position as Manager of the New Products Department.

E. S. Pattison (1951) has been named Manager and Secretary of the Soap and Detergent Association. Mr. Pattison has been Divisional Manager of the SDA, heading up the Glycerine Producers' Association and the Fatty Acid Producers' Council.

Ingenuin Hechenbleikner



W. N. B. Armstrong

E. S. Pattison

• *New Literature*

Glycerine Producers Association has issued a new booklet entitled "Physical Properties of Glycerine and Its Solutions." This 28 page booklet is a compilation of the available data on glycerine, covering thirty-four subjects from adiabatic expansion to viscosity. (295 Madison Ave., New York 17, N. Y.)

Cahn Instrument Co. is offering a four page reprint (in German) of the article "Apparatus for the Measurement of Sorption Kinetics and Micro Method for the Measurement of Sorption Isotherms." (15505 Minnesota Ave., Paramount, Calif.)

Research Specialties Co. has released a 12 page bibliography on Gas Chromatography of Steroids, covering significant publications from 1960 through 1962. Listing is in alphabetical order by author. (200 South Garrard Boulevard, Richmond, Calif.)

Beckman Instruments, Inc., Scientific and Process Instruments Division, announced publication of a 50 page literature packet describing accessories for Beckman Infrared Spectrophotometers. (2500 Harbor Boulevard, Fullerton, Calif.)

Delmar Scientific Laboratories, Inc., has prepared an eight page booklet entitled "Delmar Biological Glassware," which describes five specialized glassware units for biological research. (317 Madison St., Maywood, Ill.)

Will Scientific, Inc., are distributing a new issue of "Lablog," a periodic 16 page supplement to Will's Apparatus Catalog 8. (Box 1050, Rochester 3, N. Y.)

Blaw-Knox Co. has issued Flakers Catalog 396 which presents Buflovak's advanced information of the design, construction, application, and operation of Flakers for continuously chilling and flaking many chemical and food products. (Buflovak Equipment Division, P. O. Box 2041, Buffalo 5, N. Y.)

Geigy Industrial Chemicals, Division of Geigy Chemical Corp., announced the availability of their new 15 page bulletin entitled "Sequestrene Food Grade EDTA Products." The bulletin tells how to overcome the deteriorative effects encountered in 15 food and beverage categories. A complete list of literature references is keyed to the text. (P. O. Box 430, Yonkers, N. Y.)

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diet. Conventional animals fed the same diet showed no deficiency symptoms. The addition of 25% of lard to the basal diet accelerated the appearance of vitamin K deficiency symptoms, whereas 10% of peanut oil in the diet exerted a sparing effect.

EFFECTS OF DIET HIGH IN POLYUNSATURATED FAT ON THE PLASMA LIPIDS OF NORMAL YOUNG FEMALES. B. Gunning, G. Michaels, L. Neumann, S. Splitter, and L. Kinsell (Inst. Metabolic Res., Highland-Alameda County Hosp., Oakland, Calif.). *J. Nutrition* **79**, 85–92 (1963). Substitution of a palatable mixed diet containing 45% of the calories as fat, 50% of this derived from polyunsaturated fatty acids, for an average American diet, produced a significant decrease in the level of plasma cholesterol and phospholipids in normal young women, as tested by *t* values less than the critical level of 15%. (All figures with respect to fat composition are approximate.) No significant change occurred in the plasma glycerides. The increase in cholesterol linoleate which occurred in all subjects can be used as an index of short-term diet adherence.

ATHEROSCLEROSIS IN THE RAT. EFFECT OF X-RAY AND A HIGH FAT DIET. H. Gold (L. D. Beaumont Memorial Res. Lab., Mt. Sinai Hosp., Cleveland, Ohio). *Proc. Soc. Exp. Biol. Med.* **111**, 593–595 (1962). Forty-two albino Wistar rats, average weight 133 g, fed on a supplemented high-fat diet, were divided into 2 groups. One group was treated with 2500 r (X-rays) to the thorax, and the other kept on the high fat diet, but not irradiated. The rats were killed 20 to 28 weeks after completion of irradiation. Marked atherosclerotic lesions were observed in the coronary arteries of 38.8% of the irradiated group and in 22.7% in the group on the high fat diet alone. In the pulmonary arteries similar changes were noted in 25% of the irradiated group and none in the unirradiated group. Previous studies showed that in 8–15 weeks after irradiation, marked coronary lesions were present in 26.6% of the irradiated group and none in the unirradiated. It is suggested that X-irradiation accelerates the process that ordinarily develops slowly.

VITAMIN E DEFICIENCY IN THE MONKEY. V. ESTIMATED REQUIREMENTS AND THE INFLUENCE OF FAT DEFICIENCY AND ANTIOXIDANTS ON THE SYNDROME. C. D. Fitch and J. S. Dinning (Dept. of Biochem., School of Med., Univ. of Arkansas, Little Rock). *J. Nutrition* **79**, 69–78 (1963). The influence of a fat-deficient diet and N,N′-diphenyl-p-phenylenediamine (DPPD) on vitamin E deficiency was studied in the rhesus monkey. Fat deficiency did not prevent the monkeys from developing the full syndrome of vitamin E deficiency including the anemia, but it appeared to reduce the requirement for vitamin E. The estimated requirement for monkeys receiving the diet containing fat was 2 to 3 mg of DL-α-tocopherol per kg body weight per day, whereas a single estimate of the requirement in a monkey supplied with the fat-deficient diet was 0.7 mg per kg of body weight per day. Also the average length of time required to develop vitamin E deficiency was longer in the fat-deficient monkeys. The DPPD had a beneficial effect in the vitamin E-deficient monkeys but the response was not complete. Several electrocardiograms were obtained for each of the monkeys in these experiments and a relatively high incidence of abnormalities due to pericarditis was noted. No abnormalities were present in the electrocardiograms that could be attributed either to vitamin E deficiency or fat deficiency.

EFFECT OF OVARIECTOMY ON BLOOD CONCENTRATION OF ORALLY ADMINISTRATED TRIOLEIN I^{131} IN BITCHES ON LOW AND MODERATE FAT INTAKE. E. N. Dost and W. M. Dickson (College of Veterinary Med., Washington State Univ., Pullman). *Proc. Soc. Exp. Biol. Med.* **111**, 674–676 (1962). Triolein I^{131} was administered to castrate and intact female beagles maintained on 2 levels of dietary fat. Castrate bitches were found to have a greater maximum percentage of administered radioactivity in circulation than intact females. Curves representing blood radioactivity plotted against time were similar after castration to those of some conditions in the human in which deranged lipid metabolism is implicated. Curves produced under conditions of low availability of dietary fat became erratic and presented only slightly different mean peak values when intact and castrate animals were compared.

EFFECT OF DIET UPON THE IN VITRO METABOLISM OF RAT EPIDIDYMAL ADIPOSE TISSUE. J. Di Giorgio, R. A. Bonanno, and D. M. Hegsted (Dept. Nutrition, Harvard School of Public Health, Boston, Mass.). *J. Nutrition* **78**, 384–392 (1962). Rats were fed crude and purified diets for several weeks in order to study their effects on the *in vitro* release of fatty acids from rat epididymal tissue. The purified diets were isocaloric and differed only in the kind and amount of dietary fat. It was found that the total quantities of fatty acids released during a 4-hour incubation period of epididymal adipose tissue from the various groups of rats were not significantly different. However, the adipose tissue fatty acids were released in proportions different from those initially present in the parent tissue.

