was recrystallized from 10 cc. of hot water. Yield 6.75 Gm., melting at 190–192°, with decomposition.

Catalytic Hydrogenation to Phenyl Ethanolamine.—$C_6H_5.CO.CH_2.NH_2.HCl \xrightarrow{H_2} C_6H_5.$-$CHOH.CH_2.NH_2.HCl$.

0.2 Gm. of platinum oxide (prepared by the method of Adams and Shriner, Org. Syn., VIII, 92) was reduced by shaking with hydrogen in aqueous suspension. The platinum black was filtered off and added to the solution of 6.75 Gm. of ω-aminoacetophenone hydrochloride in 225 cc. of redistilled alcohol and 12.5 cc. of conc. HCl. Absorption of hydrogen took place at the rate of 2 cc. per minute. When 970 cc. had been taken up, the reaction was stopped; theoretical for 1 mol., 963 cc. The filtrate from the platinum was evaporated to dryness *in vacuo*. The residue was twice recrystallized from absolute alcohol-ether; yield, 4.31 Gm., melting point 165–168°, with decomposition. The composition of the compound was verified by analysis of its chloroplatinate.

0.2 Gm. of the hydrochloride was dissolved in 2 cc. of absolute alcohol containing 0.25 cc. of HCl, and treated with 3 cc. of 10% aqueous chloroplatinic acid. The orange precipitate was washed with ice-cold alcohol and dried at 105°. Yield 0.29 Gm., melting point 203–204° with decomposition.

Analysis:

Found: Pt.: 28.45%.
Calcd. for $(C_8H_{11}ON)_2.H_2PtCl_6$: 28.53%.

Preparation of the Oleate.—In order to avoid all possibility of decomposition, the free base was prepared by the action of silver oxide and converted, without isolation, to the oleate. 4.0 Gm. of the hydrochloride was dissolved in alcohol and an excess of freshly precipitated silver oxide stirred in until the formation of silver chloride was complete. The filtrate was evaporated *in vacuo* with the theoretical quantity of oleic acid (6.54 Gm.) until free of alcohol.

The neutral oleate thus obtained was dissolved in liquid petrolatum for the physiological tests.

The biological tests on compounds reported herein were made in the Biological Research Laboratories of E. R. Squibb and Sons and we gratefully acknowledge their assistance.

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VARIATIONS IN HAND-MOLDED HYPODERMIC TABLETS.*

BY S. WALLEY BOWER.

During the past year the question of Variations in Hand-Molded Hypodermic Tablets arose, which suggested the following observations:

(*a*) What is the error in the manufacture of these tablets as based on the theoretical?

(*b*) What variations take place when the molding of the same lot of tablets extends over a period of several days?

(*c*) What is the relationship of the percentage error of the total count of the entire lot (as an average) with the error of tablets when weighed in small subdivisions?

* Section on Practical Pharmacy and Dispensing, A. Ph. A., Madison meeting, 1933.

(*d*) What is the difference in error in the molding of one-half grain and one-fourth grain tablets?

Four lots of one-half grain morphine sulphate tablets were selected at random. Each lot was molded by the same operator. This person has been molding tablets for ten years and is experienced in the manufacture. A steel plate containing 200 perforations was used in the making, thus turning out 200 tablets at each operation.

The formula was based on the following: Morphine sulphate, U. S. P. 100 ounces; milk sugar, 16 ounces; making a total weight of 116 ounces, or 50,750 grains. Thus, each 100 tablets was calculated to weigh 58 grains, the mixture theoretically yielding 87,500 one-half grain tablets.

Inasmuch as one-fourth grain tablets are made from a mold the thickness of which differs from that of one-half grain tablets, these two sizes are considered separately.

Four lots of one-fourth grain morphine sulphate tablets were selected. These were based on the following formula: Morphine sulphate, U. S. P., 100 ounces; milk sugar, 88 ounces; total weight, 188 ounces, or 82,250 grains. Each 100 tablets in this instance weighed 47 grains, producing a total theoretically of 175,000 tablets

The molding extended over a period of days, as shown in the following table

TABLE I.—TABLETS MOLDED EACH DAY.

Days.	Lot 1.	Lot 2.	Lot 3.	Lot 4.
		One-Half Grain Tablets.		
1	9,000	27,000	14,000	4,000
2	22,000	32,000	24,000	23,000
3	26,000	29,124	30,000	28,000
4	24,000		20,887	26,000
5	9,802			7,590
Total	90,802	88,124	88,887	88,590
		One-Fourth Grain Tablets.		
1	34,000	18,000	30,000	20,000
2	34,000	30,000	36,000	33,000
3	33,000	34,000	36,000	30,000
4	33,000	34,000	40,000	33,000
5	33,000	34,000	35,308	33,000
6	7,662	25,713		29,008
Total	174,662	175,713	177,308	178,008

TABLE II.—ERROR IN YIELD BASED ON THE THEORETICAL.

