work. At least in a series of gels prepared at the same time as those represented by the Table I experiments, but opened not at all, or at least but occasionally during the year, there is no sign whatever of any decomposition. A duplicate set prepared with the added sodium phosphate appears no different from the controls it duplicates. It must be remembered also that Jelly of Ephedrine Sulfate should be dispensed and used from a tube and not from an open container. In such a case there would be no opportunity for a loss of volatile preservative.

As it stands at present, it would seem that the proper evaluation of tragacanth cannot be made until the question of what might be called abnormal swelling in certain specimens has been satisfactorily answered. Likewise, neither would it be possible to expect any marked uniformity in tragacanth gels such as is basically represented by the N. F. Ephedrine Jelly, until the evaluation of tragacanth itself has been properly determined.

CONCLUSIONS.

Certain tragacanths which appear of poor quality as tested by the falling ball-gel method, show an increased value over so-called good tragacanth when their gels are allowed to age. This may be due to a dehydration of the tragacanth itself upon aging, with the resulting change in the nature of the gel prepared from it.

The Preservation of Jelly of Ephedrine Sulfate, N. F. VI, has been considered and the feeling is expressed that the present formula is probably satisfactory in that respect.

HYDROGENATED CASTOR OIL IN OINTMENTS—PART III. PRODUCT OF SULFONATION.*

BY GEORGE W. FIERO.[1]

Sulfonated oils have long been employed in industry as emulsifying agents and detergents. In cosmetics they have been included in cleansing creams for detergent action as well as to insure proper emulsification. In the manufacture of these oils, the sulfuric acid unites with the fatty acid molecule at the double bond to produce the "sulfonated" oil. Actually this is not sulfonation, but more correctly "sulfation" since the "—OSO_2OH" group is attached to the carbon chain.

In the case of hydrogenated castor oil, however, there are no double bonds which the sulfuric acid may attack, and the reaction is between the sulfuric acid and the "—OH" group on carbon atom 12 to produce the sulfate ("—OSO_2OH") at this point. Thus the product of "sulfonation" of hydrogenated castor oil differs from other "sulfonated" oils chemically. Physically it likewise differs in that it is solid while they are liquids.

"Sulfonated" hydrogenated castor oil[2] (hereafter abbreviated "SHCO") is a yellowish solid, practically insoluble in hot water, but soluble in alcohol and liquid petrolatum. The combining weight as determined by the acid value, was found to be 412 (theoretical 410). It readily combined with alkalies to produce salts

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* Presented before the Section on Practical Pharmacy and Dispensing, A. PH. A., Minneapolis meeting, 1938.

[1] University of Buffalo, School of Pharmacy.

[2] Manufactured by National Oil Products Co., Harrison, N. J.

(*i. e.*, double sulfates). This is accomplished by adding a hot aqueous solution of the molecular equivalent of the alkali to the molten SHCO. The following salts were prepared:

1. *Sodium SHCO.*—A yellowish colored, hard solid, soluble in hot water yielding with four parts of water a white, soft, paste-like mass upon cooling; with 20 parts, a soft jelly resulted; with 40 parts, a thick liquid was produced. An 0.25% solution precipitated when cooled to room temperature. It is soluble in hot alcohol, crystallizing therefrom as a white solid. With liquid petrolatum, if heated sufficiently high to drive off the residual water, a 10% solution formed a hard gel upon cooling. A 1% solution produced a gel which "bled" oil on a hot day, while an 0.25% solution produced a soft gel.

2. *Potassium SHCO.*—Yellowish colored, hard solid, soluble and producing a gel in water and liquid petrolatum; soluble in alcohol.

3. *Ammonium SHCO.*—Yellowish colored, soft solid, soluble and producing a gel in water and liquid petrolatum; soluble in alcohol.

4. *Calcium SHCO.*—White solid, insoluble in water, practically insoluble in alcohol, forms cloudy solution with liquid petrolatum, but no gel forms when cooled.

5. *Triethanolamine SHCO.*—Yellowish colored, soft solid, soluble in water—more soluble than any of the above, the 1% solution having less precipitate; producing a gel in water; insoluble in liquid petrolatum; soluble in alcohol.

6. *Triisopropanolamine SHCO.*—Yellowish colored, semi-solid, soluble in water but not producing a gel. The solution with equal parts was semi-solid, with two parts a thick liquid, and with four parts quite liquid; soluble in alcohol and glycerin; insoluble in liquid petrolatum.

7. *"Mixed Isopropanolamine"* SHCO.*—Similar to triisopropanolamine SHCO.

Characteristics of Salts of SHCO.—The solutions of various salts of SHCO were tested in the same manner as the salts of triethanolamine previously reported (1), as indicated in the following table (all data were obtained at 45° C.):

TABLE I.