THE HYDROLYSIS OF LONG-CHAIN FATTY ACID ESTERS OF CHOLESTEROL WITH RAT LIVER ENZYMES. D. Deykin and D. S. Goodman (Lab. Cellular Physiol. and Metabolism, Nat'l Heart Inst., Nat'l Insts. of Health, Bethesda, Md.). *J. Biol. Chem.* **237**, 3649–3656 (1962). The hydrolysis of long-chain fatty acid esters of cholesterol with rat liver homogenates has been shown. The bulk of hydrolytic activity was associated with the soluble protein fraction, although the microsomes contributed between 11 and 32% of the observed total hydrolysis. The soluble enzyme was partially purified by ammonium sulfate precipitation and calcium phosphate gel absorption. The enzyme was unstable and lost activity after freezing, dialysis, or lyophilization. The soluble cholesterol esterase was separable from the major esterase activities involved in the hydrolysis of *p*-nitrophenylacetate and *p*-nitrophenylphosphate.

SYNTHESIS OF SOME 3β-HYDROXYLATED BILE ACIDS AND THE ISOLATION OF 3β,12α-DIHYDROXY-5β-CHOLANIC ACID FROM FECES. H. Danielsson, P. Eneroth, K. Hellström, and J. Sjövall (Dept. of Chem., Karolinska Inst., Stockholm, Sweden). *J. Biol. Chem.* **237**, 3657–3659 (1962). The synthesis of 3β,7α-dihydroxy, 3β,12α-dihydroxy, and 3β,7α,12α-trihydroxy-5β-cholanic acids is described. 3β,12α-Dihydroxy-5β-cholanic acid has been isolated from rabbit feces and was found to be a metabolite of deoxycholic acid.

CARNITINE IN INTERMEDIARY METABOLISM. THE METABOLISM OF FATTY ACID ESTERS OF CARNITINE BY MITOCHONDRIA. J. Bremer (Inst. of Clinical Biochem., Rikshospitalet, Univ. of Oslo, Oslo, Norway). *J. Biol. Chem.* **237**, 3628–3632 (1962). A simple method for the preparation of DL-palmityl-, DL-octanoyl-, and DL-butyrylcarnitine is reported. These compounds have been incubated in the presence of catalytic amounts of succinate with mitochondria isolated from several tissues of the rat. Under these conditions, oxygen uptake corresponding to a complete oxidation to carbon dioxide and water of the acyl group of one of the optical isomers, presumably the L isomer, is observed.

IDENTIFICATION OF LIPIDS IN BLOOD THROMBOPLASTIN. H. P. Bentley, Jr. (Dept. of Pediatrics, Univ. of Alabama Medical Center, Birmingham). *Proc. Soc. Exp. Biol. Med.* **111**, 757–759 (1962). Lipids from blood thromboplastin were identified by column chromatography and paper chromatography as inositol phosphatide, lecithin, sphingomyelin, phosphatidyl serine, phosphatidyl ethanolamine, and cholesterol. Despite wide variations in thromboplastic acitvity in 70 samples of blood thromboplastin, there was no change in the presence of any of the lipids.

ERYTHROCYTE PHOSPHOLIPIDS IN THE NEWBORN INFANT. H. P. Bentley, Jr. (Dept. of Pediatrics, Univ. of Alabama Medical Center, Birmingham). *Proc. Soc. Exp. Biol. Med.* **111**, 591–592 (1962). The total phospholipids from both the entire erythrocyte and the erythrocyte stroma of the newborn infant have been shown to be equal to the adult. The individual phospholipids from the entire red cell have been shown to be identical to the adult.

EFFECTS OF OIL INGESTION ON LIPOPROTEIN FATTY ACIDS IN MAN. A. V. Nichols, C. S. Rehnborg, F. T. Lindgren, and R. D. Wills (Div. of Med. Physics, Donner Lab. of Med. Physics, Lawrence Radiation Lab., Univ. of Calif., Berkeley). *J. Lipid Res.* **3**, 320–26 (1962). This report describes preliminary clinical investigations on the influence of safflower and olive oil ingestion on (a) the lipid composition of the major serum lipoprotein classes, (b) the fatty acid composition of the lipoprotein lipids, and (c) the fatty acid composition of the ultracentrifugal protein residue fraction. Significant glyceride increases occurred in the S_f 20–10^5 and the high-density lipoproteins (HDL). Fatty acid composition changes occurred in the glyceride moieties of the S_f 20–10^5, S_f 0–20, and HDL fractions. Marked alterations in the composition of the fatty acids associated with the ultracentrifugal protein residue fraction occurred following oil ingestion. The origin of the HDL lipid following oil ingestion is discussed in relation to the metabolism of the S_f 20–10^5 lipoproteins.

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1962 Margarine Production Sets Record

Margarine production in 1962 maintained a 7-year record of annual increases with a total production of 1,726 million lb—a 2.2 million gain over the previous year. Americans consumed an average of 9.3 lb of margarine in 1962 compared to 6.4 lb of commercially sold butter.

Margarine provided a major market for the large and new supplies of edible fats and oils that the nation's farms produced last year. In 1962 margarine producers used 1,352 lb of these fats and oils, including 1,057 million lb of refined soybean oil, 107 million lb of cottonseed oil, and 9.7 million lb of corn oil. Margarine also provided a major outlet for the expanding safflower crop and absorbed approximately 26 million lb of nonfat dry milk.

Margarine's retail price, as reported by the U.S.D.A., for leading cities averaged 28.3 cents per lb in 1962 compared with 28.6 cents in 1961.

MARGARINE PRODUCTION AND STOCKS—1962
(Millions of pounds)

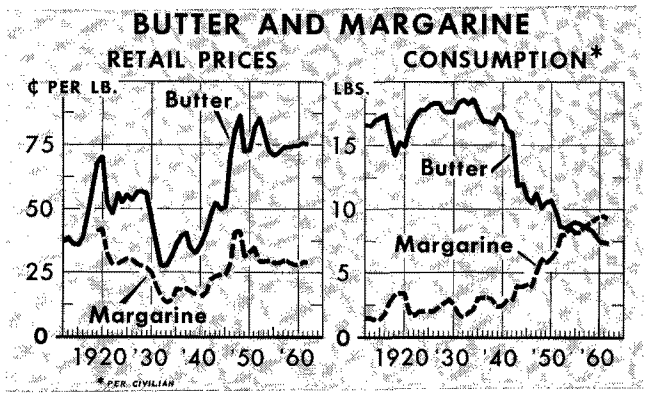
Month	Total production	One-pound units [b c]	Pats or chips [c]	Other [c]	Stocks [a] Start of month	Stocks [a] End of month
January	159.8	148.0	2.8	9.2	32.8	38.3
February	140.6	130.0	2.6	8.0	38.3	37.7
March	142.9	130.7	2.9	9.3	37.7	38.3
April	135.9	124.4	2.7	8.8	38.3	37.3
May	136.1	124.0	2.7	9.4	37.3	39.9
June	129.6	117.2	2.4	10.0	39.9	42.7
July	125.9	113.3	2.5	10.1	42.7	39.9
August	140.1	127.7	2.8	9.6	39.9	38.0
September	137.0	125.3	3.0	9.0	38.0	38.5
October	165.1	150.9	3.6	10.6	38.5	37.8
November	155.9	142.2	3.4	10.3	37.8	40.3
December	157.0	144.6	3.0	9.3	40.3	39.3
TOTAL	1,725.9	1,578.3	34.4	113.6		

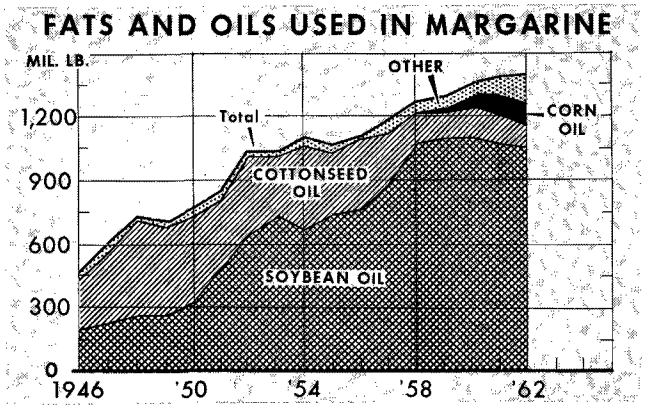
[a] Producers' and warehouse stocks; [b] includes small quantity of less-than-one-pound packages; plastic-bag margarine not reported separately; [c] the sum of these items may not agree with the production total shown above because some margarine is not packaged during the same month in which it is produced.

