terial was precipitated by evaporating the acidified tincture and redissolving the residue in water. The results obtained by this assay were slightly higher than by other methods, due probably to the shorter procedure.

8. The use of potassium dichromate as a precipitating agent as suggested by Kolthoff and Lingane (2) was satisfactory for solutions of either strychnine or brucine salts alone, but not for mixtures of the two. Because of this nothing was done to adapt it to the tincture of Nux Vomica.

9. Potassium iodide T.S., with or without the buffer solutions tried, is of no value as a quantitative precipitant for strychnine.

10. Quantitative precipitation of strychnine from solutions of its salts, and from mixtures of strychnine and brucine salts, by the use of normal sodium hydroxide was reasonably efficient. The discrepancies in percentage recovery of strychnine would probably become less with continued work in handling such small amounts of material.

It is suggested that the principle utilized may be employed to good advantage with other alkaloidal drugs in which there exists a difficult problem of separation of two similar components. Elgazin (5) and Baker and Jordan (10) have already suggested applications of this type.

11. A solution containing 0.1470 Gm. of strychnine sulfate in 100 cc. (0.1150 Gm. of strychnine) had a determined p_H of 5.79 using a Beckman p_H meter. A brucine sulfate solution containing 0.1350 Gm. in 100 cc. (0.1150 Gm. of brucine) had a p_H value of 6.1. The use of chlorphenol red, bromcresol purple and para nitrophenol as differential indicators proved unsuccessful.

12. The approximate titration curves of brucine and strychnine were determined. A study of the curves shows why the indicators were unsuccessful, and also why buffers cannot be used.

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Hydrogenated Oil as an Ointment Base. III. Potassium Iodide Ointment*

By George W. Fiero†

Potassium Iodide Ointment of the N. F. V was prepared with benzoinated lard as a base. Even though the ointment contained one per cent of sodium thiosulfate, it soon developed a yellow color due to oxidation of potassium iodide to form free iodine. This is due to rancidity of the lard. In rancidity peroxides are formed; one test for rancidity is to shake the molten fat with potassium iodide solution—the liberation of free iodine being an indication of rancidity. Obviously, a potassium iodide ointment must be prepared with a fat which will not readily rancidify. The product of the N. F. VI overcomes this through the use of lanolin and petrolatum. The former may be allergic to some skins; the latter is said to be nonabsorbent.

Hydrogenation of oils, by reducing those fatty glycerides most susceptible to oxidation, results in a product which is less susceptible to rancidity. These products, unlike petrolatum and wool fat, are true fats and by proper degree of hydrogenation may be obtained with almost any desired melting point. The hydrogenated oils used in these

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experiments are more fully described in a previous paper (1).

EXPERIMENTAL

Ointments of potassium iodide were made according to the following modification of the N. F. formula:

Potassium Iodide	10 Gm.
Sodium Thiosulfate	1 Gm.
Water	9 cc.
Hydrogenated Oil	80 Gm.

In order to obtain an accelerated deterioration test, the sodium thiosulfate was omitted in one series.

The ointments were prepared by stirring the aqueous solution with the molten fat until solid. The solid material was then placed in round-lacquered containers, 43 mm. in diameter and 9 mm. deep. These were exposed to light and air uncovered so as to obtain rapid deterioration.

One series (1) prepared without sodium thiosulfate was exposed (*a*) in diffused light; and (*b*) near a south window (March). A second series (2) prepared with sodium thiosulfate was exposed as above; the data are contained in Table I.

Since the aqueous solution of potassium iodide does not readily incorporate with the fat, emulsions were prepared using the following formula:

Potassium Iodide	10.00 Gm.
Triethanolamine	1.00 Gm.
Water	9.00 cc.
Hydrogenated Oil	80.00 Gm.
Stearic Acid	2.25 Gm.

