

President McCullough said that it was his purpose to serve the Conference to the best of his ability and hoped for the support of all the members. He stated that soon after his return home he would prepare a bulletin from the notes he had made and send mimeographed copies to the members.

A. L. I. Winne asked the President to appoint the committee to confer with the AMERICAN PHARMACEUTICAL ASSOCIATION. The following committee was named: F. V. McCullough, J. Lester Hayman, A. L. I. Winne and R. C. Wilson.

The motion was made and duly seconded, giving a vote of thanks and appreciation to the retiring officers. The meeting of the Conference was then adjourned.

(Report of the Joint Meeting with the Section on Education and Legislation and Conference of Law Enforcement Officials, will be printed in the same issue with the Minutes of the Law Enforcement Officials.)

COMMITTEE REPORTS

REPORT OF COMMITTEE ON PRESCRIPTION TOLERANCES.*

BY HUGO H. SCHAEFER, CHAIRMAN.

The Committee on Prescription Tolerances has now been functioning for two years. During the first year no actual data were collected but a general study of the problems involved was made, meetings were held with Dr. Campbell, Chief of the Bureau of Food and Drug Administration, a news bulletin was prepared and sent out and the entire subject given as much publicity as possible. This was done with a view of obtaining sufficient publicity and to arouse enough interest to enable the Committee to obtain a large number of compounded prescriptions of which a study could be made. The chairman wishes to thank not only the members of his Committee but also Dr. R. L. Swain, of Baltimore, and Mr. John M. Woodside, of Harrisburg, Pennsylvania, for furnishing material and data.

The chief factors to be studied in connection with prescription tolerances are as follows:

- (a) Moisture and allowable impurities in chemicals.
- (b) Decomposition and deterioration.
- (c) Unavoidable errors in the weight of the individual powders, pills or capsules.
- (d) Unavoidable losses due to a portion of the prescription ingredients remaining in the mortar or adhering to utensils.
- (e) Unavoidable errors in weighing and measuring.

It was realized that not all of these points could be properly considered at one time and the work of the past year was chiefly in connection with making a study of the unavoidable and normal variations in the weights of individual powders and capsules.

With this in view a prescription not subject to decomposition or moisture content changes was selected. It represented a mixture of powdered charcoal and magnesium oxide. Since the work of the Committee members consisted essentially of weighing the contents of the individual powders it was deemed necessary to first determine what losses this weighing operation involved. For this purpose 15-grain powders consisting of 10 grains of charcoal and 5 grains of heavy magnesium oxide were prepared by weighing the ingredients directly on a counterbalanced powder paper. The latter were then folded and placed in a prescription box. This operation was repeated with 10 grains as well as 5 grains of the mixture per powder. One set was prepared with ordinary powder papers and another with wax impregnated papers. The papers were then unfolded and the contents carefully transferred to a watch glass and weighed. The findings were as follows:

AVERAGE LOSS PER POWDER.

	Plain Paper.	Waxed Paper.
15-grain powders	0.05 grain	0.16 grain
10-grain powders	0.04 grain	0.14 grain
5-grain powders	0.035 grain	0.13 grain

* Presented before Section on Practical Pharmacy and Dispensing, A. Ph. A., Washington meeting, 1934.

It will be noted that these variations are negligible but, of course, become proportionately greater with the smaller powders. While the above are average losses yet all of the 12 powders in any one set varied only very slightly from the mean. All in all the losses were considered negligible and not taken into consideration in further powder weight determinations of this particular mixture although, no doubt, the character of the powder may at times increase this error considerably.

Some 600 prescriptions of 10 powders each of the previously mentioned charcoal and magnesia mixture were obtained. They had been prepared by pharmacists, by students, by college instructors and by Board candidates as part of their practical examination. In no case were the compounders aware of the fact that the preparation was to be used for any special purpose. The contents of each of the powders were accurately weighed. The tabulation of the 6000 weights showed many interesting facts.

It was found that in a considerable number of prescriptions submitted the total weight of the contents of the 10 powders varied so greatly from the amount prescribed that it became apparent that the variations were due to one or more of the following factors:

- (a) Faulty weights or balances.
- (b) Errors in reading the prescriptions.
- (c) Errors in calculation.
- (d) Loss of powder through gross carelessness.

Since this study had as its object the determination of normal and average variations in the division of the powder mixture it became obvious that the introduction of these enumerated errors would only lead to confusion. Some 150 prescriptions which varied in total weight more than 10% from that prescribed were omitted from further study and consideration. Over 90% of these had been compounded by students and by Board examination candidates.

In general the prescriptions compounded by pharmacists varied only very slightly in total weights of contents.