FATS AND OILS USED IN MARGARINE—1962
(Millions of pounds)

Month	Total oils	Soybean	Cottonseed	Corn	Peanut	Lard	Edible tallow	Safflower Seed Oil
January	127.0	97.2	9.9	7.6	(D)	(D)	(D)	(NA)
February	112.9	85.6	8.8	6.4	(D)	(D)	(D)	(NA)
March	115.1	85.1	8.8	8.1	(D)	(D)	(D)	(1)
April	109.9	82.5	8.5	6.8	(D)	(D)	(D)	(1)
May	108.7	79.0	9.4	8.1	(D)	(D)	(D)	(1)
June	104.6	78.7	8.2	7.3	(D)	(D)	0.4	(1)
July	102.3	78.8	7.6	6.6	(D)	(D)	(D)	(1)
August	112.6	85.0	8.0	9.0	(D)	(D)	(D)	(D)
September	111.4	86.7	8.4	8.6	(D)	(D)	(D)	(D)
October	133.6	106.1	9.7	9.1	(D)	(D)	(D)	(D)
November	126.8	97.0	9.2	9.3	(D)	(D)	(D)	(D)
December	127.1	96.2	10.0	9.5	(D)	(D)	(D)	1.8
Total	1,392.0	1,057.9	106.5	96.9	(NA)	(NA)	(NA)	(NA)

(D) Withheld to avoid disclosing figures for individual companies. (NA) Not available. (1) Figures withheld pending further investigation.





Gordon Research Offers Lipid Metabolism Conference

The Gordon Research Conferences on Lipid Metabolism will be held at Kimball Union Academy, Meriden, N. H., June 10-14, 1963. The following program has been released.

June 10

Fatty Acids and Sialic Acids

Newer Developments in the Biosynthesis of Fatty Acids, by S. Wakil.

Enzymatic Synthesis and Comparative Biochemistry of Unsaturated Fatty Acids, by K. E. Bloch.

Carnitine and Its Role in Fatty Acid Metabolism, by I. Fritz.

Studies on the Metabolism of the Sialic Acids, by S. Roseman.

June 11

Phosphatides and Other Complex Lipids (A)

Positional Specificities in Phosphatide Synthesis, by W. Lands.

Inositol Phosphatides, by C. Ballou.

Structural and Biosynthetic Studies on Mycobacterial Lipids, I, by E. Lederer.

Complex Glycolipids, by H. E. Carter.

June 12

Functions of Complex Lipids

Phospholipid Metabolism Associated with the Active Transport of β-Thiogalactosides in E. Coli, by H. Nikaido.

Role of Lipids in Mitochondrial Function, by S. Fleischer.

Immunological Activity of Sphingolipids, by M. Rapport.

Phosphates and Other Complex Lipids (B)

Chemistry and Metabolism of the Prostaglandins, by S. Bergstrom.

Structural and Biosynthetic Studies of Mycobacterial Lipids, II, by E. Lederer.

June 13

Lipid Absorption, Storage, Mobilization, and Transport

Role of Lipolysis in the Absorption of Glycerides, by F. Mattson.

Fatty Acid Mobilization and Utilization, by D. Steinberg.

Studies on the Biosynthesis of Plasma Lipoproteins, by J. Marsh.

Tangier Diseases—One of the Newer Genetically Determined Lipid Storage Diseases, by D. Fredrickson.

June 14

Lipids of Insects

Fat Transport in the Locust, by A. Devir.

Utilization of Sterols in Insects, by R. Clayton.

The Obese Mosquito, by E. Van Handel.

(Continued from page 31)

DISAPPEARANCE OF THE CHOLESTEROL MOIETY OF AN INJECTED CHYLOMICRON-CONTAINING FRACTION OF CHYLE FROM THE CIRCULATION OF THE RAT. S. S. Naidoo, W. J. Lossow, and I. L. Chaikoff (Dept. of Physiology, Univ. of Calif., Berkeley). *J. Lipid Res.* 3, 309–13 (1962). A chylomicron-containing, low-density lipoprotein fraction of thoracic duct chyle (S_f classes 20 and higher) obtained from rats fed either cholesterol-4-C^{14} or palmitic acid-1-C^{14} was injected intravenously into rats. Blood samples were obtained every 5 to 10 min for the first 1.5 hr, and thereafter at intervals of 30 min or longer up to 2.5 or 6.5 hr. The disappearance curves for the labeled cholesterol differed strikingly from those for the labeled triglyceride. The latter first declined rapidly and then more slowly. The former consisted of three phases: (1) rapid decline, (2) rising, and (3) leveling off. The first phase of the curves for the cholesterol-labeled, chylomicron-containing chyle fraction results from an initial rapid removal of cholesterol-C^{14} of chylomicrons accompanied by a slow removal of cholesterol-C^{14} that has been transferred intravascularly to higher-density lipoproteins. This phase, during which most of the chylomicron-cholesterol-C^{14} is removed from the circulation, is followed by a period during which labeled free sterol is rapidly recirculated from the liver as higher-density lipoproteins. The greater proportion of the labeled sterol in the plasma lipoproteins during the terminal phase is derived from the sterol that has been recirculated.

THE INCORPORATION OF ACETATE-1-C^{14} INTO THE LIPIDS OF VACUOLATED RAT LIVER CELLS. G. Gaja and A. Bernelli-Zazzera (Inst. of Gen. Pathology, Univ. of Milan, Italy). *Experientia* 18, 122–123 (1962). The results reported indicate that the incorporation of acetate-1-C^{14} into lipids occurs at a normal rate in vacuolated rat liver cells.

NOMENCLATURE OF STEROIDAL SAPOGENINS. G. P. Mueller and G. R. Pettit (Dept. of Chem., Univ. of Maine, Orono). *Experientia* 18, 404–405 (1962). A summary of the personal views of the authors is presented. Errors have been found in the nomenclature rules of 1960. The authors offer a plan to extricate sapogenin nomenclature from the confusion of the past.

IN VITRO RELEASE OF FREE FATTY ACIDS BY ADIPOSE TISSUE IN YOUNG AND OLD NEPHROTIC RATS. H. Altschubr, M. Lieberson, and J. J. Spitzer (Gerontological Res. Inst. and Hahnemann Med. Coll., Philadelphia, Pa.). *Experientia* 18, 418–419 (1962). There is a difference between old and young nephrotic rats in the amount of free fatty acid released by epidielymal adipose tissue. Adipose tissue triglyceride content of nephrotic rats was significantly higher than in normal rats. It was concluded that the primary change in causing nephrotic hyperlipemia is an increased lipid output by the liver and not by adipose tissue.

R_{Mg} VALUES IN THE GAS CHROMATOGRAPHY OF STEROIDS. B. A. Knights and G. H. Thomas (University of Birmingham). *Chem. & Ind. (London)* 1963, 43–4. The relative retention time of a steroid on gas chromatography may be expressed by the equation: Log $r = \Sigma\Delta R_{Mg} + \log r_N$ where r_N is the relative retention time of the steroid nucleus and R_{Mg} is the change in Log r brought about by the introduction of the group (g) into the nucleus.

THE SIGNIFICANCE OF SERUM TRIGLYCERIDES. Margaret J. Albrink (West Virginia University). *J. Am. Dietet. Assoc.* 42, 29–31 (1963). If a man is found to have a high level of triglycerides in his serum, the odds are good that he is a middle-aged, weight-gaining, coronary-prone male with a family history of coronary artery disease or diabetes. He may respond to a low-fat, high-carbohydrate diet by a further increase in triglyceride concentration. These findings indicate the fallacy of the determination to lower serum cholesterol by rigid fat restriction. The author states that the interrelated effects of dietary fat and carbohydrate on total metabolism require further study to evaluate the impact of modern diet on vascular disease.

