SUGGESTED STANDARDS FOR CHLOROFORM LINIMENT.*

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In the list of research on Pharmacopœial Problems the Committee of Revision of the United States Pharmacopœia mentions Chloroform Liniment and suggests that an assay process should be devised and a maximum and minimum standard adopted. The authors, in their work as chemists in the food and drug laboratory of a town adjacent to Boston, collected and examined many samples of chloroform liniment and were amazed to find that only a very few of the samples checked with the results obtained on a sample of known composition. This led to the investigation that we are about to report upon. In preparing the samples of Chloroform Liniment for analysis the authors first prepared soap Liniment and from it made the Chloroform Liniment. Eight different samples of Chloroform Liniment were prepared, using various methods of preparation.

We first observed the general appearance of the Liniment, including its odor and taste, also its miscibility with solvents.

Description of Physical Properties.—A clear, transparent, straw to yellowish colored mobile liquid, having a characteristic ethereal odor, and a saponaceous, sweet, burning taste. It is miscible with alcohol and ether. It is not miscible with water, acetone, petroleum benzine, benzol, carbon disulphide, fixed and volatile oils.

The specific gravity of the liniment was determined with the Westphal balance at 15.56° C.

Sample no.	Sp. gr.	Sample no.	Sp. gr.
1	1.0680	5	1.0661
2	1.0675	6	1.0675
3	1.0690	7	1.0637
4	1.0684	8	1.0654

The refractive index was determined using the Abbé Refractometer at 20° C.

Sample no.	Refractive index.	Sample no.	Refractive index.
1	1.3925	5	1.3920
2	1.3920	6	1.3920
3	1.3925	7	1.3925
4	1.3925	8	1.3925

The average refractive index on soap Liniment was found to be 1.3720 at 20° C., and the average refractive index of Chloroform was found to be 1.4420. It was also found that wherever the Chloroform content was low in a sample the refractive index was low also provided that a soap Liniment of U. S. P. quality was used in its preparation. It was found that a sample of Chloroform Liniment could be low in Chloroform content and still have a relatively high refractive index due to high soap content in the soap Liniment.

Determination of Alcohol.—Place 25 cc. of the Liniment into a separatory funnel, add 75 cc. of a saturated solution of sodium chloride, rotate for a few minutes taking care not to form an emulsion and allow to stand until the Chloroform settles out. Then draw off the lower Chloroform layer into another separatory funnel, to it add 25 cc. of the saturated sodium chloride solution and shake out with 2-15-cc. portions of petroleum benzine and add the saturated salt solu-

* Scientific Section, A. PH. A., St. Louis meeting, 1927.

tion thus extracted to the mixture in the first separatory funnel, mix well and transfer to a distilling flask, distil and collect 50 cc. of the distillate. Cool to 15.56° C., take the specific gravity and compute the per cent of alcohol from the alcohol tables.

Sample no.	Specific gravity.	Per cent alcohol by volume.	Sample no.	Specific gravity.	Per cent alcohol by volume.
1	0.9428	45.53	5	0.9442	44.69
2	0.9432	45.28	6	0.9440	44.79
3	0.9438	44.92	7	0.9444	44.55
4	0.9440	44.79	8	0.9440	44.79

Determination of Total Solids.—Evaporate 10 cc. of the Liniment in a tared porcelain evaporating dish on a boiling water-bath for two hours. Then transfer to a drying oven and heat for 2 hours at 100° C., cool in desiccator and weigh. Platinum dishes are not used in this determination because they are badly stained and the stain is removed only with great difficulty and loss of platinum.

Sample no.	Solids per 100 cc.	Sample no.	Solids per 100 cc.
1	4.216 grams	5	4.170 grams
2	4.241 grams	6	4.244 grams
3	4.213 grams	7	4.286 grams
4	4.197 grams	8	4.248 grams

Determination of Total Ash.—The residue from the total solids determination was gently ignited until all of the organic matter was burnt off and the heat gradually increased and ignition continued until a white ash was obtained.