Lot.	Yield.	Theoretical.	Over or Under Theoretical.	Per Cen .
		One-Half Grain Tablets.		
1	90,802	87,500	3,302 over	96.40
2	88,124	87,500	624 over	99.49
3	88,887	87,500	1,387 over	98.44
4	88,590	87,500	1,090 over	98.77
		One-Fourth Grain Tablets.		
1	174,662	175,000	338 under	100.19
2	175,713	175,000	713 over	99.59
3	177,308	175,000	2,308 over	98.70
4	178,008	175,000	3,008 over	98.31

In this connection, during several days' work, the human element and physical condition varying in the operator must be taken into consideration. Fatigue might develop late in the day, which would have a tendency to vary the hand pressure in the filling of the molds and slow down the production. Also, the person might work a longer period of time one day than another on this work. This variation may be noted in Table II.

The tablets were allowed to air dry for two days. From each lot manufactured, 5000 tablets were counted and weighed; this being considered as a representative sample. The percentage variation from the theoretical was computed. Also, this percentage variation was compared with the average percentage variation of the entire lot, and the difference noted.

TABLE III.—PERCENTAGE VARIATION OF 5000 TABLETS.

Lot.	Weight of 5000 Tablets in Grains.	Per Cent Variation from Theoretical.	Average Per Cent Variation of Entire Lot.	Per Cent Variation from Average.
		One-Half Grain Tablets.		
1	2768	95.45	96.40	0.95−
2	2855	98.46	99.49	1.03−
3	2846	98.15	98.44	0.29−
4	2809	96.87	98.77	1.90−
		One-Fourth Grain Tablets.		
1	2335	99.39	100.19	0.80−
2	2328	99.10	99.59	0.49−
3	2292	97.55	98.70	1.15−
4	2353	100.15	98.31	1.84+

TABLE IV.—VARIATIONS IN 500 TABLETS FROM THEORETICAL.

	Lot 1.		Lot 2.		Lot 3.		Lot 4.	
	Wt. of 500 Tablets in Grains.	Per Cent.	Wt. of 500 Tablets in Grains.	Per Cent.	Wt. of 500 Tablets in Grains.	Per Cent.	Wt. of 500 Tablets in Grains.	Per Cent.
				One-Half Grain Tablets.				
1	275.6	95.02	283.7	97.84	279.1	96.23	282.6	97.45
2	282.8	97.50*	288.2	99.38	284.7	98.18	274.7	94.72
3	282.5	97.42	291.5	100.54	280.1	96.58	288.8	99.60
4	278.9	96.12	279.8	96.50**	286.7	98.86	283.5	97.75
5	268.2	92.47**	281.3	97.00	280.2	96.61	289.1	99.71*
6	274.9	94.78	294.0	101.38*	286.6	98.85	274.5	94.65
7	274.7	94.74	289.4	99.80	278.6	96.07**	274.6	94.70
8	278.1	95.88	292.0	100.70	293.8	101.33*	284.7	98.17
9	279.9	96.51	291.7	100.57	292.9	101.02	282.7	97.59
10	272.4	93.94	283.5	97.76	284.3	98.02	273.8	94.43**
				One-Fourth Grain Tablets.				
1	228.8	97.35	232.4	98.89	224.4	95.48	229.8	97.77**
2	235.9	100.39	234.3	99.68	228.4	97.19	237.2	100.95
3	236.0	100.40	227.3	96.73**	232.1	98.76	237.5	101.07
4	233.6	99.41	234.6	99.82	230.3	98.00	230.1	97.92
5	236.5	100.64*	234.1	99.60	231.5	98.53	232.2	98.79
6	228.4	97.20**	234.6	99.84	231.2	98.40	232.6	98.97
7	236.3	100.54	228.4	97.20	233.2	99.08*	234.3	99.72
8	233.5	99.36	234.1	99.61	223.1	94.92**	233.9	99.54
9	233.3	99.28	234.2	99.67	227.9	96.98	242.8	103.34
10	233.5	99.36	234.7	99.87*	230.3	98.01	243.1	103.47*

* High. ** Low.

To determine what variations occurred in 5000 tablets, these were divided into lots of 500 tablets. The subdivisions were weighed and the percentage variation calculated from the theoretical.

The theoretical weight of the one-half grain tablets was 290 grains; that of the one-fourth grain, 235 grains.

As it was desired to note the greatest variation that could be found in each lot, the high and the low 500 tablets of each of these was now divided into five parts of 100 tablets each and weighed. From these weighings, the percentage error was computed and tabulated. This was based on the theoretical that 100 tablets of half-grain strength weighed 58 grains and 100 tablets of one-fourth grain strength, 47 grains.

TABLE V.—VARIATIONS IN THE HIGH AND LOW OF 500 TABLETS.