TOCOPHEROLS IN NUTS. G. Lambertsen, H. Myklestad, and O. R. Braekkan (Norwegian Fisheries Res. Inst.). *J. Sci. Food Agr.* 13, 617–20 (1962). The α- and γ-tocopherol contents of different nuts have been determined spectrophotometrically on chromatographic fractions. Thin-layer chromatography was applied to study the tocopherol pattern. Values for α-tocopherol and γ-tocopherol, respectively, were as follows: filberts 210 and ~15 μg/g nuts; walnuts ~15 and 205; brazil nuts 65 and 110; pecans ~15 and 170; almonds 150 and 5; groundnuts 65 and 110; coconuts 7 and 2.5; chestnuts ~5 and 70.

(Continued on page 36)

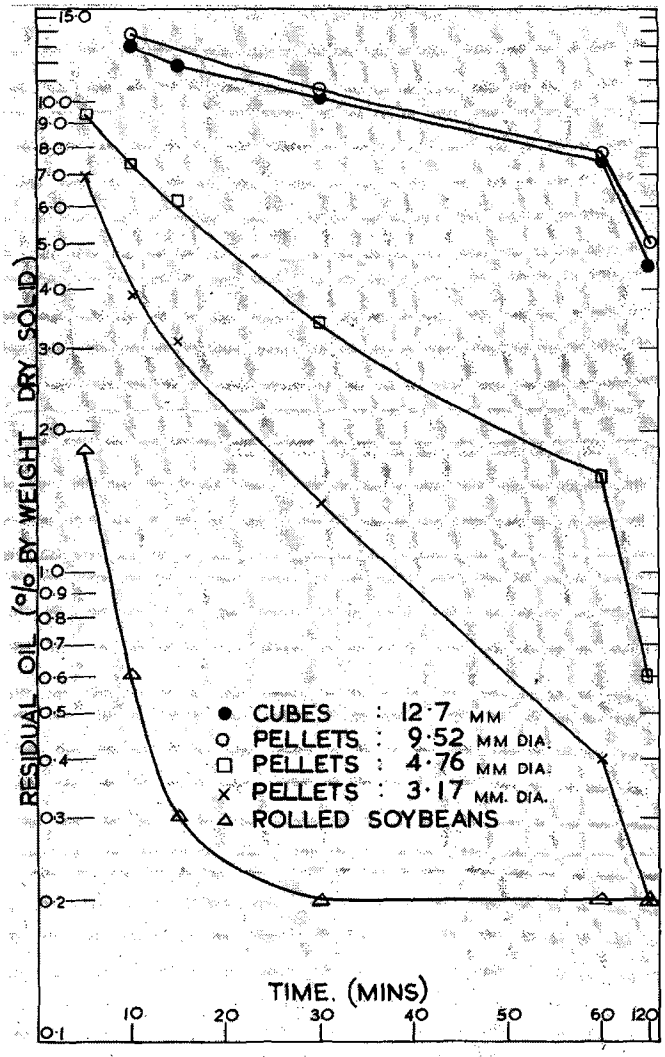


FIG. 1. Effect of pellet size on the comparative extraction rates of rolled and pelleted soybeans with trichloroethylene at 55C.

Solvent Extraction . . .

(Continued from page 22)

to merit further experiments with soybeans on a larger scale.

(b) *Plant scale.* A Simons' Century feed pelleting machine driven at 260 r.p.m. by a 100 H.P. motor was installed to take rolled soybeans routed to the machine via a conditioning kettle and feed worm. The machine output was directed along 36 m of Redler conveyors to a Bibby basket extractor (8) where the oil was extracted with trichloroethylene. Two types of desolventizing equipment were used: a conventional toaster of the type described by Sipos et al. (9) in which 90% of the heat requirements are supplied by live steam and a Bibby steamer relying mostly on jacket heat with live steam to strip the final 2% of solvent.

Rolled soybeans were fed cold to the machine, passing through the kettle where the bulk density was increased from 0.45 g/cc to 0.65 g/cc by agitation. A maximum load of 6½–7 long tons/hr soybeans was attained with a 4.76 mm diam hole die ring at a power consumption of 6 kW. per ton soybeans. The fines content of the pellets from the machine (classified on a 5/20 S.W.G. screen) was 19.0% increasing to 29.0% at the extractor hopper.

From Table II it is seen that the retention value of the fines is higher and bulk density and drainage lower than the corresponding pellets so it would be preferable to screen out fines and recirculate to the kettle. However,

TABLE II

Effect of Fines on Bulk Density, Drainage Rate, and Solvent Retention of 4.76 mm diam Soybean Pellets

	Bulk density	Drainage rate	Solvent retained
	g/cc	*cc sq cm /sec*	*g/g oil free meal*
Feed to pelleting M/c	0.65	0.047	1.26
Pellets/fines mixture	0.65	>2.44	0.54
Pellets	0.65	>2.44	0.53
Fines	0.58	0.232	0.72

the extraction rate is faster than pellets, therefore as we were limited with this extractor as regards miscella recirculation the retarding effect of solvent drainage through the pellets was useful in prolonging the contact time.

Residual oil results of 1.0–1.5% were achieved with an extraction time of 64 min; the actual level varied slightly with the pellet length but corresponded to the forecast values from rate determinations. Desolventizing proceeded satisfactorily by both processes, i.e. through the D.T. and the Bibby steamer. The meal was slightly overtoasted based on the analyses (protein (46.8%, water soluble protein 3.78%, urease activity 29.2 mg urea destroyed by 1 g meal, residual trichloroethylene (0.02%), and contained approximately 40% of pellets of modified shape. Maximum plant throughput was increased by 50–60% without adjusting the steam consumption. This capacity increase was greater than predicted and was attributed to a more even feed, better distribution and depth tolerance in the buckets.

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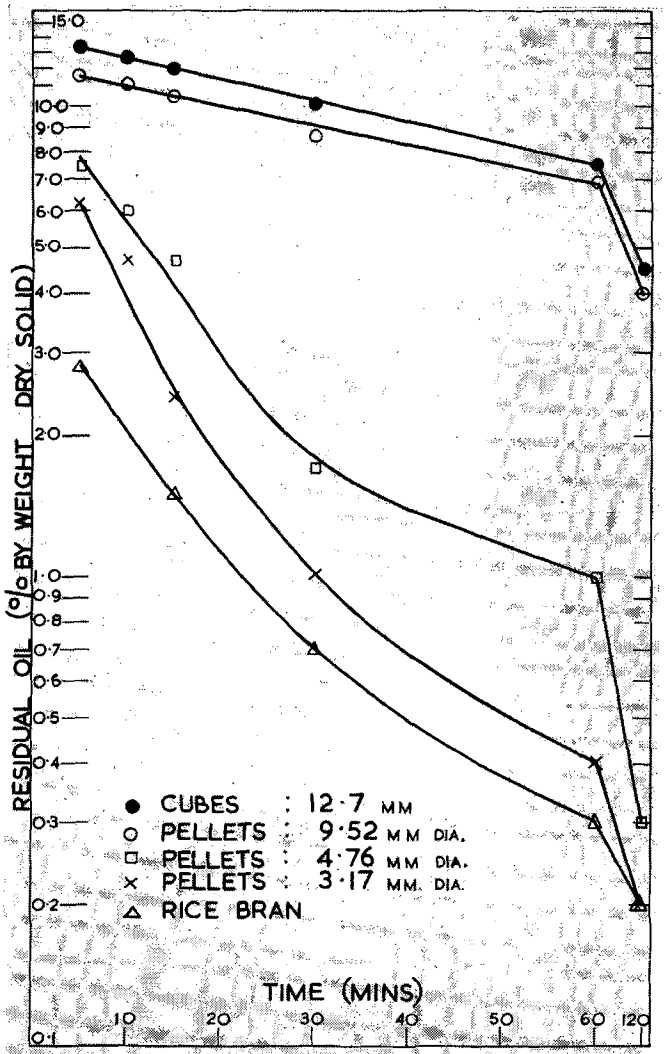

FIG. 2. Effect of pellet size on the comparative extraction rates of rice bran and pelleted rice bran with trichloroethylene at 55C.

