

A NOTE ON THE ASSAY OF TINCTURE OF FERRIC CHLORIDE.*

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INTRODUCTION.

The tenth revision of the United States Pharmacopœia directs Tincture of Ferric Chloride to be assayed iodimetrically. This assay has been official for three decades. It was criticized by G. S. Ferrey (1) "on the grounds of inconvenience and large experimental error." In a study of the iron determinations for the eleventh revision of the Pharmacopœia the authors found the criticism of Ferrey to be warranted. The official method requires a weighed charge of the tincture to be employed. This seems unnecessary as the specific gravity of the tincture is approximately unity, and furthermore it is prepared upon a volume to volume basis. A portion of the tincture is evaporated to dryness, presumably to remove the alcohol, which appears to be an unnecessary procedure, as a preliminary step in the assay. The residue is dissolved in hydrochloric acid and hydrogen peroxide solution added presumably to oxidize any ferrous salt present to the ferric state. This step seems unwarranted as the solution from which the tincture is made is required to be free from divalent iron and the tincture is required to be preserved in amber-colored bottles protected from the light. The official definition, which standardizes the product in terms of trivalent iron is frustrated to some extent by the assay. If the product is exposed to light and reduction to divalent iron ensues, before titration the official assay insures that this is converted into the trivalent state and determined as such.

Furthermore in the official assay the reaction mixture is set aside for 30 minutes at 40° C. before titration. E. H. Swift (2) very recently made a critical study of this method of estimating the ferric ion. This investigator concluded that when the reaction between the ferric chloride and the iodide is allowed to take place in a closed flask for a period of only 5 minutes at room temperature a high degree of accuracy can be obtained. It was concluded also that the volume of the solution should be limited to 30 cc., 3 Gm. of potassium iodide should be present and from 0.25 to 25 milli-equivalents of hydrochloric acid.

With these facts before us the authors proceeded to modify the official assay method and study the relative accuracies of the procedures.

EXPERIMENTAL.

A series of 18 commercial samples of Tincture Ferric Chloride was examined. Each showed slight traces of ferrous iron. These were assayed by the official method using 5 cc.; and also by allowing the reaction mixture to stand and discharging the blue color, which re-appears owing to an insufficient quantity of potassium iodide, by adding more tenth-normal sodium thiosulphate solution. These tinctures were assayed also by the following modified procedure.

Pipette 5 cc. of the tincture into a suitable flask. Add about 20 cc. of distilled water, 3 Gm. of potassium iodide, and 3 cc. of hydrochloric acid. Titrate the iodine with tenth-normal sodium thiosulphate solution using starch T.S. as an indicator if preferred by the operator.

Table I shows the results obtained by the three methods.

* Scientific Section, Miami meeting, 1931.

TABLE I.

No.	U. S. P. First End-Point, Per Cent Fe.	U. S. P. Second End-Point, Per Cent Fe.	Modified Method, Per Cent Fe.	No.	U. S. P. First End-Point, Per Cent Fe.	U. S. P. Second End-Point, Per Cent Fe.	Modified Method, Per Cent Fe.
1	4.83	4.99	5.04	11	4.42	4.89	4.78
2	5.29	5.39	5.47	12	4.67	4.80	4.85
3	4.74	Lost	4.86	13	4.65	4.73	4.77
4	6.73	6.77	6.76	14	4.14	4.76	4.83
5	4.33	4.41	4.39	15	4.56	4.64	4.69
6	4.58	4.61	4.67	16	4.50	4.55	4.62
7	4.36	4.39	4.52	17	4.15	4.36	4.48
8	5.32	5.38	5.72	18	4.68	4.85	4.96
9	4.64	4.73	4.77		—	—	—
10	4.14	4.72	4.83	Mean	4.71	4.88	4.94

These results indicate that the present official method and the modified method correlate quite well, however, the mean of the modified method is higher than that of the official method or of the second end-point reading of the official method.

A sample of the tincture was assayed gravimetrically using 1 cc. The first determination yielded 91.1 mg. Fe_2O_3 corresponding to 6.37 per cent Fe; the second determination yielded 90.8 mg. Fe_2O_3 corresponding to 6.35 per cent Fe; the third determination yielded 92.5 mg. Fe_2O_3 corresponding to 6.46 per cent Fe; the fourth determination yielded 91.7 mg. Fe_2O_3 corresponding to 6.41 per cent Fe.

This sample was assayed several times using the official method and the modified method. The results obtained are recorded in Table II.

TABLE II.

No.	U. S. P. Per Cent Fe.	Modified Method, Per Cent Fe.	No.	U. S. P. Per Cent Fe.	Modified Method, Per Cent Fe.
1	5.91	6.14	10	6.05	6.12
2	5.99	6.14	11	5.84	6.08
3	5.85	6.08	12	5.82	6.15
4	5.88	6.15	13	5.97	6.15
5	5.94	6.12	14	6.03	6.08
6	5.91	6.08	15	5.98	6.12
7	5.89	6.08		—	—
8	5.98	6.08	Mean	5.94	6.11
9	6.03	6.11			

The probable error of a single determination was calculated by the formula

$$r = \pm 0.6745 \frac{\Sigma (V^2)}{N - 1}$$

The probable error of the mean of the series determinations was calculated by the formula

$$R = \pm 0.6745 \frac{\Sigma (V^2)}{N(N - 1)}$$

In these formulas V is the deviation from the mean and N the number of determinations. For the U. S. P. method $r = \pm 0.054$ per cent and $R = \pm 0.014$ per cent. For the modified method $r = \pm 0.019$ per cent and $R = \pm 0.005$ per cent.

The modified method more closely approaches the percentage of iron obtained by the gravimetric method, and is more rapidly carried out. The probable error of the modified method is far less than that of the U. S. P. method.

The P.E. of a single determination by the modified method is about 0.02 per cent, *i. e.*, the chances are even that one in two determinations will be either mean \pm P.E. or that it will differ from the mean by more than one P.E.

SUMMARY.

A statistical study of the data obtained on the assay of Tincture of Ferric Chloride shows the modified method described herein to be more accurate than the present official method. The method is more rapid and less cumbersome.

BIBLIOGRAPHY.

- (1) *Quart. J. Pharm. and Pharmacol.*, 3 (1930), 471.
- (2) *J. Am. Chem. Soc.*, 51 (1929), 2682.

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HARDENED GELATIN CAPSULES.

J. D. B. Hubers van Assenraad (*Pharm. Ztg.*, 77, 27, 371), states that a capsule more satisfactory than by keratin coating can be prepared by the following process: the capsules are closed by dipping them into collodion. Into the bottom part of a desiccator a layer of cotton wool is spread and sprinkled with one cc. of formaldehyde solution for each liter of capacity; above this the capsules are placed on a piece of absorbent gauze, and allowed to remain from ten to twelve hours.

MEETING OF FEDERAL WHOLESALE DRUGGISTS ASSOCIATION.

The dates for the Convention of the Federal Wholesale Druggists Association have been changed to October 4th, 5th and 6th. This was done in order that the time of our Convention would not conflict with the Convention of the N. A. R. D. The City in which the Convention will be held is Washington, D. C., and the headquarters will be at the Hotel Raleigh.