The following list shows the total weight of the contents of ten sets of 15-grain powders taken at random:

146.5 grs.	147.1 grs.	154.2 grs.	146.2 grs.	151.7 grs.
143.2 grs.	143.8 grs.	144.6 grs.	148.3 grs.	152.1 grs.

The following can be taken as a cross section of the total weights of the 10-grain powders:

104.5 grs.	102.9 grs.	99.0 grs.	97.4 grs.	103.3 grs.
98.2 grs.	97.6 grs.	101.7 grs.	102.6 grs.	96.7 grs.

The 5-grain powders showed the following:

49.2 grs.	48.7 grs.	51.3 grs.	52.6 grs.	48.3 grs.
47.9 grs.	52.2 grs.	51.9 grs.	50.6 grs.	49.6 grs.

These figures are characteristic of the prescriptions compounded by pharmacists and show a considerable degree of accuracy. The average variation in the 15-grain powders is ± 0.383 gr. per powder, for the 10-grain powders ± 0.261 gr. per powder and for the 5-grain powders ± 0.149 gr. per powder. The interesting point here is that the error becomes smaller as the powders become lighter although the percentage of error is about the same.

These figures would indicate that in a mixture of this kind losses due to faulty weighing, mixing in a mortar and transferring to powder papers are small when properly conducted. Unfortunately, however, this cannot be said of the variations found in the weights of the individual powders. It would seem that many physicians prescribe powders in order to be reasonably sure of proper dosage and the findings of this committee would indicate that there is much room for improvement of this phase of prescription compounding.

The following is a tabulation of the weights in grains of some of the 15-grain sets of powders taken at random:

No.										
1	10.6	15.3	13.2	9.5	17.2	16.3	15.2	14.3	16.4	17.0
2	13.7	14.6	15.3	15.0	15.4	14.1	13.9	14.2	15.6	16.2
3	13.5	16.1	15.9	14.8	15.1	13.9	16.2	14.9	13.9	14.2

4	18.6	16.3	12.2	16.5	17.2	11.6	14.1	13.9	12.8	15.0
5	16.5	16.1	15.0	14.9	13.9	16.5	15.1	14.8	14.7	15.2
6	14.6	14.9	15.2	15.9	13.9	16.0	15.3	14.6	14.1	15.1
7	11.2	11.9	17.2	15.8	16.9	18.0	12.2	10.9	14.2	17.2
8	12.6	14.3	15.9	12.1	14.9	16.2	17.0	14.9	15.2	16.0
9	13.8	14.2	14.1	16.3	16.1	14.8	15.2	15.7	14.9	16.2
10	10.6	17.8	17.2	16.9	12.3	13.4	16.8	16.5	15.1	17.3
11	19.7	16.3	14.2	17.6	11.2	13.8	14.2	16.5	15.3	16.5
12	14.6	14.0	13.9	16.2	16.3	15.2	15.7	15.6	14.9	16.1
13	14.3	14.9	16.1	14.7	15.3	15.6	15.1	15.4	19.9	16.3
14	15.2	15.0	14.6	14.9	14.1	16.1	13.9	15.5	14.2	16.2
15	18.2	17.3	14.3	15.7	12.1	11.0	10.9	17.2	15.4	15.1
16	17.6	15.2	14.3	13.2	12.6	18.0	17.1	12.2	15.4	17.2
17	14.3	13.9	15.1	16.2	15.3	15.9	16.1	14.0	15.2	13.8
18	14.1	15.9	15.2	15.0	16.0	15.5	13.9	14.1	14.3	15.2

These represent a good cross section of the 180 sets examined. The complete tabulation would be entirely too long and serve no good purpose at this time. This complete tabulation, however, shows that 53.3% of the sets consisted of powders which varied by less than ± 1.5 grains from the theoretical 15 grains. 72.2% of the sets were made up of powders which varied less than ± 2.25 grains. 83.8% of the sets were made up of powders which varied less than ± 3 grains.

The 10-grain powders showed the following cross section:

No.										
1	9.2	8.0	12.0	10.2	10.9	7.6	11.9	11.9	8.1	10.3
2	12.2	10.6	10.1	11.9	8.6	8.7	9.2	10.3	9.6	8.6
3	9.2	9.6	10.4	10.6	9.1	11.0	9.7	9.1	10.7	9.9
4	9.7	10.2	10.6	9.3	10.2	10.3	9.2	10.1	9.7	9.2
5	10.3	10.6	10.7	9.2	9.1	9.7	10.8	10.6	9.4	9.7
6	7.3	8.9	13.6	13.9	7.9	10.4	10.9	12.2	12.1	7.4
7	8.1	11.7	11.3	8.9	9.1	10.8	11.7	11.9	8.8	8.2
8	8.4	8.9	11.7	10.2	11.6	9.8	10.1	8.8	11.2	10.2
9	10.6	10.5	9.5	9.8	9.9	10.2	10.0	10.9	9.1	10.7
10	9.7	10.0	10.1	10.5	9.6	9.8	9.6	9.2	10.7	10.2
11	7.9	7.4	6.9	14.2	8.9	10.6	10.1	7.8	9.2	14.5
12	8.7	7.9	12.1	12.3	10.8	10.7	9.2	9.9	10.2	10.8
13	10.6	10.1	9.8	9.2	9.5	10.6	10.1	10.0	9.9	10.4
14	10.5	10.2	10.3	10.1	10.0	9.1	9.2	9.4	9.4	9.2
15	10.4	11.0	9.9	9.7	9.5	10.3	10.2	10.0	9.7	9.1
16	7.2	8.4	12.3	10.6	10.2	10.1	11.9	11.8	9.6	9.9

The entire tabulation of 160 sets of 10-grain powders showed that 50.6% of the sets consisted of powders which varied by less than ± 1 grain from the theoretical 10 grains. 69.4% varied less than ± 1.5 grains and 82.5% varied less than ± 2 grains.

The following will show the weight of the 5-grain powders:

No.										
1	4.7	4.9	5.2	5.1	5.3	5.4	4.9	4.7	4.6	4.8
2	4.1	4.3	5.7	5.2	5.6	5.7	5.9	4.3	4.7	4.1
3	4.9	4.6	5.3	5.4	5.0	4.5	4.7	4.8	5.1	4.5
4	4.0	5.7	5.9	6.1	3.9	4.2	4.9	5.8	4.1	3.9
5	3.8	7.1	7.0	4.1	4.3	4.6	4.2	4.7	5.1	5.5
6	7.0	6.9	3.9	4.7	4.6	5.2	5.4	4.7	4.9	4.6
7	4.7	5.2	5.3	4.6	4.5	5.4	5.4	5.2	4.9	4.6
8	4.6	4.8	4.7	4.9	5.2	5.5	5.0	5.1	4.7	4.5
9	4.7	4.6	5.2	5.3	5.4	5.0	4.7	4.9	4.8	5.3
10	5.1	5.7	5.4	5.2	4.6	4.6	4.9	4.5	4.7	4.7

No.										
11	3.9	4.2	7.2	6.5	5.4	5.1	4.0	4.7	4.6	4.9
12	4.1	4.7	4.6	4.9	4.3	5.4	5.5	5.2	5.3	5.0
13	6.2	6.4	6.3	4.1	4.5	4.2	4.3	5.1	5.0	5.5
14	4.2	4.8	4.9	4.7	5.3	5.8	5.9	5.2	5.0	5.9

A total of 140 sets of 5-grain powders were tabulated as to their individual weights and showed that 50% varied by less than ± 0.5 grains. 70.7% varied by less than ± 0.75 grains and 80.7% by less than ± 1.0 grain.

An abstract of all of the preceding findings would show the following:

Number of powder prescriptions studied, 600 (10 powders each).

Number eliminated because of excessive variation in gross weight, 150 or 25%.

	% of Sets within $\pm 10\%$ Variation.	% of Sets within $\pm 15\%$ Variation.	% of Sets within $\pm 20\%$ Variation.
15-grain powders	53.3	72.2	83.8
10-grain powders	50.6	69.4	82.5
5-grain powders	50.0	70.7	80.7

It would seem, therefore, that in ordinary powder prescription compounding there is little difference in the degree of accuracy obtained with powders of different weights. It would also seem that there is considerable room for a greater degree of accuracy than that commonly practiced in the division of the powder mixture.

No data were obtained as to the exact method by which the powders had been divided in the compounding of these prescriptions. Probably most of them were divided by the "eye" method and not weighed individually as that seems to be the general practice. In this connection it was reported by a member of this Committee that as much as a 1-grain variation was found in the weights of the powder papers in a box of 500 (No. 40) papers examined. This would indicate that if the powders are weighed individually it should be done by use of a counterbalanced watch glass and not by weighing with or on the paper. Your chairman has found that a group of advanced pharmacy students when told in advance that the contents of the papers would be weighed could prepare 5-, 10- and 15-grain powders all within a $\pm 10\%$ variation by the "eye" method. A variation of 1 grain in the weights of the empty powder papers would prevent this degree of accuracy particularly in the lighter mixtures when made by weighing the individual powders on the papers. It seems reasonable to suppose that the prescription pharmacist could use the same degree of skill in his ordinary work.