The stearic acid was melted with the hydrogenated oil and the melted fat incorporated with a warm

Table I.—Hydrogenated Oils in Potassium Iodide Ointment

Hydrogenated Oil	Iodine Value	2 Days	4 Days	6 Days	9 Days	13 Days	17 Days	28 Days	45 Days
1. Without Sodium Thiosulfate									
(a) Diffused Light									
Peanut	73.3	0	T	1	2	3	4	5	5
Soy Bean	70.3	0	0	0	0	0	0	0	0
Cottonseed	66.7	2	3	4	5	5	5	5	5
Sesame	57.7	0	0	0	0	0	0	0	0
Lard	51.0	0	0	0	T	2	3	3	3
Coconut	5.1	0	0	0	0	0	0	T	T
Control (1)	54.2	2	4	5	5	5	5	5	5
(b) Direct Sunlight									
Peanut	73.3	..	4	4	5	5	5	5	..
Soy Bean	70.3	..	2	2	3	3	4	4	..
Cottonseed	66.7	..	4	4	5	5	5	5	..
Sesame	57.7	..	0	T	1	2	2	2	..
Lard	51.0	..	2	3	3	4	5	5	..
Coconut	5.1	..	1	1	2	2	2	2	..
Control (1)	54.2	..	4	4	5	5	5	5	..
2. With 1% Sodium Thiosulfate									
(a) Diffused Light									
Peanut	73.3	0	T	T	1	1	1	1	2
Soy Bean	70.3	0	0	0	0	0	0	0	0
Cottonseed	66.7	1	1	2	2	2	2	2	2
Sesame	57.7	0	0	0	0	0	0	0	0
Lard	51.0	0	0	0	0	T	1	2	2
Coconut	5.1	0	0	0	0	0	0	0	0
Control (1)	54.2	0	0	T	1	1	2	2	2
(b) Direct Sunlight									
Peanut	73.3	..	1	2	2	2	3	4	..
Soy Bean	70.3	..	T	1	1	2	2	2	..
Cottonseed	66.7	..	2	2	3	4	4	4	..
Sesame	57.7	..	0	0	0	T	T	1	..
Lard	51.0	..	1	1	1	2	3	3	..
Coconut	5.1	..	0	0	T	1	2	2	..
Control (1)	54.2	..	2	3	3	3	4	4	..

Legend: (1) = Untreated lard; 0 = white; T = trace of color; 1–5 colors varying from pale yellow (1) to dark amber (5).

aqueous solution of potassium iodide and triethanolamine. An emulsion immediately formed; the mixture was stirred occasionally until cooled. Emulsions were also prepared containing 1 Gm. of sodium thiosulfate. Samples were exposed in the same manner as indicated in Table I. Data are shown in Table II.

The ointments were exposed to ultraviolet light for a period of 15 minutes with intervening periods of five minutes to prevent heating. Emulsified ointments yellowed by ultraviolet were practically colorless after standing in diffused light for 24 hours; this was not true with the non-emulsified ointments. Results are shown in Table III.