Crude Glycerine Production Rises

According to the U.S. Department of Commerce, production of crude glycerine (including synthetic) for the month of January 1963 was 22.5 million lb, up 0.4 million lb from December, but down 0.1 million lb from crude production reported for January 1962.

The crude glycerine stocks figure for December 1962, originally stated at 29.0 million lb, has been revised downwards to 24.7 million lb, now placing the total December stocks level at 53.2 million lb. Crude and refined stocks in the producers' hands totalled 55.8 million lb at the end of January, up 2.6 million lb from the revised December figure, but down 11.5 million lb from January last year.

JANUARY
(Million lb)
Preliminary

Factory Production			Factory & Warehouse Stocks (Producers *)	
Glycerine 100% Basis	Jan. 1963	% Change from Dec. 1962	End of Jan. 1963	% Change from Dec. 1962
Crude	22.5 *	+ 1.8	22.9	— 7.3
Refined, all grades	23.1	+ 8.5	32.9	+ 15.4
			55.8	+ 4.9

* Includes synthetic glycerine.

PRODUCTION OF ETHYLENE GLYCOL, PROPYLENE GLYCOL & PENTAERYTHRITOL
(Millions of lb)

	Ethylene Glycol	Propylene Glycol	Pentaerythritol	Total **
Year				
1957	1,199.9	98.4	56.5	1,354.9
1958	1,145.5	42.0 [b]	53.3	1,240.8
1959	1,214.6 [a]	151.5 [a]	64.1 [a]	1,430.2
1960	1,297.3 [c]	152.0 [c]	64.3 [c]	1,513.5
1961	1,183.3	160.3	62.4	1,406.0
1962 [d]	1,211.0	177.1	62.1	1,450.1
1960				
November	104.9	8.7	5.2	118.8
December	108.8	.....	5.1	113.8
1961				
January	119.5	12.0	5.5	137.0
February	101.0	12.7	4.4	118.1
March	101.3	14.0	5.3	120.7
April	95.7	14.1	5.4	115.3
May	98.4	15.4	5.3	119.1
June	97.0	15.1	5.1	117.2
July	94.4	16.0	4.6	115.1
August	99.3	15.3	5.0	119.7
September	87.7	10.7	5.2	103.6
October	97.5	12.3	5.9	115.6
November	95.2	10.8	4.9	110.9
December	97.3	11.9	5.1	114.3
1962				
January	91.3	19.1	5.8	116.1
February	80.8	15.4	4.5	100.7
March	87.9	16.0	4.7	108.5
April	88.8	12.2	5.0	106.0
May	98.4	17.2	4.8	120.4
June	103.7	13.6	4.5	121.7
July	119.1	13.2	4.9	137.2
August	122.0	12.7	5.4	140.0
September	106.4	13.0	5.5	124.9
October	112.9	9.9	6.6	129.4
November	114.4	23.4	5.5	143.3
December	117.9	16.8	4.9	139.6

** Totals may not agree exactly because of independent rounding of figures.

[a] Revised, but does not agree with total of monthly figures.

[b] Incomplete—sum of five monthly figures only. Tariff Commission did not publish an official 1959 annual figure for propylene glycol.

[c] Official figure, but does not agree with total of the months.

[d] Official, preliminary totals. Figures shown for ethyene glycol and propylene glycol do not agree with the total of individual monthly figures.

• *Obituaries*

C. N. Andersen (1946-60), Ossining, N. Y., passed away December 22, 1961. He maintained a consulting research laboratory for ten years immediately perceding his death. One of the best known chemists in the East, Dr. Andersen held more than 175 U. S. and foreign patents.

E. B. Kester (1940-60), Berkeley, Calif., died February 16, 1963. He has served as a research chemist with the U. S. Department of Agriculture's regional laboratory in

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FATTY ACID COMPOSITION OF THE MILK FAT OF THE ELAND ANTELOPE (TAUROTRAGUS ORYX). S. H. W. Cmelik (Liebig's [Rhodesia] Ltd.). *J. Sci. Food Agr.* 13, 662–5 (1962). The acetone-soluble milk fat of the eland has been analyzed. Myristic, palmitic, and stearic acids are the most prominent among the saturated acids. No lauric acid was detected. The presence of C_{12}–C_{18} monoenic acids was confirmed. Polyunsaturated acids, both conjugated and non-conjugated, were also present in small quantities. A glyceride identical with palmito-distearin has been isolated.

SEED FATS OF THE NEW ZEALAND AGAVACEAE. Isobel M. Morice (Dept. of Scientific & Industrial Research, Wellington). *J. Sci. Food Agr.* 13, 666–9 (1962). The seed fats of 5 species of *Cordyline* and 2 species of *Phormium*, the only New Zealand genera of the family *Agavaceae*, have been shown to be similar in fatty acid composition, containing the following ranges of fatty acids: linoleic acid 75–89%, oleic acid 5–16%, palmitic acid 3–11%, and stearic acid 1–3%.

HYDROGENATED TALLOWPERHYDROSQUALENE DERMATOLOGICAL EXCIPIENT. P. L. V. Monot. *U. S. 3,069,324.* An excipient of dermatological use comprises a mixture of 15–40% by weight hydrogenated tallow and 85–60% by weight perhydrosqualene.

WATER-DISPERSIBLE LECITHIN. G. W. Cogswell (A. E. Staley Mfg. Co.). *U. S. 3,069,361.* An aqueous dispersible lecithin composition comprises from 90 to 99 parts by weight lecithin and from 10 to 1 parts of a vegetable oil-soluble nonionic alkylated phenoxy compound in which the alkyl group contains from 6 to 18 carbon atoms.

PARENTERAL AQUEOUS SOLUTIONS OF FAT-SOLUBLE VITAMINS. J. D. Mullins and T. J. Macek (Merck & Co.). *U. S. 3,070,499.* The described solution comprises a fat-soluble vitamin active substance and, as a solubilizing agent, a condensation product of castor oil and ethylene oxide (20–40 moles ethylene oxide per mole of castor oil). The condensation product is present in the solution in an amount of from 5 to 25 milligrams of fat-soluble vitamin active substance.

PROCESS FOR PREPARING STABLE ALCOHOLIC EMULSION OF GRAPE SUGAR. C. H. Buer. *U. S. 3,070,500.* A process for preparing stable alcoholic emulsions of therapeutically useful glycerine difatty acid phosphoric acid amino alcohol esters comprises adding a glycerine difatty acid phosphoric acid amino alcohol ester to a boiling aqueous alcoholic solution containing at least 10% grape sugar and stirring the mixture at a temperature of 82–87C until an emulsion has been formed. The ratio of ester and sugar is so adjusted that the obtained emulsion contains at least 10% of the ester and at least 6% sugar.

EFFECTS OF STARVATION ON THE CARDIOVASCULAR SYSTEM OF THE CHICKEN. J. A. Vogel and P. D. Sturkie (Rutgers Univ., New Brunswick, N, J.). *Proc. Soc. Exp. Biol. Med.* 112, 111–113 (1963). Acute starvation of chickens produces a drop in heart rate, blood pressure and cardiac output. The decline in heart rate, which is influenced by excitement and handling of the bird may be due to enhanced vagal tone.

EFFECT OF AGE AND RESTRAINT ON POSTPRANDIAL LIPEMIA CLEARANCE IN DOGS. H. Sobel and H. V. Thomas (Veterans Admin. Hosp., Sepulveda, and St. Joseph Hosp., Burbank, Calif.). *Proc. Soc. Exp. Biol. Med.* 112, 206–209 (1963). A meal containing 1 g of lard per pound body weight in a meat patty was given to male mongrel dogs after a 16-hour fast. Lipemia clearance was observed in dogs of 4 age groups as follows: Group 1, less than 1 year; Group 2, 1 to 3 years; Group 3, 4 to 8 years and Group 4, over 9 years. Peak lipemia was apparent after 4 hours in Group 1–3 and was greater in Group 2 than in Group 1 and in Group 3 than in Group 2. In Group 4 dogs peak lipemia occurred later than in the others but was not as great as that observed in Group 3.