CONCLUSIONS ON POWDER PRESCRIPTIONS.

That in a prescription of this general nature the gross weight of the powders should not vary more than $\pm 5\%$ from the theoretical weight.

That in the division of the powders the "eye" method is satisfactory.

That the variations in the weights of the individual powders should not exceed $\pm 10\%$ from the gross weight divided by the number of powders in the prescription.

VARIATIONS IN CAPSULE PRESCRIPTIONS.

A study was begun by our Committee of normal variations in the weights of capsule contents. This study is far from complete and may therefore be considered in the nature of a preliminary report.

Since the usual practice of pharmacists in filling capsule prescriptions is to weigh each filled capsule and using as a counterbalance an empty capsule it was thought important to determine variations in the weights of empty capsules with the following findings:

	Number Weighed.	Average Wt. per Capsule.	Wt. of Lightest Capsule.	Wt. of Heaviest Capsule.	Average \pm Variation from Mean Capsule Wt.
No. 0 capsule	200	0.1084 Gm.	0.0892 Gm.	0.1262 Gm.	11.9%
No. 1 capsule	200	0.08809 Gm.	0.0798 Gm.	0.1012 Gm.	9.2%
No. 4 capsule	200	0.03740 Gm.	0.0310 Gm.	0.0411 Gm.	8.1%

These figures prove that the variations in the weights of the empty capsules themselves are so great as to preclude a degree of accuracy comparable with the results obtained in the preceding study of the powder weights. The average empty capsule weight varies about 10% from the average weight of a large number. A few capsule prescriptions were obtained and the contents of the individual capsules weighed. While the number of determinations were not considered large enough to allow of any final conclusions yet the following tabulation will give some insight as to what may be expected. The same charcoal and magnesia mixture employed in the powder investigation was again used and 50 weights of each size were determined.

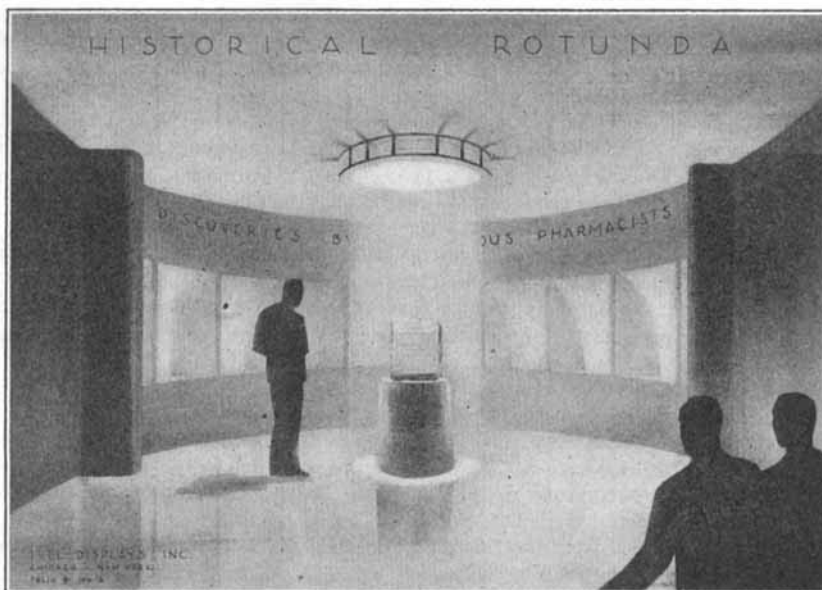
5-GRAIN CAPSULES (5 SETS OF 10 CAPSULES EACH).

Gross weight of sets in grains	46.2	44.3	47.2	42.1	45.6
Average \pm variation—14.2%					
Highest individual capsule content—5.62 grains					
Lowest individual capsule content—3.15 grains					

3-GRAIN CAPSULES (5 SETS OF 10 CAPSULES EACH).

Gross weights of sets in grains	26.5	24.6	23.2	27.8	26.3
Average \pm variation—16.3%					
Highest individual capsule content—3.23 grains					
Lowest individual capsule content—1.9 grains					

A study of the tabulation made shows that in any single set the contents of the individual capsules run as a rule fairly constant for seven or eight capsules and then there are several which run far under or over weight. This of course can be explained by the fact that the compounder filled the first capsules fairly uniformly but found toward the end that there was either too much or too little powder left for the last few capsules. Further determinations and more study must however, be given to capsule compounding.



The Historical Rotunda tells the story of discoveries, and spaces are assigned to portraits of famous pharmacists; the American Pharmacy Building is featured. In order to interest the public a portion of Ebers Papyrus is shown of the World's oldest prescription.