Table II.—Hydrogenated Oils Emulsified in Potassium Iodide Ointment

Hydrogenated Oil	Iodine Value	2 Days	4 Days	6 Days	9 Days	13 Days	17 Days	28 Days	35 Days
1. Without Sodium Thiosulfate									
(a) Diffused Light									
Peanut	73.3	0	0	0	0	0	0	0	0
Soy Bean	70.3	0	0	0	0	0	0	0	0
Cottonseed	66.7	0	0	0	0	0	0	0	0
Sesame	57.7	0	0	0	0	0	0	0	0
Lard	51.0	0	0	0	0	0	0	0	0
Coconut	5.1	0	0	0	0	0	0	0	0
Control (1)	54.2	0	0	0	0	0	0	0	0
(b) Direct Sunlight									
Peanut	73.3	..	T	1	5	5	5	5	..
Soy Bean	70.3	..	T	T	1	1	2	3	..
Cottonseed	66.7	..	4	5	5	5	5	5	..
Sesame	57.7	..	0	0	T	1	1	2	..
Lard	51.0	..	0	0	T	1	2	4	..
Coconut	5.1	..	0	0	0	0	0	T	..
Control (1)	54.2	..	0	5	6	5	5	5	..
2. With 1% Sodium Thiosulfate									
(a) Diffused Light									
Peanut	73.3	0	0	0	0	0	0	0	0
Soy Bean	70.3	0	0	0	0	0	0	0	0
Cottonseed	66.7	0	0	0	0	0	0	0	0
Sesame	57.7	0	0	0	0	0	0	0	0
Lard	51.0	0	0	0	0	0	0	0	0
Coconut	5.1	0	0	0	0	0	0	0	0
Control (1)	54.2	0	0	0	0	0	0	0	0
(b) Direct Sunlight									
Peanut	73.3	..	T	1	3	4	4	4	..
Soy Bean	70.3	..	0	0	2	2	2	3	..
Cottonseed	66.7	..	0	T	1	3	3	4	..
Sesame	57.7	..	0	0	0	0	T	1	..
Lard	51.0	..	0	0	1	2	3	3	..
Coconut	5.1	..	0	0	0	0	0	0	..
Control (1)	54.2	..	0	2	5	5	5	5	..

Legend: (1) = untreated lard; 0 = white; T = trace of color; 1–5 colors varying from pale yellow (1) to dark amber (5).

Ultraviolet Light.—The source of light consisted of a mercury-quartz coil 17 cm. in diameter in a circular reflector 25.5 cm. in diameter. The light emitted was over 90% wave-length 2536 Å. Samples of ointment of potassium iodide prepared in the same manner as the previous experiments were placed upon a disk 23 cm. in diameter. The disk was placed 15 cm. from the quartz coil and slowly revolved so that the light would be equalized. The temperature was but little changed, being not more than one degree greater than room temperature. Ozone, of course, was produced by the ultraviolet light.

In order to determine the stability of emulsified ointment of potassium iodide, a number of emulsifying agents were employed in place of triethanolamine stearic acid according to the following formula:

Potassium Iodide	10 Gm.
Water	9 cc.
Emulsifying Agent	.....
Hydrogenated Cottonseed Oil (I. V. 66.7)	80 Gm.

Duplicate ointments were prepared using lard (I. V. 54.2) in place of the hydrogenated cottonseed oil

Table III.—Effect of Ultraviolet Light on Potassium Iodide Ointment

Hydrogenated Oil	Iodine Value	15 Min.	30 Min.	45 Min.	60 Min.	75 Min.	90 Min.	105 Min.	120 Min.	135 Min.	150 Min.
1. Not Emulsified											
(a) Without Sodium Thiosulfate											
Peanut	73.3	T	+	+	+	+	+	+	+	+	+
Soy Bean	70.3	–	–	–	T	T	+	+	+	+	+
Cottonseed	66.7	T	T	+	+	+	+	+	+	+	+
Sesame	57.7	–	–	–	–	–	–	–	–	–	–
Lard	51.0	–	–	T	+	+	+	+	+	+	+
Coconut	5.1	–	T	+	+	+	+	+	+	+	+
Control (1)	54.2	+	+	+	+	+	+	+	+	+	+
(b) With Sodium Thiosulfate											
Peanut	73.7	–	–	–	–	–	T	T	T	T	T
Soy Bean	70.3	–	–	–	–	–	–	–	–	–	–
Cottonseed	66.7	–	–	–	–	–	–	–	–	–	T
Sesame	57.7	–	–	–	–	–	–	–	–	–	–
Lard	51.0	–	–	–	–	–	–	–	–	–	–
Coconut	5.1	–	–	–	–	–	–	–	–	–	–
Control (1)	54.2	–	–	–	–	–	T	T	T	+	–
2. Emulsified											
(a) Without Sodium Thiosulfate											
Peanut	73.3	–	–	–	–	T	T	+	+	+	+
Soy Bean	70.3	–	–	–	–	–	–	–	–	–	–
Cottonseed	66.7	–	T	T	T	T	T	T	T	T	T
Sesame	57.7	–	–	–	–	–	–	–	–	–	–
Lard	51.0	–	–	–	–	–	–	–	–	–	–
Coconut	5.1	–	–	–	–	–	–	–	–	–	–
Control (1)	54.2	–	T	T	+	+	+	+	+	+	+
(b) With Sodium Thiosulfate											
Peanut	73.3	–	–	–	–	T	T	T	T	T	T
Soy Bean	70.3	–	–	–	–	–	–	–	–	–	–
Cottonseed	66.7	–	–	–	–	–	–	–	–	–	–
Sesame	57.7	–	–	–	–	–	–	–	–	–	–
Lard	51.0	–	–	–	–	–	–	–	–	–	–
Coconut	5.1	–	–	–	–	–	–	–	–	–	–
Control (1)	54.2	–	–	–	–	–	–	–	–	–	–

