HYDROGENATED CASTOR OIL AS AN OINTMENT BASE. IV. HYDROXYSTEARIC ACID.*

BY GEORGE W. FIERO.[1]

Castor Oil differs chemically and physically from practically all other commercial fixed oils in that it contains a very large amount of ricinoleic acid. Likewise completely hydrogenated castor oil differs both chemically and physically from other hydrogenated oils in that it contains a large amount of 12-hydroxystearic acid (dihydro-ricinoleic acid). The fatty acid may be freed from the oil by usual methods: alcoholic saponification, catalytic hydrolysis under pressure, aqueous saponification, etc. Because of the high melting point of the oil (86° C.) and the comparatively low water solubility of the soaps, aqueous saponification was not as satisfactory as the other two methods. The fatty acid is a hard white solid, soluble in hot alcohol and hot liquid petrolatum.

EXPERIMENTAL.

Characteristics of Salts.—Salts were prepared using equivalent weights of hydroxystearic acid[2] and the base. In the case of inorganic bases, a concentrated aqueous solution was mixed with the melted fatty acids, stirred and dried at 105°. In the case of inorganic bases, the amine was added to the melted fatty acid, stirred and cooled.

Inorganic Salts.—Salts of sodium potassium and ammonium were white solids, soluble in hot water and hot alcohol. Salts of calcium, lead and aluminum were white solids practically insoluble in water and alcohol.

Triethanolamine.—Amber-colored solid, soluble in water, alcohol and hot liquid petrolatum, less soluble in the latter than isopropanolamine salts, forming a gel upon cooling.

Triisopropanolamine.—Pale straw-colored solid, softer than the above, soluble in water, alcohol and hot liquid petrolatum.

Mixed Isopropanolamines.—Pale straw-colored solid, softer than the above, soluble in water, alcohol and hot liquid petrolatum.

Physical Properties of Solutions.—Solutions (0.14%) of various salts of hydroxystearic acid were tested in the same manner as salts of other fatty acids previously reported (1). The data with the exception of surface tension (45° C.), were obtained at 22° C. Table I indicates a comparison of salts of hydroxystearic acid with stearic acid (1) and ricinoleic acid.

TABLE I.—CHARACTERISTICS OF SALTS.

(0.14% Aqueous Solutions.)

Salt.	Surface Tension (45°).	Lather (22°).	pH.
Triethanolamine Hydroxystearate	40.5	35%	8.5
Triethanolamine Stearate	40.4	0	8.3
Triethanolamine Ricinoleate	..	18%	7.3
Triisopropanolamine Hydroxystearate	39.9	30%	8.1
Triisopropanolamine Stearate	33.3	10%	8.3
Triisopropanolamine Ricinoleate	..	25%	7.1
Mixed Isopropanolamine Hydroxystearate	40.5	40%	8.5
Mixed Isopropanolamine Stearate	33.8	5%	9.2
Mixed Isopropanolamine Ricinoleate	..	15%	7.3

Emulsions.—Liquid petrolatum emulsions were prepared by dissolving the fatty acid in hot mineral oil (25%) and the base in water as previously reported for other fatty acids (*loc. cit.*).

* Presented before the Section on Practical Pharmacy and Dispensing, A. PH. A., Atlanta meeting, 1939.

[1] University of Buffalo, School of Pharmacy.

[2] Manufactured by National Oil Products Co., Harrison, New Jersey.

After agitation with a mixer for 15 seconds, and standing 48 hours, the condition of emulsion was recorded. As with other fatty acids there was a tendency to "cream" without breaking the emulsion. In many cases with 5% and 2½% emulsions the "cream" was quite solid, but readily became homogenous when shaken; data are shown in Table II.

TABLE II.—EMULSIONS.

Salt of Hydroxystearic Acid.	5%.	2.5%.	1.0%.	0.5%.	0.25%.
Sodium	+	90% C	70% C	60% C	50% C
Potassium	30% C	25% C	25% C	25% C	10% C
					15% O
Ammonium	+	30% C	25% C	20% C	10% C
				5% O	15% O
Triethanolamine	+	90% C	70% C	20% C	10% C
				10% O	15% O
Triisopropanolamine	85% C	85% C	85% C	15% C	10% C
				15% O	20% O
Mixed Isopropanolamines	25% C	50% C	75% C	50% C	30% C

Legend: + = perfect emulsion; C = cream; O = oil.

