Weight of Drops of Various Liquid Medicaments.

Friederich Eschbaum has recently made an exhaustive study of the question, propounded at the meeting of the German Pharmaceutical Association last year, "Is it possible to obtain from the same liquid, at all times, drops of identical size and weight?" The study is published in full in the *Deutsche Medizinische Wochenschrift*, from which we extract the following conclusions:

The size and weight of a drop is determined by two circumstances or conditions, viz.: (1) The adhesion existing between the liquid and the glass, and (2) the specific cohesion of the liquid.

In regard to the first condition, the author says: *Drops of uniform size cannot be obtained by uniformity in the size or shape of the neck of the container, since the quantity of liquid in the latter has an influence on the quantity massing itself into the drop. They can be obtained, however, from a burette, and the sharper the point of the latter the smaller the size of the drops, and vice versa;* but it is the size of the external circumference of the point of exit which determines the size of the drop.*

To demonstrate this proposition, Eschbaum gives the following figures:

External diameter of point of pipette.	Weight of a drop.
0.67 mm.	0.0134 gm.
1.39 mm.	0.0262 gm.
2.89 mm.	0.0492 gm.
3.07 mm.	0.0522 gm.
4.17 mm.	0.0690 gm.
6.56 mm.	0.1000 gm.
8.32 mm.	0.1260 gm.
14.90 mm.	0.2250 gm.

SPECIFIC COHESION OF THE LIQUID.

The specific cohesion of various liquids varies within very wide bounds, being *greatest in water* and least in ether, glycerin and alcohol standing in that order between the two. To illustrate this, Eschbaum let the liquids drop from a burette of 6.56 mm. external diameter at 15° C., *and found that* 50 drops of each named liquid had the following weight:

Water	5.00 gm.
Glycerin	3.90 gm.
Absolute alcohol	1.54 gm.
Alcohol, 93	1.70 gm.
Alcohol, dilute, G.P.	1.87 gm.
Ether	1.22 gm.

The specific cohesion of a fluid is affected by temperature, but, according to our author, in small amounts the variation from this cause is too small to be taken into account practically.

The specific cohesion of a solution of a solid substance in a liquid *is lower than that of the liquid.*

The drops of a solution, all other circumstances being equal, are therefore smaller than those of the menstruum.

The specific cohesion of liquids is therefore *in inverse ratio to their specific weight, so that the absolute weight of a drop of a salt solution, for instance, is almost identical with that of a drop of the original menstruum.* All these results demonstrate the absurdity of our present methods, and led Eschbaum to formulate the following proposition for

RATIONAL DOSATION BY DROPS.

As a standard of unity, let a pipette be chosen having an external diameter of point of delivery of 6.56 mm. Such a pipette delivers drops of distilled water weighing 10 cgm. each, or 10 drops to the gram; or 26 drops of a tincture made of dilute alcohol to the gram.

While the ordinary medicine dropper, with a gum bulb, seems to Eschbaum the most convenient for the patient, on account of its inaccuracy and the careless habits of the majority of nurses he advises a measuring apparatus for lay use, described as follows:

THE RATIONAL MEDICINE DROPPER.

Take an ordinary medicine glass, holding from 30 to 60 ccm., and fit it with a bored cork, through which pass a strong glass tube from 2½ to 3 cm. long, the inner end of which is even with the lower surface of the cork, and the outer end projects, say a centimetre, from the top of the latter. The delivery point *is not drawn to a point*, but is so molten as to leave a very small opening in it, while the lower end of the tube is molten only sufficient to remove the sharp edge, and even this may be omitted. The outer end should have a diameter of from 7 to 7½ mm. (from .28 to .30 inch) and be nearly flat, or only slightly rounded at the edges.

The dropper thus formed should be not more than half filled, and when it is desired to use it, it should be grasped in the palm of the hand and turned upside down over the spoon or other receiver. The heat of the hand, expanding the residual air, will slowly drive out several drops, each of exactly the same size. A well-made dropper of this sort may be turned upside down and left thus for several minutes without a drop escaping until the hand (or other external source of warmth) is applied.

While the use of the "drop" as a unit of measure in medicine and pharmacy is to be discouraged, and no one is more convinced of the fact than our author, he recognizes the impossibility of reforming the professions all at once, and the futility of such an attempt. He has therefore done the next best thing, and has, with most commendable patience and accuracy, worked out a table of the weight of drops of the various medicaments in common use, selections from which we present below.

The results presented in the following table were obtained by the use of a burette with an external diameter of 6.56 mm. (say .26, or a full quarter of an inch). It is unnecessary to remark that a burette should be firmly held in measuring, as a trembling hand causes the drop to be shaken off the point before it has completely formed.

TABLE OF DROPS TO THE GRAM OF LIQUID.

Acetum	13
Acid, carbolic liq	18
Acid, hydrochloric	11
Acid, hydrochloric dil	10
Acid, phosphoric	10
Acid, sulphuric aromatic	25
Acid, sulphuric dilute	10
Amylene, hydrate	31
Amyl, nitrate	33
Bromine	17
Creosote	19
Chloroform	26
Ether	41
Ether, acetic	30
Ether, bromic	29
Extracts, narcotic, dissolved, according to the solvent, which see	17-20
Formaldehyde, solution	16
Glycerin	13
Liquor, ammoniæ aromatic	27
Liquor, ammoniæ caustic	11
Liquor, ferri subacetat	12
Liquor, ferri sesquichlor	9
Liquor, potass, arsenit	15
Oil of almonds	20
Oil of anise	20
Oil of caraway	21
Oil of clove	20
Oil of cinnamon	21
Oil, croton	21
Oil of lemon	26
Oil of peppermint	24
Oil, olive	21
Oil, mustard	22
Oil of turpentine, rect	27
Oil, paraffin	23
Paraldehyde	27
Syrup of iodide of iron	10
Spirit (alcohol)	29
Spirit of ether	31
Spirit of nitrous ether	29
Spirits camphor	26
Spirit, dilut (alcohol dilute)	27
Tinctures prepared with alcohol	29
Tinctures prepared with dilute alcohol	27
Tincture, ethereal acetate of iron	26
Tincture, ethereal chloride of iron	30
Tincture of malate of iron	14
Tincture of iodine	29
Tincture of musk	21
Tincture of opium (G.P.)	26
Tincture of rhubarb, aqueous	14
Tincture of rhubarb, vinosus	17
Tincture of strophanthus	26
Tincture nux vomica	26
Tincture of valerian	26
Tincture of valerian, etheric	30
Water of bitter almond	19
Water, chlorine	10
Water, distilled	10
Wine of camphor colchicum, ipecac, etc	17

TO THE DOCTORS.

In conclusion, Eschbaum gives the following very good advice to the physicians: Either regulate your doses after the information conveyed to you in this table, or, what is better, name the absolute weight or measure of the dose prescribed.—*National Druggist.*

Copper hemal (hæmalum cupratum), a compound of hæmoglobin with copper (2 per cent.), has been recommended by Prof. Kobert, in doses of not to exceed 0.5 gram three times daily.

Anesthyle describes a local anæsthetic mixture, composed of five parts of ethyl chloride and one part of methyl chloride.

Sodium nitrite, combined with an acid vegetable extract in pills, has been observed to decompose, causing the pills to swell.

*Quicksilver is the only fluid that forms an exception to this rule. The size of the drops of this substance is determined by the diameter of the opening in the clear.