Legend: (1) = untreated lard; – = white; T = trace of color; + = definite color.

The following emulsifying agents were employed:

(1) Triisopropanolamine, 1 Gm.—stearic acid, 2.25 Gm.

(2) Mixed Isopropanolamines, 1 Gm.—stearic acid, 2.25 Gm.

(3) Castile Soap (Sapo, U. S. P.), 1 Gm.

(4) Soft Soap (Sapo Mollis, U. S. P.), 1 Gm.

(5) Borax (Sodium Borate, U. S. P.), 0.5 Gm.

Samples were exposed in the same manner as previously recorded; data are shown in Table IV.

Nine different hydrogenated cottonseed oils obtained from various manufacturers (1) and having different iodine values were used as bases for potassium iodide ointment using the formula:

Potassium Iodide	10 Gm.
Water	9 cc.
Hydrogenated Oil	80 Gm.

The samples were exposed in the same manner as previously recorded; the data are shown in Table V.

Since the results using commercial hydrogenated cottonseed oils of different manufacturers did not show a definite relationship between rancidity and iodine value, samples of the same lot of cottonseed oil were hydrogenated to various iodine values.[1] Ointments prepared from these samples in the same manner as Table V indicate a definite relationship between deterioration and the iodine value of the hydrogenated cottonseed oil. The data are shown in Table VI.

The data in Tables I and II indicate that sesame oil hydrogenated to an iodine value of 57.7 is the most satisfactory of the hydrogenated oils employed. In order to determine if this is due to an inherent

[1] The writer is indebted to the Research Department of Armour and Co. of Chicago for hydrogenating these samples.

Table IV.—Effect of Emulsifying Agents on Emulsified Ointment of Potassium Iodide

1. Diffused Light

Emulsifying Agent	Base	First Day	3 Days	12 Days	18 Days	35 Days
Triisopropanol-amine	HCO	0	0	0	0	0
	Lard	1	2	3	4	5
Mixed Isopro-panolamines	HCO	0	0	0	0	0
	Lard	0	0	0	0	0
Soap	HCO	1	2	2	2	2
	Lard	0	1	2	2	2
Soft Soap	HCO	1	2	2	2	2
	Lard	0	1	2	2	2
Borax	HCO	1	2	3	5	5
	Lard	0	0	2	4	5

2. Direct Sunlight

Triisopropanol-amine	HCO	0	4	4	4	5
	Lard	1	4	4	4	5
Mixed Isopro-panolamines	HCO	0	4	4	4	5
	Lard	0	3	4	4	5
Soap	HCO	1	3	4	4	4
	Lard	0	4	4	4	5
Soft Soap	HCO	1	3	4	4	6
	Lard	0	4	4	4	6
Borax	HCO	1	3	4	4	5
	Lard	0	4	4	4	5

character of hydrogenated sesame oil or to the fact that the iodine value was lower than any of the other vegetable oils except coconut, samples of the sesame oil were hydrogenated to different iodine values.[1] Ointments were prepared from these fats in the same manner as Table V; the data are shown in Table VII.