Cosmetics.—Creams were prepared in the same manner previously reported (*loc. cit.*) using the following basic formula:

White Wax	15 Gm.
Hydroxystearic Acid	*q. s.*
Heavy Liquid Petrolatum	50 cc.
Distilled Water	30 cc.
Base (hydroxide or amine)	*q. s.*

Molecular equivalents of the fatty acid were dissolved in the oil and wax and the base in water; the two liquids, heated to the same temperature, were agitated for a few seconds with a mechanical stirrer and allowed to cool without further agitation. After standing five months in an open glass vessel color was observed. Data are shown in Table III.

TABLE III.—CREAMS.

Salt.	5.0%. A	5.0%. B	2.5%. A	2.5%. B	1.25%. A	1.25%. B	0.60%. A	0.60%. B	0.30%. A	0.30%. B	0.15%. A	0.15%. B	0.08%. A	0.08%. B
Sodium	+	1	+	1	+	1	+	1	−	1	−	1	−	1
Potassium	+	1	+	1	+	1	+	1	+	1	+	1	+	1
Ammonium	+	2	+	3	+	3	+	2	−	1	−	1	−	1
Triethanolamine	+	4	+	3	+	2	+	1	+	1	+	1	+	1
Triisopropanolamine	+	2	+	1½	+	1	+	1	+	1	+	1	−	1
Mixed Isopropanolamines	+	2	+	1½	+	1	+	1½	+	1½	+	1	−	1

Legend: + = good emulsion; − = separated; column A indicates condition while cooling; column B after 5 months; color indicated by numbers white (1) to amber (4).

Vanishing Cream.—Most vanishing creams consist of an emulsion of stearic acid, the emulsifying agent often being a salt of stearic acid. Vanishing creams were prepared with several alkalies using hydroxystearic acid, stearic acid, and mixtures of the two. The following basic formula was used:

Fatty acid	20 Gm.
Water	80 cc.
Base	*q. s.*

The water containing the base was heated to the same temperature as that of the melted fatty acid and poured into it. The mixture was agitated for a few seconds with a slowly moving

mechanical mixer. Hydroxystearic acid was substituted for stearic acid as follows: 100%, 75%, 50% and 25% hydroxystearic with balance stearic acid, U. S. P. After standing five months in sealed glass jars, the creams were examined for consistency; the state of emulsion was obtained by heating the creams for 24 hours in an oven at 90° C and examining them while in a molten condition. Results are shown in Table IV.

TABLE IV.—VANISHING CREAMS.

Base.	Amount.	100%. A	100%. B	75%. A	75%. B	50%. A	50%. B	25%. A	25%. B	0%. A	0%. B
Potassium hydroxide KOH	1.5%	G		+	T-O	+	0% O	+	0% O	+	0% O
					100% C	1	40% C	L	60% C	L	75% C
	0.75%	G		+	10% O	+	10% O	+	10% O	+	5% O
					5% C	1	25% C	L	40% C	L	30% C
Triethanolamine TEA	2%	+	5% O	+	0% O	+	+	+	T-O	+	T-O
			20% C	h	75% C				100% C	L	95% C
	1%	+	5% O	+	T-O	+	5% O	+	5% O	+	5% O
			20% C		100% C		85% C		80% C	1	95% C
Triisopropanolamine TIA	2%	G	10% O	G	....	g	....	+	10% O	+	10% O
		H	90% C	H		H		H	90% C	H	90% C
	1%	G	15% O	G	....	g	....	+	10% O	+	18% O
		H	85% C	H		S		1	90% C	1	5% C
Mixed Isopropanol-amines	2%	+	5% O	+	10% O	+	10% O	+	10% O	+	10% O
		H	85% C	H	30% C	H	15% C		60% C	L	85% C
MIA	1%	G	10% O	G	15% O	+	10% O	+	10% O	+	10% O
		H	85% C	S	5% C		15% C		40% C	1	50% C
Mixture KOH	0.5	+	O% O	+	T-O	+	+	+	1% O	+	10% O
TEA	1.0		75% C		100% C			1	99% C	L	70% C
Mixture KOH	0.5	+	5% O	+	5% O	G		+	10% O	+	10% O
TIA	1.0	h	95% C		50% C	S			20% C	L	90% C
Mixture KOH	0.5	+	5% O	+	5% O	+	5% O	+	8% O	+	10% O
MIA	1.0	h	20% C		50% C	h	50% C		30% C	L	90% C