Salt.	Suds.	Surface Tension.
1% Aqueous Solutions.		
Sodium SHCO	130%	33.4
Potassium SHCO	65%	38.6
Ammonium SHCO	100%	35.5
Triethanolamine SHCO	80%	34.2
*"Mixed Isopropanolamine" SHCO	200%	36.8
Commercial Sulfonated Castor Oil	70%	37.5

* Carbide and Carbon Chemicals Corp. Approximately 14% mono-, 43% di- and 43% triisopropanolamine.

TABLE II.

Salt.	Suds.	Surface Tension.	pH.
0.25% Aqueous Solutions.			
Sodium SHCO	250%	31.4	8.5
Potassium SHCO	35%	41.9	8.1
Ammonium SHCO	35%	36.9	8.7
Triethanolamine SHCO	60%	35.5	8.3
*"Mixed Isopropanolamine" SHCO	70%	34.2	8.1
Commercial Sulfonated Castor Oil	50%	39.6	7.3

* Carbide and Carbon Chemicals Corp. Approximately 14% mono-, 43% di- and 43% triisopropanolamine.

Emulsifying Agent.—Since the sodium salt of SHCO had the greatest foam capacity and least surface tension, it was employed in the following experiments. A series of emulsions were

prepared to determine the value of SHCO as an emulsifying agent as compared with commercial sulfonated castor oil. A 25% oil emulsion was employed since this "breaks" more readily than a 50% emulsion. With this emulsion there is often a separation of "cream" which, if no free oil separates, may readily be made homogeneous by shaking. The emulsions were prepared by dissolving the sodium SHCO in warm water (75 cc.) and added to the oil (25 cc.) and agitated with a fast mechanical mixed for 15 seconds. The results are indicated as follows:

TABLE III.

No. Gm. SHCO.	State of Emulsion. After 1 Hour.	After 3 Days.
5	100%	95% cream
2.5	90% cream	80% cream
1.25	70% cream	65% cream
0.67	55% cream	50% cream—trace oil

Similar emulsions prepared using commercial sulfonated castor oil in the same manner (10, 5, 2.5, 1.25 and 0.67 Gm.) all were "broken" as indicated by separation of oil.

Cosmetics.—In order to ascertain the value of SHCO as an emulsifying agent in cosmetics, creams were prepared with the following as a basic formula:

White Wax	15 Gm.
Liquid Petrolatum, Heavy	50 cc.
Distilled Water	30 cc.
Sodium SHCO, *q. s.*	

The cream was prepared by melting the wax, adding the liquid petrolatum and mixing this hot solution with the aqueous solution of SHCO heated to the same temperature. The mixture was agitated for a few seconds with a fast mechanical mixer and stirred by hand occasionally until cool. The results are indicated in the following table:

TABLE IV.

No. Gm. SHCO.	State of Emulsion.	After 6 Months.
2.500	Perfect	Perfect
1.870	Perfect	Perfect
1.250	Perfect	Perfect
0.670	Perfect	Perfect
0.250	Perfect	Perfect
0.125	Perfect	Perfect
0.067	Perfect	Perfect
0.033	Perfect	Perfect
0.016	Good	Good
0.008	Fair*	Fair
0.004	Fair*	Fair
0.002	Fair*	Fair

* These samples separated slightly while hot and required a few seconds agitation with mechanical mixer when cooled to just above the congealing point.

Creams were prepared in the same manner with commercial sulfonated castor oil. Those containing 2.5 and 1.25 Gm. of sulfonated castor oil separated slightly; samples with smaller quantities were unsatisfactory. After six months these samples had a faint rancid odor while those with SHCO had a faint, but not disagreeable odor. After standing ten months, the creams were placed in an oven at 80° C. for a period of 24 hours. Upon examination it was found that in those containing 0.67–2.50% of SHCO the emulsion was still unbroken; those with less emulsifying agent were broken. In creams containing as much as 10% of commercial sulfonated castor oil, the emulsion was broken.

Vanishing creams were prepared according to the following basic formula:

Stearic Acid	15 Gm.
Distilled Water	60 cc.
Sodium SHCO, *q. s.*	

The SHCO was dissolved in hot water, added to the molten stearic acid and agitated with a mechanical mixer. Prepared with 2.5 Gm. SHCO, the emulsion and consistency were quite satisfactory; with 1.25 Gm. SHCO, the emulsion was satisfactory, but the consistency too soft; with 0.67 Gm. a thick liquid resulted with separation of "cream" but the emulsion was not broken.

Vanishing creams were prepared in the same manner using commercial sulfonated castor oil. The sample containing 2.5 Gm. "creamed" readily and required more agitation than SHCO; this is undesirable in a vanishing cream as it tends to include too much air. Even though the sample was stirred constantly by hand until congealing point, the emulsification was not satisfactory and the cream was very soft. Samples with smaller amounts of sulfonated castor oil did not produce good emulsions.