SUMMARY

Ointment of potassium iodide was prepared using six different partially hydrogenated oils as the ointment base. None of them deteriorated as rapidly as lard although the iodine value of lard (54.2) was lower than all except hydrogenated coconut oil (5.1) and hydrogenated lard (51.0). Obviously the extent of hydrogenation would affect rancidity and liberation of free iodine. The hydrogenated oils are listed according to their tendency to deterioration: Cottonseed Oil (I. V. 66.7), Peanut Oil (I. V. 73.3), Soy Bean Oil (70.3), Lard (51.0), Coconut Oil (5.1) and Sesame Oil (57.7).

Emulsified ointment of potassium iodide, using triethanolamine—stearic acid emulsifier, was more stable than mixtures using the same ointment base. The effect of the emulsifier was distinct; the emulsifying

[1] The writer is indebted to the Research Department of Armour and Co. of Chicago for hydrogenating these samples.

Table V.—Potassium Iodide Ointment with Various Hydrogenated Cottonseed Oils

Iodine Value	Soft Point	Diffused Light				Direct Sunlight			
		2 Days	5 Days	11 Days	28 Days	2 Days	5 Days	11 Days	28 Days
66.7	36.3	2	3	4	4	4	4	5	5
70.0	29.8	0	0	T	T	4	4	5	5
66–69	39.4	0	1	1	1	0	1	3	5
62.7	41.5	0	0	0	0	4	4	4	5
62.0	35.7	0	0	T	T	4	4	5	5
62.0	37.2	0	1	1	1	1	2	3	5
57.9	41.8	0	0	0	T	2	3	4	5
..	29.5	0	1	1	1	2	3	4	4
66.0	31.3	0	0	0	2	1	1	2	3

Table VI.—Potassium Iodide Ointment with Hydrogenated Cottonseed Oils

Iodine Value	Diffused Light				Direct Sunlight			
	2 Days	5 Days	11 Days	28 Days	2 Days	5 Days	11 Days	28 Days
74.9	1	2	3	5	4	5	5	5
70.7	T	1	2	4	3	4	5	5
65.9	T	T	1	3	2	3	5	5
59.5	0	0	T	1	1	3	4	5
53.0	0	0	T	1	0	1	3	5

Table VII.—Potassium Iodide Ointment with Hydrogenated Sesame Seed Oils

Iodine Value	Diffused Light				Direct Sunlight			
	2 Days	5 Days	11 Days	28 Days	2 Days	5 Days	11 Days	28 Days
78.9	0	1	2	3	1	2	3	5
73.3	0	T	1	2	T	1	2	4
69.8	0	0	0	0	0	T	1	4
65.5	0	0	0	0	0	0	T	3
61.5	0	0	0	0	0	0	T	2

agents are listed according to their tendency to stability, using lard (I. V. 54.2) and hydrogenated cottonseed oil (I. V. 66.7) as ointment bases: Mixed isopropanolamines-stearic acid, triisopropanolamine-stearic acid, soft soap, hard soap, borax.

Using hydrogenated cottonseed oils of different manufacturers, there seemed to be no distinct relationship between the iodine value and melting point and the tendency to deterioration.

On the other hand, there is a definite relationship between tendency to deterioration and iodine value of the same oil hydrogenated to different iodine values.

Hydrogenated sesame oil was found to be definitely superior to hydrogenated cottonseed oil of the same melting point as a base for potassium iodide ointment.