Sample no.	Ash per 100 cc.	Sample no.	Ash per 100 cc.
1	0.678 grams	5	0.699 grams
2	0.694 grams	6	0.702 grams
3	0.714 grams	7	0.702 grams
4	0.691 grams	8	0.701 grams

$$CHCl_3 + 4KOH \text{———} 3KCl + 2H_2O + HCOOK$$

Determination of Chloroform.—Into a flask fitted with a Bunsen valve place 5 cc. of the sample and 40 cc. of an alcoholic solution of potassium hydroxide (prepared by dissolving 30 Gm. of KOH in 30 cc. of water, cooling the solution and adding enough methyl alcohol to make 100 cc.) and boil for 10 minutes. Allow the mixture to cool and transfer to a 500-cc. volumetric flask and fill to the mark with distilled water mixing well. Pipette exactly 10 cc. of this dilution into a 100-cc. volumetric flask, add a few cc. of nitric acid, about 25 cc. of distilled water and exactly 50 cc. of 0.1 *N* silver nitrate solution. Shake well and add sufficient distilled water to make 100 cc. The mixture is then well agitated and filtered taking an aliquot part of the filtrate and determining the Chloroform using a modified Volhard's method. Each cc. of 0.1 *N* silver nitrate solution is equivalent to 3.98 mg. of $CHCl_3$. The equation for the saponification is as follows:

$$CHCl_3 + 4KOH \longrightarrow 3KCl + 2H_2O + HCOOK$$

Several attempts were made to find a simpler method for the estimation of Chloroform, and in the end for the accurate determinaton of Chloroform this method was adopted. This method was described by T. M. Willgerodt in the *American Journal of Pharmacy.* A rapid and approximate method for determining Chloroform in Chloroform Liniment which helps to identify the low samples is as follows:

Place 50 cc. of the Liniment in a 100-cc. graduated cylinder, add 10 cc. of carbon disulphide, and enough saturated sodium chloride solution to make 100 cc. Mix well and allow to stand until two distinct layers separate out. The lower carbon disulphide-chloroform layer will measure

between 24.5 cc. and 25.5 cc. for a Liniment containing between 29.5 cc. and 30.5 cc. of Chloroform per 100 cc.

RESULTS OBTAINED IN ASSAY FOR CHLOROFORM.

Sample no.	Cc. Liniment.	Cc. $AgNO_3$.	Cc. KSCN.	Factor KSCN.	Gm. $CHCl_3$ per 100 cc.	Cc. $CHCl_3$ per 100 cc.
1	5	50	18.0	1.0818	44.1028	29.88
2	5	50	17.95	1.0818	44.5329	30.17
3	5	50	18.05	1.0818	43.6724	29.59
4	5	50	17.90	1.0818	44.9632	30.39
5	5	50	18.00	1.0818	44.1028	29.88
6	5	50	18.95	1.0818	44.4844	30.34
7	5	50	18.00	1.0818	43.8401	29.70
8	5	50	17.95	1.0818	44.5329	30.17

The average Chloroform content by volume: 30.01 cc. per 100 cc.
The average Chloroform content by weight: 44.2788 Gm. per 100 cc.

Determination of Camphor.—The determination of camphor presents some real difficulties; the volatile substances in the Liniment have a tendency to retain some of the camphor of the Liniment. Also the volatile substances are readily shocked from solution taking with them some of the alcohol if not all of the alcohol of the Liniment. The authors are at present working on a method for the determination of camphor which they feel will be of practical value but at present have not sufficient collected data for a complete report. We hope to report on this phase of our investigation in a future paper.

In concluding the authors have ventured to recommend that the standards for Chloroform Liniment fall between the following limits:

1. That the Alcohol content fall between 44.5 per cent and 45.5 per cent by volume.
2. That the specific gravity of the Liniment fall between 1.0654 and 1.0690 at 15.56° C.
3. That the refractive index of the Liniment fall between 1.3920 and 1.3925 at 20° C.
4. That the total solids of the Liniment fall between 4.200 and 4.275 Gm. per 100 cc.
5. That the total ash of the Liniment fall between 0.690 and 0.710 Gm. per 100 cc.
6. That the Chloroform content fall between 43.5 Gm. and 45.0 Gm. per 100 cc. corresponding to not less than 29.47 cc. and not more than 30.48 cc. of Chloroform per 100 cc.

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GERMAN PRODUCTION OF ETHYLENE GLYCOL.

Emulating American production of ethylene glycol, two German concerns are coming into the market in competition with glycerin. It is believed that effective competition with glycerin will soon be a reality here with consequent dislocation of the market. Although it is as yet impossible to get essential details concerning local production, etc., observers consider the future of ethylene glycol with less scepticism. Production of glycerin in Germany fluctuates around 6000 tons annually and future competition in glycol would be further incentive to European glycerin producers to unite in a convention to combat danger from the new product. (Trade Commissioner William T. Daugherty.)