Legend: + = satisfactory; H = hard; h = slightly hard; S = soft; G = granular; T = trace; O = oil; C = cream; L = luster; l = slight luster; column A—consistency after standing 5 months; column B—state of emulsion of melted creams 5 months old.

Ricinoleic Acid.—In order to illustrate the differences between the fatty acid of hydrogenated castor oil and of untreated castor oil, the experiments were duplicated using the mixed fatty acids of castor oil (chiefly ricinoleic acid).[1] This substance, unlike hydroxystearic acid, was insoluble in mineral oil.

TABLE V.—EMULSIONS OF RINCINOLEATES.

Salt of Ricinoleic Acid.	5%.	2.5%.	1.0%.	0.5%.	0.25%.
Sodium		25% O	26% C	25% C	15% C
		T C	3% O	5% O	11% O
Potassium	24% C	23% C	22% C	21% C	4% C
	2% O	3% O	5% O	7% O	21% O
Ammonium	26% C	25% C	23% C	23% C	11% C
	T O	1% O	2% O	4% O	16% O
Triethanolamine	27% C	27% C	27% C	27% C	3% C
			T O	2% O	23% O
Triisopropanolamine	29% C	26% C	26% C	26% C	5% C
	T O	1% O	2% O	3% O	20% O
Mixed Isopropanolamines	28% C	27% C	27% C	21% C	3% C
	T O	1% O	3% O	7% O	22% O

Legend: C = cream; O = oil; T = trace.

[1] Courtesy of Woburn Degreasing Co. of New Jersey, Harrison, N. J.

Emulsions.—The emulsions were prepared in the same manner as those with hydroxystearic acid with the exception that heat was not required to maintain the oil in a liquid state.

Cosmetics.—Creams were prepared in the same manner as with hydroxystearic acid.

TABLE VI.—CREAMS WITH RICINOLEATES.

Salt of Ricinoleic Acid.	5%. A	5%. B	2.5%. A	2.5%. B	1.25%. A	1.25%. B	0.60%. A	0.60%. B	0.30%. A	0.30%. B	0.16%. A	0.16%. B	0.008%. A	0.008%. B
Sodium	+	1½	+	1	+	1	+	1	+	1	+	1	−	1
Potassium	+	1½	+	1½	+	1	+	1	+	1	+	1	−	1
Ammonium	+	3	+	3	+	2	+	2	+	1½	+	1½	−	1
Triethanolamine	+	4	+	4	+	3	+	2	+	1	−	1	−	1
Triisopropanolamine	+	2	+	1½	+	1½	+	1	+	1	−	1	−	1
Mixed Isopropanolamines	+	3	+	3	+	3	+	2	−	1	−	1	−	1

Legend: + = good cream; − = separated; column A indicates condition while cooling; column B, after 5 months. Color indicated by numbers white (1) to amber (4).

Stearic Acid.—Stearic acid, which differs from hydroxystearic acid only by the hydroxy group, has previously been shown to have the following properties when combined with an alkylolamine (1); the data in Table VII and VIII were obtained in the same manner as hydroxystearic preparations.

TABLE VII.—EMULSIONS OF STEARATES.

Salt of Stearic Acid.	5%.	2.5%.	1.0%.	0.5%.	0.25%.
Triethanolamine	+	+	+	25% C 3% O	15% C 12% O
Triisopropanolamine	+	+	30% C T O	23% C 2% O	15% C 10% O
Mixed Isopropanolamines	+	+		32% C	24% C 1% O

TABLE VIII.—CREAMS WITH STEARATES.