REFERENCE

(1) "Hydrogenated Oil as an Ointment Base. II," JOUR. A. PH. A., 29 (1940), 18

Book Reviews

The Elements of Physico-Pharmaceutical Calculations, by M. L. SCHROFF, A.B. Hons. (Cornell), M.S. (Mass.). Published by the U. P. Pharmaceutical Association, Dept. of Pharmaceutics, Benares Hindu University. 281 + ix pages; $7\frac{1}{2}$ x 5. Price 8s. 6d.

This book on physico-pharmaceutical calculations provides explanations and problems covering weighing, solutions of electrolytes, indicators in acidimetry and alkalimetry, oxidation and reduction, oxidation-reduction potentials, electrolysis, solubility product principle, gravimetric analysis, the gas laws and gas analysis, and evaporation and distillation. There is also an appendix comprising tables of international atomic weights, the solubility products of some salts, ionization constants of some acids and bases, indicators in general use, vapor pressure of water, specific gravity of strong acids and bases, specific gravity of aqueous ammonia, and logarithms. The presentation of the subject matter is clear and concise and is believed to be admirably suited to the needs of students. It contains a goodly number of excellent exercises and should be appreciated by teachers as well as students.—A. G. D.

Manual of Prescription Writing, by HAROLD N. WRIGHT. ii + 96 pages, $8\frac{1}{2}$ x $10\frac{7}{8}$. "Mimeoprinted" with spiral binding. Burgess Publ. Co., Minneapolis, 1939. Price, $1.50.

This small volume considers the prescription from various angles. There is a short historical introduction followed by chapters on Latin nouns and adjectives, the form of the prescription, weights and measures and Latin abbreviations. The forms of medication are discussed and sample prescriptions are given. The book also discusses the laws governing prescriptions for narcotic and hypnotic drugs, incompatibilities, errors and certain medico-legal aspects of the prescription. It is believed that the book will prove a worth-while addition to the pharmacist's library.—A. G. D.

The Vitamins, by the Councils on Pharmacy and Chemistry and Foods, of the A. M. A. 637 pages, $5\frac{1}{4}$ x $8\frac{1}{4}$. American Medical Association, Chicago, 1939. Price, $1.50.

A number of specialists in the field of nutrition have contributed to the writing of this volume and there are numerous bibliographical references and footnotes. It may be looked upon, therefore, as a source of authentic information on the vitamins. This book is a comprehensive discussion of the new food principles known as vitamins. The isolation of these principles and the synthesis of those which have been prepared by synthetic methods are discussed in detail. This discussion includes sources, chemistry, physiology, therapeutic use and assay. Because of the voluminous amount of material published on the vitamins in recent years and because this published information is frequently of a contradictory nature, the appearance of this book is most timely. It should be in the library of every pharmacist where it will serve as a source of reliable information.—A. G. D.

The Pharmacopœia and the Physician, under the sponsorship of United States Pharmacopœia and the American Medical Association, by 24 outstanding authorities as authors. Flexible binding, 353 pages, $4\frac{1}{4}$ x $7\frac{1}{4}$. American Medical Association, Chicago. Price, $1.50.

This volume is a compilation of the 24 articles published in the series of papers entitled "The Pharmacopœia and the Physician" which appeared from time to time in the *Journal of the American Medical Association* from 1937 to date. There is a preface by Dr. Morris Fishbein in which the aims of the program are explained. Each of the 24 papers represents a rather complete and thorough discussion of the therapy of a certain disease or group of diseases and includes diagnoses, treatment and the drugs which may be preseribed. This is a useful little volume and should find a place in every pharmacist's library and on the desk of every physician. A second series of these articles is now appearing in the *Journal of the American Medical Association*.—A. G. D.

Monograph on an Old Healing Plant, Solidago Virga Aurea L. Dissertation by ROLF GNEKOW, pharmacist of Hamburg-Wandsbek. A thesis submitted to the Institute of Applied Botany, University of Hamburg, 1938. 100 pages, illustrated.—E. G. E.