Detergency.—In order to determine the relative detergent properties of various salts of SHCO, artificially soiled cloth was washed with 1% aqueous solutions of the salts. White cotton cloth, 6 x 9 inches was soiled with artificial soil mixture, dried at 80 degrees C. for 1 hour, aged over night, ironed with a low-heat iron and the extent of soil determined by means of reflection of light from the cloth to a photoelectric cell.[1] Two samples were washed 10 minutes in 200 cc. of the solution at 45 degrees C., rinsed three times with distilled water, dried on blotter, then in oven at 80 degrees for 1 hour and finally in the air for 30 minutes. The cloth was then ironed with a medium-hot iron and the extent of soil again determined. The extent of soil is expressed in per cent of brightness; the reflection obtained by a black photographic plate-cover representing 0% and that obtained by the original cloth representing 100%.

The cloth was soiled with soil solution composed of:

Lamp Black	2 Gm.
Liquid Petrolatum, Heavy	5 Gm.
Tallow	3 Gm.
Carbon Tetrachloride	2000 cc.

Four readings were made on each sample and four samples were washed with each salt. The average of the four samples is reported in the table below:

TABLE V.

Salt of SHCO.	Original Soil.	First Wash.	Soil Removed.	Second Wash.	Soil Removed.
"Mixed Isopropanolamines"	59.6%	76.7%	17.1%	85.5%	25.9%
Triethanolamine	59.8%	80.6%	20.8%	87.0%	27.2%
Ammonium	59.8%	78.9%	19.1%	86.7%	26.9%
Potassium	60.9%	81.5%	20.6%	85.6%	24.7%
Sodium	60.7%	85.8%	25.1%	90.8%	30.1%
Commercial Sulfonated Oil	60.6%	81.5%	20.9%	86.2%	25.6%

SUMMARY.

1. Salts of "sulfonated" hydrogenated castor oil were prepared with the following bases: calcium, sodium, potassium, ammonium, triethanolamine, triisopropanolamine and "mixed isopropanolamines." Their solubilities in water, alcohol and petrolatum and the surface tension, p_H, and "foam ability" of their aqueous solutions are reported. A gel with liquid petrolatum was produced with salts of sodium, potassium and ammonium. The sodium salt was the most satisfactory

[1] For details of apparatus and method of washing, see "Salts of Triethanolamine.—Part II. Detergency," presented to the Scientific Section, A. PH. A., Minneapolis meeting, 1938.

from the standpoint of surface tension and "foam ability." Salts with tri-isopropanolamine and "mixed isopropanolamines" were semi-solid; all others were solid.

2. "Sulfonated" hydrogenated castor oil was superior to commercial "sulfonated" castor oil as an emulsifying agent. A good 25% oil emulsion was produced with 1.25% of the former while an emulsion with 10% of the latter "broke."

3. "Sulfonated" hydrogenated castor oil was likewise superior to commercial "sulfonated" castor oil for production of cosmetics. A stable cold cream was readily prepared with 0.035% of "sulfonated" hydrogenated castor oil as the sole emulsifying agent. Cold cream prepared with 0.0025% was stable, but required considerable agitation while cooling. Likewise "sulfonated" hydrogenated castor oil was found satisfactory as an emulsifying agent for vanishing creams.

4. Salts of "sulfonated" hydrogenated castor oil were found to be good detergents as compared to "sulfonated" castor oil. The sodium salt was most satisfactory.

LITERATURE CITED.

(1) Fiero, JOUR. A. PH. A., 27, 402 (1938).

THE ABILITY AND OPPORTUNITY OF THE PHARMACIST TO SERVE ALL HOSPITALS, LARGE OR SMALL.*

BY MARY DIENHART.[1]

Hospital pharmacy is becoming an important phase of the pharmaceutical profession. For many years, the larger hospitals have employed one or more full-time pharmacists and they have found it advisable to do so not only to insure the confidence of the physicians on their staff but also that of the patients, and for economic reasons. Due to the size of the hospital and the number of patients under constant care, the services of the pharmacist are necessary to fill the medicinal needs of the patients.

The duties of the pharmacist in any hospital are innumerable but in a large hospital they are carried out on a larger scale and consequently require more of the pharmacist's time. Among these duties may be listed:

1. The preparation of stock materials and the proper storage of them—many preparations may be made by the pharmacist more economically than they can be purchased from the pharmaceutical houses because hospitals have access to tax-free alcohol.
2. The dispensing of narcotic drugs and a perpetual inventory of them.
3. The dispensing of all standard and official preparations as well as the specialties of the manufacturing houses.
4. The preparation and sterilization of parenteral solutions.
5. The sterilization and care of all surgical and parenteral supplies.
6. The purchase of all drugs, chemicals and biologicals and the proper storage of them.

Briefly, the hospital pharmacy should be a department of every hospital in which drugs and medical supplies are purchased, stored and dispensed and in which necessary records are kept.

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* Presented before the Sub-Section on Hospital Pharmacy, A. PH. A., Minneapolis Meeting, 1938.

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