Salts.	5%. A	5%. B	2.5%. A	2.5%. B	1.25%. A	1.25%. B	0.6%. A	0.6%. B	0.3%. A	0.3%. B	0.16%. A	0.16%. B	0.008%. A	0.008%. B
Triethanolamine	+	+2½	+	+2	+	+1½	?	−1	?	−1	−	−1	−	−1
Triisopropanolamine	+	+2	+	+2	+	+1	+	−1	−	−1	−	−1	−	−1
Mixed Isopropanolamines	+	+4	+	+3	+	−2	+	−1	+	−1	+	−1	−	−1

DISCUSSION.

Hydroxystearic acid, obtained as the fatty acid saponified from hydrogenated castor oil, possesses properties different from other fatty acids including ricinoleic acid, from which it differs by two hydrogen atoms, and stearic acid, from which it differs by one oxygen atom. Salts of hydroxystearic acid with alkylolamines are, as would be expected, more solid than those of stearic acid. Creams prepared with those salts did not become colored to as great an extent upon aging as those prepared with salts of ricinoleic or stearic acid. Vanishing creams prepared with hydroxystearic acid alone were not as satisfactory as those prepared with a mixture of hydroxystearic and stearic acids. They did not possess the luster found in stearic acid vanishing creams.

SUMMARY.

Salts of hydroxystearic acid obtained from completely hydrogenated castor oil were prepared and their characteristics reported. Emulsions and cold creams compared with those prepared with ricinoleic stearic acids. Vanishing creams

were prepared with hydroxystearic acid and with mixtures of hydroxystearic and stearic acids.

Alkylolamine salts of hydroxystearic acid were superior emulsifying agents compared with those of ricinoleic acid and practically equal to those of stearic acid.

REFERENCES.

(1) Fiero, George W., JOUR. A. PH. A., 27, 658 (1938).
(2) Fiero, George W., unpublished.

QUALIFICATIONS OF THE PERSONNEL FOR A PROFESSIONAL PHARMACY.*

BY J. K. ATTWOOD[1]

The success of a professional pharmacy is dependent to a great extent upon the ability of the proprietor to select and train the proper type individuals as members of his staff. The selection of an efficient worker is far from a simple matter and cannot be done casually. There are many requirements of the staff members of a professional pharmacy that are not essential to the average drug store.

Twenty-five years ago the stocks of most drug stores were about the same, but within the past two decades, especially the last, a tremendous change has taken place. Modern methods of merchandising have entirely changed the appearance of the drug store of a quarter century ago. A merchandising phobia seems to have engulfed many stores and there is frequently nothing to suggest what our profession really is. All of you are familiar with this change. The many jokes about the articles sold in drug stores has not dignified our profession. Those of us operating professional stores resent such humor.

In the selection of pharmacists for our type stores, the first consideration is education, of course. Take sufficient time in interviewing applicants to ascertain all facts possible pertaining to their qualifications for the position.

1. Education and Intelligence. He must be a graduate of a recognized college with fairly high marks, at least one of top six.

2. A genuine and sincere interest in Pharmacy is necessary. He should be anxious to read drug and medical Journals so as to be informed, and be capable of discussing the new developments of his profession when the occasion arises. None of these can be forced. There must be a desire already created and deeply rooted.

3. He must possess or acquire a professional manner. Calm, dignified, but friendly. A successful physician must have that hard-to-describe asset, a good bed-side manner. The pharmacist must have a store manner which inspires confidence and assures the customer that the prescription is not just a scrap of paper, but something that will receive careful attention and be filled with utmost exactness and skill. The manner in which a pharmacist accepts a prescription is important. Avoid an attitude of indifference. Every day opportunities are provided for the pharmacist to build confidence.

4. Personality. After talking to him do you like him? First impressions are not always lasting, but they are important. A grouch or trouble-maker can wreck an entire organization.

5. Character. Investigate his past record carefully. I am inclined to believe once a thief always one if the opportunity presents itself. Does his former employer speak well of him? Recommendations are of little value. Get a confidential report and treat it so. Will he be loyal and coöperative?

* Presented before the Section on Practical Pharmacy and Dispensing, A. PH. A., Atlanta meeting, 1939.

[1] Retail Pharmacist, Jacksonville, Fla.