ACCELERATED INCREASE IN EGG WEIGHT OF YOUNG PULLETS FED PRACTICAL DIETS SUPPLEMENTED WITH CORN OIL. J. V. Shutze, L. S. Jensen and J. McGinnis (Dept. of Poultry Sci., Washington State Univ., Pullman). *Poultry Sci.* 41, 1846–1851 (1962). Four experiments were conducted with S. C. White Leghorn pullets fed practical diets containing different cereal grains with and without corn oil. During the first 6 to 8 weeks of production, supplementation with corn oil consistently improved average egg weight, regardless of the cereal grain used. Differences among cereal grains were generally correlated with energy concentration, except for milo and oats. Corn oil did not stimulate egg weight significantly when compared to an isocaloric diet containing tallow.

THE EFFECTS OF COTTONSEED OIL AND COTTONSEED OIL DERIVATIVES ON THE QUALITY OF EGGS STORED AT 30 AND 60F FOR VARYING PERIODS OF TIME. W. F. Pepper, E. S. Snyder, I. R. Sibbald and S. J. Slinger (Dept. of Poultry Sci. and Nutr., Ontario Agricul. College, Guelph, Ontario, Can.). *Poultry Sci.* 41, 1943–1946 (1962). An experiment was conducted to study the effects of the dietary inclusion of cottonseed oil, acidulated cottonseed soap-stocks and cottonseed still bottoms on the interior quality of eggs stored at either 30 or 60F. Eight diets were formulated, each of which was fed to 4 replicated pens of 10 pullets for a period of 20 days. During the latter 10 days, eggs were collected, marked according to treatment and replicate, and placed in storage. Eggs were broken out after 1, 8, 15, 29, 57 and 113 days of storage. A number of criteria of egg quality deterioration were observed. On the basis of the data collected it would seem unwise, at the present time, to incorporate any of the three products into diets for laying hens.

THE RESPONSE OF FAT DEFICIENT LAYING HENS TO CORN OIL SUPPLEMENTATION. J. E. Marion and H. M. Edwards, Jr. (Dept. of Poultry, Univ. of Georgia, Athens). *Poultry Sci.* 41, 1785–1792 (1962). Two trials, each of 70 days duration, have been conducted with fat deficient laying hens to determine the influence of isocalorically adding corn oil to a low fat diet on various measures of lipid metabolism. A higher rate of egg production was maintained when hens received dietary corn oil but the treatment differences were not statistically significant. Egg weights were significantly increased by corn oil feeding but no differences in the dry matter, total lipid content or major lipid components in the egg were attributable to diet treatment. The total weight, dry matter and lipid content of the liver, in addition to plasma lipids into glycerides, phospholipids, cholesterol and cholesterol esters showed that corn oil feeding resulted in a lower glyceride content in the plasma and liver. Adding dietary fat appeared to widen the ratio of esterified to free cholesterol in the plasma while having little influence on the total content of cholesterol. Total liver cholesterol was reduced by dietary corn oil. Hatchability of fertile eggs and progeny growth were each found to be significantly increased when supplementary fat was added to the low fat diet.

EFFECTS OF LONG-TERM FEEDING OF VEGETABLE FATS ON ATHEROSCLEROSIS. H. B. Lofland, Jr. and T. B. Clarkson (Dept. of Biochem., and the Vivarium, Bowman Gray School of Med., Wake Forest College, Winston-Salem, N. C.). *Proc. Soc. Exp. Biol. Med.* 112, 108–111 (1963). White Carneau pigeons were maintained for 26.5 months on cholesterol-free diets (pigeon pellets). When such diets were supplemented with 10% hydrogenated shortening aortic atherosclerosis and the level of aorta cholesterol were less than in birds receiving no supplement, or 10% safflower oil. Serum cholesterol levels were not different in these 3 groups. When other groups were maintained on diets containing 1% cholesterol for 6 months, the severity of atherosclerosis was increased, and inclusion of 10% safflower oil in the diets exerted no prophylactic effect. When cholesterol was removed from the diets, and the birds were maintained for an additional 12 months on either pellets alone, or pellets plus 10% safflower oil, there was no decrease in the level of aorta cholesterol and a slight decrease in aortic atherosclerosis.

CHOLESTEROL CONTENT OF HUMAN SERUM LIPOPROTEINS OBTAINED BY DEXTRAN SULFATE PRECIPITATION AND BY PREPARATIVE ULTRACENTRIFUGATION. D. Kritchevsky, S. A. Tepper, P. Alaupovic and R. H. Furman (Wistar Inst. of Anatomy and Biology, Philadelphia, Pa., and Oklahoma Med. Res. Inst., Oklahoma City). *Proc. Soc. Exp. Biol. Med.* 112, 259-262 (1963). A comparison of cholesterol levels of α- and β-lipoprotein of human serum obtained by dextran sulfate precipitation compares well with analysis of lipoproteins obtained by ultracentrifugation. Comparison of dextran sulfate from 2 different sources gave identical results. The presence of oxalate may interfere with the analysis of β-lipoprotein cholesterol, but this can be avoided by using analytical methods which entail digitonide precipitation.

ACTIVITY OF VITAMIN K_1 AND MENADIONE SODIUM BISULFITE COMPLEX WHEN MEASURED BY MORTALITY OF CHICKS WITH CECAL COCCIDIOSIS. R. H. Harms, P. W. Waldroup and D. D. Cox (Florida Agricultural Exper. Stations, Gainesville, Fla.). *Poultry Sci.* 41, 1836–1839 (1962). Four experiments conducted with day old Vantress X White Plymouth Rock chicks indicated the relative activity of vitamin K_1 on a weight basis, to be three times that of menadione sodium bisulfite complex when measured by mortality from cecal coccidiosis. Although an inverse relationship existed between vitamin K activity in the diet and mortality from coccidiosis, this did not appear

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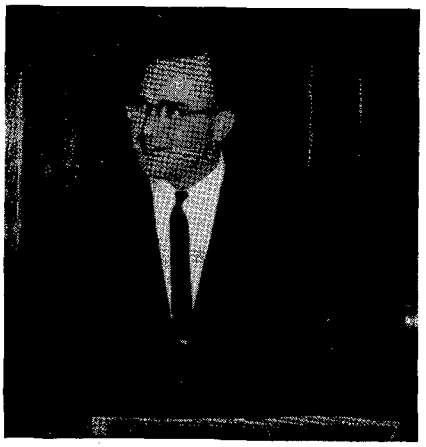
Local Section News. . .

(Continued from page 23)

Mr. Marshack advised that "Doc" MacGee and C. H. Hauber, AOCS Executive Secretary, will be present at the April 2, 1963—Second Symposium of the Northeast Section. The Symposium affords an interesting subject matter to compliment the variety presented in the first Symposium. We all thank Oscar Ackelsberg and his Committee for the wonderful job in soliciting such a formidable group of speakers. We hope to top the attendance at the First Symposium, and look forward to a successful meeting.

Next, the Chairman for the evening, E. A. Lawrence, was presented. We all wish him the best in his new position with Union Carbide. Mr. Lawrence introduced the speaker, L. R. Driscoll of Blaw Knox, who spoke on "Trends in Instrumentation." Mr. Driscoll discussed the specific tools of the trade presently used in measuring flow, analyzing and pneumatics. He also discussed the future relative to instrumentation and predicted more activity in process control.

The evening was enjoyed by all, and the entire Section looks forward to the all-day Symposium on April 2, 1963.



D. B. Lake, Du Pont Co., seen delivering his talk entitled "Recent Developments in Amine Oxide Chemistry," at the December Meeting of the AOCS Northeast Section December 4.