	Lot 1.		Lot 2.		Lot 3.		Lot 4.	
	Wt. of 100 Tablets in Grains.	Per Cent.	Wt. of 100 Tablets in Grains.	Per Cent.	Wt. of 100 Tablets in Grains.	Per Cent.	Wt. of 100 Tablets in Grains.	Per Cent.
				One-Half Grain Tablets.				
High.								
A	56.75	97.84	58.89	101.53*	58.91	101.54*	57.72	99.51
B	57.02	98.31*	58.74	101.27	58.69	101.20	58.40	100.68*
C	56.41	97.26	58.69	101.19	58.66	101.14	57.67	99.43
D	56.37	97.19	58.84	101.45	58.69	101.20	57.21	98.63
E	56.84	98.00	58.67	101.16	58.66	101.14	58.07	100.12
Low.								
A	53.64	92.49	55.83	96.27	55.71	96.05	54.53	94.03**
B	53.60	92.41	55.83	96.27	55.59	95.84**	54.77	94.43
C	53.72	92.62	55.82	96.24	55.70	96.03	54.68	94.27
D	53.55	92.33**	55.63	95.92**	55.73	96.08	55.03	94.88
E	53.66	92.52	56.10	96.72	55.66	95.97	54.83	94.53
				One-Fourth Grain Tablets.				
High.								
A	47.19	100.40	46.93	99.85	46.47	98.86	48.55	103.30
B	47.33	100.70	47.06	100.13*	46.58	99.10*	48.64	103.50
C	47.50	101.06*	46.65	99.49	46.42	98.77	48.70	103.63*
D	47.09	100.17	46.80	99.57	46.39	98.70	48.32	102.80
E	47.06	100.15	46.87	99.72	46.47	98.86	48.61	103.43
Low.								
A	45.73	97.29	45.37	96.53**	44.63	94.96	46.00	97.88
B	45.70	97.22	45.52	96.85	44.53	94.69	45.90	97.65
C	45.90	97.65	45.42	96.63	44.57	94.83	45.90	97.65
D	45.32	96.43**	45.43	96.65	44.47	94.63**	46.05	97.98
E	45.54	96.90	45.37	96.53	44.66	95.02	45.76	97.36**

* High.
** Low.

The figures in the above columns represent the greatest and least deviation from the required standard as found in a representative sample of 5000 tablets taken from each lot. It is quite sufficient that these figures may be considered in basing an average. Consulting the above table, the greatest and least variations of one hundred tablets may be noted. By subtracting the low figure from the high, the total variation in weight of each separate lot may be determined. This represents the variation which may be expected and caused by the difference of hand pressure in the filling of the molds by the operator.

TABLE VI.—EXTREMES OF VARIATION.

	Lot 1. Wt. of 100 Tablets in Grains.	Lot 1. Per Cent.	Lot 2. Wt. of 100 Tablets in Grains.	Lot 2. Per Cent.	Lot 3. Wt. of 100 Tablets in Grains.	Lot 3. Per Cent.	Lot 4. Wt. of 100 Tablets in Grains.	Lot 4. Per Cent.
One-Half-Grain Tablets.								
High	57.02	98.31	58.89	101.53	58.91	101.54	58.40	100.68
Low	53.55	92.33	55.63	95.92	55.59	95.84	54.53	94.03
Variation	3.47	5.98	3.26	5.61	3.32	5.70	3.87	6.65
One-Fourth Grain Tablets.								
High	47.50	101.06	47.06	100.13	46.58	99.10	48.70	103.63
Low	45.32	96.43	45.37	96.53	44.47	94.63	45.76	97.36
Variation	2.18	4.63	1.69	3.60	2.11	4.47	2.94	6.27

The results of the weighings thus place the variations of the tablets within certain limits. These limits may now be assumed to represent the extreme limits of error over or under the theoretical, and within which the tablets of each lot occur. The following table shows this as percentage error.

TABLE VII.—EXTREMES OF VARIATION FROM THEORETICAL.

	Lot 1. Per Cent Error.	Lot 2. Per Cent Error.	Lot 3. Per Cent Error.	Lot 4. Per Cent Error.
One-Half Grain Tablets.				
High	1.69−	1.53+	1.54+	0.68+
Low	7.67−	4.08−	4.16−	5.97−
One-Fourth Grain Tablets.				
High	1.06+	0.13+	0.90−	3.63+
Low	3.57−	3.47−	5.37−	2.64−

SUMMARY.

There does not appear to be any fixed ratio between the percentage error of the entire lot of these tablets, taken as a single unit, and the percentage error of the component subdivisions. Several weighings of small quantities of tablets must be made to base an average. However, the percentage error of the entire lot may serve as a guide. Too large a percentage error, that is, too great an over or under yield in the total number of tablets of any single lot, should convey the idea that in the weighing of the subdivisions some of these might be found to be considerably over or under in strength.

The variation is similar in both the one-half grain and the one-fourth grain tablets.

The variations appear to be reasonable, when the nature of the work is considered, and to fall within reasonable tolerances. Therefore, the present tolerances for hypodermic tablets should not be lessened with any new or proposed changes in the law.

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