D. S. Bolley (left), candidate for AOCS Board Member at Large, enjoys dinner at the February 5 Northeast Section Meeting with Meeting Chairman E. A. Lawrence and L. R. Driscoll, speaker for the evening. Mr. Lawrence (right) spoke on "Trends in Instrumentation."

• *New Products*

FISHER SCIENTIFIC, Pittsburgh, Pa., has introduced the C-H-N/Analyzer, which performs simultaneous determination of carbon, hydrogen and nitrogen at milligram levels. The Analyzer has been designed for maximum stability and combines a Pregl combustion train furnace, a gas chromatograph, and a solid-state frequency-converter.

PERKIN-ELMER CORP., Norwalk, Conn., has announced the development of a new Atomic Absorption Spectrophotometer. The new Spectrophotometer will bring simplicity and speed to routine analyses, and is expected to offer advantages in the analyses required by many different fields.

ANALYTICAL MEASUREMENTS, INC., Summit, N. J., recently announced the development of the Titra-Kit, a simplified and compact instrument package

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to be a satisfactory assay of the vitamin K activity of the diet. Coccidiosis did not appear to increase the chicks' requirement for vitamin K.

THE RAPID INCORPORATION OF PHOSPHATE INTO MITOCHONDRIAL LIPIDS. J. Garbus, H. F. DeLuca, M. E. Loomans, and F. M. Strong (Dept. of Biochem., Univ. of Wisconsin, Madison). *J. Biol. Chem.* **238**, 59–63 (1963). Liver and kidney mitochondria catalyze a rapid incorporation of radioactive phosphate into their lipid fraction. This process requires magnesium ion but not substrate, and is inhibited by dinitrophenol, azide, cyanide, antimycin A, Dicumarol, gramicidin, anaerobiosis, and storage of the mitochondria at 4C, but not by oligomycin. An unidentified mitochondrial lipid is labeled more rapidly than is phosphatidic acid. The unknown lipid has some of the properties of a phosphorylated analogue of phosphoinositide. Present evidence makes it unlikely that this material functions as an intermediate in oxidative phosphorylation.

COENZYME Q. XXXVI. ISOLATION AND CHARACTERIZATION OF COENZYME Q_{10} (H-10). P. H. Gale, B. H. Arison, N. R. Trenner, A. C. Page, Jr., and K. Folkers (Merck Sharp & Dohme Research Lab., Division of Merck & Co., Inc., Rahway, N. J.). *Biochemistry* **2**, 196–200 (1963). A new naturally occurring member of the coenzyme Q group has been isolated and crystallized from cells of *Gibberella fujikuroi*. Comparison of ultraviolet, infrared, and nuclear magnetic resonance spectra of this compound with spectra of coenzyme Q_{10} and related known compounds has revealed a structure differing from coenzyme Q_{10} in that the terminal unit in the ten-unit side-chain is isopentanyl, rather than isopentenyl. This new compound is designated coenzyme Q_{10} (H-10).

CHARACTERIZATION OF VITAMIN K_9(H) FROM MYCOBACTERIUM PHLEI. P. H. Gale, B. H. Arison, N. R. Trenner, A. C. Page, Jr., and K. Folkers (Merck Sharp & Dohme Research Lab., Merck & Co., Inc., Rahway, N. J.) and A. F. Brodie (Dept. of Bacteriology and Immunology, Harvard Med. School, Boston, Mass.). *Biochemistry* **2**, 200–203 (1963). A newly characterized naphthoquinone has been isolated from *Mycobacterium phlei*. Spectral data and analytical and papergram results revealed that it is closely related structurally to vitamin $K_{2(45)}$, but differs in that one of the side-chain isoprenoid units is reduced. Nuclear magnetic resonance data also show that the saturated isoprenoid unit is not located at either end of the side-chain. This compound is designated vitamin K_9(H) by the same nomenclature used for the new coenzyme Q_{10}(H-10).

FATTY ACID COMPOSITION OF EMBRYONIC FAT ORGAN LIPIDS. G. L. Feldman, H. T. Jonsson, T. W. Culp and R. H. Gowan (Biochem. Section, Div. of Ophthalmology, Baylor Univ. College of Med., Houston, Texas, and Metabolic Endocrine Research Dept., The Methodist Hospital, Houston, Texas). *Poultry Sci.* **41**, 1851–1857 (1962). The fatty acid composition of embryonic adipose tissue bears a striking resemblance to that of egg fat and not to the fat of the adult chicken. The triglyceride fatty acids are relatively constant and do not reflect the changes associated with embryonic development. However, the phospholipid fatty acids fluctuate widely and appear to be related to the onset of triglyceride synthesis and pipping of the shell. An unidentified fatty acid occurs in all of the phospholipids, in which it comprises a major component.

EFFECTS OF GLUCOCORTICOIDS ON METABOLISM OF ADIPOSE TISSUE IN VITRO. J. N. Fain, R. O. Scow, and S. S. Chernick (Lab. of Nutrition and Endocrinology, National Institute of Arthritis and Metabolic Diseases, NIH, Bethesda 14, Md.). *J. Biol. Chem.* **238**, 54–58 (1963). Dexamethasone at very low concentrations, 10^{-8} to 10^{-7} *M*, increased the release of fatty acid by incubated parametrial and mesenteric adipose tissue. Corticosterone at 10 times the above concentrations produced similar effects. 2α-Methylcortisol was as potent as corticosterone, whereas 2α-methylcortisone was ineffective. Deoxycorticosterone had little effect on fatty acid release. Glucose uptake and its conversion to carbon dioxide, total lipid, and fatty acid was decreased by glucocorticoids. Addition of small amounts of insulin (4 milliunits per ml) to the media reversed the effects of dexamethasone on fatty acid release and glucose uptake in parametrial adipose tissue. The onset of action of glucocorticoids was slow; at least 2 hours of incubation were required before dexamethasone had any effect on adipose tissue.

INULIN AND SUCROSE DISTRIBUTION IN TISSUES OF VITAMIN E-DEFICIENT AND CONTROL RABBITS. J. F. Diehl and J. K. Bissett (Dept. of Biochem., Univ. of Arkansas Med. Center, Little Rock). *Proc. Soc. Exp. Biol. Med.* **112**, 173–176 (1963). Inulin and sucrose space were determined under *in vivo* conditions in 4 tissues of vitamin E-deficient and vitamin E-supplemented rabbits, and inulin space was determined in the same tissues of starved rabbits. In vitamin E-deficient, but not in starved animals, a significant increase in inulin and sucrose space of skeletal muscle was found. Whether this increase reflected an actual increase of the extracellular fluid compartment or was caused by increased permeability to the saccharides, could not be established. It was concluded that if there was an actual increase of extra-cellular space in the dystrophic muscle, this increase was not greater than by a factor of 2. Inulin space in livers of all 3 experimental groups was very variable and in most cases much higher than average sucrose space.

THE OCCURRENCE OF CYTOCHROME AND COENZYME Q IN THIOBACILLUS THIOOXIDANS. T. M. Cook and W. W. Umbreit (Dept. of Bacteriology, Rutgers—The State Univ., New Brunswick, N. J.). *Biochemistry* **2**, 194–196 (1963). The existence of a cytochrome system and coenzyme Qs has been demonstrated in *Thiobacillus thiooxidans* and *Thiobacillus thioparus*. Cytochrome 550 of *T. thiooxidans* has an absorption spectrum resembling that of cytochrome c. The coenzyme Qs content of *T. thiooxidans* was estimated to be 4.3 μmoles (3.2 mg) per gram of dry weight.

EFFECT OF DIETARY FAT ON THE DISPOSITION OF CHOLESTEROL-4-C^{14} IN RATS. J. G. Coniglio, F. R. Blood, W. Youmans, L. Gibson and N. Warnock (Dept. of Biochem., Vanderbilt Univ. School of Med., Nashville, Tenn.). *Proc. Soc. Exp. Biol. Med.* **112**, 140–144 (1963). Rats were maintained for 30 to 76 days on a purified diet containing 20% fat as hydrogenated cottonseed oil, corn oil, or coconut oil and then injected intravenously with a tracer dose of cholesterol-4-C^{14}. In the 6 days following injection higher excretion of C^{14} was observed in animals maintained on hydrogenated cottonseed oil. Of the activity extracted by petroleum ether after saponification, a lower percentage was present in the digitonin-precipitable fraction in animals fed coconut oil. Smaller amounts of cholesterol were excreted by the coconut oil-fed rats. No consistent differences were observed in total C^{14} activity of various organs of the different dietary groups at any time period; Neither serum cholesterol nor serum C^{14} activity was affected by variation of the type of dietary fat given these rats.

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Solvent Extraction . . .

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Using a 3.2 mm diam hole die ring a maximum throughout of 3½–4 T/hr of cold pelleted soybeans was achieved with a power consumption of 8.5 kW./ton soybean. Harder pellets were produced with less fines e.g. 7% at the machine and 10% after conveying to the extractor. To maintain production we were forced to run with added flakes on these tests, however, pellets separated from the extracted meal, analyzed at 0.8% oil after a 64 min extraction time. Throughput was increased by 40–50% for the same steam consumption. Unfortunately we were not able to measure the heat savings precisely, on the other hand, the increased throughput for the same steam consumption coupled with a reduction in moisture of the toaster outlet meal from 22–24% to 19% are both indications of the potential economies.

The foregoing work was carried out with trichloroethylene as solvent. In the middle of the tests the project had to be re-appraised as a solvent change to hexane was envisaged. As the steam processing costs for hexane are only two thirds of the costs for trichloroethylene the steam economy is not so great. On the other hand, the extraction rate of soybeans with hexane is faster than with trichloroethylene (Fig. 3). Hence the extraction cycle can be reduced or a larger pellet used thus reducing pelleting costs. The advantages are set out below for a hexane plant combined with a D.T.

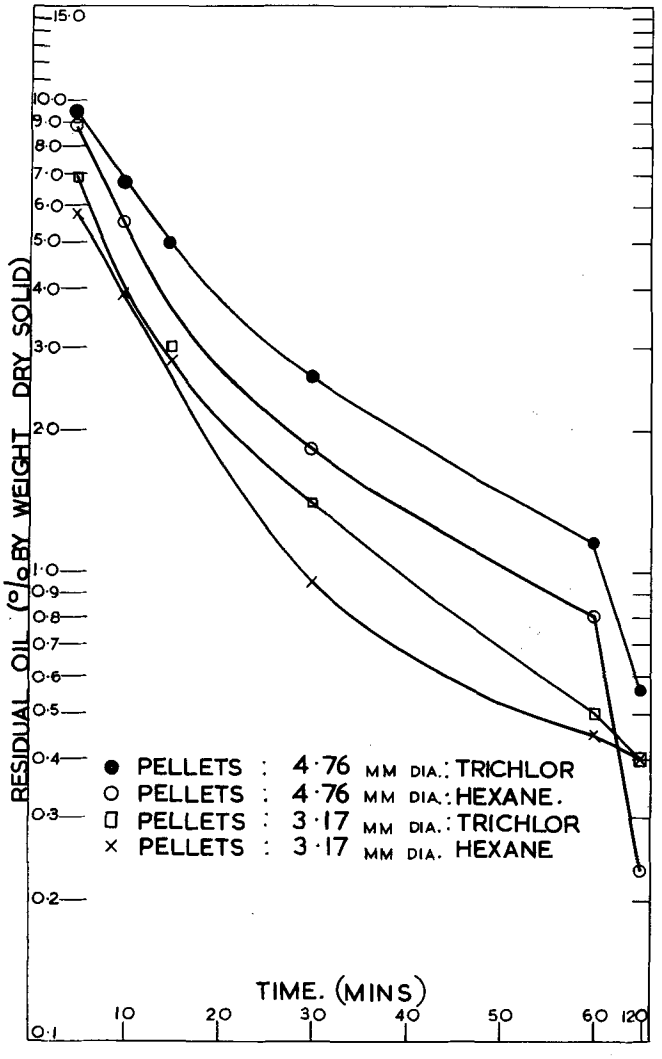

FIG. 3. Comparative extraction rates of soybean pellets with trichloroethylene and hexane at 55C.

Advantages of Soybean Pellets on a Hexane Plant

(a) For a given throughput the volumetric size of the extractor can be reduced by 25–30%. The increased drainage rate through a bed of pellets means the drainage time can be shortened and the extraction time lengthened to counteract a slightly slower extraction rate than on rolled soybeans.

(b) Steam saving in D.T.

Theoretical heat requirements for rolled soybeans at 0.44 W./W. retention of hexane = 19.2×10^4 B.t.u.'s per ton soybeans.

Theoretical heat requirements for 3.2 mm diam soybean pellets at 0.26 W./W. retention of hexane = 13.8×10^4 B.t.u.'s per ton soybeans. Assuming 150% of the theoretical heat is required the saving is about 85 lb steam/ton soybeans.

(c) The product from a D.T. is of relatively high moisture content and largely depends on the solvent used, the inherent moisture of the seed, the solvent retention of the meal entering the D.T., the extent of drying with the excess of superheated steam required for desolventization, and flashing in the exit worm. The reduced hexane retention on pellets would reduce the exit moisture from 18–19% to 15% which would require less steam to dry down to the customary 12%.

(d) With less static hold-up of solvent a lower solvent ratio can be used, morever, the very considerable reduction in air input to the extractor entails lower costs for exhaust solvent recovery. Both factors will contribute to an overall reduction in solvent loss.

(e) A smaller D.T. is required due to the reduced volume of material and of solvent to be evaporated.

(f) Reduced fines in miscella.

(g) A less dusty compacted product which may be of importance for plant using superheated solvent vapor desolventizers where fines are troublesome.

Discussion

This work has shown the feasibility of processing soybeans and rice bran in pelleted form compared with the more usual flaked or finely rolled material. With soybeans in particular, the plant scale tests showed that the Bibby basket extractor and steamer could be run at an increased capacity of 40–50% for the same steam costs. Using 3.2 mm diam pellets and an extraction time of 64 min the residual oil in the marc is not increased.

Consideration of the advantages of pelleting soybeans, rice bran (or any other material) will have to be offset against the cost of pelleting; the balance will no doubt vary both nationally and internationally. The life of a 3.2 mm diam hole die on soybeans—a major pelleting cost—was estimated as at least five times its normal life on animal feeds. The cost of the pelleting machines should be offset by savings in plant size when new plant is considered. The process however is thought to be most valuable for increasing the capacity and reducing costs of existing plant whether working with trichloroethylene or hexane. The choice of pellet size will depend on local conditions such as extraction cycle, residual oil requirements, etc. In general as pelleting costs are inversely proportional to size the largest acceptable pellets should be used.

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REFERENCES

1. Karnofsky, G., JAOCS, *26*, 564–569 (1949).
2. Hutchins, R. P., *Ibid.*, *33*, 457–462 (1956).
3. American Soybean Assoc., Soybean Blue Book, Executive Office, Hudson, Iowa, 1961, p. 60.
4. Oetken, F. A., (Metallgesellschaft Aktiengesellschaft), Germany, 970, 855 (1958).
5. Boucher, D. F., J. C. Brier, and J. O. Osburn, Trans. Am. Inst. Chem. Engrs., *38*, 967 (1942).
6. Clark, S. P., and A. C. Wamble, JAOCS, *29*, 56–59 (1952).
7. The Fertilisers and Feeding Stuffs Regulations, H.M.S.O. (London), 1960, p. 52.
8. Bibby, J. E. (J. Bibby & Sons, Ltd.), Gt. Britain, 618,780 (1949).
9. Sipos, E., and N. H. Witte, JAOCS, *38* (No. 3), 11–19 (1961).